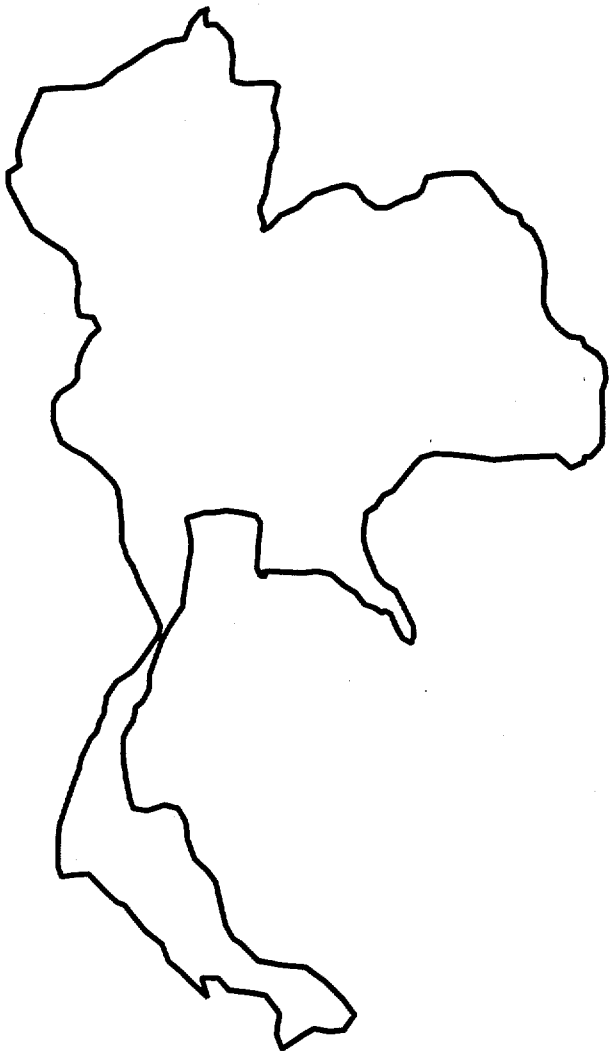
PN-ABZ-452
92153

Feasibility Study *for a* Thailand Global Transpark

Final Report

THAILAND
Open Society
Dynamic Economy

June 1994



Feasibility Study
for a
Thailand Global Transpark

Final Report

June 1994

prepared by **Kimley-Horn and Associates, Inc.**
3001 Weston Parkway
Cary, North Carolina 27513-2301
USA

tel. (919) 677-2000 ■ fax (919) 677-2050

Kimley-Horn

2

Table of Contents

CHAPTER		PAGE
I.	**ACKNOWLEDGEMENTS AND REPORT SUMMARY**	
	A. Purpose	I-1
	B. Study Authority and Oversight	I-1
	C. Research Team and Support	I-2
	D. Report Conclusions	I-2
	E. Report Summary	I-3
	F. Special Considerations	I-8
II.	**GLOBAL TRANSPARK CONCEPT AND BACKGROUND**	
	A. Introduction	II-1
	B. Global Trade Trends	II-1
	C. Industrial Trends	II-10
	D. Logistics Trends	II-17
	E. Concept Overview	II-23
	F. Global Transpark Network	II-29
III.	**NORTH CAROLINA GLOBAL TRANSPARK**	
	A. Introduction	III-1
	B. Development of the Site of North Carolina Global TransPark	III-1
	C. North Carolina Air Cargo Airport Authority	III-2
	D. Global TransPark Foundation, Inc. and Development Commission	III-6
	E. North Carolina Site Selection Process	III-9
	F. North Carolina Global TransPark Description	III-21

Thailand Global Transpark

Final Report

CHAPTER		PAGE
IV.	**SOUTHEAST ASIA OVERVIEW**	
	A. Introduction	IV-1
	B. Economic Growth Review and Trends	IV-2
	C. Industrial Development	IV-54
	D. Transportation and Infrastructure	IV-68
	E. Summary	IV-102
V.	**THAILAND OVERVIEW**	
	A. Introduction	V-1
	B. Economic Growth Review and Trends	V-1
	C. Industrial Development	V-6
	D. Transportation and Infrastructure	V-21
	E. Government Policy	V-42
	F. Social Structure	V-45
	G. Summary	V-47
VI.	**MARKET FORECASTS FOR A THAILAND GLOBAL TRANSPARK**	
	A. Introduction	VI-1
	B. General Economic Trends	VI-1
	C. Industrial Structure, Growth and Investment	VI-3
	D. Foreign Trade	VI-14
	E. Air Cargo Activity	VI-24
	F. Industrial Forecasts	VI-33
	G. Summary	VI-42
VII.	**SOCIAL IMPACT ASSESSMENT**	
	A. Overview	VII-1
	B. Current Social Structure	VII-1
	C. Royal Thailand Government Social Development Plans	VII-10
	D. Population Forecasts	VII-13
	E. Social Impact of Thailand Global Transpark on Surrounding Site	VII-20

4

CHAPTER		PAGE
VIII.	**THAILAND GLOBAL TRANSPARK CHARACTERISTICS/CRITERIA**	
	A. Introduction	VIII-1
	B. Economic Considerations	VIII-1
	C. Industry Needs	VIII-2
	D. Technical Criteria	VIII-4
IX.	**ALTERNATIVE SITE ANALYSIS**	
	A. Introduction	IX-1
	B. Existing Commercial Service Airports	IX-2
	C. Level 1 Airports	IX-3
	D. Level 2 Airports	IX-14
	E. Selection of Candidate Airports for On-Site Surveys	IX-32
	F. Description of Site Reviews	IX-38
	G. Comparative Analyses	IX-59
X.	**REGULATORY ALTERNATIVES**	
	A. Overview	X-1
	B. Construction and Operation of a Commercial Airport	X-2
	C. Construction and Operation of Air Cargo Terminal and Ground Service Facilities	X-3
	D. Regulations Applicable to the Construction and Operation of an Industrial Estate (Industrial Park)	X-4
	E. Regulations on Land Use	X-6
	F. Operating Aircraft in Thailand	X-6
	G. Customs Regulations on Importation and Exportation of Goods and Materials	X-6
	H. Immigration Regulation	X-8
	I. On-Site Security	X-8
	J. Assessment of Regulatory Options for a Thailand Global Transpark	X-9
	K. Management and Operating Options	X-10

CHAPTER **PAGE**

XI. FINANCIAL FEASIBILITY
A. Current Thai Financial Sector XI-1
B. Recent Major Project Funding XI-6
C. Review of Funding Alternatives for a Thailand Global Transpark XI-10
D. Assessment of Funding Alternatives XI-13

XII. CONCLUSIONS AND IMPLEMENTATION RECOMMENDATIONS
A. Conclusions XII-1
B. Supporting Trends and Factors XII-2
C. Recommended Sites for a Thailand Global Transpark XII-8
D. Implementation Recommendations XII-9

6

LIST OF EXHIBITS

		PAGE
Exhibit II-1.	Per Capita Gross National Product 1971-1991	II-3
Exhibit II-2.	Leading Exporters and Importers in World Merchandise Trade, 1991	II-5
Exhibit II-3.	Regional Structure of World Merchandise Exports in 1991	II-7
Exhibit II-4.	Impact of Material Requirements Planning (MRP) and Just-In-Time (JIT) Techniques	II-15
Exhibit II-5.	Logistics Chain	II-18
Exhibit II-6.	Transit Time	II-20
Exhibit II-7.	Federal Express Corporation: U.S. Service Options	II-21
Exhibit II-8	The Global Markets	II-31
Exhibit II-9	North American and Asian Markets Connected Via Europe	II-33
Exhibit II-10.	Air Transportation in the GTP Network	II-37
Exhibit II-11.	The GTP Network	II-39
Exhibit III-1.	Proposed Global TransPark Sites in North Carolina	III-13
Exhibit III-2.	North Carolina Global TransPark Ultimate Development Plan	III-23
Exhibit III-3.	North Carolina Global TransPark Summary of Forecasts	III-26
Exhibit IV-1.	Structure of GDP in Selected Economies of the Asian and Pacific Region	IV-3
Exhibit IV-2.	Growth Rates of World Trade	IV-4
Exhibit IV-3.	Selected Socioeconomic Indicators of Hong Kong	IV-6
Exhibit IV-4.	Sectoral Share of GDP — Hong Kong	IV-7
Exhibit IV-5.	Direction of Trade — Hong Kong	IV-11
Exhibit IV-6.	Selected Socioeconomic Indicators of Singapore	IV-13
Exhibit IV-7.	ASEAN's Member Countries	IV-16
Exhibit IV-8.	Selected Socioeconomic Indicators of Thailand	IV-18
Exhibit IV-9.	Selected Socioeconomic Indicators of Indonesia	IV-20
Exhibit IV-10.	Total Foreign Investment in Indonesia	IV-22
Exhibit IV-11.	Japanese Direct Investment in Asia	IV-22
Exhibit IV-12.	Foreign Investments in Indonesia	IV-23
Exhibit IV-13.	Selected Socioeconomic Indicators of Malaysia	IV-25
Exhibit IV-14.	Sectoral Share of GDP — Malaysia	IV-27
Exhibit IV-15.	Direction of Trade — Malaysia	IV-29
Exhibit IV-16.	Malaysia's Output of Degree Holders by Engineering Course in Local Institutions	IV-31
Exhibit IV-17.	Malaysia's Institutional Supply of Engineering Manpower	IV-32

7

LIST OF EXHIBITS **PAGE**

Exhibit IV-18.	Selected Socioeconomic Indicators of Philippines	IV-34
Exhibit IV-19.	Philippines — Approved Foreign Investments	IV-35
Exhibit IV-20.	Priority Areas for Joint Ventures — Philippines	IV-36
Exhibit IV-21.	Intra-regional Export Transactions in Asia and the Pacific	IV-39
Exhibit IV-22.	Rate of Change of Intra-regional Export Transactions in Asia and the Pacific	IV-40
Exhibit IV-23.	Changing Sectoral Composition of Industrial Exports in Selected Asian and Pacific Economies	IV-42
Exhibit IV-24.	Vietnamese Economic Indicators	IV-46
Exhibit IV-25.	Direction of Trade — Vietnam	IV-47
Exhibit IV-26.	ASEAN's Major Trading Partners' Economic Indicators	IV-51
Exhibit IV-27.	Exports and Imports	IV-55
Exhibit IV-28.	Leading Hong Kong Export Commodities	IV-58
Exhibit IV-29.	Leading Singapore Export Commodities	IV-60
Exhibit IV-30.	Leading Malaysia Export Commodities	IV-62
Exhibit IV-31.	Leading Indonesia Export Commodities	IV-64
Exhibit IV-32.	Road Network	IV-71
Exhibit IV-33.	Road Density	IV-73
Exhibit IV-34.	Road Length	IV-74
Exhibit IV-35.	Paved Road Length	IV-74
Exhibit IV-36.	Ocean Cargo Volumes	IV-79
Exhibit IV-37.	Malaysian Port Facilities	IV-81
Exhibit IV-38.	Major Indonesian Port Facilities	IV-83
Exhibit IV-39.	Malaysian Civil Aviation	IV-87
Exhibit IV-40.	Weekly Non-Stop Arriving Flights	IV-92
Exhibit IV-41.	Surveyed Weekly Arriving Flights	IV-93
Exhibit IV-42.	Origin-Destination Service Matrix	IV-98
Exhibit IV-43.	Cargo Payload Estimates	IV-100
Exhibit V-1.	Real Growth of Thai Exports Classified by Sector	V-5
Exhibit V-2.	Average Wage of Employees by Size of Establishment and Region	V-8
Exhibit V-3.	Number of Firms by Size of Employment	V-8
Exhibit V-4.	Composite Index of Development	V-10

8

LIST OF EXHIBITS

		PAGE
Exhibit V-5.	Number of Industrial Factories	V-14
Exhibit V-6.	New Employment Certificates	V-15
Exhibit V-7.	Employment at Proposed Industries by Product and Zone	V-16
Exhibit V-8.	Gross Domestic Product	V-18
Exhibit V-9.	Regional Per Capita GDP	V-19
Exhibit V-10.	Thailand Exports Annual Growth Rates	V-20
Exhibit V-11.	Leading Thailand Export Commodities	V-21
Exhibit V-12.	Infrastructure Capabilities	V-22
Exhibit V-13.	Modal Split of Domestic Freight and Passenger Transport	V-23
Exhibit V-14.	Roads and Road Vehicles	V-25
Exhibit V-15.	Department of Highways Jurisdiction	V-25
Exhibit V-16.	Major Highways	V-27
Exhibit V-17.	Eastern Seaboard Development Programme	V-28
Exhibit V-18.	SRT Railway Facilities and Traffic	V-29
Exhibit V-19.	Rail Freight Traffic	V-30
Exhibit V-20.	State Railway System	V-31
Exhibit V-21.	International Trade by Mode	V-33
Exhibit V-22.	Bangkok Port Container Traffic	V-33
Exhibit V-23.	Domestic Air Traffic	V-41
Exhibit V-24.	Projected Population, Labor Force, Employment and Unemployment	V-46
Exhibit VI-1.	Southeast Asian Population and Labor Force	VI-2
Exhibit VI-2.	Economic Growth Trends for ASEAN Countries	VI-2
Exhibit VI-3.	Thailand's Gross Domestic Product	VI-4
Exhibit VI-4.	Thailand's Consumption Expenditures	VI-5
Exhibit VI-5.	Foreign Investment in Southeast Asia	VI-7
Exhibit VI-6.	Major Foreign Investment in Selected Southeast Asian Countries	VI-8
Exhibit VI-7.	U.S. Direct Investment in Southeast Asia	VI-9
Exhibit VI-8.	U.S. Direct Investment in Southeast Asia by Manufacturing Industry	VI-9
Exhibit VI-9.	Manufacturing Share of Thailand Employment	VI-11
Exhibit VI-10.	Total Plants in Thailand for Selected Industries	VI-12
Exhibit VI-11.	Total Plants in Thailand by Location	VI-13

LIST OF EXHIBITS **PAGE**

Exhibit VI-12.	New Plants in Thailand for Selected Industries	VI-14
Exhibit VI-13.	1991 Foreign Trade for Southeast Asian Countries	VI-15
Exhibit VI-14.	1991 Foreign Trade for Southeast Asia by Trade Region	VI-16
Exhibit VI-15.	Top Inter-Regional Trading Partners for Southeast Asia	VI-17
Exhibit VI-16.	Top Export Commodities for Southeast Asia	VI-17
Exhibit VI-17.	Southeast Asia Air Exports to the U.S.	VI-18
Exhibit VI-18.	To Air Export Commodities from Southeast Asia to USA	VI-19
Exhibit VI-19.	Thailand Foreign Trade Trends	VI-21
Exhibit VI-20.	Thailand Foreign Trade Trends by World Region	VI-22
Exhibit VI-21.	Airport Share of Thailand International Trade	VI-23
Exhibit VI-22.	International Traffic for Top Southeast Asian Airports	VI-24
Exhibit VI-23.	International Air Cargo Activity at Singapore by World Region	VI-25
Exhibit VI-24.	Air Cargo Traffic for Southeast Asia by World Area	VI-26
Exhibit VI-25.	IATA Air Traffic Forecasts for Southeast Asia	VI-27
Exhibit VI-26.	Boeing Asian Cargo Forecasts	VI-28
Exhibit VI-27.	Baseline Air Cargo Forecasts to 2020	VI-30
Exhibit VI-28.	Southeast Asia Export Air Weight Estimate	VI-31
Exhibit VI-29.	Thailand Airport Statistics	VI-32
Exhibit VI-30.	International Traffic Summary for Bangkok Airport	VI-32
Exhibit VI-31.	Thailand Airport Forecasts to 2020 (Baseline)	VI-34
Exhibit VI-32.	Target Commodity Forecasts to 2020	VI-38
Exhibit VI-33.	Southeast Asian Export Production for Target Industries	VI-39
Exhibit VI-34.	Global Transpark Target Industry Forecasts (2020)	VI-41
Exhibit VI-35.	GTP Thailand Forecast Summary - Manufacturing Employment and Cargo Activity	VI-44
Exhibit VI-36.	GTP Thailand Forecast Summary- Total Industrial Cargo and Employment	VI-45
Exhibit VII-1.	Population Distribution in Thailand	VII-3
Exhibit VII-2.	Distribution of Human Resources and Economic Activity	VII-4
Exhibit VII-3.	Employment Levels, Distribution and Growth	VII-11
Exhibit VII-4.	Manufacturing Employment Multipliers	VII-15
Exhibit VII-5.	Generated Employment Estimates	VII-16
Exhibit VII-6.	Labor Force Needs by Education Levels	VII-18
Exhibit VII-7.	Monthly Income Generated by Global Transpark	VII-18
Exhibit VII-8.	Population, Households and Housing Needs Generated by a Thailand Global Transpark	VII-19

10

LIST OF EXHIBITS **PAGE**

Exhibit VII-9.	Impact of Thailand Global Transpark on the Chonburi-Rayong Area Employment Level	VII-21
Exhibit VII-10.	Impact of Thailand Global Transpark on Chonburi-Rayong Area Employment Composition	VII-22
Exhibit IX-1.	Summary of Commercial Service Airports	IX-33
Exhibit IX-2.	Regional Distribution of Existing Commercial Service Airports	IX-34
Exhibit IX-3.	Candidate Site Evaluation Matrix	IX-60
Exhibit IX-4.	Technical Evaluation Criteria	IX-65
Exhibit XI-1.	Loans from Commercial Banks	XI-2
Exhibit XI-2.	Loans from Financial Companies	XI-3
Exhibit XI-3.	Foreign Banks in Thailand	XI-5
Exhibit XI-4.	BIBF Loans	XI-5

LIST OF FIGURES

		PAGE
Figure VII-1.	Population Density in Thailand: 1960	VII-5
Figure VII-2.	Population Density in Thailand: 1970	VII-6
Figure VII-3.	Population Density in Thailand: 1980	VII-7
Figure VII-4.	Population Density in Thailand: 1990	VII-8
Figure VII-5.	Selected Areas of Thailand	VII-9
Figure IX-1.	Location and Dispersion of Commercial Airports in Thailand	IX-5
Figure IX-2.	Sketch of Surat Thani Airport	IX-41
Figure IX-3.	Partial Sketch of Bangkok International Airport	IX-45
Figure IX-4.	Partial Sketch of U-Tapao Airport	IX-49
Figure IX-5.	Sketch of Lampang Airport	IX-57

12

LIST OF APPENDICES

Appendix I. General Assembly of North Carolina 1991 Session Ratified Bill

Appendix II. Site Alternatives Matrix

Appendix III. Forecast Support Data

Appendix IV. Initial Site Development Cost Comparison

13

Chapter I
Acknowledgements and Report Summary

I. ACKNOWLEDGEMENTS AND REPORT SUMMARY

A. PURPOSE

The Final Report is a presentation of the findings of the Feasibility Study for a Thailand Global Transpark.

B. STUDY AUTHORITY AND OVERSIGHT

This study is being conducted under Emerging Problems of Development II Project No. 393-0341, Contract No. 493-0341-C-00-3454-00 administered by the U.S. Agency for International Development/Bangkok, Thailand, and is being coordinated with the National Economic and Social Development Board and the Department of Technical and Economic Cooperation of the Royal Thai Government.

On a daily basis, the project has being overseen by Mr. Kriangkrai Boonyayothin, Project Manager, Chief, Transport and Planning Section, Infrastructure Project Division of NESDB, and Ms. Thongkorn Hiranraks, Project Manager of USAID/Thailand. In addition, a Steering Committee was created to oversee the study and coordinate its findings among various Royal Thai Government agencies. Committee members include:

Secretary General of NESDB *Dr. Phisit Pakkasem*	Chairman
Permanent Secretary of Ministry of Industry *Mr. Sivavong Changkasiri*	Member
Permanent Secretary of Transport and Communications *Mr. Mahidol Chantrangkurn*	Member
Permanent Secretary of Science, Technology and Environment *Mr. Kasem Snidvongs*	Member
Chief of Staff, Royal Thai Navy *Admiral Surawut Maharom*	Member
Director-General of DTEC *Miss Priya Osthanonda*	Member
Director-General of Aviation Department *Mr. Srisook Chandrangsu*	Member
Governor of the Airports Authority of Thailand *Air Marshal Taworn Kerdsin*	Member
General Manager of Thai Airways International Ltd. *Mr. Thamnoon Wanglee*	Member
Governor of Industrial Estate Authority of Thailand *Dr. Somchet Tinapong*	Member
President of the Federation of Thai Industries *Dr. Chokohai Aksaranan*	Member
Mission Director USAID *Mr. Thomas H. Reese*	Member
Assistant Secretary General of Board of Investment *Mr. Chakramon Phasukavanich*	Member
Assistant Secretary General of NESDB *Mr. Somchet Tearacoop*	Member & Secretary

15

C. RESEARCH TEAM AND SUPPORT

The project manager for the feasibility study was Mr. Charles H.W. Edwards of Kimley-Horn and Associates, Inc. Mr. Stephen J. Oenbrink, also of Kimley-Horn, was the principal-in-charge.

The research was conducted by Kimley-Horn, working in both Thailand and the United States. These efforts were supported by members of the research team at the Faculty of Commerce and Accountancy, Thammasat University, under the direction of Dr. Sununta Siengthai and Mr. Supoj Chawawiwat; Dr. John D. Kasarda in the United States; and Dr. Stephen J. Appold in both Thailand and the United States; Leeper, Cambridge & Campbell, Inc. in the United States; and KPMG Peat Marwick Suthee in Thailand.

D. REPORT CONCLUSIONS

The creation of a Global Transpark in Thailand is feasible. Specifically, it could be a major force contributing to the beneficial dispersal of economic activity in Thailand away from the Bangkok area. The park will become a magnet for industrial development. Additionally, a Thailand Global Transpark, in association with other similar complexes in North Carolina and Germany, can significantly contribute to the industrial competitiveness of the Kingdom of Thailand.

A Global Transpark located outside of Bangkok would spark the development of facilities and support infrastructure for the complex, as well as for the surrounding area, thereby greatly benefitting the local population. Through forward planning and development, traffic congestion and consequent diseconomies now being experienced in Bangkok would be avoided. The quality of life of the local population would improve in turn and contribute to competitive advantage for those industries locating at or around the Global Transpark.

Due to the economic growth of Southeast Asia, and the rapid increase in average per capita incomes spurred by expansion of the industrial/manufacturing sectors, it is highly likely that a Global Transpark will be constructed somewhere in the region. If it is located in another country, such a development could place Thailand at a competitive disadvantage.

After a thorough examination of seven alternative locations throughout the Kingdom, three finalist sites have been identified which meet site selection considerations: U-Tapao, Khon Kaen (Nam Phong site) and the proposed new Korat Airport site.

The complexity of the project suggests that a joint public-private venture is a logical way to develop, manage and operate such a complex. Underlying such an arrangement should be a cooperation agreement between Thailand and the other initial developers of the concept, notably the State of North Carolina in the United States, and the State of Mecklenburg-Vorpommern in Germany.

E. REPORT SUMMARY

1. Global Forces

Global trade has become the primary force in economic expansion around the world. Since 1950 global trade has grown at an average annual rate of 6 percent and now exceeds the growth of worldwide product output and services by over 50 percent. In 1991, inter-regional trade and associated intra-regional trade between Asia, North America and Western Europe accounted for $2,760 billion (US), or 76 percent of the world total.

As trade has grown, global business has undergone significant changes. Average product life cycles have been reduced and with that the number of products have increased. Agile and flexible manufacturing systems have replaced extended production runs and "mass customization," the ability to produce tailored products for individual customers during a production run, is now the norm. Reduced inventory levels, tighter inventory control, and a speedup in delivery to market are ways to reduce expenses and improve market responsiveness.

2. Southeast Asia

The nations of Southeast Asia vary greatly in terms of per capita gross domestic income. In each case, there is an increasing diversification of economies as the industrial/manufacturing sectors grow faster than other sectors of the economy. This diversification has contributed to the region's average 9.4 percent GDP growth rate, sparked by significant inflows of foreign direct investment from other Asian nations and other regions of the world.

In 1990, exports totalled $141.2 billion (US), while imports totalled $160 billion (US). Between 1990 and 1992, exports grew at an average 7.4 percent annual rate.

17

To support economic expansion in the region, a wide variety of infrastructure projects are under development. They include new airports to serve Hong Kong and Kuala Lumpur, the expansion of road and rail systems, construction of bridges, and the expansion of port facilities. While sea and air services handle the majority of the intra-regional and all of the inter-regional traffic, the importance of road and rail services for intra-regional flows is now being recognized.

In a survey of over 3,500 non-stop flights serving Bangkok, Hong Kong, Jakarta, Kuala Lumpur, Penang and Singapore, it was identified that over 77 percent were between points in Asia. Among the six airports, Bangkok, Hong Kong and Singapore handled over 80 percent of all surveyed flights. While all-cargo flights only accounted for 5 percent of flight operations, they provided an estimated 25 percent of available cargo capacity.

3. **Thailand**

Thailand has experienced a tremendous rate of growth in its gross domestic product. Even through periods of economic uncertainty, the basic fundamentals of the Thai administration—specifically open investment policies, joint public-private cooperation, and innovative macroeconomic policies—created an attractive investment environment for domestic and international firms.

Eleven percent of the Kingdom's population of 54.5 million resides in Bangkok, which covers only 0.25 percent of the nation's land area. At the same time significant economic discrepancies have emerged between Bangkok and the central region of Thailand and outlying regions. This discrepancy is even more pronounced in terms of the higher educated and skilled sectors of the population. About 30 percent of all manufacturing employees are in Bangkok. Recognizing this, the Board of Investment has created a policy directed towards addressing this imbalance. There is a need for additional infrastructure investments, particularly in Bangkok, to ease traffic congestion. The growth of industrial activity has also strained the educational system of Thailand and the slowing birth rate suggests a smaller entering workforce by the turn of the century.

Unattended, all of these factors could hamper the ability of Thailand to compete with countries with lower education and wage bases, such as Indonesia and Vietnam, or those with high skill-sets and technology bases such as Japan, Korea and Taiwan.

4. Thailand Global Transpark Forecast

Potential industrial tenants of a Global Transpark in Thailand are represented by 34 different industry types. The industry groups were identified through the application of 5 selection criteria which reflected the current and future use of air cargo services, and the propensity of export activity. Major industrial categories include fresh fish and other agricultural products, apparel and other clothing, metal products and machinery, industrial machinery and equipment, electrical equipment, communications equipment, electronic products, motor vehicles and parts, and engineering and scientific equipment and components.

Based on this analysis, estimates of direct employment, number of plants and air cargo tonnage were developed. Within 20 years of initial operation, over 57,000 people are anticipated to be employed in 600 on-site plants. Their efforts would generate over 142,000 tonnes of cargo each year.

Year of Transpark Operation	Direct Employment	No. of Plants	Air Cargo Tonnage (Metric Tonnes)
5	8,800	104	6,200
10	21,500	235	23,100
15	36,900	392	60,100
20	57,600	600	142,400

5. Social Impact Analysis of a Global Transpark

Based upon the direct Global Transpark employment estimates, the local population could increase to over 231,000 by the 20th year of operation. Direct and indirect employees have earning potentials in excess of 426 million baht a month by the 20th year of operation.

A generic analysis of a Global Transpark was conducted, and the local impact of such a complex was not expected to be overwhelming. For example, if the complex were located in the Chonburi-Rayong area, the combined 20th year employment levels would only comprise 4.7 percent of the area's labor force.

Characteristic	Year of Transpark Operation			
	5	10	15	20
Direct Employment (000)	8.8	21.5	36.9	57.6
Indirect Employment (000)	8.5	20.8	35.6	55.7
Total Employment (000)	17.2	42.3	72.5	113.3
% of Chonburi-Rayong Employment	2.1	4	4.8	4.7
Total Population (000)	35.2	86.6	148.2	231.6
Households (000)	9.4	23.1	39.5	61.6
Monthly Income (million baht)	64.8	159.4	272.8	426.3

6. Global Transpark Considerations

A successful Transpark rests on the satisfaction of three broad sets of considerations:

- *Economic considerations* revolve around its ability to be an economic catalyst. In order to improve its economic benefit, the complex should be sited where there is adequate land available and costs are reasonable. The costs of developing the needed access and support infrastructure should also be reasonable.

- *Industry considerations* include the availability and scale of existing transportation facilities, support services such as water, power, and telecommunications, and access to an educated labor pool, with appropriate economic incentives.

- *Technical siting criteria* concern the physical consideration of the site which facilitate construction, the existence of airfield facilities, transport access by more than one mode, the extent of the existing utility infrastructure, environmental concerns, and the general ease of constructibility.

7. **Potential Global Transpark Sites**

Thailand's 25 existing commercial service airports were overviewed and seven candidate sites identified for evaluation as the potential Global Transpark site: Surat Thani, Bankok International/Don Muang (after construction of SBIA), U-Tapao Ubon Ratchathani (new site), Nakhon Ratchasima/Korat (new site), Khon Kaen (Nam Phong site), and Lampang (new site).

Site visits were made to all seven sites and a comparative matrix developed. The sites were then compared on the basis of five elements: economic considerations (cost to develop), ability to meet tenant industry requirements, technical site criteria, timing for implementation and adherence to Seventh Plan objectives (particularly regional dispersion of industry).

The resulting analysis indicates that the three finalist sites to consider are: U-Tapao Khon Kaen (Nam Phong site), and Nakhon Ratchasima/Korat (new site). *U-Tapao is the recommended site* on the basis that it will be the least costly to develop, is the only site with excellent access to two seaports (an important regional transport mode), has unrestricted property potential, and can be put into service more quickly than any greenfield site due to its existing airfield and location within the ongoing Eastern Seaboard Development Program.

8. **Regulatory Alternatives**

A total of six alternatives for the development, management and operation of a Global Transpark have been developed and analyzed. The alternatives included exclusively public or private organizations, build-operate-transfer arrangements, and joint ventures. Overall, any option which combines a public-private joint venture appears to be the most feasible alternative. Such an option would combine the entrepreneurial spirit and flexibility of private enterprises, with the funding capabilities and considerable foundation of expertise of public agencies.

9. **Financial Assessment**

In recent years, Thailand has embarked on a series of major infrastructure projects. The funding for these projects has come from foreign sources as well as from an increasingly vibrant domestic capital market.

Based on an assessment of recent project financing and capital availability, the likely primary sources of funding of such a project will include overseas and local private capital markets with possible public funding in terms of guarantees and land transfers.

F. SPECIAL CONSIDERATIONS

Domestic and international factors point to the feasibility of creating a Global Transpark in Thailand. In order to pursue this project, there are a number of critical steps to take:

1. Confirmation of the decision to proceed with the development of a Thailand Global Transpark.

2. Selection of a site for the complex and the development of a comprehensive master plan.

3. Establishment of a cooperation arrangement with the North Carolina Global Transpark and a similar proposed facility in Germany.

4. Development of a comprehensive marketing program, including sectors to identify and attract industrial tenants, creation of support infrastructure, and establishment of appropriate economic incentives.

5. Creation of an appropriate organization to develop, manage and operate the Global Transpark.

6. Identification and development of appropriate funding mechanisms for the development of the Global Transpark and for assisting industrial tenants.

Chapter II
Global Transpark Concept and Background

II. GLOBAL TRANSPARK CONCEPT AND BACKGROUND

A. INTRODUCTION

This chapter discusses the foundation upon which the Global Transpark concept was created. It also examines trends in worldwide trade and development, the emergence of new technologies, and the establishment of new trade centers. Industrial trends, particularly those influencing transportation developments also are discussed, and the changes in thinking regarding logistics are reviewed. Finally, the chapter looks at the creation of the Global Transpark concept as promulgated by Dr. John D. Kasarda.

B. GLOBAL TRADE TRENDS

1. Overview

In its World Development Report 1991[1] the World Bank noted that "the technological changes of this century have enabled countries to use their resources much more productively than ever before. Living conditions have improved beyond recognition, not just in industrial countries, but also in most developing countries. The pace of this improvement has seemed to accelerate with time."[2] The report also noted that the real income gap between developed and developing countries, particularly those countries in East Asia, was rapidly narrowing. The World Bank Report further reported that "Rapid development also requires that economic integration expand for all. The boundaries that separate national markets for goods, capital, and labor have continued to erode."[3] Global trade, which had grown at an average annual rate of over six percent since 1950, was reported to be expanding more than 50 percent faster than the growth of output of goods and services.

In contrast, the United Nations Industrial Development Organization (UNIDO) sounded the alarm about the emergence of the trading blocs. The 1991/92 UNIDO report observed the "growing trend towards large regional trading blocs with free trade among those within and a protective wall against foreign trade with those without."[4] They also warned that the trading blocs were being created by developed nations to the potential detriment of developing nations.

[1] World Bank, *World Development Report 1991*, The Challenge of Development, 1991.
[2] Ibid., p. 2.
[3] Ibid., p. 3.
[4] United Nations Industrial Development Organization, Industry and Development, *Global Report 1991/92*, Vienna 1992.

The expansion of global trade and the creation of trading blocs exemplify the increasing importance of trade in the world economic fabric. No nation is immune from international flows of goods, services, capital or labor competition. Many countries recognize this fact and rely on international trade to support the expansion of their gross domestic product.

This section discusses trends in international trade, the emergence of major regional trading centers, and the impact of certain factors on the expansion of trade into the next century.

2. World Economic Development

The growth in per capita gross national product is but one measure and indicator of the growth of the world economy. While there remain significant differences among developing and developed economies, the overall changes in the past 20 years are impressive. Between 1971 and 1991, the world's average per capita gross national product increased from $860 (US) to $4,010 (US). During that same period, Organization for Economic Cooperation and Development (OECD) member nations realized an increase in their average from $3,370 (US) to $21,020 (US[5]).

On a region-by-region basis, an historical review of per capita gross national product readily identifies those regions that have experienced above-average growth in the last 20 years. They are illustrated in Exhibit II-1.

[5] *World Tables 1993*, The World Bank, 1993, Table 1.

Exhibit II-1
Per Capita Gross National Product
1971 - 1991
(U.S. Dollars)

Region/Country	1971	1981	1991
Sub-Saharan Africa	190	600	350
South Asia	120	270	320
East Asia & Pacific	140	440	650
Latin America & Caribbean	640	2,160	2,390
Middle East & North Africa	370	2,360	1,940
East Europe & Central Asia	N/A	2,580	2,670
OECD Members	3,290	10,990	20,570
Japan	2,130	10,390	26,930
United States	5,320	13,340	22,240

Source: World Bank, *World Tables 1993*

With the exception of Sub-Saharan Africa and the Middle East/North Africa regions, which experienced declines in the per capita gross national product between 1981 and 1991, the rest of the regions and countries maintained the previous decade's expansion of their economies through the 1980s.

Between 1971 and 1991 the OECD average per capita gross national product grew by approximately 26 percent annually. This was about 8 percentage points higher than that recorded for all of the developing nations in East Asia. However, four East Asian nations—Indonesia, Korea, Malaysia, and Thailand—jointly achieved an average annual growth rate of 49 percent in per capita gross national product.

3. World Trade

As previously stated, a primary engine of economic expansion during the past two decades has been the growth of world trade.

From 1965 to 1980, the average annual growth rate of merchandise trade for all countries was 6.7 percent. In the same period, imports grew at a rate of 4.7 percent per annum. In the next decade, export growth declined to 4.1 percent per annum for all countries, while imports grew faster, achieving an average annual growth rate of 4.3 percent.[6]

During the 1980s, exports from Indonesia, Korea, Malaysia, and Thailand grew at an average of nearly 11 percent per annum. This growth was double the rate recorded for Hong Kong, Japan, and Singapore of about 5 percent each year. In comparison, merchandise exports from the United States grew by 2.3 percent each year. In the case of imports, the respective figures were 7.4 percent, 6.7 percent, and 8.2 percent.

In 1991, the estimated value of all merchandise exports was $3,506 billion, while all imports were valued at $3,610 billion. As shown in Exhibit II-2, the United States accounted for 12 percent of the world's exports and 14 percent of the world's imports. The top 10 countries generated $2,189 billion, or 62 percent of the world's exports, and consumed $2,232 billion, or 61 percent of the world's imports. The top 50 countries generated over 96 percent of the world's exports and consumed 95 percent of the world's imports.[7]

[6] World Bank, *World Development Report 1991 — The Challenge of Development*, Table 14.

[7] General Agreement on Tariffs and Trade, *International Trade 91-92 Statistics*, Geneva 1993.

Exhibit II-2
Leading Exporters and Importers in World Merchandise Trade, 1991

Rank	Exporters	Value	Share	Rank	Importers	Value	Share
1	United States	422.2	12.0	1	United States	509.0	14.1
2	Germany	402.8	11.5	2	Germany	389.9	10.8
3	Japan	314.8	9.0	3	Japan	237.0	6.6
4	France	217.0	6.2	4	France	231.8	6.4
5	United Kingdom	185.0	5.3	5	United Kingdom	209.9	5.8
6	Italy	169.5	4.8	6	Italy	182.7	5.1
7	Netherlands	133.5	3.8	7	Netherlands	125.9	3.5
8	Canada	127.2	3.6	8	Canada	124.8	3.5
9	Belgium-Luxembourg	118.2	3.4	9	Belgium-Luxembourg	120.2	3.3
10	Hong Kong	98.6	2.8	10	Hong Kong	100.3	2.8
11	Chinese Taipei	76.1	2.2	11	Spain	93.9	2.6
12	China	71.9	2.1	12	Korea Rep.	81.5	2.3
13	Korea Rep.	71.9	2.0	13	Switzerland	66.5	1.8
14	Switzerland	61.5	1.8	14	Singapore	66.3	1.8
15	Spain	59.4	1.7	15	China	63.8	1.8
16	Singapore	59.0	1.7	16	Chinese Taipei	63.1	1.7
17	Sweden	55.2	1.6	17	Austria	50.8	1.4
18	Saudi Arabia	48.8	1.4	18	Sweden	49.7	1.4
19	Former USSR	47.3	1.4	19	Mexico	48.3	1.3
20	Mexico	43.1	1.2	20	Former USSR	46.1	1.3
21	Australia	41.9	1.2	21	Australia	41.7	1.2
22	Austria	41.1	1.2	**22**	**Thailand**	**37.6**	**1.0**
23	Denmark	36.0	1.0	23	Malaysia	36.8	1.0
24	Malaysia	34.4	1.0	24	Denmark	32.9	0.9
25	Norway	34.1	1.0	25	Saudi Arabia	30.0	0.8
26	Brazil	31.7	0.9	26	Portugal	26.1	0.7
27	Indonesia	29.3	0.8	27	Indonesia	26.0	0.7
28	**Thailand**	**28.3**	**0.8**	28	Norway	25.3	0.7
29	Ireland	24.2	0.7	29	Brazil	23.0	0.6
30	South Africa	24.2	0.7	30	Finland	21.8	0.6
31	Finland	23.1	0.7	31	Iran Islamic Rep.	21.7	0.6
32	United Arab Emirates	20.9	0.6	32	Greece	21.6	0.6
33	India	17.6	0.5	33	Turkey	21.1	0.6
34	Portugal	16.3	0.5	34	Ireland	20.8	0.6
35	Iran Islamic Rep.	15.9	0.5	35	India	20.4	0.6

28

Exhibit II-2 (continued)
Leading Exporters and Importers in World Merchandise Trade, 1991

Rank	Exporters	Value	Share	Rank	Importers	Value	Share
36	Venezuela	15.3	0.4	36	South Africa	18.8	0.5
37	Poland	14.9	0.4	37	Israel	18.6	0.5
38	Former Yugoslavia	14.0	0.4	38	Poland	15.8	0.4
39	Turkey	13.6	0.4	39	Former Yugoslavia	14.7	0.4
40	Nigeria	12.6	0.4	40	Philippines	12.8	0.4
41	Argentina	12.2	0.3	41	United Arab Emirates	12.7	0.4
42	Algeria	11.8	0.3	42	Hungary	11.5	0.3
43	Israel	11.7	0.3	43	Venezuela	11.1	0.3
44	Czech & Slovak Fed.Rep.	10.9	0.3	44	Czech & Slovak Fed.Rep.	10.0	0.3
45	Libyan Arab Jamahiriya	10.5	0.3	45	Pakistan	8.4	0.2
46	Hungary	10.2	0.3	46	New Zealand	8.4	0.2
47	New Zealand	9.6	0.3	47	Egypt	8.2	0.2
48	Chile	8.9	0.3	48	Argentina	7.8	0.2
49	Philippines	8.8	0.3	49	Algeria	7.7	0.2
50	Greece	8.7	0.2	50	Nigeria	7.5	0.2
	Total of Above	**3376**	**96.3**		**Total of Above**	**3442**	**95.3**
	World	**3506**	**100.0**		**World**	**3610**	**100.00**

Source: General Agreement on Tariffs and Trade, *International Trade 91-92 Statistics*, Geneva 1993, Table 1.4.

As illustrated in Exhibit II-3, on a geographical basis, Western Europe was the largest generator of merchandise exports, followed by Asia and then North America. These three regions accounted for an estimated 86 percent of the world's total.

Exhibit II-3
Regional Structure of World Merchandise Exports in 1991 (billion dollars)

Origin	North America	Latin America	Western Europe	C/E Europe & Former USSR	Africa	Middle East	Asia	World	%
North America	181	66	131	6	10	17	139	550	15.5
Latin America	67	24	32	6	2	2	15	147	4.0
Western Europe	117	32	1171	51	52	50	119	1616	46.0
C/E Europe & Former USSR	2	2	51	20	2	2	11	91	2.5
Africa	13	2	53	3	6	2	6	99	3.0
Middle East	16	5	34	2	3	6	51	118	3.5
Asia	217	20	171	14	16	29	414	885	25.0
World	**614**	**149**	**1641**	**102**	**91**	**108**	**753**	**3506**	

Source: General Agreement on Tariffs and Trade, *International Trade 91-92 Statistics*, Geneva 1993, Table 11.2.

As shown in the table above, the three largest flows of merchandise traffic, excluding intra-regional flows, were between North America and Asia ($356 billion), Asia and Western Europe ($290 billion), and North America and Western Europe ($248 billion). These three inter-regional flows, in addition to the intra-regional traffic flows within Asia, North America, and Western Europe, accounted for $2,660 billion, or 76 percent of the world total.

It is interesting to note that intra-regional trade within Western Europe and Asia was larger than the largest inter-regional trade flow between Asia and North America.

As global trade has increased, the bipolar domination of North America and Western Europe has been challenged by East Asia. The economic success stories of Japan, Taiwan, Hong Kong, and Singapore have been duplicated in Korea, Malaysia, China, and Thailand. This region of the world has become a major factor in international trade, particularly for consumer goods, and industrial products.

4. **Trade Factors**

Many factors affect the expansion of international trade. Some factors originate within the borders of a single nation, while others are either regional or worldwide in scope. Certain factors constrain or limit trade, while others facilitate trade.

The General Agreement on Tariffs and Trade (GATT) has created an environment within which negotiations are undertaken to achieve a universal reduction of tariffs and other trade-inhibiting barriers. The 110-member countries continually negotiate reductions in order to promote world trade. This process has been underway for over 60 years. While the current round of negotiations, the Uruguay Round, is stalled, numerous examples exist wherein trade has been facilitated by the reduction, and sometimes the removal of tariffs.

Countering the efforts of GATT have been the emergence of trading blocs. The European Community (EC), the North American Free Trade Area (NAFTA), and various proposed groups in Asia suggest that many countries are looking to regional associations as a way to improve trade. The EC has the longest track record. Recent efforts to ratify the Maastricht Agreement have exhibited the tensions and dynamics of merging the different economies, political structures, and cultural biases of many countries into a single entity. NAFTA, which was ratified in 1993 by the U.S. Congress, seeks to create an economic powerhouse by combining the economies of Canada, Mexico, and the United States, which have a combined population of 370 million and a gross domestic product of $6.8 trillion (US). At the same time, numerous countries in Asia are exploring the creation of trading arrangements.

While the members of GATT are striving to create a non-preferential trading environment, proponents of the trading blocs are creating environments within which certain countries are more equal than others.

The People's Republic of China (PRC) embarked in the 1980s on an aggressive program to introduce a market-driven economic system to its agricultural sector. The result has been the expansion of not only agricultural, but also industrial production, and the emergence of zones oriented to international trade such as Shenzen. The restructuring of the Vietnamese economy and the demise of central-planning within Eastern Europe have brought both significant dislocations from the past ways as well as challenges and opportunities never experienced under the past economic systems. Not only have these shifts opened up new opportunities for entrepreneurs, but they have also opened up the markets to international competition, and more importantly, the transfer of technologies and capital.

The explosion of worldwide communications pathways and systems contributes to an almost uninhibited transfer of information between any two points on the globe. The foundation of international capital flows are the telephone and computer link-ups that allow traders and investors to access information, sources, and markets on a never-ending basis around the world. A major factor in the success of a capital market now is its access to telecommunications services.

The combination of the more extensive communications networks and the tying together of communications and computers has been further enhanced by the relaxation of currency and investment controls and the establishment of fixed, uniform controls on property ownership and taxation. This combination has enhanced and promoted the international transfer of capital and the expansion of foreign direct investment.

Transportation changes have affected not only the accessibility of locations around the world, but also facilitated the flow of information and goods. By reducing the cost of moving between points on the globe, the creation of business relationships has been made easier and with it, the creation of new businesses and trade. Likewise, the introduction of new transport technologies has created an environment in which goods can be moved faster and more securely. This later evolution has provided a foundation upon which companies have created global sourcing networks and entered new international markets.

Relying on labor cost differentials or access to natural resources has been replaced by the creation of value-added functions. Raw materials, previously extracted and shipped to a manufacturing center, almost unchanged from the mercantile systems established by European nations in the 17th and 18th centuries, have been replaced by on-site processing. At the same time, most

developing nations have embarked on macroeconomic programs designed to take advantage of such watersheds as the 1985 Plaza Accord, which led to the dramatic shift of manufacturing activities away from Japan and into Southeast Asia. Medium- and high-technology production operations are active around the world. They are all contributing not only to the expansion of the local economies, but also to the expansion of international trade as the products are shifted from source to assembly to consumer.

C. INDUSTRIAL TRENDS

1. Overview

The increased level of global trade has created an environment in which old methods are being abandoned and the rate of change, adoption of new technologies and processes, and even the creation of new industry, is rapidly accelerating. The various forces acting on industry have resulted in the establishment of a new paradigm. Such terms as "world-class," "agile manufacturing," and "mass customization" have emerged, been reviewed, and then revised in ever shorter spans of time.

Unlike previous eras, the definition and longevity of these terms are not fixed or precise. Rather, each industry, company, or country is continually adapting and changing their structures through technological developments or responses to market demands or competitive pressures. Just as the average life cycle of products and services is declining, so too the particular approach to a system is subject to continued change or even discontinuance.

This section presents an overview of the changes being experienced by industries around the world. For the purposes of this study, the term "industry" is broad in scope and, with the exception of certain examples, generic in nature.

The review examines some key factors that both independently and/or collectively support the need for new approaches for product development, manufacturing, and distribution. In the next section, analysis concentrates on the logistical implications of these trends. There has been an overwhelming shift to time-based competition while maintaining high quality. This general development trend has led to the adoption of new approaches, including a reduction in average product life cycle, product proliferation, reduced inventory levels, global distribution of manufacturing and distribution, emergence of "agile

manufacturing" and "mass customization" techniques, and the complete integration of formerly disparate members of the logistics chain.

2. **Product Life Cycle and Product Proliferation**

The increase in competition has contributed to a reduction of the average product life cycle. In some cases, such as the capacity and price of integrated circuits (IC), this change has been astonishing. The number of components per IC has doubled each year and the cost per chip has declined from an average of $1,000 (US) per unit to less than $1 (US). At the same time, competitors have begun to adopt other measures to extend the life of a basic product through continual redesign. This has created product proliferation in which a basic product, such as a pager, is tailored to specific market needs and applications that are increasingly refined and modified.

The reduction in the average product life cycle has created new demands on manufacturers to change their product development processes. One approach has been to move closer to the customers. Rather than developing a product and then convincing a customer that they "need" it, manufacturers are "listening" to their customers and working with them in product development and product re-engineering. As an example of this change, the ISO 9000 certification process (Europe), the Deming Award (Japan), and the Baldridge Awards (United States) "all look for mechanisms that incorporate the customer's requirements into the design, production, and distribution processes."[8]

At the same, time, the increase in global competition has created new opportunities to expand knowledge of overseas markets, manufacturers, and products. This is the case for both industrial and consumer products. As noted by Whybark,[9] "industrial products are great sources of ideas for new processes for improving product cost, quality and/or desirability... manufacturing capability of global competitors and the logistics competence...and is an important element for benchmarking requirements in the marketplace. With respect to consumer products, increased international competition increases knowledge of overseas markets and consumer interest, provides ideas of products or changes, and can even identify complimentary product possibilities."[10]

[8] Whybark, D.C., "Opportunities and Concerns In Global Logistics," Global Manufacturing Research Group, Kenan Institute of Private Enterprise, April 1993.

[9] Ibid., p. 2.

[10] Ibid., p. 2.

34

Thus, each company engaged in selling to both domestic and international markets must be prepared to change an existing product or create a new one as quickly as possible in order to protect market share. This requirement to continually adapt to new market needs and competitive threats has forced manufacturers to seek new ways to not only produce their products, but also to get them to the marketplace.

3. **Manufacturing Systems**

The market demands and competitive pressures previously identified have forced manufacturers to change their methods of production. Over the past decade, much attention has been directed toward the systems known as "just-in-time" (JIT) or "kanban." The fundamental basis of these approaches has been to reduce inventories and free up production assets, both human and machine, to respond to changing needs. Instead of the traditional sequentially arrayed manufacturing systems, which require and produce large volumes of work-in-process inventory, these processes listed above and other "new" approaches have dispensed with the interim levels of inventory and also have contributed to a closer attention to product quality control.

The drive for efficiency has been reflected in different responses. Some firms have invested in computer-integrated manufacturing (CIM) composed of either a series of single process numerically controlled machine tools or robots, or multi-task machines. Other firms, noting the sometimes limited flexibility of the CIM approach, have adopted flexible manufacturing systems (FMS) that create an environment in which many tasks are performed on a single part using both manual- and machine-based methods.

As the average product life cycle has declined and the number of products multiplied, the conflict with traditional methods of inventory planning and levels has created a demand for smaller production lot sizes. The more flexible, quickly adjustable production methods have become pre-eminent; this has been labelled as "agile manufacturing." Initially, agile manufacturing reflected reduced inventory, smaller lot sizes, and high quality; recent developments have added the element of high flexibility and reliability of delivery[11] to the equation. The combination of all of these elements has created yet another new label, known as "mass customization."

[11] Ibid., p. 9.

Mass customization is a manufacturing approach in which the individual needs of each customer are accommodated within the ongoing production cycle. In theory, mass customization allows the manufacturer to achieve production lot sizes of one,[12] for example:

- A Canadian manufacturer of refrigerators, washing machines, dishwashers, and ranges builds each unit to a specific customer order so that the entire production cycle from order to delivery is reduced to three days;
- A U.S. producer of cellular telephones and pagers starts production within six hours of a customer's order; and
- A Japanese bicycle manufacturer custom builds each unit for each customer with direct delivery to the customer's residence or business.

In all cases, the adoption of such systems requires a thorough review of the entire process, an examination of the support systems and suppliers, and a detailed implementation plan. George Stalk of the Boston Consulting Group[13] recently reviewed the internal process for a heavy truck manufacturer. As a result of a thorough analysis, the general observation was of a ridiculously high level of work effort duplication, too many non-value adding activities, and no clear-cut link between the customer and the manufacturer; all of this in an environment of custom manufacturing.

The results of the initial analysis identified a process from sale to delivery which averaged 100 days, of which only two days (2 percent) was for manufacturing. Approximately forty days were spent coding the order at various steps in the process, and another eight days were used up in scheduling. Faced with nearly 50 percent of the process time devoted to such activities, the maker embarked on a program to eliminate redundant tasks in order to speed up the entire process.

4. Future Developments

Whybark notes in his paper[14] that there is a fundamental need to eliminate bottlenecks in order to achieve desired levels of flexibility, speed, and response

[12] Ibid., p. 9.

[13] Stalk, G., speech at Air Cargo Shippers Conference, September 1993.

[14] Whybark, D.C., "Opportunities and Concerns in Global Logistics," Global Manufacturing Research Group, Kenan Institute of Private Enterprise, April 1993, p. 11.

to market demands. New theories and techniques are being developed. Some are amalgamations of existing approaches, while others are the adaptation of methods developed elsewhere to the manufacturing environment.

One example of the amalgamation approach is the combination of materials requirement planning (MRP) and distribution requirement planning (DRP) with JIT control systems. In this approach, the basic production flow is developed and then, through the use of MRP and DRP logic, the raw material and distribution flows are determined in detail. Unlike previous methods, the more flexible system (JIT) is the basic building block of the planning effort.

The identification of bottlenecks and the creation of alternative production methods is based on the application of optimized production technology (OPT) and the theory of constraints (TOC). These methods focus attention on the limiting critical resource. As a result, detailed analysis and planning is concentrated on the key areas, rather than being dispersed throughout the system. By employing these techniques, one maker of industrial labels has reduced the work week from six and one half days with three shifts, to five days with minimal overtime, without affecting customer deliveries.[15]

In all examples, the fundamental basis of these efforts is the reduction of the complexity and the elimination of redundant or non-value-adding efforts within the process.

5. **Implementing Systems**

McLaughlin,[16] et al., analyzed data from over 400 companies in two industries in more than 20 countries regarding the benefits of applying some available materials management techniques, such as economic order quantity (EOQ) and MRP, and JIT production control, as well as the employment of computerized production planning activities. The benefits were expressed in terms of average days of inventory for raw materials, work-in-process, finished goods, weeks of safety stock, and days of lateness.

[15] Ibid. p. 11.

[16] McLaughlin, C.P., Vastag, G., and Whybark, D.C., "Statistical Inventory Control in Theory and Practice," *International Journal of Production Economics* (forthcoming).

The researchers identified negligible benefits of using computerized forecasting methods or production planning and scheduling. This suggested that the surveyed firms either had improperly developed systems or were misapplying the information.

A similarly observed lack of benefit from EOQ usage suggested that another technique might be more appropriate. There was a similar result regarding the use of MRP techniques.

Exhibit II-4 summarizes the results of that study. All inventory types, including safety stock, have been combined. The table looks at MRP and JIT techniques usage only.

Exhibit II-4
Impact of Material Requirements Planning (MRP) and Just-In-Time (JIT) Techniques

Category	Weeks of Inventory		Days of Lateness	
	MRP	JIT	MRP	JIT
Never heard of	37.4	31.8	9	9
Know, but don't use	26.8	40.6	7	8
Just starting to use	30.6	22.8	13	9
Starting with problems	22.0	29.6	11	11
Using without benefits	14.8	10.6	3	10
Using with benefits	28.8	20.2	9	6
Average	**26.7**	**25.9**	**8.7**	**8.8**

Source: McLaughlin, C.P., Vastag, G., and Whybark, D.C., "Statistical Inventory Control in Theory and Practice," *International Journal of Production Economics* (forthcoming).

An interesting observation is that those respondents who indicated they were garnering no benefits from using either technique, in fact had lower levels of inventory than those who said they were enjoying related benefits. This might suggest that their measurement of benefits was wrong or that they were not focusing on levels of inventory as a critical element or measure of success. In all cases, with respect to inventory, those respondents who either did not know of the technique or did not use either one had the highest levels of combined inventory; they were at a competitive disadvantage.

With respect to days of lateness of delivery to customers, which is an increasingly critical component of competitiveness, the results of the study show a high level of randomness. This possibly suggests that MRP and/or JIT systems are not major factors in achieving timely delivery.

While the preceding study indicates a low use-benefit ratio, a study[17] conducted by the Boston Consulting Group strongly suggests that adopting more flexible, more responsible techniques is a prime contributor to increased profitability and expansion of market share. Overall, they have identified that a firm able to deliver its product faster to its customers experiences a two to three times higher growth rate than its competitors and also has a profitability level generally twice that of its competitors.

6. Conclusions

Competition is demanding more solutions while at the same time creating new opportunities. Tried manufacturing processes are being discarded for new techniques that collectively achieve such benefits as reduced inventory levels, reduced response time from order to delivery, increased product types, smaller production lot sizes, defined delivery schedules to customers, and increased efficiency and profitability through elimination of extraneous and redundant production steps.

There are many examples of companies benefiting from actively responding to these challenges. There are also numerous examples of others that are being left behind as they either do not acknowledge changes or do not employ appropriate techniques to the fullest.

Regardless of the individual outcomes, continual change is clearly the watchword of the future. Also clear is that a concentration on cost efficiencies is not necessarily the appropriate response, especially when it leads to large scale operations that are less flexible and hide low levels of quality.

Bigger is not always better. Being faster, with matching or better quality, and responding to customer needs, is more important.

[17]Stalk, G., speech at Air Cargo Shippers Conference, September 1993.

34

As described in the next section, these changes are creating new pressures on the logistics chain. In fact, rather than looking at various components separately, an integrated approach is being mandated by the external and internal factors.

D. LOGISTICS TRENDS

1. **Overview**

Globalization of activities, such as "world-class/scale," as well as "agile manufacturing" and "mass customization," are creating new and different pressures on the logistics chain. For this review, the logistics chain is defined as those functions that affect or control the flow of information and goods from the point of order generation to the point of customer delivery. The following diagram, Exhibit II-5, while not exhaustive, illustrates this chain. For simplicity, the information and product flows are separate. At all of the displayed steps, there is a series of processes for generation, processing, and transfer of information.

The focus of new techniques can no longer be solely oriented toward efficiency improvement and/or cost reduction. In fact, increasing value is a more appropriate focus, without forgetting the challenges of increasing efficiency and reducing costs. As noted in his study,[18] the selection of the location of facilities to add value is based on a thorough evaluation of the total global logistics network. The evaluation incorporates the identification of factors such as labor costs, tax systems, marketing costs and opportunities, competition levels, and other logistics elements. Once each factor has been identified, it is then examined and quantified in order to prepare a cross-factor trade-off analysis.

This section examines a variety of components of a global logistics chain. Among the components are information systems, inventory management systems, transport selection, quality maintenance, product inspection, and information-transportation-manufacturing relationships.

[18]Ibid.

Exhibit II-5

LOGISTICS CHAIN

Product Chain			Information Chain	
			Customer Places Order	
			↓	
Withdraws from RM Inventory	←	←	Order Raw Materials and Components	
↓			↓	
↓			Place Order in Production Plan	
Begin Production			↓	
↓			Prepare Invoice and Shipping Documentation	
End Production			↓	
↓			Prepare Shipping Plan	
↓			↓	
Package for Shipping	→	→	Advise Customer	
↓			↓	
Ship Product			↓	
↓	→	→	Monitor Shipment Flow	←
↓			↓	
↓			Advise Customer	
↓			↓	
Deliver to Customer	→	→	Confirm Receipt	
			↓	
			Receive Payment	

2. Inventory Management

One response to the drive for increased efficiency is the expansion of inventory levels. This, while ensuring a continuous high level of goods flow through the logistics system, also creates a situation in which the company is committing excessive capital to unproductive assets, is reducing its ability to respond quickly to market changes (because it wants to sell what it has already made or what has been invested in raw materials and components for one product line), and is generating an increased transport/warehousing requirement due to the higher volumes. The bottom line to this approach is significant waste potential and lower profits.

To counter this situation, a more appropriate response is the reduction of inventory at all steps in the logistics chain. This, however, creates a new set of challenges including the need for higher levels of quality (there are lower levels of safety stock at all steps), faster processing of inventory, and more detailed information. To meet this latter situation, different techniques can be employed. While in traditional logistics management, many of these techniques would not be considered the responsibility of the logistics team, they are becoming part of the job description, due in part to the rising importance of logistics control.

Higher quality levels, whether pertaining to raw materials or work-in-process components or finished goods, can be achieved through closer coordination among vendors, manufacturers, and customers. The rapid and open transfer of information is the vital basis for this activity. It also requires continual attention to the situation and a commitment to jointly address any problem and quickly create a solution. Longer term contracts and stationing of personnel at customer locations are some of the ways to achieve the free flow of information and a high level of commitment.

Reduced inventory levels also demand a faster response time throughout the logistics chain. Total stock levels can be measured in hours rather than weeks. While some firms respond to this by shifting inventory responsibility and investment to suppliers (up the chain) or distributors (down the chain), the truly innovative firms look to identify and implement ways to reduce collective inventories. Again, a key element to achieving this is the free and rapid sharing of information. One U.S. maker of office furniture provides direct access to its production planning system for its vendors so they can prepare their components as required, not as anticipated. A Canadian manufacturer of telecommunications equipment requires delivery of components within two hours of order, but then

pays it vendors upon receipt. A leading retailer of women's clothing counters changes in women's fashions by employing higher cost air transport instead of sea to move clothes from the production facilities in the Far East. By reducing the total logistics chain from months to weeks, the retailer can order later and thus respond to changing fashion trends or more accurate forecasts of demand.

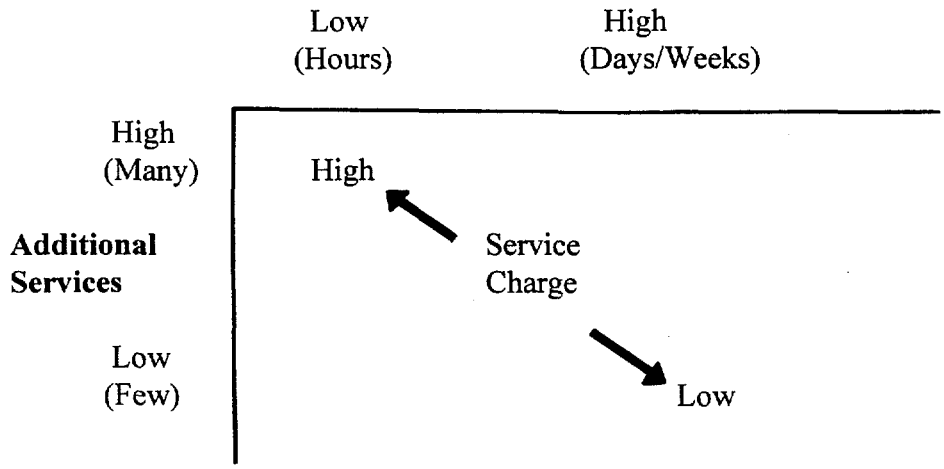
In these and other instances, the basic objective is to reduce inventory levels and to increase the velocity of product through the system, hence maximizing capital while increasing revenues and profits.

3. **Transport Alternatives**

As previously mentioned, the selection of a higher cost transport alternative can contribute to lower overall costs and reduced risks due to unsold finished goods. However, while faster transit times are a key to reducing inventory levels, there are a variety of other solutions. The common thread among all of them is delivery reliability. This has led to the use of the term "time definite."

In its infancy, Federal Express championed the concept of guaranteed, overnight delivery. Now it and its many competitors offer a complex array of services with various transit times in the continental United States, which range from hours to multiple days. In the international arena, the same situation is true, although the transit time ranges from one/two days to multiple weeks. While a casual observer might focus on the difference in service based on elapsed time of transit, there are many other aspects of the service offerings. Exhibit II-6 identifies the general relationship between service charge, level of services, and transit time.

Exhibit II-6
TRANSIT TIME



43

Additionally, while modal choice, i.e. truck vs. rail or sea vs. air, can play a factor in the price of the service, even that distinction is being blurred. As motor carriers seek new markets such as individual small package handling, the integrated air carriers (Federal Express, UPS, etc.) are looking to highway services to achieve operational flexibility and efficiency.

While the creation of the integrated air carrier industry, initially by Federal Express, has established norms of service within the air cargo industry, many of their service features have been adapted to other modes. Before examining these adaptations, a brief description of the basic service features is necessary.

Federal Express was created to take advantage of the then recently created uniform location system established by the U.S. Postal Service, the "zip code," and the recognition by its founder, Fred Smith, that businesses needed a more reliable, faster way to convey documents within the United States. From that start, Federal Express has continued to revise and expand its service offerings, both geographically and from the perspective of features. In recent years, Federal Express has created a stable of services, all based on one common theme—time-definite delivery. Today, a shipper in the United States can choose from a myriad of choices as portrayed in the following service map (Exhibit II-7). Regardless of the choice or size of shipment, Federal Express guarantees it will meet the schedule.

Exhibit II-7
Federal Express Corporation
U.S. Service Options

Shipment Type	Delivery Options		
	Next Business Morning	Next Business Afternoon	Two-Day
FedEx Letter	•	•	
FedEx Pak	•	•	•
FedEx Box	•	•	•
FedEx Tube	•	•	•
Freight (>150 lb.)		•	•

Source: Federal Express Airbill

There are a growing number of examples of similar service developments in other modes of transport. Motor carriers (trucking companies) are creating both time-definite services that concentrate, in some cases, on specific size groups of shipments. Major U.S. motor carriers, such as Roadway, have created a family of subsidiaries that handle overnight and second-day small packages, less-than-truckload (LTL) shipments (i.e., generally between 220 and 11,000 pounds, 100 and 5,000 kilograms) within geographic regions or nationwide, and truckload (TL) shipments of 40,000 pounds (18,180 kilograms) either regionally or nationwide.

Shipping lines have also developed a variety of services, all reflecting the demand for time-definite delivery. Fixed-day sailings, i.e., departures/ arrivals, on an established pattern such as the same day every week, have replaced a continually changing schedule. Just as the integrated air carriers and motor carriers use hubs to sort and transfer shipments through their system, shipping lines have developed similar service patterns. Smaller ships serve lower traffic ports and provide direct connections to the larger ships, which ply the longer, higher load routes. In addition, shipping lines have extended their services beyond the ports by creating joint operations with railways to move containers to inland points or even across continents. These services are coordinated with the ship schedules to ensure a time-definite flow of traffic.

As an example, in the past year, American President Line (APL), a major U.S. shipping line, has changed it handling system for U.S.-bound shipments from the Far East for Toys-R-Us, a major U.S.-based toy retailer, resulting in a 20 percent reduction in the distribution cycle. This has been accomplished by closely monitoring the flow of inbound containers and presorting them in Hong Kong in order to speed up the transfer at the U.S. entry point in Long Beach, California. Toys-R-Us is able to inform APL exactly what is loaded in each container, which allows APL to accurately position containers for efficient handling through their system.

While the physical handling of the shipments has been improved, the use of electronic, accurate manifest information permits APL to pre-clear shipments while they are still at sea using the U.S. Customs' Automated Manifest System. This process has further reduced the transit time. By creating a time-definite service, APL can now provide Toys-R-Us with an additional 12 to 13 days advance notice for its U.S. distribution centers to plan for their new inventory.

45

This, in turn, means that the stores get new products and/or replenishments faster.[19]

4. **Third Party Logistics**

Third party logistics services are expanding worldwide. Firms are concentrating their skills and assets on core businesses, and using other parties to provide support services. It has been predicted that this industry, in the United States alone, will grow in the next ten years from about $9 billion (US) per year to about $365 billion (US) in annual revenues.

E. CONCEPT OVERVIEW

1. **Overview**

The Global Transpark concept was based on the research of Dr. John D. Kasarda into the fundamental changes occurring in global business. Employing his skills and tools in business and social demography, Dr. Kasarda identified fundamental patterns of change in business activities, particularly with respect to choice of transport mode and the underlying principals of business.

Dr. Kasarda identified "waves" of transportation-urban-economic development. As discussed in his concept paper, *A Global Air Cargo-Industrial Complex For The State of North Carolina,*[20] he identified four preceding waves of development, with the fifth being the increased use of air transport in response to the pressures to respond more quickly to competitive pressures and market needs.

As a result of his efforts, Governor James G. Martin, of the State of North Carolina initiated a feasibility study of such a concept. That report, which was presented in February 1992 found the concept to be technically feasible and recommended continued development of the project.

Based on the findings of the feasibility study, the State of North Carolina embarked on a master planning project, involving the design of the airfield facilities, a detailed environmental assessment, the creation of an infrastructure

[19]Brennan, T., "Streamlined distribution system earns APC top vendor award from Toys-R-Us," *Traffic World*, October 4,1993, p. 37.
[20]Kasarda, J.D., *A Global Air Cargo-Industrial Complex For The State of North Carolina*, The Frank Kenan Institute of Private Enterprise, February 21, 1991.

plan, and the design of the industrial development. This program was funded by both the State of North Carolina and the U.S. Government through the Federal Aviation Administration.

This section examines the evolution of the concept. It is primarily a chronological review of the evolution rather than a detailed survey of each of the steps.

2. Transportation/Development History

As noted in Dr. Kasarda's paper, the movement of goods has always been "paramount to community economic development."[21] In looking at the United States, there have been four major eras or "waves" of development in transportation facilities and services. The first was the creation of the seaports, followed by the establishment of riverine/canal based urban areas. The third wave was fostered by the railroads, while the creation of the complex road network, particularly as exemplified by the U.S. Interstate Highway system, characterized the fourth wave.

In recent decades, air transport has become a major player in the movement of goods. In fact, air transport, both within the United States and in Europe, really began as a means to move goods rather than people. However, it was not until the Second World War and the Berlin Airlift that air transport of goods became an accepted alternative. As business has become more international, the role of aviation has increased. Although air cargo transport only accounted for less than one percent of the total international traffic, as of 1990, the value of goods handled by air services was nearly one-third of the total.

No longer is air cargo regarded only as a transport mode for emergency shipments or for those goods which are a combination of light weight and high value. The range of commodities now routinely shipped by air includes products generated by many different industries. In fact, on a worldwide basis, approximately 80 percent of all goods shipped to a significant degree by air, are produced by over 70 different industry types. The total merchandise weight carried by air has been estimated at 42.7 billion pounds with an estimated value of $1.01 trillion (US).[22]

[21]Ibid., p. 1.
[22]Sherck, T.R., "Business and Economic Factors That Drive The Use Of Air Cargo Services," Air Cargo Shippers Conference, Portland 1991.

This acceptance of air cargo has been due to changes in the way business is done and the scale of business. Many of the trends identified in the preceding sections have led to the demand for air cargo services.

In examining transportation development, three characteristics emerge. The first is that each transport form has not disappeared, but has been succeeded generally by a transport form employing a higher order form of technology. Each new level of transport has brought together a different combination of natural and man-made technologies. Second, the flexibility of each new transport form has increased and, third, the potential sustained speed of each new transport mode has also increased.

The use of water and wind for ocean crossings, was a straightforward marriage of natural forces. On the canals, the motive force of the wind was replaced by human, animal, and eventually mechanical power, while the right of ways were available natural routes. In both cases, the resistance of the water, the control of the wind, or the power of the man or animal dictated the speed of the vehicle. While the replacement of wind power by other forms of power increased the speed of the ships and barges, the fact remained that these were slower forms of transport.

Railroads dispensed with natural or animal/ human power and natural right of ways. An "engineered" form of motive power was combined with a man-made right of way. This higher technology form of transport allowed the economic development of areas that were not accessible by either sea or river transport services. In addition, because of the design of the vehicles and the motive power, the average speed of the railroads was higher than that of its predecessors.
This differential has continued to widen as new rail technologies, such as the French TGV and the Swedish X2000, have been introduced. Another increase in speed is expected to occur as technologies such as Maglev are developed for commercial service.

With the development of the automobile, and eventually the creation of a complex network of roads, the fourth wave can be characterized as yet a higher order and a more flexible form of technology. The sheer size of the railroad has precluded it from serving every point. Its size, in fact, dictates larger minimum scales of economy, which in turn dictates where it is routed. In contrast, the truck, by both design and size, is much more flexible. Truck service to and from any point is possible. In fact, the development of the United Parcel Service system, with over 50,000 vehicles, in the United States has been based on exactly

that one feature—total flexibility and maximum coverage for service development. While railroads, particularly the newer models, have higher sustained speeds, the truck has a higher overall point-to-point speed potential given both the design of the road systems and the design of the vehicle, notwithstanding the adverse effect of congestion.

The creation of the airplane elevated the technology of transportation yet again. Unlike railroads and trucks, airplanes merge an engineered form of locomotion with a natural environment. The result has been a transport mode with, in some respects, maximum flexibility. An aircraft is not encumbered by natural surface boundaries such as the shore of an ocean, which limits both sea-borne and surface modes. While there are differing economies of scale that affect the design and function of the aircraft, there is a broad range of vehicle sizes and hence flexibility in terms of scheduling and choice of service points. Another factor, and one that Dr. Kasarda focussed on, is that of speed.

The use of a natural environment with a very low friction factor has meant that the speed of the air vehicle has been limited by the technology and cost-benefit trade-off of the airframe and the powerplant.

This evolution in transport forms has contributed to an expanding choice for shippers and consignees. As new technologies have emerged and have been adapted to each of the transport forms, differentials have changed. The high speeds reached by trains such as the TGV have, subject to the availability of a network design, created a more meaningful choice between rail and truck, particularly over long distances. So too, the emergence of larger and faster ships, particularly in concert with air or surface modes, has created competition for other choices using just one mode.

3. The Concept Paper

Dr. Kasarda's paper synthesized the forces affecting manufacturing, distribution, internationalism, transportation modal choice, and dynamic changes into a single concept. The paper identified a number of key forces, including globalization, just-in-time production and delivery, the coming aviation era, and the next generation of freighters as factors underlying the need to create a single complex where transportation and manufacturing/distribution activities are interconnected.

With the identification of the five waves of transport development, the paper looked at each of these factors in turn. The paper traced the rapid expansion of international telephone calls, from 300 million to almost 5 billion annual minutes between 1977 and 1987, as an indicator of the expansion of international business transactions. The paper also noted the expansion of world trade and overseas investment by U.S. firms to 1990 levels of $4 trillion (US) and $1.3 trillion (US), respectively.

In examining specific changes, Dr. Kasarda's paper noted the creation by Ford of the "world car," and the international sourcing of components by IBM at the Research Triangle Park in North Carolina in the assembly of personal computers

In addition to the globalization of economic activity, Dr. Kasarda's paper looked at the new forms of manufacturing and distribution. As previously discussed, Dr. Kasarda noted that the increased use of processes to reduce inventories led to the demand for faster modes of transport.

The discussion of increased use of air cargo services and the emergence of new all-cargo aircraft (freighters) examined the Boeing B747 family of freighters and the Russian designed Antonov 124 and 225 aircraft. Also, the potential for additional, larger supersonic and even hypersonic aircraft was reviewed along with their potential to further shrink the world by reducing flight times between points scattered across the globe.

4. **The Concept**

The original concept, which was named the Global Air Cargo Industrial Complex (GACIC) as detailed in Dr. Kasarda's paper, envisioned a complex unlike anything created anywhere else in the world. As Dr. Kasarda stated in his paper, "I must make clear from the start that I am not talking about an air cargo airport, but a computer-age industrial complex in which aviation will play a pivotal role."[23] He went on further to state that, "The complex will integrate just-in-time (JIT) manufacturing systems with air freight systems . . . such that the two systems function as a synergistic unit."[24] The concept incorporated two 13,000-foot runways, each served by four parallel taxiways with industrial plants lining the taxiways, affording direct linkages between manufacturing and air cargo services.

[23]Kasarda, J.D., *A Global Air Cargo-Industrial Complex For The State of North Carolina*, The Frank Kenan Institute of Private Enterprise, February 21, 1991.
[24]Ibid., p. 10.

The other modes of rail and roads were not ignored. In fact some original concept designs included a rail and road spine corridor through the center of the complex, thereby linking the GACIC with points not only within North Carolina, but the rest of the United States as well.

Dr. Kasarda's concept included the centralization of U.S. Customs, security, sophisticated loading equipment, and the establishment of central distribution terminals and an internal network of transport vehicles to move goods among the tenants of the complex.

Another feature of the GACIC was the creation of a Foreign Trade Zone in order to attract and develop international industrial operations.

The concept paper suggested that about 15,000 acres (37,500 rai) would be required on which to develop the complex and that its location should be no more than one hour from the major urban areas of North Carolina. It also identified the need to ensure that the facility would be free from noise restrictions, that tall structures would be precluded within 10 miles (16 km) of the facility, and that land within 5 miles (8 km) of the complex would be zoned to minimize conflicting functional use. The concept also envisioned the creation of a "wayport" to provide relief from the congestion of the major hub airports in the region.

5. **North Carolina Project**

As discussed in more detail in the next chapter, the efforts of Dr. Kasarda's lobbying of the Governor of North Carolina has led to the development of the concept and planning the complex.

A technical feasibility study was commissioned by the State. That study was combined with a wide ranging analysis of air cargo services and flows in the State of North Carolina. The two studies were funded jointly by the State of North Carolina and the U.S. Federal Aviation Administration.

While the study was being conducted, the North Carolina state legislature passed enabling legislation to create an Authority to study the concept. Following the release of the study, a process was followed to select a site.

In November 1992, a master planning project was initiated to translate the concept into a physical plan that would provide the basis for the design and construction of the complex. That master plan was completed in January 1994 and is included in Chapter III.

Throughout this process, the concept has undergone changes and alterations. Such features as the length of the runways have been discussed and changed to reflect the specific site and operational requirements. The addition of an educational institution on site has emerged, as well as the assessment of phasing of technology, particularly materials handling systems, through the development of the project.

Throughout this process, the fundamentals of the concept have held firm.

F. GLOBAL TRANSPARK NETWORK

1. Overview

The Global Transpark Network (GTN) represents both a concept and a coordinated group of sites. Its initial structure is based on bringing together three strategically located Global Transparks serving the North American, European and Asian markets. On a conceptual level, the Global Transpark Network represents the creation of a global infrastructure for the global economy of the next century.

This section describes the strategic importance of each of the proposed Global Transparks and identifies the three logical sites for the initial members of the Global Transpark Network. It also describes the *modus operandi* of the network, the function of the individual Global Transparks, and how the creation of the GTN not only validates the creation of each Global Transpark, but also uniquely responds to the needs of global businesses.

2. The Global Perspective

The three largest world markets are Asia, Europe and North America. Each are undergoing change and growth. The rise of the economies of South East Asia is expanding the Asian marketplace. The formation of the European Union, the expansion of that trade group, and the formation of market economies in Eastern Europe are steps in the growth of that region. With the passage of the North American Free Trade Agreement and its highly probable expansion into Central

and South America, the economies of the western hemisphere are being drawn together.

Against this background of economic growth and the emergence of global enterprises, the value of providing a new infrastructure to support worldwide commerce has become increasingly evident.

If one looks at the world from a polar view (see Exhibit II-8), it is readily apparent that Thailand and the east coast of the North America are exactly opposite to each other, and that northern Europe lies almost exactly halfway. Further, if one examines the time zones, there are twelve time zones between Thailand and the east coast of the United States and exactly six time zones from continental Europe in either direction to the other regions.

While many might consider linking Asia and North America via the traditional trans-Pacific routing, a route via Europe is not only just as far, but also ties together these two markets with the European market. Thus, when we look at the world from a global economy and dismiss national boundaries only as points where passports are checked and shipments inspected, the value of linking the three largest markets together becomes overwhelming.

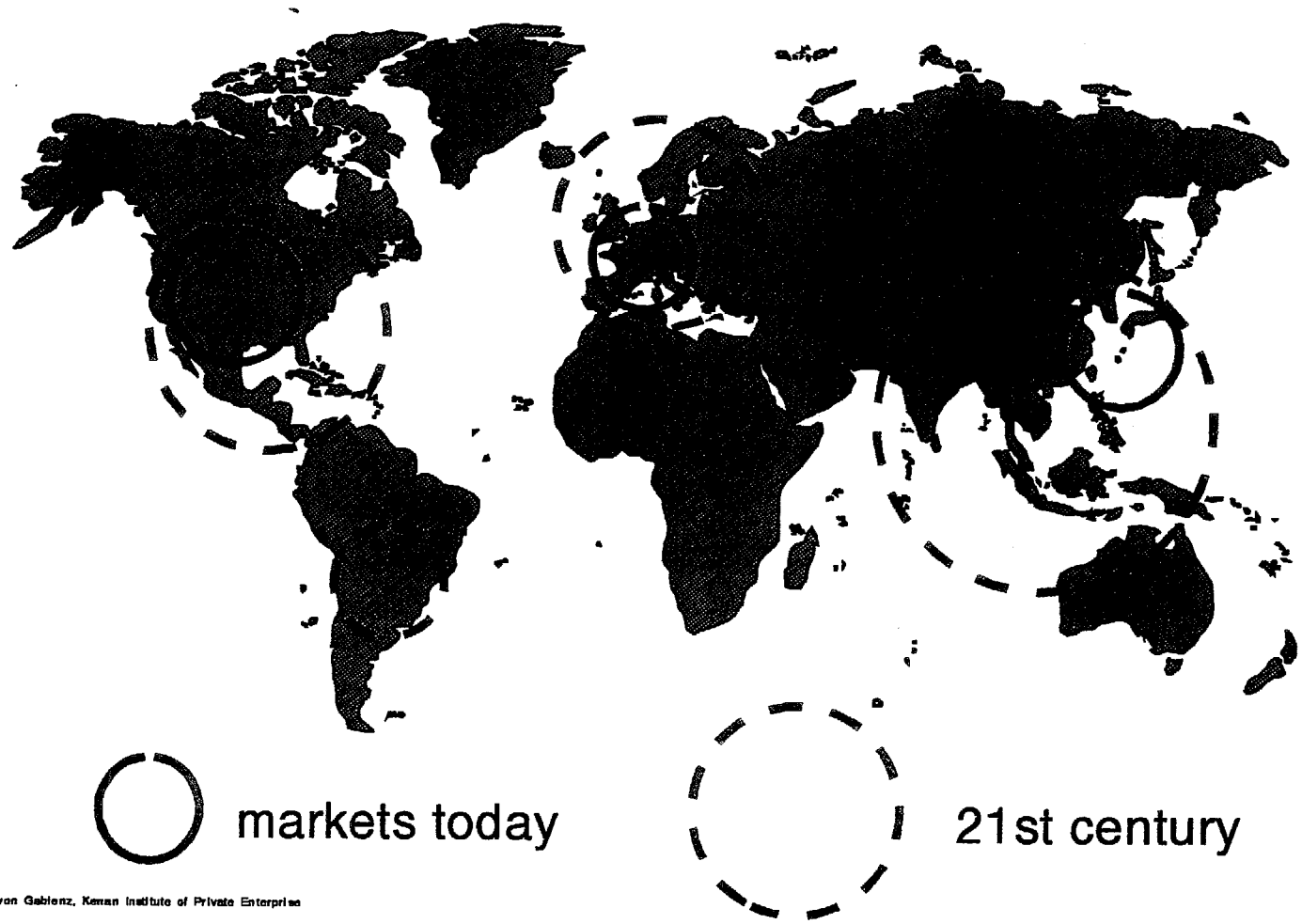
Through the creation of a network of Global Transparks, the real potential of the concept can be realized. Unlike a single facility or a combination operating independently of each other, a network can spread the value of the concept farther and multiply the benefits faster. Each Global Transpark then becomes a gateway for non-resident firms to serve the local market region, as well as for resident firms to serve the distant market regions.

3. Global Transpark Network

a. The initial network

There are three sites under various stages of development as the first three Global Transparks. Their locations (see Exhibit II-9) in Thailand, North Carolina and Germany, coincide with the three major market regions. They also, by virtue of their location, support a potentially highly efficient air transport system. Finally, the three initial Global Transparks provide excellent locations from which to build a larger network. As an example, the Thailand Global Transpark can act as the gateway to the Asian markets, with an eventual satellite location serving northern Asia. Similarly, the North

The Global Markets



Dr.von Gablenz, Kenan Institute of Private Enterprise

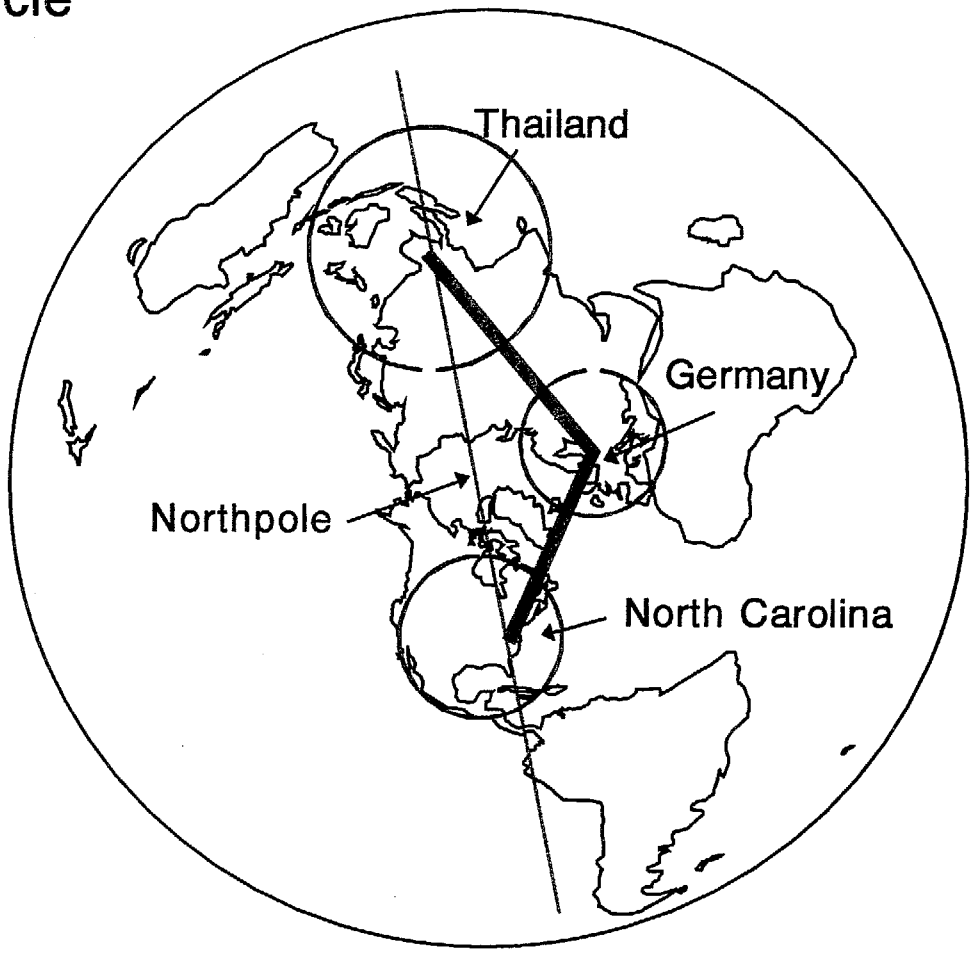
Exhibit II-8

North American and Asian markets connected via Europe

Flying the great circle

North Atlantic Route

Connecting the Triad by going only half the way around the world



Dr von Gablenz, Kenan Institute of Private Enterprise

Exhibit II-9

Carolina Global Transpark can also serve South America until a complex is developed on that continent. The formation of a network linking the three sites would ensure cooperation and coordination and realization of the benefits of the system.

b. Network operation

The locations of the three sites support the operation of a fixed schedule of flights linking the three Global Transparks. As graphically displayed in Exhibit II-10, overnight service can be provided from Thailand to the United States and from the United States to Thailand in an eastbound direction. The following schedule, with times expressed in a 24-hour format, summarizes a possible flight schedule. The schedule is based on having two-aircraft in operation and allows a two-hour aircraft turnaround in each location. With the addition of two additional aircraft, twice-daily service could be provided.

Local Time	Leave/Arrive	Location
1800	Leave	Thailand
0001/0200	Arrive/Leave	Germany
0500/0700	Arrive/Leave	North Carolina
2100/2300	Arrive/Leave	Germany
1600	Arrive	Thailand

c. Global Transpark functions

In addition to the main shuttle flight service, each Global Transpark will also act as a transport hub in their respective regions. A mixture of feeder services employing all available transport modes will link each Global Transpark to the surrounding region. The location of each Global Transpark promotes the integration of all transport modes for the benefit of users of the network.

The North Carolina Global Transpark is served by rail and highways, and is within four hours of four major East Coast ports in the United States. The proposed German Global Transpark at Parchim, is adjacent to the autobahn and main rail line between Hamburg and Berlin. It is also close to the ports of Bremerhaven and Rostok.

A Global Transpark in Thailand, located in the Eastern Seaboard, would have access to the rest of the Kingdom by way of the highway and rail systems, and would be close to the deepwater ports at Laem Chabang and Map Ta Phut.

In addition to the transport hub function, each Global Transpark will act as gateways for firms serving the respective market regions. The provision of all forms of support services, access to state-of-the-art telecommunications, and education and training facilities at each location, will facilitate the entry of firms into each region and the development of their market presence.

4. **A Global Infrastructure**

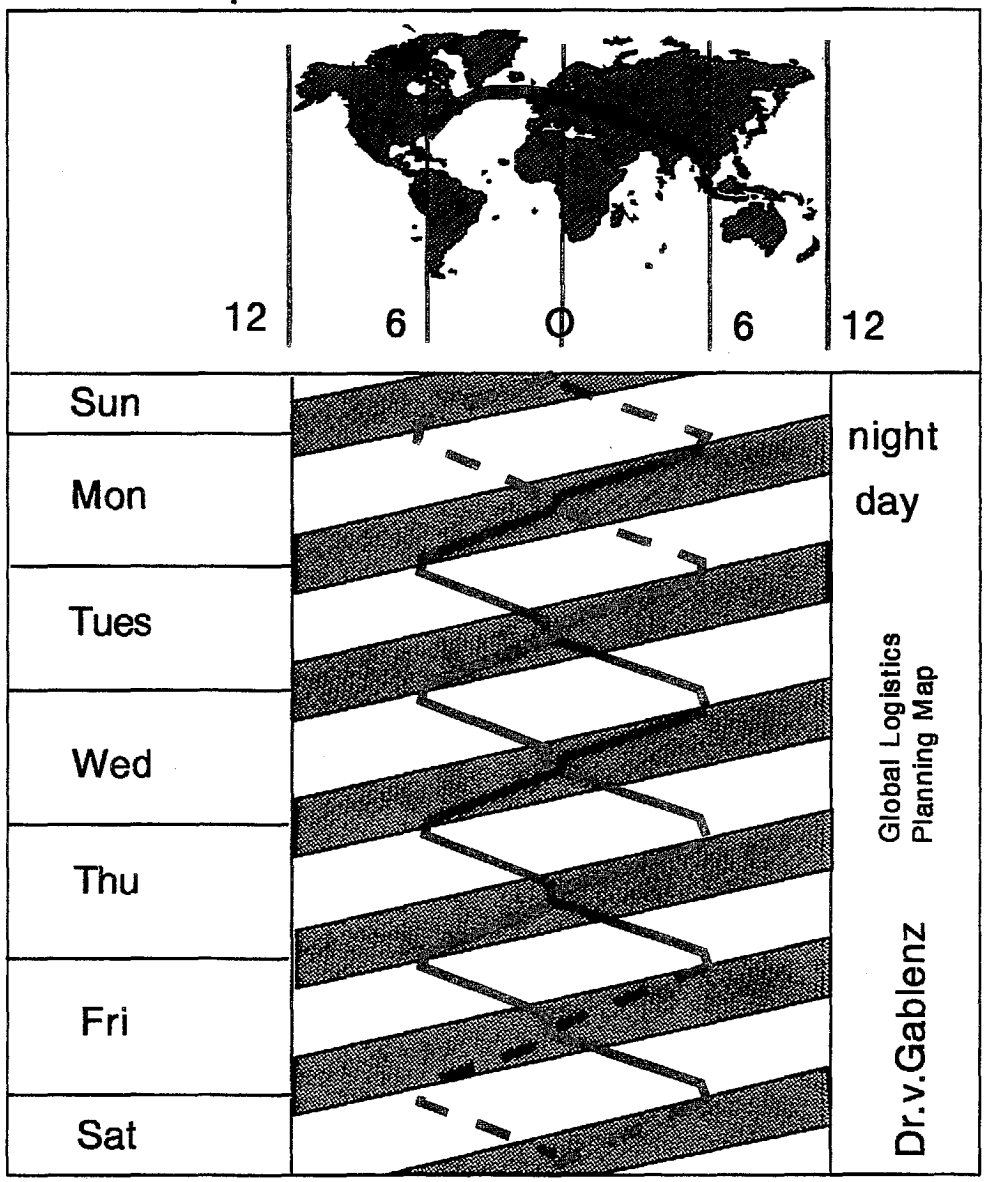
The network of Global Transparks provides a global infrastructure for firms engaged in the global economy. As Exhibit II-11 illustrates, by linking the activities of plants and distribution centers at or adjacent to the three Global Transparks, global firms can maintain continuous and coordinated operations.

An assembly operation in North Carolina can rely on the production of components in Asia and Europe, which if produced during the respective daylight hours, can be transported to the assembly plant overnight. In this way, an integrated assembly operation can reduce the level of inventory in the logistics chain. That reduction can save money, by reducing assets committed to work-in-process inventory. The reduced time between component manufacture and assembly of the final product also allows the manufacturer to delay manufacture of each product. In that way, the manufacturer can reduce its level of assets committed to the finished goods inventory. No longer does a company have to build a product and hope to sell it. Rather, they can manufacture products in response to known demand.

With business' increasing refusal to be bound by the artificial limitation of national borders, and the growing worldwide need to improve the ability to respond to market demands quickly, the proposed network of Global Transparks provides an infrastructure which is uniquely designed to meet these needs.

57

Air Transportation in the GTP Network



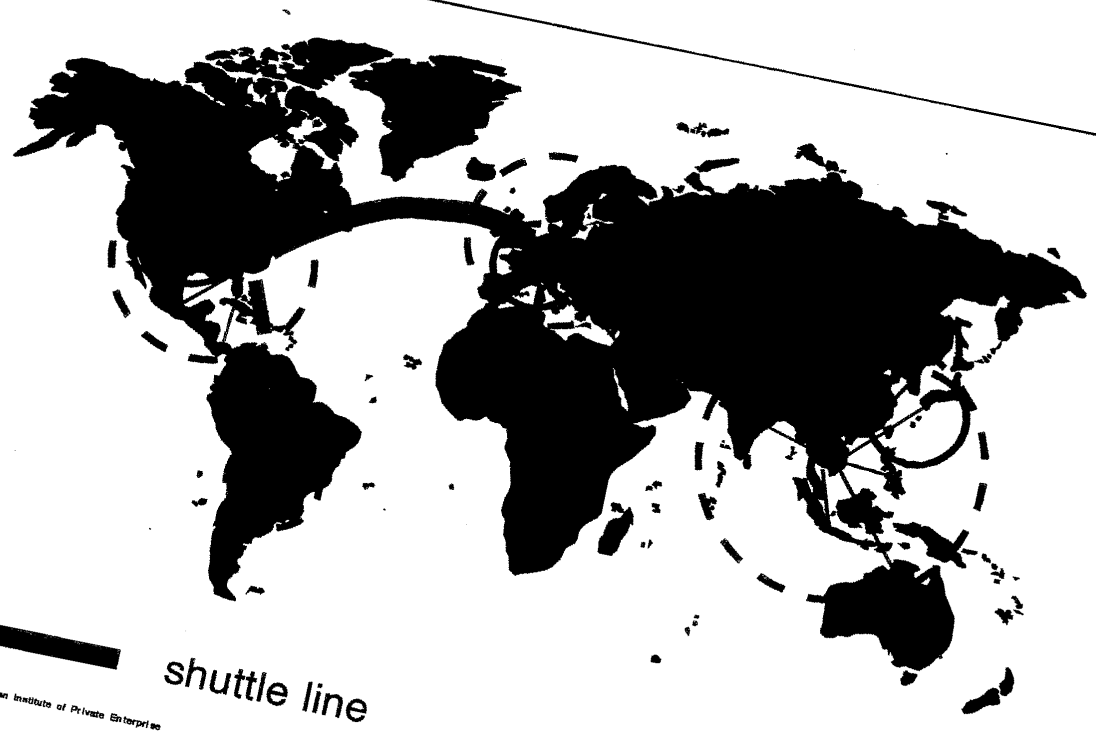
747 No.1

747 No.2

each round trip = 48 hours

Exhibit II-10

The GTP Network



shuttle line

feeder and distributor

Dr. von Gablenz, Kenan Institute of Private Enterprise

Exhibit II-11

Chapter III
North Carolina Global TransPark

III. NORTH CAROLINA GLOBAL TRANSPARK

A. INTRODUCTION

This chapter examines the translation of Dr. John D. Kasarda's concept to a more tangible form, including the selection of a site and the creation of a series of related support organizations.

In addition to reviewing the operating entities of the Transpark (the North Carolina Air Cargo Airport Authority, the Global TransPark Foundation, Inc, and the Global TransPark Development Zone) this chapter also examines the site selection process and reviews the two finalist locations.

The development of the North Carolina Global TransPark has involved a broad range of political groups within the state. The formation of three operational bodies has reflected the scale of the project as well as the need to have specific organizations focused on specific elements of the project.

The selection of the site for the North Carolina Global TransPark was conducted in an open environment in which all prospective hosts for the complex were invited to present their site proposals. Following an extensive review of the proposals, two finalist sites were identified. After further examination and review, the joint proposal by the City of Kinston and Lenoir County was selected for the North Carolina Global TransPark.

B. DEVELOPMENT OF THE SITE OF NORTH CAROLINA GLOBAL TRANSPARK

In the previous chapter we discussed the concept developed by Dr. Kasarda. However, while the publication of the concept paper was a significant step in the evolution of the idea, it was the adoption of the proposal by the State of North Carolina, in particular by former Governor James G. Martin, that ensured the idea would be given a thorough review.

Governor Martin, intrigued by the visionary nature of the Global TransPark concept, quickly recognized the potential long-term benefits, not only for the State, but also for United States' industrial competitiveness. The creation of the North Carolina Air Cargo Airport Authority to manage the creation of the Global TransPark confirmed the commitment of the State to carefully examine the concept and to embark on the development of the facility.

Since the publication of the technical feasibility study in February 1992, there have been a number of important milestones:

- A Request for Proposal was issued by the State of North Carolina for those counties and regions wanting to host the North Carolina Global TransPark.
- A site was selected for the North Carolina Global TransPark.
- A contract was issued, funded jointly by the State of North Carolina and the U.S. Federal Aviation Administration, to prepare a Master Plan for the North Carolina Global TransPark.
- A research grant was issued by the U.S. Federal Aviation Administration to fund a series of research projects examining critical issues surrounding the Global TransPark concept.
- A private foundation, the North Carolina Global TransPark Foundation was formed to solicit private donations to be used in funding the development of the project.
- A collection of counties in eastern North Carolina bonded together and formed a Development Commission to levy additional taxes in order to fund infrastructural improvements within that region of the State.

The following sections of this chapter examine the North Carolina Air Cargo Airport Authority, the Global TransPark Foundation, Inc. and the Global TransPark Development Commission.

C. NORTH CAROLINA AIR CARGO AIRPORT AUTHORITY

The North Carolina Air Cargo Airport Authority, which also operates under the name of North Carolina Global TransPark Authority, has the primary responsibility for managing the planning, construction and operation of the Global TransPark. This section reviews the legislation by which the Authority was formed, the powers of the Authority, and the governing mechanism and composition of the current Board of Directors.

It has been said that the North Carolina Air Cargo Airport Authority is one of the most powerful bodies ever created by the General Assembly of the State of North Carolina. The creation of the Authority and the passage of the enabling legislation

was based on a bipartisan coalition of both parties (Republicans and Democrats) within the Administration and General Assembly of the State of North Carolina.

1. **Enabling Legislation**

   During the 1991 session of the General Assembly of North Carolina, the passage of Senate Bill 649, "North Carolina Air Cargo Airport Authority Act," formed the North Carolina Air Cargo Airport Authority. During the 1992 session, the enabling legislation was amended. Copies of the original bill and the amendments are attached in Appendix I. The original bill and the amendments were passed and ratified by a coalition of members representing both, Democrats and Republicans, which reflected the keen interest in the project within the State.

2. **Board of Directors**

   The Authority is governed by an appointed Board of Directors. The legislation specified that the Authority be governed by a Board of Directors of no more than 19 members who would be appointed jointly by the Governor, the Speaker of the House of Representatives, and the Senate. Additional members of the Board would include the State Treasurer, the President of the North Carolina System of Community Colleges, the President of The University of North Carolina, the Chairman of the State Ports Authority, a member of a board of the Lenoir County Commissioners, and a member of the Kinston City Council. Current Board Members include:

   — The Honorable James B. Hunt, Jr., **Chairman**
   Governor, State of North Carolina

   — Mr. Thomas W. Bradshaw, Jr., **Vice Chairman**
   Managing Director, The First Boston Company

   — Mr. Seddon Goode, Jr., **President & Executive Director**
   University Research Park

   — The Honorable Henson P. Barnes
   Former President Pro-Tem of the State of North Carolina Senate

   — The Honorable J. Phillip Carlton
   Partner, Poyner & Spruill, Attorneys at Law

— Dr. Richard R. Eakin
Chancellor, East Carolina University

— Mr. Charles A. Hayes
Chairman of the Board, CEO, Guilford Mills

— Mr. Frank B. Holding, Jr.
Area Vice President, First Citizens Bank

— Mr. Fred E. Hunneke
Chairman of the Board and CEO, Domestic Industries

— Ms. Jeanette Hyde

— Mr. Frank E. Laughon, Jr.
Chairman and President, Richmond Cold Storage

— Mr. Roger A. McLean
Vice Chancellor for Business and Finance
Elizabeth City State University

— Mr. John O. McNairy
Harvey Enterprises

— Mr. Hugh Morton
Owner, Grandfather Mountain

— Mr. Gordon S. Myers
Vice President of Real Estate, Ingles Markets, Inc.

— The Honorable Robert W. Scott
President, North Carolina System of Community Colleges

— Mr. Maceo K. Sloan
Chairman, President and CEO
NCM Capital Management Group, Inc.

— Mr. P.A. Thomas
Chairman, State Ports Authority

— Dr. John D. Kasarda, **Board Advisor**
Director, Kenan Institute of Private Enterprise

— General James J. Lindsay, **Board Advisor**
U.S. Army (Retired)

3. **Authority Powers**

The Authority's daily functions are currently guided by Mr. William T. Powell, Jr., the Executive Vice President. Its offices are located in the Raleigh, the state capital, with an additional office at the Kinston Regional Jetport, site of the Global TransPark.

The Authority has been vested with extensive and wide-ranging powers. (The complete list of those powers is presented in Appendix I, Section 63A-4 of Senate Bill 649.) The following list summarizes the significant powers of the Authority:

- To establish, finance, purchase, construct, operate and regulate cargo airport complexes, including highways, bridges, shipping facilities, cargo transfer systems, mass transit systems, and other transport facilities;

- To enter into contracts with both public and private entities, to conduct all necessary business related to the Global TransPark;

- To issue obligations, both secured by land or expected revenues, to finance the Global TransPark; and

- To exercise the power of eminent domain on all required property, and also to have zoning jurisdiction over all areas within six miles of the boundaries of the Global TransPark.

With these powers, the Authority has complete control over the immediate site of the Global TransPark, including ownership and control of the land, as well as the activities on the site and control, through zoning jurisdiction, of a broad area surrounding the complex. The zoning jurisdiction ensures that compatible land uses will emerge that will enhance the function and operation of the Global TransPark.

By having broad powers regarding the construction of a wide range of transport facilities, including the hiring of engineers and planners, the Authority has the power to ensure that all aspects of the Global TransPark are integrated completely.

Finally, the North Carolina Air Cargo Airport Authority is able to employ a wide variety of funding mechanisms, including both debt, equity and revenue sources to fund the development, construction and operation of the Global TransPark.

D. GLOBAL TRANSPARK FOUNDATION, INC. AND DEVELOPMENT COMMISSION

The Global TransPark Foundation, Inc. (Foundation) is a private, non-profit corporation dedicated to supporting the development of the Global TransPark. The Foundation works in concert with the Authority. This section examines the purpose of the Foundation and the members of the Board of Directors.

1. Structure and Purpose

The Global TransPark Foundation, Inc. was chartered as a private organization within the State of North Carolina. It was formed to assist the Authority in the successful development of the Global TransPark by facilitating the marketing, recruitment, and location of manufacturing and distribution companies within the GTP. The Foundation was established as a non-profit organization operating under sections 501(c)3 of the Internal Revenue Service regulations. As a 501(c)3 organization, private donations to the Foundation are tax deductible to the extent the regulations permit.

The Foundation's offices are also located at the Kinston Regional Jetport. The Foundation's daily operations are administered by Ms. Nancy Stallings, its Vice President.

In order to establish a pool of working capital, the Foundation set an initial goal of raising $30 million (US). Within one month in the summer of 1993, the Foundation has raised in excess of $3 million (US) from local donors in Lenoir County. The intended uses of Foundation Capital will include:

- Acquiring land for development purposes;
- Funding incentives for locating companies;
- Funding private infrastructure works for tenants;
- Supporting marketing and industry recruitment; and
- Providing general support of the GTP project.

2. **Board of Directors**

The Board of Directors of the Foundation is currently composed of 24 members. There are a number of members who are also associated with the Authority. The following is a current list of the Board of Directors.

— The Honorable James G. Martin, **Chairman**
Former Governor, State of North Carolina

— Mr. C. Felix Harvey, **Vice Chairman and President**
President, Tidewater Transit

— Mr. Seddon Goode, Jr., **Vice President**

— Mr. David J. Wichard, II, **Executive Secretary**
Chairman, Greenville Daily Reflector

— Mr. John A. Allison
Chairman and CEO, Branch Banking and Trust Company

— Mr. Thomas A. Bennett
Retired - Wachovia Bank & Trust Company

— Mr. Edwin B. Borden
President, The Borden Manufacturing Company

— The Honorable Harlan E. Boyles
State Treasurer, State of North Carolina

— Mr. Thomas W. Bradshaw, Jr.
Managing Director, The First Boston Company

— Mr. Frank H. Dunn, Jr.
Chairman and CEO, First Union National Bank of North Carolina

6d

— Mr. Paul Fulton
President, Sara Lee Corporation

— Mr. Frank B. Holding
Vice Chairman, First Citizens Bank

— Mr. Wayne D. Keller
Executive Vice President, Carolina Electric Cooperatives

— Mr. Owen G. Kenan
CEO and President, Kenan Oil Company, Inc.

— Mr. Robert R. Maudlin
CEO and President, Centura Banks, Inc.

— Mr. John G. Medlin
Chairman and CEO, Wachovia Corporation

— Mr. Sherwood H. Smith, Jr.
Chairman and CEO, Carolina Power and Light Company

— Senator Terry Sanford
Partner, McNair and Sanford

— Mr. P.A. Thomas
Chairman, State Ports Authority

— Mr. James W. Thompson
Chairman, NationsBank East

— Mr. William T. Powell, Jr.,
Executive Treasurer & Assistant Secretary
Executive Vice President
North Carolina Global TransPark Authority

— Mr. Nathan R. Skipper, Jr.,
Assistant Secretary & Assistant Treasurer
Ward and Smith

67

— Ms. Nancy Stallings
Vice President and Assistant Treasurer
Global TransPark Foundation, Inc.

— Mr. David Ward, **Legal Counsel**
Partner, Ward and Smith

3. **Development Commission**

In July 1993 the General Assembly of North Carolina passed legislation which authorized the creation of the Global TransPark Development Zone. Fourteen counties in the eastern portion of the state were designated as being eligible to participate in the zone. The Global TransPark Development Commission (Commission) was created to govern the operation of the Zone. Mr. Henson P. Barnes, a member of the Board of the Authority was identified to act as the official liaison between the Commission and the Authority. The General Assembly approved a $7.5 million (US) appropriation and further authorized the counties in the Zone to levy a $5 annual vehicle fee on residents of the counties for a period of five years. It was estimated that the tax levy would generate a total of approximately $28 million (US) in available funds.

The funds are designated to provide revolving loans to fund local infrastructure developments such as water and sewer systems within member counties. Additionally, the funds are designated to provide limited grant assistance for economic development. Some examples of the economic development programs include the development of remote industrial parks and the establishment of industrial training programs.

E. NORTH CAROLINA SITE SELECTION PROCESS

1. **Request for Proposal**

With the assurance that North Carolina had the resources and the will to make the Global TransPark a reality, the Authority has continued to press forward with its planning efforts. After the Feasibility Study determined in February 1992 that development of the Global TransPark was technically feasible, the Authority began its search for reasonable and practical site locations in North Carolina that could meet the purposes and needs for this project. The Authority solicited proposals from interested public and/or private groups in North Carolina, because local support would be essential to the GTP's success.

The Authority recognized that, to meet the commercial, manufacturing, and military needs, planning and development of the GTP would require consideration of a range of factors, including safety, airspace limitations, land limitations, ground access, environmental impacts, financial limitations, noise impacts, and political constraints. Accordingly, a "Request for Proposal—Potential Sites for North Carolina Global TransPark" (RFP) was developed which requested information on the following factors from each proposer:

- Site Characteristics
  - Size
  - Land Cost
  - Land Availability/Ownership
  - Topography
  - Geotechnical and Environmental
    (Wetlands, Floodplain, Watershed, Hazardous Materials, Air Quality, Threatened and Endangered Species, Historic Structures/ Archaeology)

- Transportation Proximity
  - Highways
  - Railways
  - Airports
  - Seaports
  - Airspace

- Utilities Availability
  - Electric
  - Natural Gas
  - Waste Water Treatment
  - Water
  - Telecommunications
  - Solid Waste Disposal

- Labor Characteristics
  - Availability
  - Costs
  - Training Opportunities

- Facility Support Services
  - Industry
  - Public

- Quality of Life

- Zoning and Permitting

- Financial Participation

On February 11, 1992, the Authority released the RFP to all "Interested North Carolinians." The purpose of the RFP was to provide the Authority with the information needed to determine which site or sites in North Carolina warranted further consideration in the master planning process based on their ability to accommodate reasonable and practical alternatives for development of the Global TransPark.

2. **Alternative Site Identification**

Eleven proposals were received and considered as alternative sites for the Global TransPark. Proposals were submitted by the following municipalities, counties, and joint ventures:

- City of Charlotte
- Piedmont-Triad (City of Greensboro)
- Bladen County
- Laurinburg County/Maxton County
- Southern Piedmont (Montgomery and Richmond Counties)
- Harnett/Cumberland (Fayetteville)
- New Hanover (Wilmington)
- Wayne County
- Duplin County
- Lenoir County (City of Kinston)
- Pitt County

The site proposals are available for review at the Authority's offices. A map showing the locations of the eleven proposed North Carolina sites is included as Exhibit III-1.

3. **Site Alternatives Matrix**

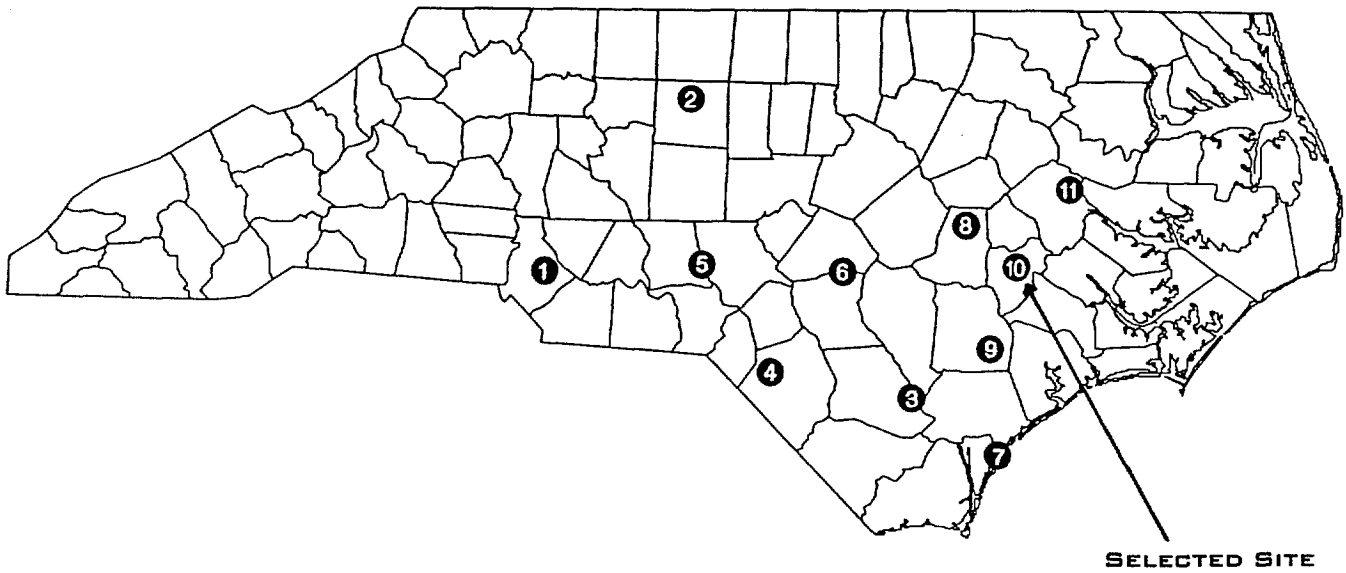
To consolidate the information contained in the responses to the RFP, a matrix was developed reflecting the RFP topics and included information related to each topic. With the exception of wetlands data, the information in the matrix was taken from the written proposals. The wetlands data was based on independent analysis of U.S. Fish and Wildlife Service National Wetlands Inventory maps, U.S. Soil Conservation Service Soils Surveys, and U.S. Geological Survey Topographic maps. The matrix identified each of the 11 alternate sites and contained the following areas and subtopics:

- Site Engineering
  - Size
  - Cost
  - Shape
  - Miscellaneous (topography, soils, etc.)

- Site Environmental
  - Wetlands
  - Floodplain
  - Watershed
  - Hazardous Materials
  - Landfill
  - Underground Storage Tanks
  - Air Quality Non-attainment
  - Threatened and Endangered Species
  - Farmland
  - Historic Structures/Archaeology
  - Population Density within 5-mile radius (noise)

Exhibit III-1

Proposed Global TransPark Sites in North Carolina



LEGEND

1. CHARLOTTE
2. PIEDMONT—TRIAD (GREENSBORO)
3. BLADEN COUNTY
4. LAURINBURG/MAXTON
5. SOUTHERN PIEDMONT
6. HARNETT/CUMBERLAND (FAYETTEVILLE)
7. NEW HANOVER (WILMINGTON)
8. WAYNE COUNTY
9. DUPLIN COUNTY
10. LENOIR COUNTY (KINSTON)
11. PITT COUNTY

72

- Transportation
  - Distance to Major Interstate Highways
  - Distance to Other 4-lane Highways
  - Proximity to Railways
  - Proximity to Seaports
  - Airspace Availability
  - Other Transportation Considerations

- Utilities
  - Electric
  - Gas
  - Wastewater
  - Water
  - Solid Waste Disposal
  - Telecommunications

- Labor
  - Availability within a 50-mile Radius
  - Cost (Wage/Salary)
  - Training (Technical)

- Facility Support
  - Industry
  - Public (Police/Fire)

- Quality of Life
  - Crime Statistics
  - Housing Availability
  - Cultural/Recreational Opportunities
  - Health Services Availability
  - Colleges Proximity
  - Schools Proximity

- Zoning/Permitting
  - Responsible Authorities
  - Willingness to Work Cooperatively with the Authority

- Financial Participation
  - Level
  - Cooperative Efforts (such as provision of infrastructure, joint funding by general obligation bond offering, donation of land, etc.)

Additional information responding to topics that were discussed during the site review/comparison process also was available. These topics also were included in the matrix:

- Accommodates Essential GTP Requirements
- Proximity to Military Installations
- Economic Development Potential

A copy of the Site Alternatives Matrix is attached in Appendix II.

4. **Alternative Site Evaluation**

The Authority proposed to develop the GTP to meet the current and future needs of global, time-critical supply, and distribution for commercial and military operations. To develop a facility that would meet the Authority's objectives, all factors listed in the RFP were considered. However, four criteria for eliminating sites from further study were critical in selecting the reasonable and practical site(s) for development of the GTP:

- Site did not meet the essential GTP criteria.

- Local supporters withdrew and opted to support another site.

- Extensive time for implementation of initial phase of GTP precluded acceptance.

- Extensive cost of implementation precluded acceptance.

The Authority reviewed the wetlands impacts associated with all of the proposed alternative sites as required by Section 404 of the U.S. Clean Water Act. The Section 404(1)(b) guidelines require that wetlands impacts first be avoided, then minimized, and that all remaining impacts be compensated through mitigation. No site-specific wetlands analysis by the Authority was necessary for proposed sites that failed to satisfy one or more of the essential GTP requirements.

The remaining finalist sites were subjected to a more detailed wetlands impact review. This review reflected the Authority's continuing commitment to develop the GTP in such a way as to avoid, minimize, and mitigate wetlands impacts.

a. Site Did Not Meet the Essential GTP Criteria

Applying the essential GTP criteria to the alternative sites resulted in elimination of three candidates: New Hanover (Wilmington), Piedmont-Triad (Greensboro), and Charlotte. Each of these three sites, as explained below, did not satisfy a fundamental or critical aspect of the GTP concept:

- *Alternative 1 - Charlotte* — A preference to retain the traditional air cargo handling approach rather than provide integrated JIT manufacturing opportunities, as well as a below minimum required contiguous acreage, eliminated the Charlotte site. In addition, full implementation of the GTP concept would possibly be restricted by capacity conflict with USAir hub operations, the high cost of additional land acquisition, and possible restrictions on industrial development in the Charlotte area.

- *Alternative 2 - Piedmont-Triad (Greensboro)* — A lack of properly zoned available land adjacent to the Piedmont Triad International Airport and a lack of commitment to the integrated on-site industrial development element of the GTP concept eliminated the Greensboro site. In addition, full implementation of the GTP concept would be potentially restricted by limitations on runway expansion because of residential and commercial development near the airport and high cost of acquiring additional land.

- *Alternative 7 - New Hanover (Wilmington)* — The lack of public support and reasonable land available for a site greater than 4,500 acres eliminated the New Hanover site.

Accordingly, these sites were neither reasonable nor practical alternatives for meeting the purposes and needs of the GTP.

b. Local Supporters Withdrew and Opted to Support Another Site

Voluntary withdrawal from site consideration eliminated Pitt County as a candidate. The County's action made the Pitt County alternative impractical and unreasonable for meeting the purposes and needs stated for this project.

- *Alternative 11 - Pitt County* — The County withdrew from further consideration and requested that their support be transferred to the Lenoir County (Kinston) site. Accordingly, these actions eliminated the Pitt County site.

c. Extensive Time for Implementation Precludes Acceptance

The Authority determined that expedited construction and operation of an initial GTP phase were essential for at least two reasons. First, the Feasibility Study determined that demand existed now for infrastructure to support expedited and integrated distribution. Second, the Authority recognized that, to exploit the economic benefit and funding opportunities for the GTP, North Carolina should pioneer the GTP concept. Therefore, any proposed site with timing circumstances or requirements that would significantly delay the planning, design, construction, and operation of the GTP was considered by the Authority to be neither reasonable nor practical.

Because the start of detailed planning and development of the Wayne County site would have been delayed by an estimated five-year period needed to negotiate a joint use agreement with the Air Force for Seymour Johnson Air Force Base, the Wayne County site was eliminated from further consideration.

- *Alternative 8 - Wayne County* — An estimated five-year period needed to reach agreement with the Air Force for joint use of Seymour Johnson Air Force Base eliminated the proposed Wayne County site. Because the Authority had determined that expedited construction and operation of an initial phase of the GTP was essential, the delay associated with the time needed for the joint use agreement was deemed to be unacceptable.

Also, although Wayne County representatives made an alternate presentation to the Authority, they withdrew their proposal from site consideration one week before the deadline for submittals.

d. Extensive Cost of Implementation Precluded Acceptance

Cost considerations, in both economic and environmental contexts, formed the basis for the fourth criterion. Use of an existing airfield site, rather than development of a new "greenfield" site, was considered preferable because of the delays attendant on the construction of a new facility, and the fact that voluntary transfer to the Authority of existing airfield infrastructure would result in reduced costs.

The Authority concluded that development of a new site would jeopardize the GTP project because it would preclude a prompt response to accelerating global market demands. Moreover, the development of a new site would contribute additional costs and time to the GTP which would not have to be incurred at a site with compatible, pre-existing airfields. Furthermore, overall environmental impacts would be, in most cases, significantly greater for development of a new or greenfield site, as opposed to an incremental approach which could be more readily implemented at an existing site. For example, additional runway capacity can be constructed in anticipation of GTP demand but will always be available to enhance the safety margin for existing passengers and general aviation operations. A new runway at a greenfield site would leave a permanent scar with minimal alternative use/benefit.

Based upon these factors, four alternative sites were eliminated from further consideration and determined not to be reasonable or practical alternatives for meeting the purposes and needs of the GTP:

- Alternative 3—Bladen County
- Alternative 5—Southern Piedmont (Montgomery and Richmond Counties)
- Alternative 6—Harnett/Cumberland (Fayetteville)
- Alternative 9—Duplin County

Unacceptable time requirements and associated costs, as well as the potential magnitude of environmental impacts that would result from greenfield site development, eliminated each of these sites from further consideration.

5. **Alternative Site Finalists**

As a result of the preliminary alternative site analysis, the Authority determined that the Laurinburg-Maxton and Lenoir County (Kinston) sites would be subject to additional review as finalists for the location of the GTP.

a. Analysis and Evaluation of Laurinburg-Maxton Site

Analysis and evaluation of the Laurinburg-Maxton site revealed several areas of potential significant impact to the environment. There was a high likelihood that archaeologically significant sites would exist in the area, and numerous wetlands (including the Lumber River, a natural and scenic river; the Shoe Heel Creek; and a "Carolina Bay") would be unavoidably impacted and adversely affected by the GTP integrated runway/facility layout.

The high cost of developing the Laurinburg-Maxton site was another serious concern. Extension of existing runway 5/23 would require construction fill depths of 15 to 20 feet. Furthermore, extension of runway 13/31 would require construction fill depths of 5 to 10 feet. Since the fill (earth material used to raise the grades for the runway approaches) would most likely have to be obtained off-site, the cost of development for the Laurinburg-Maxton site was significantly increased due to this major earthwork expense.

For these reasons, the Authority determined that the Laurinburg-Maxton site was not a reasonable or practical alternative for meeting the purposes and needs stated for the GTP and therefore should be eliminated from further consideration as an alternative site.

b. Preferred Alternative-Lenoir County (Kinston)

The Authority has selected the Lenoir County (Kinston) site because, among other reasons, it permits the use of an existing compatible airfield facility and offers immediate availability for initial development. The existing airfield has an FAA air traffic control tower. Kinston Regional Jetport (KRJP) is a commercial airport which can currently accommodate fully loaded B727-200 aircraft on its 7,500-foot runway. In comparison, the existing Laurinburg-Maxton Airfield has a 6,500-foot runway which is used for general aviation purposes only. The status of KRJP as a commercial airport was viewed by the Authority as likely to facilitate the approval of federal funding for the facility. Furthermore, KRJP has an FAA-approved Master Plan which includes a

future parallel runway, which the Authority considered to be potentially compatible with the GTP concept.

Analysis and evaluation of the Lenoir County (Kinston) site raised some concerns about the noise impacts to nearby Dobbs School, as well as construction impacts to an area of wetlands associated with Stonyton Creek. In regard to Dobbs School, the site proposal recommended eventual relocation of the facility. With respect to wetlands, the total Lenoir County (Kinston) site wetlands acreage of 3,500 is somewhat larger than Laurinburg-Maxton's 2,290 acres (1 acre = 2.5 rai). However, when wetlands acreage were subtracted from the total acreage available as proposed for each site, Lenoir County (Kinston) could provide a net of approximately 6,500 non-wetlands acres, compared to 3,700 non-wetlands acres at the Laurinburg-Maxton site. Therefore, the Lenoir County (Kinston) site presented more options for avoiding and, if necessary, minimizing and mitigating wetlands impacts.

The value of existing available assets and resources at the Lenoir County (Kinston) site, which Lenoir County and the City of Kinston agreed to transfer to the Authority, were estimated to be approximately $140 million. This figure greatly exceeds the value of existing assets at most of the other alternative sites and was considered significant by the Authority.

The Lenoir County (Kinston) site is located near several U.S. military installations. Seymour Johnson Air Force Base (U.S. Air Force) is approximately 18 miles (29 kilometers) to the west, and four other military installations are located within 75 minutes of the site. Kinston's unique location close to both Fort Bragg (U.S. Army) and Camp Lejeune (U.S. Marine Corps) (two important installations in U.S. overseas contingency operations) will provide the military with a state-of-the-art facility to meet its need for stateside logistical support of overseas contingencies.

Finally, public support is also critical to the GTP's success. Both public support and financial commitments from the local community were and remain strong factors that favor the Lenoir County (Kinston) site.

In summary, the Lenoir County (Kinston) site accommodated the original concept and all essential GTP requirements.

6. **Alternatives Site Conclusion**

The Authority reasonably concluded that the Lenoir County (Kinston) site was the only proposed site that accommodated all essential GTP requirements. As a part of its determination, the Authority considered the issue of wetlands and concluded that all other proposed sites also involved potentially significant wetlands impacts. The Authority reasonably determined that the Lenoir County (Kinston) site had less overall wetlands impact potential than the Laurinburg/Maxton site and significant (non-wetlands) advantages over Laurinburg/Maxton. Moreover, in selecting the Lenoir County (Kinston) site, the Authority committed to an open public interest process to ensure that potential wetlands impacts would be avoided and minimized where possible and fully compensated where necessary.

F. NORTH CAROLINA GLOBAL TRANSPARK DESCRIPTION

The Master Plan for North Carolina's Global TransPark was presented to the North Carolina Global TransPark Authority on January 21, 1994. At the meeting, the Kimley-Horn consulting team presented a review of the process used in developing the plan, as well as an overview of the major components of the plan including the forecasts, the airfield design, the environmental assessment, the infrastructure plan, and the industrial plan. Development of the comprehensive master plan involved nearly 50,000 man-hours expended by approximately 200 people.

1. **Major Features**

A major differentiating feature of the North Carolina Global TransPark from traditional airports is its integration of innovative and basic infrastructure and services. This creates a rapid response environment that allows TransPark businesses to improve productivity and enhance profitability. Some of the specific valuable features of North Carolina's Global TransPark include:

- A site encompassing up to 15,300 acres with industrial and commercial parcels offering options to direct air, truck, and rail access combinations, located near deep-water ports;

- A dual runway airfield system capable of supporting simultaneous operations and long-range, intercontinental flights operated by all sizes of air transports;

- A natural environment that has been enhanced through proactive planning;

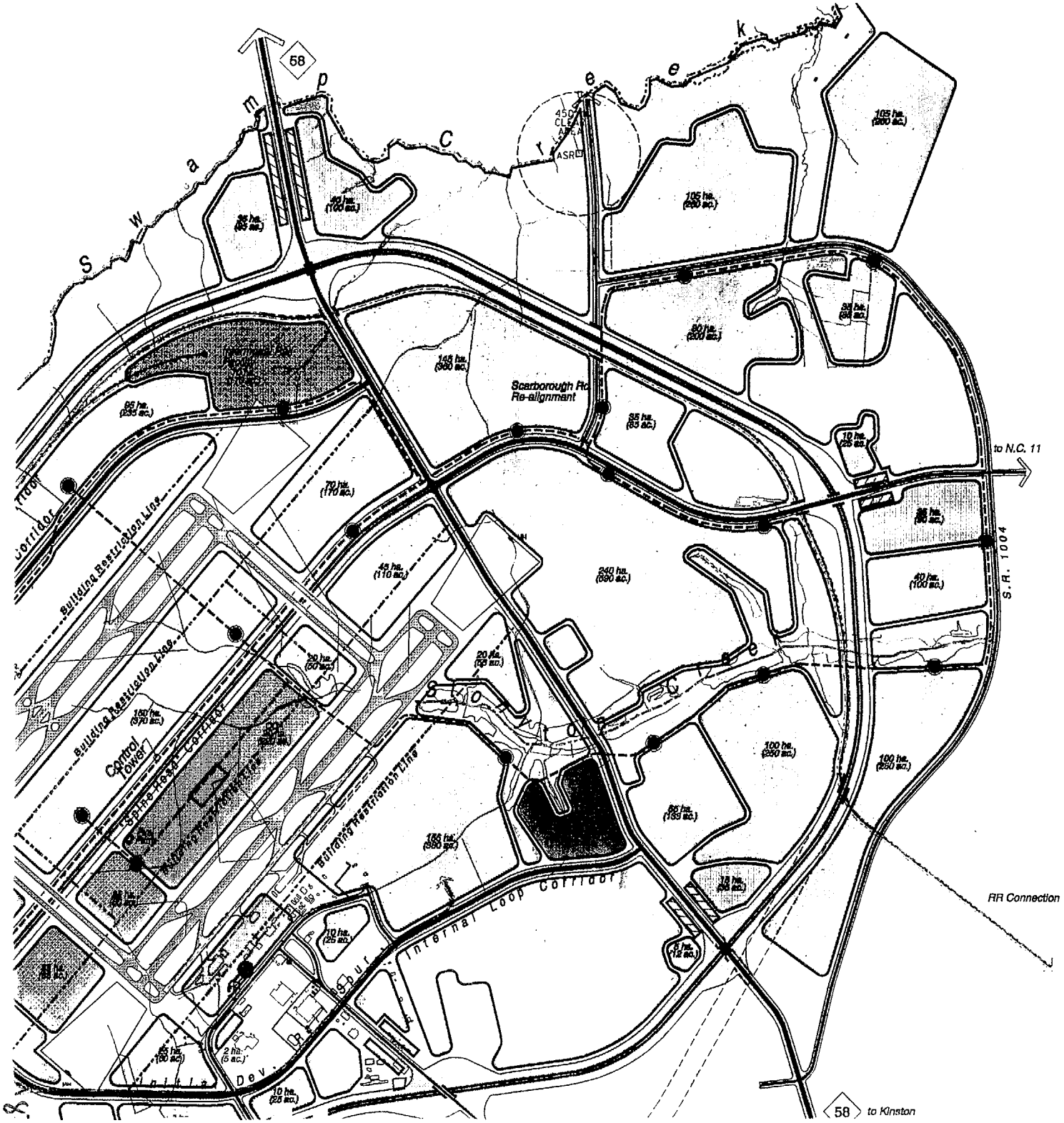
80

- Flexible and efficient cargo processing facilities with both air and ground transportation access;
- An internal transport system serving all areas of the GTP site for interpark cargo and people movement;
- A state-of-the-art global communications network consisting of direct links to national fiber optic telecommunications networks;
- On-site integrated commercial development;
- On-site education and training facilities;
- Foreign Trade Zone;
- Flexible and modular infrastructure including water, sewer, and storm water lines, as well as redundant telecommunications and power sources.

Exhibit III-2 represents the ultimate development plan for North Carolina's Global TransPark.

Property/Land Use	Area (acres)	Area (rai)
Industrial Development	5,000	12,500
Central Cargo Area	250	625
Military Areas	270	675
Commercial Development	430	1,075
Education Center	100	250
Airfield Components	3,850	9,625
Intermodal Rail Facility	170	425
Right-of-Ways and Infrastructure Corridors	1,800	4,500
Open Space and Preserves	3,430	8,575
Totals	15,300	38,250

81

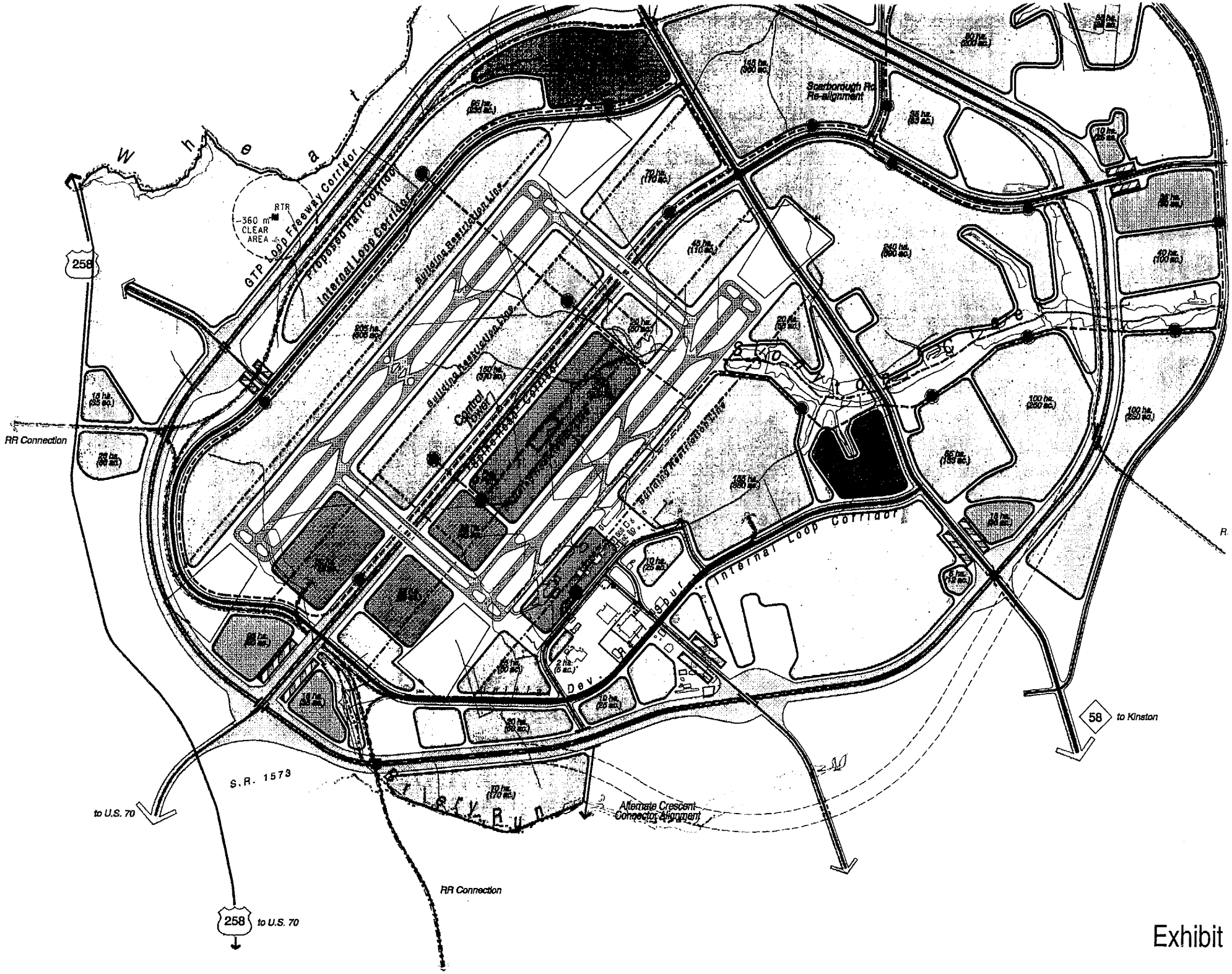


Legend

- INDUSTRIAL DEVELOPMENT
- CENTRAL CARGO AREA
- MILITARY DEVELOPMENT
- COMMERCIAL DEVELOPMENT
- EDUCATION CENTER
- GENERAL AVIATION/ PASSENGER TERMINAL
- INTERMODAL RAIL FACILITY
- INFRASTRUCTURE CORRIDOR
- RUNWAY PROTECTION ZONE
- EXISTING RUNWAY
- OPEN SPACE
- GTP ADMINISTRATION
- RAILROAD ALIGNMENT
- CARGO TRANSFER SYSTEM
- CTS "STATION"
- BUILDING RESTRICTION LINE
- GTP "GATEWAY" ZONE
- CREEK
- TRIBUTARY

North Carolina's Global TransPark

Ultimate Development


Wheat
GTP Loop Freeway Corridor
Proposed Main Corridor
Internal Loop Corridor
Building Restriction Line
Building Restriction Line
Building Restriction Line
Control Tower
RTR
360 m
CLEAR AREA
258
RR Connection
Scarborough Rd. Re-alignment
Internal Loop Corridor
Dev.
Fairy Run
Alternate Crescent Connector Alignment
S.R. 1573
to U.S. 70
258
to U.S. 70
RR Connection
58
to Kinston

Exhibit

2. Forecasts

The Global TransPark forecast effort focused upon predicting the anticipated industrial tenant types and estimating the number of future employees, volume of cargo traffic, and number of aircraft operations expected over incremental periods of time following initial construction. The forecasts were used in the development of the airfield, industrial, infrastructure, and environmental aspects of the master plan.

The forecasts were based on a unique examination of existing business parks (industrial estates). The study examined selected business parks that encompassed 1,000 or more acres (2,500+ rai) and which had a significant mix of activities and industrial uses, as well as varying levels and combinations of public and private support and involvement. A comparison of the "normalized" growth curves of the existing parks revealed a striking similarity. Based on actual employment data, a curve was developed to indicate direct employment growth versus age of the park. The curve indicated a relatively slow growth in the initial eight to ten years after development, while a significant growth rate occurred in years 12 through 25.

The number of direct employees at the GTP site is expected to increase from 3,600 in year 5 to 42,900 at ultimate development. Similarly, total employment including off-site (indirect) will increase from 7,600 in year 5 to 90,900 at ultimate development. These forecasts are predicated upon having suitable infrastructure in place at the Global TransPark. A summary of the forecasts are presented in Exhibit III-3.

The research team identified a mix of nearly ninety manufacturing and processing industry types that are likely to be the primary source of tenants. The mix included agribusiness, pharmaceutical, electronics, textiles, aircraft parts, machinery, automotive components, and machine tools. While many of the industry types rely significantly on air cargo services, others will primarily use truck, rail and shipping services.

Exhibit III-3 **North Carolina Global TransPark Summary of Forecasts**				
Characteristic	**5 Year**	**10 Year**	**15 Year**	**20 Year**
Direct Employees	3,600	8,800	15,000	23,400
Indirect Employees	4,000	9,800	16,800	26,200
Population	15,200	37,400	63,600	99,200
Annual Tenant Cargo Tonnage	13,199	54,100	132,000	297,500
Annual Total Cargo Tonnage	96,700	215,900	385,800	696,300
Annual Number of Cargo Flights	4,436	8,253	12,810	22,977

3. **Airfield Plan**

An airfield system capable of handling a full range of international and domestic flight operations is the heart of North Carolina's Global TransPark. That airfield will be constructed in two phases.

An initial runway of 3,510 meters will be constructed parallel to and at a 175 meter offset from the existing runway. The existing 2,290 meter runway will be downgraded for use as a parallel taxiway and will be extended to match the length of the new runway.

As part of a future development phase, a parallel runway will be built 1,830 meters northwest of the initial runway. The separation distance between the two runways will permit simultaneous flight operations under Instrument Flight Rules and also provide central space for location of industry adjacent to the taxiways.

The second runway will be 3,960 meters long and will also be served by two parallel taxiways. It will be linked to the first runway by two cross taxiway connectors. When the second runway is being developed, a new air traffic control tower will be built in the center of the airport. The existing passenger terminal will be expanded to meet increased levels of traffic. A regional radar facility and a major aviation communications center will also be developed on the Global TransPark site. The airfield configuration is shown on Exhibit III-2.

4. Infrastructure Plan

The master plan for North Carolina's GTP anticipates multi-modal transportation, the most advanced telecommunications, automated material handling systems, and essential utility services such as water, sewer, natural gas, and electricity. Access to every mode of transportation is critical to the success of the Global TransPark. The plan calls for direct links with the nation's highway system and nationwide rail network, and, through them, access to the State's two deep-water ports.

The key components of the Global TransPark infrastructure plan include the highway links, a surrounding loop freeway, an internal road system, rail access with an intermodal rail-to-road facility, the central cargo processing facility, a project-wide Cargo Transfer System, telecommunications, on-site training and education center, utilities, commercial centers, and a foreign trade zone. These are summarized below.

a. Highway Links

The North Carolina Department of Transportation is working closely and cooperatively with the Authority to identify major road construction needed within the region surrounding the Global TransPark. Road improvement projects are being identified that will provide efficient access to two national interstate highways as well as to other major regional highways.

b. Loop Freeway

A loop freeway is proposed to encircle the Global TransPark site. It will be a controlled access route with five major interchanges. The initial phase will run from U.S. highway 258 (US 258), at the southwest corner of the site, along the sites southern boundary to North Carolina highway 58 (NC 58). The corridor width will be wide enough (200 meters) to accommodate a multi-lane highway. The initial phase will be two or three lanes. As the sites develops, the loop freeway will be extended and widened.

c. Internal Road System

The GTP site will be served by an extensive system of internal roads, including a spine road corridor that will bisect the central airfield and connect to the loop freeway.

The spine road, a 150 meter wide transport corridor, will run from a major loop freeway interchange at the southwest corner of the site across NC 58 to the east side of the loop freeway. Within this corridor will be a multi-lane limited access road, a corridor for utilities and telecommunications links, space for rail tracks, and a route reserved for the Cargo Transfer System.

An internal loop road will serve the initial development area, located to the south and east of the existing passenger terminal area. It also will provide a link for road traffic from the area north of the airport, including the planned railroad intermodal facility.

d. Rail Access and Intermodal Facility

The Global TransPark will be linked to the U.S. national rail network via connections to two independent rail lines which serve the immediate vicinity of the Global TransPark. The first rail link, a three-mile track, will be to the south of the site to the CSX railroads, the major east-west rail line though North Carolina. Subsequent links to the west and east are also planned as well as an internal rail corridor that parallels the loop freeway.

An intermodal, rail-to-road transfer facility is planned on a 170-acre (425 rai) site. The facility is located at the northern interchange of the loop freeway with NC 58. This location provides convenient truck access and is designed to ensure that intermodal concepts are integrated into the overall design of the GTP site.

e. Central Cargo Area and Central Cargo Facility

The Central Cargo Area (CCA), located north of the first runway, will be the focal point for air shipment processing. While primarily handling truck-to-air transfers, the buildings in the CCA also will accommodate transfers among all modes via the Cargo Transfer System. Over 200 different cargo handling and processing functions will be performed within the CCA. The operations and activities will be monitored continuously and subject to the highest levels of security within the 250 acre (625 rai) complex.

A Central Cargo Facility (CCF), is a cargo processing building which at buildout will cover 400,000 square feet (37,175 SM), and will be capable of handling over 600,000 tons of cargo annually. The facility will be served by a dedicated aircraft parking apron and will be constructed in a staged modular

8

fashion to accommodate cargo demands. The CCF will provide for individual airline or handling operations as well as common-use service.

Other major resources in the Central Cargo Area will include: a Perishables Center for all forms of agricultural and other perishable products; a Live Animal Center to handle import or export of livestock and other animals; and a Central Clearance Center, which will provide a convenient one-stop location for clearing all shipments through U.S. Customs. The clearance of international shipments will be facilitated by the most advanced U.S. Customs Automated Manifest System (AMS).

f. Cargo Transfer System

The Cargo Transfer System (CTS) will be a key component in the seamless integration of industrial and transportation logistics on the Global TransPark site. Mechanical cargo transporters will shuttle shipments between tenants and to and from the transport centers including the Central Cargo Area and the Intermodal Facility. The CTS will operate in an on-demand environment, providing a secure and efficient link between all parts of the Global TransPark.

The CTS layout will ensure an equal level of service throughout the site. As the Global TransPark develops, the system will expand to serve the new areas. The CTS will include a network of routes serving strategically located transfer stations. The entire network will be fenced, and access will be controlled to provide safe and secure service.

Initially, the transporters will be driven at grade over a dedicated, secure two-lane road system. Operation of the system will be continuously monitored by telecommunications and computer-based tracking systems. As development continues, the CTS will be modified to include the use of automated guided vehicles.

g. Telecommunications

The Authority has recognized that quick, efficient access to information is vital to successful global operations. In interviews, potential tenants stressed the need for real-time access to all types of information and telecommunications services. The Authority will develop information systems as a resource for its tenants. By using extensive telecommunications links,

88

data and information from around the world will be available at the Global TransPark. Fixed telecommunications links will be available throughout North Carolina's Global TransPark.

h. Training and Education Center

A training and education center associated with the North Carolina Community College and the University of North Carolina systems is planned to provide on-site skill training, management education, and industrial research capabilities. A site adjacent to NC 58 comprising over 100 acres (250 rai) has been allocated for the training center. Construction of the center responds to needs expressed by potential tenants as well as the universal realization that the demands of the global marketplace are requiring significant changes in the way business operates. One example of those changes is the prediction that by the year 2000 approximately 70 percent of all management staff will be temporary and will continually shift from one company to another.

The training and education facility will be linked via telecommunications and computer systems to research centers and resource facilities around the world.

i. Utilities

Utility services have been designed to be expanded incrementally as demand and development evolves. Initial development will take advantage of existing electrical, natural gas, water, and sewer lines in the vicinity of the existing passenger terminal. Utility supplies will be designed to provide a high degree of reliability and adequate capacity to offer flexibility in the development of the Global TransPark. Most utilities will be constructed underground.

j. Commercial Centers

Space has been identified on the Master Plan to encourage the private development of shopping areas, lodging, child-care facilities, restaurants, and other facilities. These services will be located adjacent to the major entrances to the GTP.

k. Foreign Trade Zone

The Authority has begun the process to establish a Foreign Trade Zone. The Foreign Trade Zone will facilitate and stimulate international trade by providing an environment where value-added services can be conducted without the prior payment of U.S. import duties and excise taxes.

5. **Industrial Plan**

The final input to the overall Master Plan for North Carolina's Global TransPark was the creation of an industrial plan. Development of the industrial plan was based on the combination of traditional planning studies and a series of research projects funded in part by the U.S. Federal Aviation Administration. The planning and research efforts identified the needs of prospective industrial tenants, based on the forecasts. Their needs included not only support services such as utilities, transport access, etc., but also average building and parcel size requirements, support services such as shopping and child-care, and the tendency of certain industries to either locate in close proximity to each other or in a scattered pattern.

The design of the industrial plan reflects three general types of industrial-transportation relationships. The core of the Global TransPark will concentrate on those industries that require a high usage of air transport services. The next sector, will locate those companies which tend to require access to both air and surface transport modes. The third, outer zone, of development will accommodate tenants with little or no use of air transport, but which are highly reliant on surface transport. Linking all three zones will be a system of roads and internal transport services, including the Cargo Transfer System.

From a planning perspective, the three zones will generally reflect differing levels of development density and of open space. The highest density (and lowest open space) will be in the central zone, while the outer zone will have the lowest density and the largest extent of open space and environmentally sensitive areas.

Through a series of meetings with industry leaders in the United States and Europe, key services were identified. These included on-site training and educational facilities, and access to all types of communications services and information sources.

The industrial areas are designed to incorporate maximum flexibility in the arrangement of sites for the tenants. The team developed a profile of tenant requirements. The tenants were combined into four broad categories to facilitate the planning. These requirements included plant space needs, services and amenities (such as nearby retail and child-care facilities), power and water requirements, and transport service. A wide variety of needs can be accommodated equitably for all tenants, including manufacturers, assemblers, processors, and distributors of products.

The design of the Global TransPark recognizes that fruits, flowers, fish, vegetables and other perishables are routinely shipped from one point to another around the world. Changes in processing and packaging technology combined with timely air transport ensures that perishable agricultural products are fresh on arrival. Development of North Carolina's Global TransPark provides for facilities to handle agricultural products and to promote this vital component of international trade.

6. **Environmental Plan**

Environmental regulations in the United States and in North Carolina are extremely complex. A myriad of national and state agencies each have legal jurisdiction for the protection and enforcement of various environmental issues.

It is the stated intent of the Authority to not only avoid and minimize impacts to the local environment and surrounding communities but to enhance the existing natural environment. Consequently, the environmental consulting team has developed a GTP Conservation Plan that identifies on-site preservation zones and also recommends both on-site and off-site mitigation areas to provide restoration of those significant natural areas that will be displaced by the develoment of the GTP. "Mitigation" is a U.S. environmental term whereby significant natural features, such as wetlands or special habitat, which are destroyed by the implementation of a plan are replaced by reforestation or other manmade means either near the site, or at a remote location, at a volume either equal to or higher than that destroyed.

a. Noise Impacts

The analysis of noise impacts included determining the forecast sound levels for future aircraft operations, identifying affected areas, and providing for proposed land acquisition in future years and other measures to protect adjacent residents from noise impacts.

b. Air Quality

Air quality studies concluded that development of the Global TransPark would lead to no significant deterioration of air quality in the area.

c. Water Resources

The existing water quality of the area was studied. Recommendations were made to protect and enhance the area's water quality from industrial runoff. Adequate water supply was identified utilizing existing sources for the initial development phase.

d. Cultural Resources

Locations of on-site historic structures and archaeological sites were field identified and incorporated into conservation planning.

e. Flora and Fauna

Field analyses of the site were conducted to locate and identify any endangered animal or plant species. No endangered or threatened species were found. A program to link the retained natural areas for the propagation and migration of native animals was developed for the Master Plan.

f. Wetlands

The preservation of wetlands is an important environmental issue in the United States because wetlands provide a means of naturally filtering storm runoff, a location to recharge subsurface groundwater aquifers and a source of feeding and nesting for aquatic bird species and animals.

Approximately 30 percent of the acreage for North Carolina's Global TransPark was determined to meet the criteria, established by the U.S. Army

Corps of Engineers, as "jurisdictional wetlands." Jurisdictional wetlands are defined by the U.S. Army Corps of Engineers as "those areas that are inundated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturate soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas."[1] A wetland is usually an area where water is observed at or near the surface for at least 12 percent of the year.

The GTP Master Plan responds to the mandate to protect or mitigate wetlands by preserving all of the high quality stream-associated wetlands (Wheat Swamp Creek, Stonyton Creek, and Briery Run), preserving some of the mid-quality forested wetlands and creating new off-site wetlands to replace those destroyed.

g. *Hazardous Materials*

An on-site review was made for hazardous materials disposal sites. Several minor areas of previous aircraft fuel spills were located but none were determined to have a significant impact to the planned GTP development. Standard cleanup procedures will be instituted to absorb the fuel contamination.

[1]U.S. Army Corps of Engineers, (33 CFR 328.3)

Chapter IV
Southeast Asia Overview

IV. SOUTHEAST ASIA REVIEW

A. INTRODUCTION

Southeast Asia is comprised of Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam. The economies of these ten countries vary significantly. Collectively, this region is emerging as one of the economic powers of the world. During the 1980s, with the exception of Cambodia, Myanmar, and the Philippines, all of the countries in Southeast Asia registered significant economic growth. The growth of the economies of Brunei, Indonesia, Laos, Malaysia, Singapore, Thailand, and Vietnam outpaced population growth.[1]

This economic development was due to a number of factors, including high savings rates, which permitted domestic expansion without external indebtedness; an emphasis on education to create a pool of literate and skilled workers; a strong commitment to sound economic policies through a collaboration of government, business, intellectuals and labor leaders; and inflation control.[2]

Examples of the progress resulting from these measures are many. In terms of air cargo traffic, the Pacific Rim has been the fastest growing region. Between 1974 and 1992, intra-Orient air cargo grew at an average annual rate of 14.5 percent, nearly double the worldwide average of 7.8 percent.[3] Many of the largest container seaports are located in this region of the world, and many of the world's most profitable airlines and shipping lines are based in the region.

This economic growth has been fueled to a large measure by world trade. Participation in the international trade arena has required significant changes in all aspects of each country's economic and social fabric. A major part of that change has been the development of transportation infrastructure.

This chapter is composed of three major sections. The first section reviews economic growth of selected nations in Southeast Asia. The second section examines industrial development in those countries, while the last section details transport facilities in the region. Included in the latter section is a survey of over 3,500 airline flights. The countries surveyed include Hong Kong, Singapore, Indonesia, Malaysia, Philippines,

[1]Booth, A., "An Economic Overview of Southeast Asia," *Southeast Asian Affairs 1992*, Institute of Southeast Asian Studies, 1992
[2]Naya, S. and Imada, P., "Economic Success of the NIEs and ASEAN," *Southeast Asian Affairs 1992*, Institute of Southeast Asian Studies, 1992
[3]*World Air Cargo Forecast*, Boeing Commercial Airplane Group, July 1993

95

Thailand, and Vietnam. A more detailed examination of Thailand is presented in Chapter V.

The purpose of this examination is to provide a frame of reference for establishing the feasibility of the Global Transpark in Thailand. An element of the feasibility of the Global Transpark rests on the continued development of trade in the region. As regional and worldwide trade increases, the need for facilities such as the Global Transpark also grows.

The study of transport infrastructure includes those facilities that provide access to regions within member nations, as well as links between the nations. The road and rail networks in Southeast Asia provide both access within member countries and links between the countries. Similarly, the sea and airports provide facilities for intra-regional and intercontinental traffic flows. By understanding the extent of these facilities as well as their limitations, the feasibility of the transpark, in terms of its role in the region, can be assessed.

B. ECONOMIC GROWTH REVIEW AND TRENDS

1. **Overview**

The Asian and Pacific rim economies as a group have been among the most dynamic in the world over the last few decades. Rapid growth has been confined, however, to a relatively small subset of the regional economy, in particular, Japan, the Asian Newly Industrializing Economies (NIEs), the Association of Southeast Asian Nations (ASEAN-4), and China (see Exhibit IV-1). Between 1960 and 1980, there was a substantial decline in the share of agriculture in total output in the Asian NIEs and in three of the ASEAN-4 nations. In the Asian NIEs, it is particularly noted that the services sector has dominated the GDP.

A major contributor to the growth of the dynamic Asian economies has been the progressive liberalization of the world trading system through successive rounds of the General Agreement on Tariffs and Trade (GATT) (UNESCAP, 1991). Having adopted a strong export orientation earlier and more consistently than other countries in the region, these countries (except China, which began developing its export sector only fairly recently) have been in a favorable position to benefit from the rapid expansion of world trade occasioned by the combination of vigorous world economic growth and sustained trade liberalization (see Exhibit IV-2). At the same time, these economies have also become more vulnerable to the "open" world economy.

96

Exhibit IV-1
Structure of GDP in Selected Economies of the Asian and Pacific Region (Percentage)

Economies	Agriculture				Manufacturing				Industry				Services			
	1960	1970	1980	1989	1960	1970	1980	1989	1960	1970	1980	1989	1960	1970	1980	1989
NIEs																
Hong Kong	3	2	1	0[d]	22	29	23	20[d]	12	7	8	7[d]	63	62	68	73[d]
Singapore	4	2	1	0	12	20	29	30	6	10	9	7	79	68	61	63
Republic of Korea	37	26	15	10	14	21	30	31	6	8	12	13	43	45	44	46
ASEAN-4																
Indonesia	51	46	24	24[d]	9	10	13	19[d]	6	8	29	17[d]	33	36	34	40[d]
Malaysia	33	29	22	21[d]	8	12	21	24[d]	10	13	17	16[d]	49	46	40	39[d]
Philippines	26	28	23	23	20	23	24	25	8	7	12	8	46	42	40	43
Thailand	40	26	23	17	13	16	21	24[d]	6	9	10	11[d]	41	49	46	48[d]
SOUTH ASIA																
Bangladesh	57	55	50	46[d]	5	6	10	7[d]	2	3	5	7[d]	36	37	35	40[d]
India	50	47	38	31[d]	14	14	18	20[e]	6	7	8	10[e]	30	31	36	40[e]
Myanmar	33	38	47	48	8	10	10	9[d]	4	4	3	3[d]	55	48	41	40[d]
Nepal	66	67	62	59	3	4	4	6	8	8	8	9	23	21	26	26
Pakistan	46	37	30	27	12	16	16	16	4	6	9	8	38	41	46	49
Sri Lanka	32	28	28	23	15	17	18	16	5	7	12	10	48	48	43	51[f]
CHINA	23	39	36	32[e]	—	—	—	—	48	42	49	46[e]	29	18	15	21[e]
PACIFIC ISLAND ECONOMIES																
Fiji	41[g]	29	22	21	18[g]	14	12	11	7[g]	10	10	10	34[g]	48	56	58
Papua New Guinea	49	37	33	34	—	5	10	9	13	17	17	22	38	41	40	36
DEVELOPED ECONOMIES																
Japan	13	6	4	3	34	36	29	29	11	11	13	12	43	47	54	57
Australia	11[h]	6	5	4	21[h]	24	19	17[e]	13[h]	15	17	16[e]	50[h]	55	59	63[e]
New Zealand	—	13	11	8	—	22[i]	22	20	—	9	9	8	—	56	58	64

Sources: ESCAP calculations based on Asian Development Bank, *Key Indicators of Developing Asian and Pacific Countries*, July 19 World Bank, *World Tables 1989/1990*, World Bank data tapes 1990.

Notes:
- **a** Percentage share of GDP at current market prices
- **b** Denotes mining, utilities, and construction, except China, which includes manufacturing.
- **c** Percentage share of GDP at current factor cost
- **d** 1988, **e** 1987, **f** 1986, **g** 1963, **h** 1962, **i** 1973

5

Exhibit IV-2
Growth Rates of World Trade, 1972-1992
(Volume)

	Average[a] 1972-81	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990[c]	1991[c]
World Trade[b]	5.2	1.3	0.5	-2.4	2.5	8.6	2.7	4.9	6.7	9.1	7.3	5.4	5.3
EXPORT													
Industrialized Economies	6.1	4.0	3.6	-2.0	2.9	9.9	4.4	3.1	5.1	8.8	7.0	6.3	5.2
Developing Economies	1.9	-4.1	-5.9	-6.0	1.5	5.8	-0.9	8.3	12.2	10.5	6.7	5.0	5.3
Africa	-0.6	-0.6	-15.8	-8.9	-1.4	-1.1	-5.6	8.6	4.2	-1.5	2.7	3.4	—
Asia	10.5	9.0	8.2	1.4	9.3	13.8	3.2	13.3	20.2	13.1	9.2	8.3	7.0
Europe	5.4	4.8	11.2	4.6	6.5	13.0	1.1	—	7.5	5.6	0.8	-0.1	3.0
Middle East	-2.6	-15.2	-17.6	-17.8	-10.3	-4.8	-7.1	14.1	3.4	14.7	6.2	-1.2	3.7
Western Hemisphere	2.5	1.2	6.1	-1.0	7.6	7.8	1.0	-2.8	7.7	10.3	4.8	4.1	5.3
IMPORTS													
Industrialized Economies	4.7	-1.7	-2.2	-0.7	4.5	12.3	4.5	8.9	7.0	9.0	8.1	5.5	4.5
Developing Economies	8.0	8.5	6.7	-4.3	-3.1	1.6	-1.4	-3.0	7.2	10.6	8.6	4.1	6.3
Africa	5.4	8.7	10.9	-14.3	-13.4	-7.2	-14.9	-7.1	-0.3	2.7	-0.5	1.1	-1.3
Asia	8.8	10.2	3.4	2.1	9.1	7.7	7.8	2.1	15.5	19.0	13.6	6.3	6.1
Europe	3.7	0.5	2.2	-6.9	3.6	8.3	3.1	3.9	4.2	1.1	9.8	-1.6	4.4
Middle East	14.3	9.4	16.0	6.1	-3.1	-7.3	-13.2	-19.7	-5.1	-0.2	2.3	0.3	11.9
Western Hemisphere	6.4	9.8	2.5	-19.4	-23.7	4.4	0.1	5.3	4.5	6.4	1.5	5.2	8.7

Source: International Monetary fund, *World Economic Outlook*, October 1986 and October 1990.

Notes:
- a Compound annual rates of change in percent, excluding China.
- b Averages of growth rates for world exports and imports based on data for the two groups of economies shown separately below and on partly estimated data for the USSR and non-member economies of Eastern Europe.
- c International Monetary Fund projection.

The following sections will describe the development of the countries in Asia and the Pacific region that are considered the Thailand market area for the Global Transpark Feasibility Study. These are Hong Kong and Singapore as member countries of the Asian NIEs, and ASEAN-4 nations, namely Indonesia, Malaysia, and Philippines. Vietnam, another member of the Southeast Asian region, will also be briefly discussed.

In the late 1980s, despite growing signs of overheating and tight labor markets, the NIE economies continued to grow at high rates, with an average growth rate of 9.4 percent in 1989 (UNESCAP, 1991:19). By 1988, per capita income in Hong Kong and Singapore exceeded $9,000 (US). These levels of income were comparable to, or higher than, those of some Organization for Economic Cooperation and Development (OECD) member countries at the lower end of the income scale.

The economic success and rising incomes in Hong Kong and Singapore, their robust export growth in the face of growing obstacles, and their large, current account surpluses have generated considerable interest both within the Asian and Pacific rim region as well as globally. They have assumed a more prominent role in global and regional economic affairs and a larger share of responsibility for sustaining growth in less developed countries of the region.

In fact, the NIEs do not form a homogeneous group. Hong Kong and Singapore are small-size economies in a different situation. Aside from the problems posed by excess liquidity, labor problems and rising wages have also had a major impact on the restructuring process currently underway.

2. Hong Kong

Hong Kong has been adversely affected by labor shortages brought about by a slowing population growth (see Exhibit IV-3). The population growth rate of Hong Kong has been declining since 1979, from 2.1 percent per annum to 1.6 percent per annum since 1986. Emigration, particularly of professional and managerial workers, has worsened this labor shortage. Moreover, heavy demand for labor has come from the service sector, which has generated the largest portion of GDP since the late 1970s (see Exhibit IV-4). The service sector has grown rapidly due to entrepot trade with China, as well as the boost to the local tourist industry stemming from a relatively weak Hong Kong dollar.

Exhibit IV-3
Selected Socioeconomic Indicators of Hong Kong
1979-1989

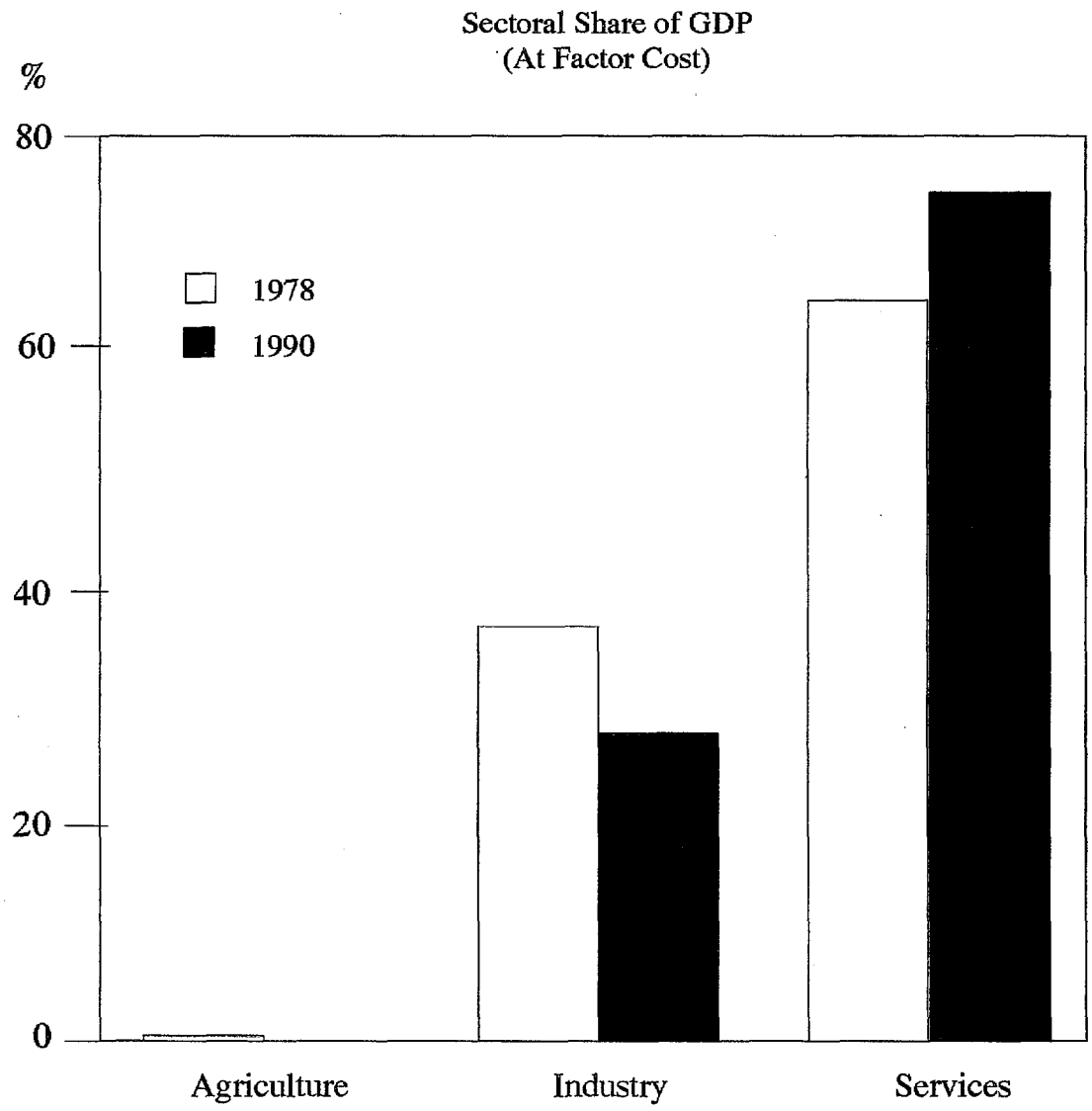
	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Current GNP per capita (US$)	4260	5210	6080	6330	6140	6330	6080	6900	8190	9250	10320
Population (thousands)	4979	5039	5120	5202	5285	5370	5456	5533	5613	5681	5735
GDP at Factor Cost (Billions of current HK dollars)	103	131.9	158.9	180.1	199.5	238.8	248.9	286.1	350.6	410.1	
Agriculture	0.99	1.11	1.12	1.23	1.24	1.27	1.24	1.33	1.36	1.44	
Industry	32.33	41.04	50.45	52.84	61.47	73.74	72.16	85.07	102.1	115	
Manufacturing	24.72	30.55	36.05	36.39	44.14	55.54	53.07	62.78	75.76	84.15	
Services, etc.	69.67	89.74	107.3	126	136.8	168.8	175.5	199.7	247.2	293.8	
Manufacturing Activity (1987=100)											
Employment	94.4	99.2	105.5	94.8	99.2	101.2	96.2	99.9	100	102.9	
Real Earnings per Employee	77.8	74.3	74	75.7	75.9	80.5	84.3	91.8	100	102	
Earnings as Percent of value Added	51.3	52	51.5	51.6	48.4	59	63.4	59.5	56.8	56.3	
Foreign Trade (Customs Basis) (Millions of Current US Dollars)											
Value of Exports fob	15156	19703	21737	20964	21951	28317	30185	35440	48473	63161	
Value of Imports cif	17137	22027	24671	23461	24009	28567	29580	35365	48462	63894	
Social Indicators											
Total Fertility Rate*	2.1	2.0	1.9	1.8	1.8	1.78	1.7	1.6	1.6	1.6	1.6
Life Expectancy at Birth	73.4	74.1	74.7	75.4	75.5	75.5	76.0	76.5	77.0	77.2	77.4
Urban Population Percent of Total	91.4	91.6	91.8	91.9	92.1	92.2	92.4	92.6	92.7	92.9	93
Primary School Enrollment Ratio	111.0	106.0	106.0	106.0	106.0	104.0	104.0	104.0	106.0	—	—
Secondary School Enrollment Ratio	60.0	64.0	66.0	67.0	68.0	72.0	72.0	73.0	74.0	—	—

Source: *World Tables 1991*, World Bank.

*Average number of children that would be born alive to a woman during her lifetime if she were to bear children at each age in accordance with prevailing age-specific fertility rates.

Exhibit IV-4

HONG KONG



Kimley-Horn

In 1978, the major Hong Kong export markets were North and Central America, Western Europe, and Asia, respectively (see Exhibit IV-5). In 1990, however, the largest market for Hong Kong exports were Asia, North and Central America, and Western Europe, respectively. In 1978, most Hong Kong imports were from Asia, Western Europe, and North and Central America, respectively. In 1990, the volume of imports from Asia had increased even more substantially compared to the decrease in import volume from North and Central America, and Western Europe (see Exhibit IV-5).

Hong Kong's position is unique among the countries surveyed in this review. Its political future is soon to change when ownership reverts from the United Kingdom to the People's Republic of China. While many doubt that the PRC is going to alter the international role of Hong Kong as a major trading center and entryway into the PRC, there is no sure answer. However, the expansion of transport facilities, including a new airport, expansion of the container port, and improved surface links to the rest of the Pearl River delta suggest a strong belief that Hong Kong will continue to dominate economic growth and activity in East Asia for many decades to come.

3. **Singapore**

Singapore has also experienced a decrease in population growth as a result of its population control policy implemented earlier. Singapore is now implementing various social programs to reverse the trend and enhance population growth. The trend seems to be increasing; for example, the population growth rate has increased to 1.9 percent per year in 1987 instead of the steady 1.8 percent per annum since 1984 (see Exhibit IV-6). However, Singapore also has been suffering from an acute labor shortage.

The recovery in the U.S. market has and will continue to be a major contributor to higher GDP growth rates in Singapore, estimated at 8.1 percent in 1993 and 8.2 percent in 1994. The better-than-expected first quarter figure of 7.1 percent, which continued into the second quarter with a significant 10.1 percent despite depressed conditions in Japan and Europe, signals that the slowdown of trade with these economies has been more than offset by increases to the U.S. and other markets, such as Malaysia and newly industrialized economies throughout the world. GNP figures are even more impressive, and the gap between GNP and GDP figures will continue to widen as Singapore proceeds with its international trade efforts.

The estimated growth rates mentioned above are well above the government forecasted sustainable rates of 4 to 6 percent. Given the critical labor and land constraints forced by Singapore, these estimated high rates are not expected to be sustained in the longer run. Furthermore, Singapore is highly sensitive to trade fluctuations because its value of trade is more than twice its GDP. The remarkable performance in the first half of 1993 may quickly change in the face of deterioration in the external trade environment. Meanwhile, pressures of significant wage increases, rising business costs, and a strong Singapore dollar are likely to adversely affect Singapore's international competitiveness.

The strong Singapore dollar has, in some ways, helped moderate local Consumer Pricing Index (CPI) figures (2.4 percent in the first quarter), but with the introduction of the new goods and services tax in April 1993 and rapidly rising housing costs, the second half is likely to see a rise in CPI figures.

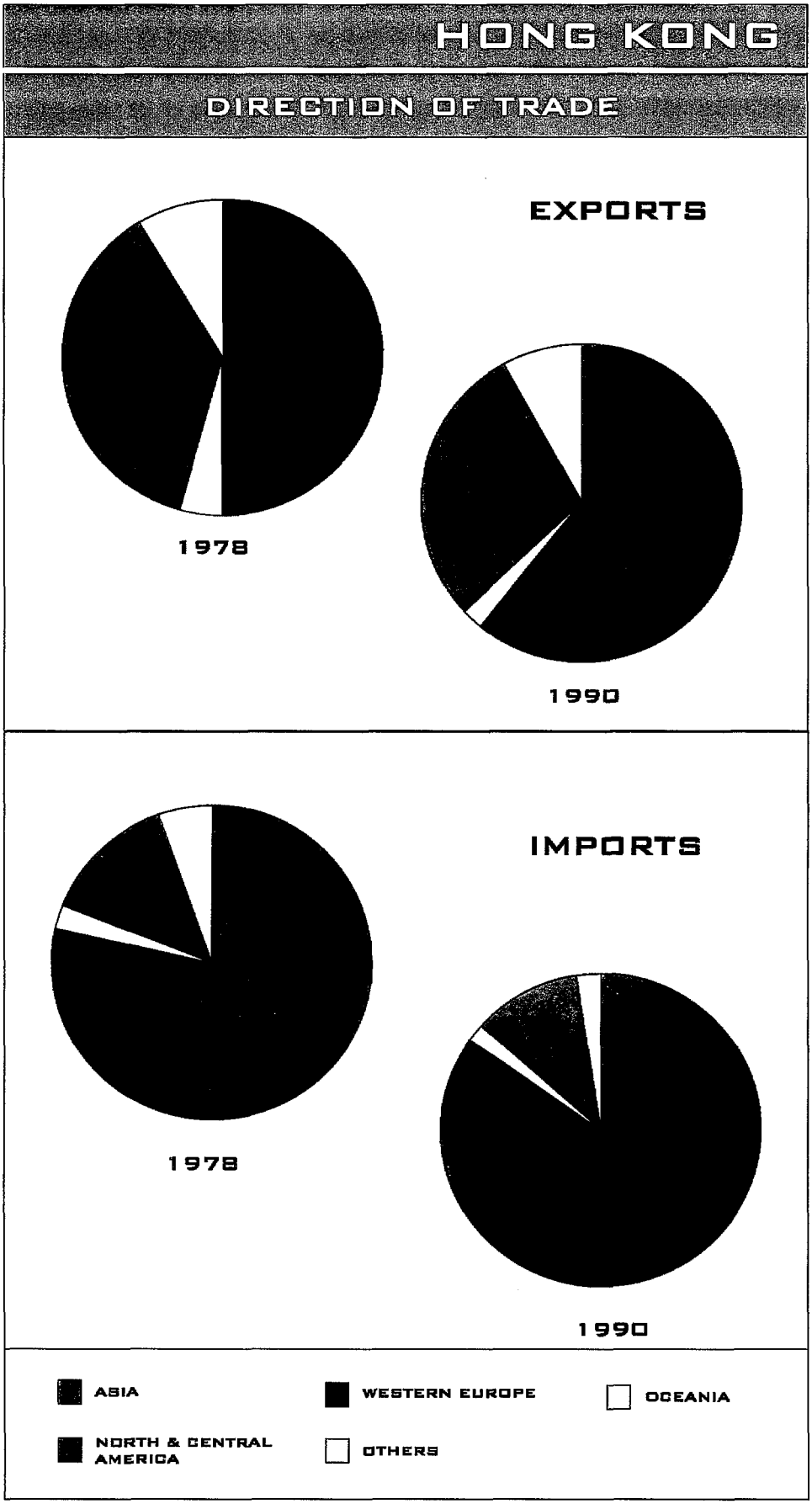
4. **Newly Industrial Economies Summary**

In general, all NIEs are experiencing labor shortages and rising inflation. In spite of these problems, national policies do not allow any major increases in the import of either skilled or unskilled labor on social and political grounds. As a result, these problems have led to an economic restructuring of these countries as follows:

- All NIEs have realized that there is an urgent need to upgrade their industrial structures and to move away from labor-intensive and low value-added activities, in which they are fast losing their competitive advantage. In fact, the Foreign Direct Investment (FDI) flow away from the NIEs to ASEAN and China is speeding up this process. This will be seen later in the discussion of ASEAN countries. In the future, the NIEs will have to place greater reliance on activities that are more skill-, capital-, and technology-intensive.

  Early strategies by NIE governments to move these Asian NIEs "up-market" have not effectively provided the expected results. Traditional labor-intensive products still occupy a significant share in NIE exports (UNESCAP, 1991). This continues, in spite of the fact that rapid advances are being made into such areas as consumer electronics, telecommunications equipment, office machines, and machine tools. Thus, clothing still accounts for 30 percent of Hong Kong's domestic manufactured exports despite the rapid transition from low value mass production to higher value-added goods such as fashion garments.

Exhibit IV-5



Kimley-Horn

Exhibit IV-6
Selected Socioeconomic Indicators of Singapore
1979-1989

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Current GNP per capita (US$)	3,880	4,540	5,440	6,170	6,930	7.740	7,600	7,390	7,900	9,090	10,450
Population (thousands)	2,384	2,415	2,443	2,472	2,502	2,529	2,558	2,586	2,613	2,647	2,684
GDP at Factor Cost (Billions of current Singapore Dollars)	18,976	23,272	27,167	30,190	33,719	36,552	35,619	36,059	39,740	46,005	50,910
Agriculture	295	322	356	349	331	340	292	245	222	204	190
Industry	7,403	9,563	11,107	12,029	13,954	15,712	14,259	14,467	15,976	18,900	20,508
Manufacturing	5,703	7,313	8,362	8,154	8,908	9,863	9.184	10,185	12,091	14,904	16,424
Services, etc.	12,825	15,206	17,876	20,292	22,448	23,996	24,372	23,942	26,412	30,262	34,612
Manufacturing Activity (1987=100)											
Employment	97.5	103.1	356	349	331	340	292	245	222	204	190
Real Earnings per Employee	64.9	68.5	74.4	81.5	89.1	97.1	104.8	101.5	100	101.5	
Real Output per Employee	82.1	82.4	91.4	91.2	88.5	93.7	94.1	91.6	100	100.1	
Earnings as Percent of value Added	30.9	29.7	30.3	35.0	36.3	36.4	37.8	31.7	29.1	28.2	
Foreign Trade (Customs Basis) (Millions of Current US Dollars)											
Value of Export fob	14,233	19,376	20,968	20,788	21,833	24,055	22,815	22,428	28,592	39,205	
Value of Imports cif	17,638	24,003	27,572	28,167	28,158	28,656	26,250	25,461	32,480	43,765	
Social Indicators											
Total Fertility Rate	1.8	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.9	1.9	1.9
Life Expectancy at Birth	71.2	71.5	71.8	72.1	72.4	72.6	72.9	73.2	73.5	73.7	74.0
Urban Population Percent of Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Primary School Enrollment Ratio	106.0	108.0	106.0	109.0	113.0	115.0					
Secondary School Enrollment Ratio	59.0	58.0	62.0	65.0	69.0	71.0					

Surce: *World Tables 1991*, World Bank.

- Hong Kong and Singapore are small-sized economies with a port resource base. They need to continue to rely on exports for further growth for some time to come. The strategies to move "up-market," indicated above, and the ability to maintain the competitiveness of their exports in world markets depend considerably on enhancing their technological capabilities, especially in the area of innovation. Hence, these two countries are giving technological upgrading high priority through intensified research and development efforts, as well as by encouraging the inflow of foreign technology. Governments are playing a key role in the process, particularly by:

  1) developing scientific and technical manpower resources;
  2) spearheading investment in high technology industries;
  3) assisting in the acquisition of foreign technology; and
  4) adopting legislation conducive to innovation and technology development, such as laws for protecting intellectual property rights (UNESCAP, 1991).

  Development of indigenous research and development assumes added significance because access to foreign technology is likely to become increasingly difficult in the 1990s. Their move up-market will bring them more and more into direct competition with the developed economies.

- Labor shortages and rising wages are forcing these two NIEs to relocate their labor-intensive, low-technology industries to other relatively labor abundant and low wage developing economies; notably in Southeast Asia. The need to find profitable investment outlets to reduce excess liquidity has added urgency to this process, which is being actively supported by their governments.

- NIEs have been giving serious consideration to the question of export market diversification in restructuring their economies in the coming decade.

Several developments in the 1990s may make the task of diversifying NIE export markets challenging, but still more attainable. The decline in the dominance of one or two countries in the world economy, the rising affluence in the Asian and Pacific regions, together with liberalization of trade and finance in Japan and the NIEs themselves, as well as other economies of the region, will be positive factors. Economic liberalization in China, despite temporary setbacks, and new developments in the socialist economies of the eastern Europe and reforms in the Soviet Union, will also open up possibilities for expanding trade and other economic ties with those economies. Aside from market diversification, NIEs

will continue to be engaged in product diversification, through industrial upgrading as well as promotion of export-oriented service industries.

5. **The ASEAN-4 Economies**

ASEAN-4 economies, namely Indonesia, Malaysia, Philippines, and Thailand, have opted for increasing openness and integration into the world economy, and good export performance is considered crucial for their continued growth and structural transformation. The success of export-led growth in the NIEs has also influenced their development strategies more than has been the case in any other group of countries. In fact, the ASEAN-4 economies are often portrayed as following in the footsteps of the NIEs by becoming export-oriented in labor-intensive production areas.

While openness and greater integration into the world economy are given priority, the current restructuring efforts of ASEAN-4 should be seen in the context of their recent history, and particularly the difficulties they faced in the first half of the 1980s.

ASEAN-4 economies were primary commodity-based economies. This served them well in the commodity boom years of the 1970s, when they achieved growth rates of 7 to 8 percent per year. However, growth began to falter in the early 1980s as the global recession triggered a sharp downturn in the prices of a whole range of primary commodities of export interest to them. Growth rates fell and external payments situations deteriorated rapidly. This forced the ASEAN-4 economies to review their policies and to adopt structural adjustment programs. Exhibit IV-7 presents summary economic statistics of the ASEAN nations.

Exhibit IV-7
ASEAN's Member Countries
Indicators: Real GDP, CPI, Trade Bal., Gross Domestic Investment, and Foreign Direct Investment

	GDP (%)	CPI (%)	Trade Bal. (US$ Bil.)	Gross Dom. Invest* (% of GDP)	Foreign Dir. Invest.** (US$ Mil.)
Brunei Darussalam					
1991	3.0	3.0	0.5	n.a.	n.a.
1992	3.0p	2.5	0.3	n.a.	n.a.
1993	**2.0**	**2.3**	—	—	—
1994	**3.0**	**2.5**	—	—	—
Indonesia					
1991	6.4	9.5	4.80	35.0	1,482
1992	5.9	4.9	5.95	34.5	1,774
1993	**6.1**	**6.5**	—	—	—
1994	**6.4**	**7.0**	—	—	—
Malaysia					
1991	8.7	4.4	-0.26	20.0	4,073
1992	8.0	4.6	0.60	22.0	6,950a
1993	**8.2**	**4.6**	—	—	—
1994	**8.4**	**4.5**	—	—	—
Philippines					
1991	-0.9	18.7	03.21	38.2	2,883
1992	0.1	8.9	-3.85	39.9	1,711
1993	**1.5**	**7.5**	—	—	—
1994	**3.5**	**9.0**	—	—	—
Singapore					
1991	6.7	3.4	-7.1	38.2	2,883
1992	5.8	2.3	-8.7	39.9	1,711
1993	**8.1**	**2.5**	—	—	—
1994	**8.2**	**4.0**	—	—	—
Thailand					
1991	8.2	5.7	-9.6	35.7	2,106
1992	7.5	4.1	-8.4	36.0	1,950e
1993	**7.5**	**4.3**	—	—	—
1994	**8.0**	**4.6**	—	—	—

Note: The figures in bold are the Bureau of Economic Cooperation's estimates.
a approval basis
e National official estimate
p Official
* from *Asian Development Outlook 1992.*
** Net inflows

Source: Central Banks of ASEAN Countries; Departments of Statistics of ASEAN Countries; Ministry of Finance,
Malaysia; Investment Agencies of ASEAN Countries; *IMF-International Financial Statistics,* June 1993;
The Economist Intelligence Unit (EIU); South East Asian Monitor (SEAM).

6. Thailand

Thailand took an early initiative in implementing a number of austerity and liberalization measures to restore economic stability and to deal with the balance of payments problem. As illustrated in Exhibit IV-8, GNP, on a per capita basis, actually declined between 1984 and 1986. In addressing this problem, the Government achieved a fairly quick turn-around with "three lows" in its favor, namely, low interest rates, lower U.S. dollar (to which the baht was linked), and low oil prices.

In 1988, Thailand achieved a growth rate of 12 percent, the highest it has attained over the past 25 years. In 1988, Thailand's per capita was $1,030 (US) compared to $590 (US) in 1979. The increase was almost doubled in 10 years.

While economic growth and exports of manufacturers remain quite promising, Thailand needs to improve its industrial infrastructure and strengthen its efforts toward human resources development to remain competitive in international markets. Available statistics suggest a declining trend of enrollment ratios both at primary school and secondary school levels.

Similar to Hong Kong and Singapore, the service sector has always been the largest share of GDP, although the industry sector's GDP share is increasing rapidly. Thailand should attempt to intensify its efforts toward developing its heavy industries, human capital, and technology-intensive manufacturing to improve its position in the global market.

Unprecedented rapid economic growth over the last six years has strained Thailand's social and physical infrastructures, affecting its competitive edge. In the face of increasing competition from other countries, coupled with depressed conditions in Europe and Japan, Thailand's exports of manufactured goods has slowed down. The agriculture sector in the first half of 1993 also observed a slowdown in exports resulting from good global harvest in 1992. However, with expected recovery in Thailand's major trading partners in the second half of 1993 and natural disasters that reduced competitive agricultural output, the exports of both manufactured and agricultural products are expected to improve.

Exhibit IV-8
Selected Socio-Economic Indicators of Thailand
1979-1989

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Current GNP per capita (US$)	590	670	750	780	810	840	800	790	850	1,030	1,230
Population (thousands)	45,659	46,700	47,727	48,740	49,739	50,720	51,683	52,654	53,605	54,469	55,200
GDP at Factor Cost (Billions of current Thai Baht)	494.4	582.3	675.4	732.6	805.5	857.7	900.5	967.0	1,083.9	1,422.5	1,711
Agriculture	134.1	152.9	163.0	156.8	185.6	175.2	169.9	180.8	198.3	250.4	271.4
Industry	169.5	203.0	240.1	258.7	285.8	325.7	345.1	374.7	428.6	540.1	677.3
Manufacturing	117.6	139.9	169.5	176.4	194.3	218.1	224.5	255.0	295.5	373.3	455.2
Services, etc.	255.2	302.6	357.1	404.5	438.7	472.5	499.4	539.2	607.2	716.5	842
Manufacturing Activity (1987=100)											
Earnings as Percent of value Added	23.2	23.2	23.4	23.5	23.6	23.6	23.4	23.6	23.6	—	—
Foreign Trade (Customs Basis) (Millions of Current US Dollars)											
Value of Exports fob	5,297	6,505	7,035	6,957	6,368	7,413	7,121	8,835	11,659	15,689	14,280
Value of Imports cif	7,132	9,450	10,055	8,527	10,279	10,518	9,239	9,124	12,955	20,285	16,100
Social Indicators											
Total Fertility Rate	4.0	3.8	3.7	3.5	3.3	3.1	3.0	2.8	2.6	2.5	2.5
Life Expectancy at Birth	61.9	62.2	62.5	62.9	63.3	63.7	64.1	64.6	65	65.3	65.6
Urban Population Percent of Total	16.9	17.3	17.8	18.3	18.8	19.3	19.8	20.4	20.9	21.5	22
Primary School Enrollment Ratio	95.0	99.0	—	—	97.0	97.0	96.0	96.0	95	—	—
Secondary School Enrollment Ratio	28.0	29.0	—	—	30.0	31.0	30.0	30.0	28	—	—

Source: *World Tables 1991*, World Bank.

7. Indonesia

Others in the ASEAN-4 group have not been as fortunate as Thailand. The two oil exporters, Indonesia and Malaysia, were adversely affected by the changing fortunes of the oil market. Yet, compared with other ASEAN-4 countries, these two countries experienced trade surpluses due to their oil export. Indonesia has experienced consistent GDP growth in all sectors. Industry accounted for the largest portion of GDP shares until 1984 when the service sector replaced it. The Indonesian economy seems to be quite promising in that all sectors are growing, particularly the manufacturing sub-sector. The manufacturing subsector's GDP share increased from 4,003 billion Indonesian rupiah in 1979, at current prices to over 30,500 billion in 1989 (see Exhibit IV-9).

The government certainly had a role in this industrial restructuring process. The end of the oil boom and the commodity slump induced Indonesia to undertake some important reforms. Deregulation policies were implemented to increase the role of the private sector and place greater reliance on market forces. The reforms, which began in 1983, covered several areas including banking and financing, foreign trade, investment, customs and shipping, and public finance. In banking, deregulation lifted credit ceilings and removed controls on commercial bank interest rates. Reserve requirements for commercial banks were lowered, state enterprises were permitted to hold up to 50 percent of their funds with private banks, and restrictive rules on foreign banks opening branches outside Jakarta were relaxed. In recent years, efforts have also been underway to liberalize the capital markets and to reduce the government's role in the stock market.

Similarly, liberalization measures were implemented in the foreign trade sector in the mid-1980s, which did much to reorient the trade regime from import-substitution to export promotion. The reforms led to the relaxation of tariff and non-tariff barriers for the manufacturing sector and simplification of import regulations. At about the same time, an important reform was launched to regulate foreign direct investment (FDI). The government's objective was to reduce restrictions on entry, liberalize procedures, relax local equity requirements in joint ventures, and widen the range of industries open to foreign investment.

Exhibit IV-9
Selected Socio-Economic Indicators of Indonesia
1979-1989

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Current GNP per capita (US$)	400	470	550	610	610	580	540	520	490	480	500
Population (thousands)	145	148	152	155	158	161	165	168	171	175	178
GDP at Factor Cost (Billions of current Indonesia Rupiah)	33,040	42,278	56,669	60,514	75,076						
Agriculture	9,374	11,725	13,649	15,001	17,765	20,420	22,513	24,871	29,116	34,193	38,998
Industry	12,944	20,405	24,076	23,745	30,915	35,162	34,772	34,648	45,252	51,452	62,195
Manufacturing	4,003	6,353	7,067	7,482	9,896	13,113	15,503	17,185	21,150	26,252	30,573
Services, etc.	12,027	16,783	20,696	23,901	28,943	34,304	39,712	43,164	50,450	56,374	65,135
Manufacturing Activity (1987=100)											
Earnings as Percent of value Added		16.4	17.71	19.8	20.0	17.6	19.0	19.0			
Foreign Trade (Customs Basis) (Millions of Current US Dollars)											
Value of Exports fob	15,590	21,909	22,260	19,747	20,961	20,345	18,711	14,787	17,206	19,504	20,855
Value of Imports cif	10,364	14,139	18,527	19,996	19,853	16,853	14,230	13,103	14,453	15,833	16,732
Social Indicators											
Total Fertility Rate	4.5	4.3	4.2	4.1	3.9	3.8	3.7	3.6	3.5	3.4	3.3
Life Expectancy at Birth	54.0	54.7	55.3	56.0	56.8	57.7	58.5	59.3	60.2	60.6	61.1
Urban Population Percent of Total	21.6	22.2	22.8	23.4	24.1	24.7	25.3	26.0	26.7	27.4	28.1
Primary School Enrollment Ratio	107.0	107.0	111.0	113.0	115.0	118.0	118.0	118.0			
Secondary School Enrollment Ratio	24.0	29.0	31.0	35.0	37.0	39.0	41.0	46.0			

Source: *World Tables 1991*, World Bank.

Exhibit IV-10 illustrates the effectiveness of this policy. It is quite clear that this policy brought about a big leap of FDI volume in the country. Indonesia received the largest portion of Japanese foreign direct investment from 1951-1988 when compared to other countries in Asia (see Exhibit IV-11). This investment level declined sharply in 1989 when Thailand was the largest recipient of the Japanese foreign direct investment. However, the Japanese FDI in Indonesia increased sharply again in 1990. Exhibit IV-12 displays the top sources of foreign direct investment in Indonesia between 1969 and 1991.

The government's efforts also included reforms to increase efficiency in the customs and shipping sectors. Moreover comprehensive overhauls of the income tax structure and introduction of a value-added tax were undertaken to improve public finance.

In spite of all the restructuring Indonesia has experienced, the per capita GNP has decreased from the 1983 level. It was $500 (US) in 1989 compared to $610 (US) in 1979. This could have been due to the mere fact that the population growth rate has been declining rather slowly. However, in terms of social infrastructure, there has been very high enrollment ratios of both primary school and secondary school levels when compared to other ASEAN-4 countries. Its urbanization process has also been faster than Thailand considering that it has much larger population, i.e., 28.1 percent compared to 22.0 percent in 1989. This could further enhance the industrial restructuring process.

Oil production is a significant part of the Malaysian economy. However, because of significant surplus production from many OPEC nations and Russia and a slow expansion of demand from the oil importing nations, oil prices remain depressed.

Prudent macroeconomic management has contained inflation, which allowed Indonesion interest rates to decline from 16.7 percent in December 1992 to 14.5 percent in March 1993. The focus on diversification and liberalization is likely to continue. Indonesia will see greater dividends in terms of increased manufactured exports and the continuing decline in dependence on oil. The depreciation of the rupiah by 5 percent in 1992 strengthened Indonesia's export position, but increasing infrastructure bottlenecks continued to plague its competitiveness. Nevertheless, increased investments in infrastructure, as reflected in the 1993 budget, will strengthen economic growth.

Exhibit IV-10 **Total Foreign Investment in Indonesia** **($US Million)**		
Year	**Investment**	**No. of Projects**
1985	854	46
1986	848	93
1987	1,480	130
1988	4,490	145
1989	4,719	294
1990	8,750	432

Source: BKPM (Investment Coordinating Board, Indonesia)

Exhibit IV-11 **Japanese Direct Investment in Asia** **1951-1988, 1989-1990**				
Country	**Cumulative Total $US Million**	**Overall Percent**	**1989**	**1990**
Newly Industrializing Economies	15,018	46.8	4,887	3355
Hong Kong	6,167	19.2	1,898	1,785
Republic of Korea	3,248	10.1	606	284
Singapore	3,812	11.9	1,902	840
Taiwan Province of China	1,791	5.6	481	446
Southeast Asia	14,750	46.0	2,982	**3,242**
Indonesia	9,804	30.6	631	1,105
Malaysia	1,834	5.7	873	725
Philippines	1,120	3.5	202	258
Thailand	1,992	6.2	1,276	1,154
South Asia	270	0.9		
Bangladesh	11	0.0		
India	148	0.5	18	30
Pakistan	18	0.1	83	9
Sri Lanka	93	0.3		
China	2,036	6.3	438	349

Source: ADB: *Asian Development Outlook 1991* (Figures for 1989 and 1990 are from Japanese Ministry of Finance.)

Exhibit IV-12
Foreign Investments in Indonesia
January 1967 - June 1991

Country	No. of Projects	Investment Jan 1969 - June 1991 ($US million)	As Percent	Foreign No. of Projects	Investment ($US million)	Percent in 1990
All Countries	1,988	45733	100.0	426	8,691.0	100.0
Japan	427	10,466.6	22.9	76	2,240.8	25.6
United States	127	2,394.6	5.2	16	153.7	1.8
Developing Countries/Areas of ESCAP	806	11,144.4	24.4	261	2,750.6	31.6
Hong Kong	192	3,943.5	8.6	36	993.3	11.4
Taiwan Province of China	207	3,280.3	7.2	94	618.3	7.1
Rep. of Korea	230	2,048.9	4.5	86	722.9	8.3
Singapore	125	1,392.8	3.0	34	264.3	3.0
Malaysia	21	105.4	0.2	3	7.2	0.1
Philippines	5	12.9				
Thailand	9	39.6	0.1	4	9.5	0.1
Brunei Darussalam	1	130.0	0.3	1	130.3	1.5
India	14	189.3	0.4	2	4.1	
Pakistan	1	1.0		1	1.0	
Papua New Guinea	1	1.0				

Source: BKPM (Investment Coordinating Board, Indonesia)

As shown in Exhibit IV-9, GDP is estimated to grow at 6.1 percent in 1993. There are signals that domestic and FDI investments are increasing. With increasing domestic demand and better economic performance expected of the major trading partners, the GDP growth rate is estimated to rise even further to 6.4 percent in 1994.

8. **Malaysia**

Following the oil price increases of 1979 and 1980, the Malaysian government initiated an ambitious program of infrastructure development and investment in heavy industry, with the aim of speeding up growth to attain the New Economic Policy objective of raising the well-being of the Buimputras. The large public spending program cushioned and delayed the impact of the world recession of 1981-1982 but contributed to serious fiscal and current account deficits and a substantial increase in Malaysia's external debt burden. The crunch, however, came in 1985 when the country experienced negative growth of -1.0 percent. A sharp downturn in the oil price that occurred in 1986 confounded the problem and GDP growth remained at the low level of 1.2 percent in that year (UNESCAP, 1991). Exhibit IV-13 presents selected socio-economic indicators for Malaysia.

In 1993, the leading sectors of the Malaysian economy continued to be construction, manufacturing, and services. The expected continuation of heavy investments in infrastructure will not only maintain Malaysia's international competitive edge, but may also improve its position. The construction sector is likely to contribute significantly to GDP growth in the second half of 1993 and the whole of 1994.

In the first quarter of 1993, the GDP growth rates increased slightly to 8.1 percent, as compared to 8 percent registered in 1992. This healthy trend is likely to continue with the expectation of higher economic growth in ASEAN's major trading partners. However, these positive developments may be counteracted by rising inflation due partly to real income growth. With the unemployment rate dropping from 3.9 percent in 1992 to an estimated low of 3.3 percent in 1993, labor shortage has become a significant bottleneck that is likely to affect economic growth. Prudent investors may also see a rise in interest rates. Given the circumstances, GDP growth rates are estimated to be 8.2 percent in 1993 and 8.4 percent in 1994. It is, however, difficult to envisage maintaining CPI figures at less than 4 percent.

Exhibit IV-13
Selected Socioeconomic Indicators of Malaysia (1979-1989)

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989e
Current GNP per capita (US$)	1,400	1,690	1,880	1,900	1,900	2,040	1,970	1,850	1,830	1,930	2,160
Population (thousands)	13,444	13,764	14,130	14,510	14,887	15,272	15,682	16,109	16,528	16,921	17,340
GDP at Factor Cost (Billions of current Malaysian Ringgit)	38,754	44,169	48,779	53,820	59,631						
Agriculture	10,988	11,680	11,962	12,807	13,555						
Industry	16,736	20,164	21,409	21,851	24,835						
Manufacturing	8,992	11,001	11,542	11,419	12,935						
Services, etc.	18,700	21,464	24,242	27,921	31,551						
Manufacturing Activity (1987=100)											
Employment	86.7	96.9	108.4	100.1	95.1	96.3	91.9	92.4	100.0	111.4	
Real Earnings per Employee	73.1	76.7	78.3	85.3	91.4	96.0	103.5	102.4	100.0	107.2	
Earnings as Percent of Value Added	25.6	28.0	30.7	32.1	30.0	28.5	29.9	29.9	29.1	29.6	
Foreign Trade (Customs Basis) (Millions of Current US Dollars)											
Value of Export fob	11,075	12,939	11,734	10.027	14,100	16,484	15,632	13,830	17,911	21,110	21,548
Value of Import cif	8,708	11,602	13,052	14,042	14,669	14,849	12,746	11,447	12,506	16,551	17,128
Social Indicators											
Total Fertility Rate	4.1	4.0	4.0	3.9	3.9	3.9	3.8	3.8	3.7	3.7	
Life Expectancy at Birth	66.3	66.9	67.4	68.0	68.3	68.6	68.9	69.2	69.5	69.7	69.9
Urban Population Percent of Total	33.5	34.2	35.0	35.8	36.6	37.4	38.2	39.0	39.8	40.7	41.5
Primary School Enrollment Ratio	92.0	93.0		94.0	96.0	98.0	100.0	101.0	102.0		
Secondary School Enrollment Ratio	51.0	48.0		49.0	51.0	53.0	53.0	54.0	59.0		

Source: *World Tables 1991*, World Bank.

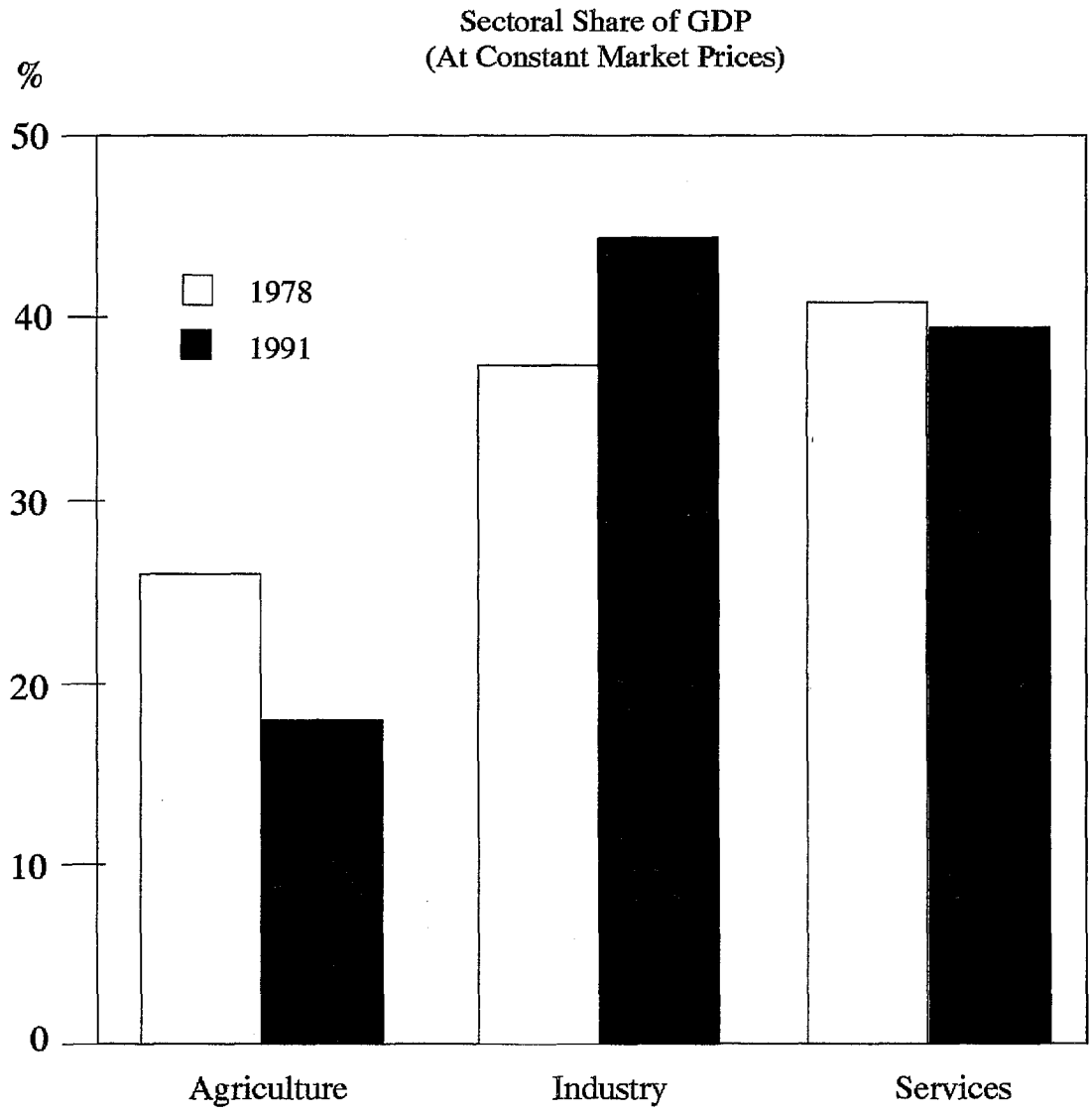
The measures adopted by Malaysia to cope with the unprecedented economic slowdown included cuts in government expenditure, a stepped-up privatization program, depreciation of the *ringgit* in relation to other major currencies, liberalization of the foreign investment code, and the initiation of a tax reform program. The subsequent recovery exceeded expectations and Malaysia's GDP grew at 8.7 percent in 1988 (UNESCAP, 1991). The growth rate for 1989 was 7.6 percent. Exhibit IV-14 suggests that all three economic sectors were experiencing declines in 1991. Among the three sectors, the industry sector increased its GDP shares in 1991 when compared to 1978. Per capita GNP also increased.

With respect to trade direction, it is suggested in Exhibit IV-15 that Asia was the largest market for Malaysian exports in 1978 while North and Central America and Western Europe seem to have had an equal share of the market for Malaysian exports. In 1990, the export volumes showed an increase. With regard to imports, again the Asian region was the largest exporter to the Malaysian market in 1978. The trend was increasing in 1990.

When considering social infrastructure, Malaysia has experienced high enrollment ratios both at the primary school and secondary school levels. Malaysian school enrollment is second only to the Philippines among ASEAN-4 countries. At the technician level, companies have indicated that there is a shortage of supply in Malaysia. The problem appears to have been worsened by the fact that technical training has not been in line with the changing needs of industry. Companies, therefore, have to "retrain" these graduates and allow time for them to learn the skills and become productive on the job. Exhibit IV-16 indicates the planned output of engineers and technicians in Malaysia from 1985 to 1990. As recently as 1985, the demand for engineers in Malaysia was low as reflected in the fact that only 12,000 out of the manufacturing work force of 500,000 were engineers (UNIDO, 1985). There was then no difficulty in meeting this demand, especially from the pool of engineers trained overseas, which was estimated to be about 80 percent of the total engineers in the labor market. A significant number were Malay scholarship holders who ended up in government service holding administrative and other non-technical jobs. However, the situation has changed in recent years and manpower shortages have arisen, despite the planned output increases in the Industrial Master Plan drawn up in 1985 (see Exhibit IV-17).

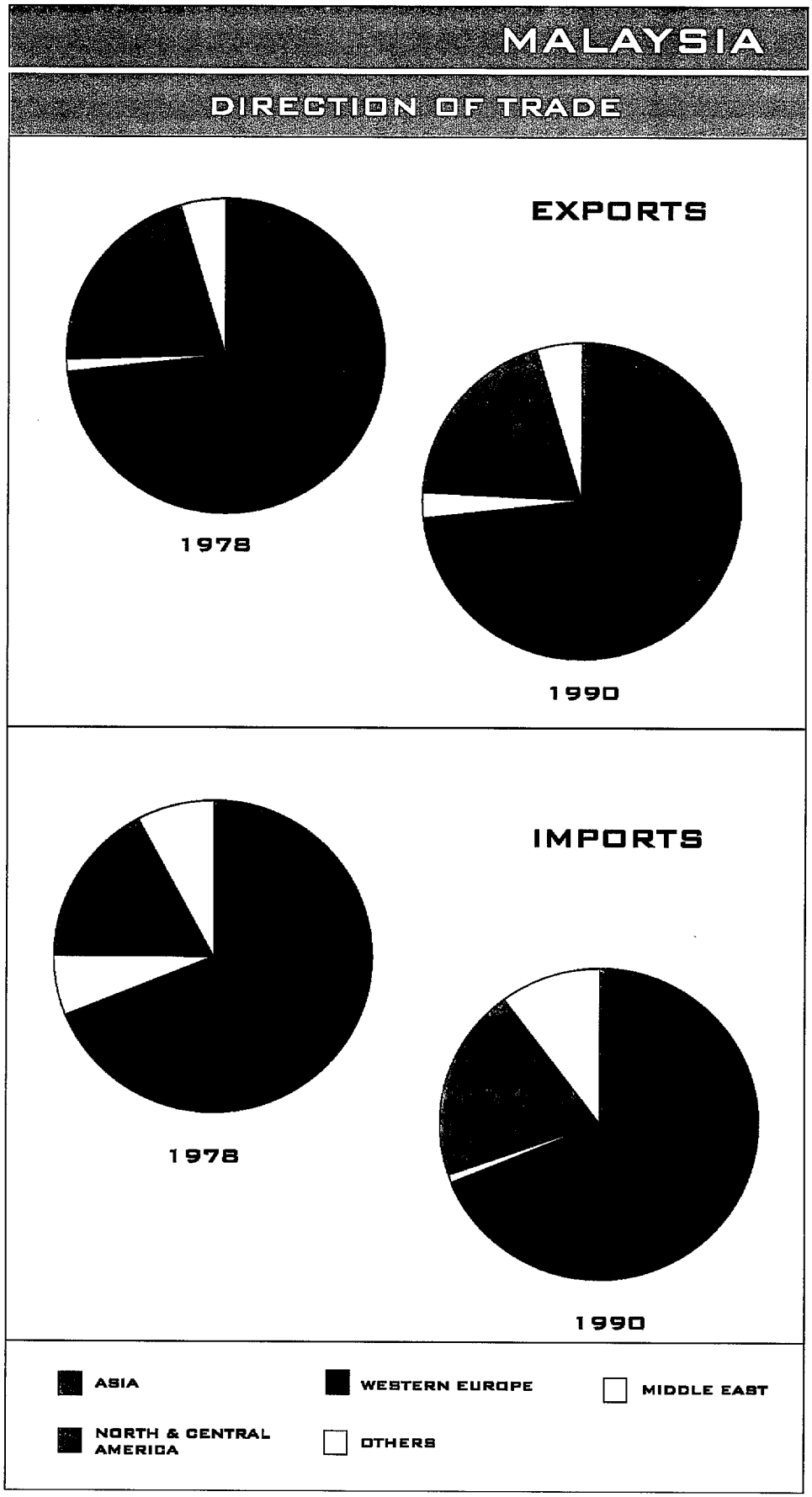
Exhibit IV-14

MALAYSIA



Kimley-Horn

Exhibit IV-15



Kimley-Horn

Exhibit IV-16
Malaysia's Output of Degree Holders by Engineering Course in Local Institutions, 1985-1990

Courses↓ Year→	1985	1986	1987	1988	1989	1990	Total
Engineering*	147	182	182	182	182	182	1,057
Civil Engineering	108	201	147	202	218	231	1,107
Mechanical Engineering	47	99	127	128	151	155	707
Electrical Engineering	81	99	168	151	155	190	844
Chemical Engineering				10	20	20	60
Marine Engineering	—	8	19	20	20	20	87
Petroleum Engineering	16	20	22	22	22	22	124
Aeronautical Engineering	—	9	9	22	22	22	84
Total Output of Engineers	399	618	674	747	790	842	4,070
Output of Other Degree Courses**	5,695	6,109	6,822	7,499	7,910	8,171	42,206
Overall Total	6,094	6,727	7,496	8,246	8,700	9,013	46,276
Percent of Engineering Courses to Other Degree Courses	6.5	9.2	9.0	10.0	9.0	9.3	9.6

*Engineering courses offered by University of Malaysia. There is no breakdown.
**These are all other degree courses besides engineering offered by local universities.
Source: Economic Planning Unit, Malaysia, unpublished figures.

Exhibit IV-17

Malaysia's Institutional Supply of Engineering Manpower—1985-1995
(Gross Fixed Assets in $Million)

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Engineers and Technicians											
Degree	399	618	674	747	790	842	978	1,135	1,318	1,530	1,776
Diploma	1,536	1,606	1,749	1,898	1,973	2,133	2,277	2,432	2,597	2,774	2,962
Overseas degree (est.)	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600
Overseas Diploma (est.)	650	650	650	650	650	650	650	650	650	650	650
Total	5,185	5,474	5,673	5,895	6,013	6,225	6,505	6,817	7,165	7,554	7,988
Estimated Total Output 1985-1995 = 70,494 (7,050 p.a. with 3,250 overseas, i.e. 46%)											
Production/Process Workers											
Certificates (Public)	12,284	14,910	15,540	17,797	20,023	22,551	25,464	28,754	32,468	36,663	41,399
Certificates (Private)	2,003	2,301	2,653	3,064	3,543	4,102	4,734	5,463	6,310	7,275	8,395
Overseas Certificates (Est)	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300
Total	16,587	19,511	20,493	23,161	25,866	28,953	32,498	36,517	41,078	43,238	52,094
Estimated Total Output 1985 - 1995 = 342,996											

Note: Outputs from local institutions from 1991-95 are estimates based on output growth rate between 1985 and 1990.
Source: *Industrial Master Plan*, 1985, Tables B-III-19, B-III-20, B-III-21.

9. Philippines

Domestic problems in the Philippines, including the ouster of the Marcos government, reduction in foreign direct investment, the continuing terrorist activities throughout the nation, and numerous natural disasters, have affected the economy, and GDP fell by 10 percent during 1984-1985 (UNESCAP, 1991). However, with the advent of the new government and institution of some important reforms, the economy has been steadily improving. Growth in 1988 was 6.2 percent, and 6 percent in 1990. No data was available for 1989.

As in other ASEAN-4 economies, the major reforms in the Philippines have been in the areas of banking and finance, foreign trade, foreign investment, and public finance. Here again, the orientation has been toward liberalization and revitalization of private initiative and a greater role for market forces. The Philippines also initiated an ambitious land reform program in the late 1980s, but its implementation has been slow. Statistics available in Exhibit IV-18 suggest that per capita GNP decreased from 1983, but that the trend reversed after 1986. The industry sector experienced an increasing trend over the years. In fact, the same trend was experienced by all three sectors of the economy. In terms of social infrastructure, the country's fertility rate declined to 3.7 in 1989 from 4.9 in 1979. The urbanization process was rather slow in recent years, but when compared to Thailand, seems more significant. Philippines also has high enrollment ratios both at the primary school (106.0 percent) and secondary school (66.0 percent) levels.

The Philippines, like other ASEAN-4 countries, has registered high levels of foreign direct investment from Japan. Between 1985 and 1990, the number of approved Japanese funded projects increased from 18 to 275 projects (Exhibit IV-19). Hong Kong and Taiwan were also the Philippines' largest foreign investors in 1990.

Philippines has set its priority areas for joint ventures with each country as indicated in Exhibit IV-20. Singapore and Indonesia are major partners for joint ventures with the Philippines. In general, the identified needs tend to center around technology, marketing, and financial support.

The Philippine economy is expected to gain a stronger foothold in 1993 as it recovers from its sluggish performance in the last two years. The economy is expected to benefit from the reforms set in place in recent years, the last one being the full liberalization of foreign exchange rates. Inflation is easing.

Exhibit IV-18
Selected Socioeconomic Indicators of Philippines
1979-1989

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989e
Current GNP per capita (US$)	590	680	770	790	740	630	570	560	590	630	700
Population (thousands)	47,974	49,253	50,551	51,863	53,183	54,504	55,819	57,149	58,493	59,851	61,224
GDP at Factor Cost (Billions of current Philippine Peso)	195.12	238.95	279.37	311.93	349.38	496.58	563.34	574.82	638.14	761.55	885.49
Agriculture	55.0	61.80	69.40	76.70	84.60	139.50	162.52	155.99	170.77	189.99	226.70
Industry	76.90	96.80	111.60	122.50	138.20	186.20	200.55	204.98	232.58	277.18	322.27
Manufacturing	52.10	64.60	75.20	83.10	95.20	137.30	150.53	155.17	173.54	207.45	241.26
Services, etc.	85.10	106.10	124.30	141.40	161.30	214.80	249.61	266.16	305.01	358.54	415.03
Manufacturing Activity (1987=100)											
Employment	138.7	141.4	144.6	144.4	103.80	94.1	91.2	93.2	100.0		
Real Earnings per Employee	68.8	69.0	70.9	72.6	89.0	77.2	74.9	83.0	100.0		
Real Output per Employee	83.6	83.0	74.9	81.2	104.3	99.4	87.1	93.1	100.0		
Earnings as Percent of value Added	18.5	22.0	24.7	33.1	20.9	18.1	22.3	20.5	26.2	25.1	
Foreign Trade (Customs Basis) (Millions of Current US Dollars)											
Value of Exports fob	4,601.2	5,787.8	15,722.1	5,020.6	5,000.6	5,391.0	4,629.0	4,841.8	5,649.0	7,074.0	7,272.6
Value of Imports cif	6,613.0	8,294.6	8,477.7	8,262.3	7,977.4	6,424.3	5,444.6	5,392.5	7,144.0	8,729.0	9,304.5
Social Indicators											
Total Fertility Rate	4.9	4.8	4.8	4.7	4.5	4.4	4.2	4.1	3.9	3.8	3.7
Life Expectancy at Birth	60.6	61.0	61.4	61.8	62.1	62.4	62.8	63.1	63.4	63.7	63.9
Urban Population Percent of Total	37.0	37.4	37.8	38.3	38.7	39.2	39.6	40.2	40.7	41.3	41.8
Primary School Enrollment Ratio	107.0	113.0		109.0	109.0	107.0	106.0	106.0		106.0	
Secondary School Enrollment Ratio	64.0	65.0		66.0	67.0	68.0	65.0	68.0		66.0	

Source: *World Tables 1991*, World Bank.

Exhibit IV-19
Philippines — Approved Foreign Investments
(Approximate Value in $US Millions)

Country	Total Approved Projects 1968-1990	1985	1986	1987	1988	1989	1990
Japan	1,042	18	17	22	104	127	275
China	10	—	—	—	—	0.5	9
Taiwan Province and Other Chinese	445	5	2	13	106	147	143
Hong Kong	688	2	6	21	21	107	217
India	14	0.3	0.2	2.4	1.9	5	1
Indonesia	10	—	—	—	—	3	1
Rep. of Korea	58	0.3	—	0.6	1.2	14	19
Malaysia	22	—	—	0.2	—	9	5
Singapore	42	1	0.2	0.7	2	19	12
Thailand	7	—	—	—	—	—	—
Developing Asia Subtotal	1,296	9	8	38	132	305	407
Other	802	64	34	67	134	216	184
Grand Total	3,140	91	59	127	370	648	866

Source: Board of Investment, Philippines

Exhibit IV-20
Philippines
Priority Areas for Joint Ventures
as selected by
Philippine Bureau of Export Trade Promotion

With	Priority Areas	Identified Needs
Singapore	• printing and publishing • construction and consultancy services • banana • computer software • tourism facilities	technology, machinery, and equipment marketing/distribution finance for expansion collaboration/marketing financial
Thailand	• garments • processed food	financial marketing/distribution
Malaysia	• garments • service • tourism facilities	financial financial financial
Indonesia	• computer software • furniture (rattan) • construction services • industrial chemicals • processed food	marketing/distribution raw material collaboration/marketing financial financial
Brunei	• footwear • garments • processed food	financial for raw material procurement finance for expansion finance for expansion

From a rate of 18.7 percent in 1991, it has fallen to a single digit level of 8.9 percent in 1992. It is estimated to average 7.5 percent from 1993. Consequently, interest rates have declined sharply. The 91-day T-Bill rate has gone down from 20.2 percent in January 1992 to 10 percent in July 1993. This has continued to help stimulate domestic investment as the percentage of GDP and FDI have increased steadily since 1991 and are expected to continue into 1994. The improvement of the global economy will help elevate the Philippines to a healthier export and trading position.

The Government plans to upgrade infrastructure on an urgent basis. The 1994 budget will be revised upward to increase public investment. However, the long gestation period involved in infrastructure projects implies that a full recovery may not be seen for several years. Nevertheless, the power shortage should be easing, and the coming monsoon rains should increase the hydroelectric power supply. In addition, the government is working hard to gain public confidence and "put its house in order" to generate a conducive investment and business environment.

The GDP for the first quarter of this year was 0.9 percent, which takes into account overseas workers' remittances. Against this background, 1993 is likely to record a modest GDP growth of about 1.5 percent (a rate that is 2 percent less than the government revised forecasted figure). Given this scenario for 1993, the continuing improvement in power supply, and the commitment of President Ramos' administration to push the economy to a higher level of growth, an estimated 3.5 percent GDP growth is likely to be achieved in 1994.

10. Challenges for the ASEAN-4 and Asian NIEs

The ASEAN-4 face some challenges which are be briefly stated as follows:

- Prospects for non-oil primary commodities are generally not very promising and they are likely to face weak demand and low prices in the foreseeable future. Moreover, conditions of over-supply and excess capacity prevail with respect to many of these commodities in the ASEAN-4 economies.

- The external debt burden has risen significantly for Indonesia, Malaysia, and the Philippines. In 1989, Indonesia's outstanding foreign debt was $53.1 billion (US) and its debt service ratio was 20 percent. In the same year, Malaysia's foreign debt amounted to $19.4 billion(US) , giving rise to a debt service ratio of 20 percent. As is well known, the Philippines is on the list of

the world's 15 highly indebted countries, and its external debt—which stood at $28.5 billion (US) in 1989 with a debt service ratio of 27 percent—has been a source of major concern.

- Manufactured exports offer an attractive option to ASEAN-4 countries. A measure of success has been achieved in this area; however, these exports are facing an increasing protectionist threat from North America, Europe, and Japan.

In view of the dim prospects for primary commodities noted above, reducing dependence on the primary sector is a major aim of the current restructuring efforts in the ASEAN-4. This objective has been most vigorously pursued in the export sector. Consequently, there has been a significant shift in the export structure of these economies, with the share of primary commodities declining and manufactured exports gaining in importance.

In 1988, Japan was the main market for ASEAN-4 and absorbed 25 percent of the group's combined exports. The bulk of these exports was still comprised of oil and other primary commodities. The United States accounted for 20 percent of the total in the same year, with a much larger share of its imports consisting of manufactured goods. Interestingly, ASEAN-4 exports to the NIEs in 1988 slightly exceeded the group's exports to the United States. Hence, next to Japan, the NIEs became the second most important market for ASEAN-4 exports. (The United States was still the most important trade partner of the Philippines.) NIEs' share in ASEAN-4 exports rose from 18 percent in 1980 to 21 percent in 1988. Exhibits IV-21 and IV-22 suggest substantial increase in trade volume and rate of change of intra-regional export transactions in Asia and the Pacific, 1975 and 1991. Asian NIEs and China have become the main export market for the region.

Of considerable interest is the flow of direct foreign investment into ASEAN-4 from the NIEs and other sources. The perception is that such flows are likely to intensify in the 1990s. This is because the restructuring process underway in the NIEs will require moving up-market and there will be increasing incentive to relocate their low technology labor-intensive industries to other developing countries. At the same time, the ASEAN-4 economies are receptive to foreign investment and have devoted much energy in the 1980s to creating a climate congenial to foreign investors.

Exhibit IV-21
Intra-regional Export Transactions in Asia and the Pacific
1975 and 1991

1991

From↓ To→	Millions of US $		Percentage of Distribution				
	World	ESCAP Region	Developed ESCAP Region	South Asia	Newly industrializing economies	China	ASEAN-4
World	3,454,657	745,865					
ESCAP Region	872,301	395,111					
Developed ESCAP Region	366,520	143,642	17.12	2.99	52.97	6.29	20.00
South Asia	30,874	7,590	39.86	8.68	34.15	2.46	14.85
NIEs	302,972	137,749	27.68	3.12	28.25	20.25	20.70
China	71,986	50,357	21.62	2.11	72.09	—	4.19
ASEAN-4	99,949	55,728	44.81	2.35	41.56	4.27	7.01

1975

From↓ To→	Millions of US $		Percentage of Distribution				
	World	ESCAP Region	Developed ESCAP Region	South Asia	Newly industrializing economies	China	ASEAN-4
World	916,000	122,412					
ESCAP Region	140,105	46,655					
Developed ESCAP Region	83,271	23,626	36.23	4.64	29.35	8.27	21.51
South Asia	7,687	1,789	51.54	12.35	17.78	4.47	13.86
NIEs	22,827	7,988	49.76	2.58	18.04	0.86	28.76
China	6,943	3,495	38.97	2.06	48.38	—	10.59
ASEAN-4	19,377	9,758	64.93	1.59	25.08	1.49	6.92

Exhibit IV-22
Rate of Change of Intra-regional Export Transactions in Asia and the Pacific 1975 and 1991

From↓To→	Millions of US $		Percentage of Distribution			China	ASEAN-4
	World	ESCAP Region	Developed ESCAP Region	South Asia	Newly industrializing economies		
World	277.1	509.3	—	—	—	—	—
ESCAP Region	622.6	746.9	—	—	—	—	—
Developed ESCAP Region	340.2	507.9	-52.7	-35.6	80.5	-23.9	-7.02
South Asia	301.6	324.3	-22.7	-29.7	92.1	-44.9	-7.14
NIEs	1,227.3	1,624.4	-44.4	+20.9	56.6	2,254.6	-28.02
China	936.8	1,340.8	-44.5	+02.4	49.0	—	—
ASEAN-4	415.8	471.1	-30.9	47.8	65.7	186.6	-60.4

Increased investment and associated intra-firm transactions, together with trade liberalization in both the NIEs and ASEAN-4, will expand trade between these two groups of economies during the 1990s. This prospect of increased economic interaction in investment, trade, and finance in East and Southeast Asia, provides the framework for significant structural changes in the economies of ASEAN, especially in the manufacturing sector.

In sum, in the late 1980s the ASEAN-4 countries recovered from the downturn they faced in the first half of the decade. With this recovery there was a growing sense of confidence and optimism in the prospects for meeting the challenges as well as taking advantage of the opportunities ahead through structural changes in their manufacturing sectors.

The ASEAN-4 nations possessed an abundance of natural resouces when they began their industrial development. Thus, resource-intensive industries figures more prominently intheir industrial structures than in the Asian NIEs (see Exhibit IV-23). However, over time several factors contributed to a decline in the relative importance of such industries.

The most important of these factors has been the depletion of certain nonrenewable resources, as well as the virtual exhaustion of supplies of certain renewable resources, such as tropical hardwoods, which have been harvested at unsustainable yields. The relative decline of those industries has also coincided with the growth of labor-intensive manufactured exports; the latter absorbing a growing proportion of the agricultural surplus population. However, the labor-intensive manufacturing industries now face shortages of skilled labor. Meanwhile, the ASEAN-4 nations are allocating a growing share of gross domestic capital formation to capital-intensive industries, as the boom in manufactured exports generates strong demands for intermediate and component products.

Perhaps because of a less urgent need to depend on human resources at an early stage of industrial development, limited financial resources have been invested in human capital. Skill bottlenecks and rising costs of unskilled and semi-skilled labor have indicated an urgency for increased human resouces development investments. The development trend that emerges from these examples is roughly as follows: from natural resource-intensive industries and labor-intensive industries to physical capital-inensive industries to human capital- and technology-intensive industries.

Exhibit IV-23
Changing Sectoral Composition of Industrial Exports in Selected Asian and Pacific Economies

Economies	1965	1970	1975	1980	1985	1986	1987	1988
Resource-Intensive[a]								
Japan	5.9	4.3	3.6	3.5	2.3	2.1	2.2	2.1
Bangladesh	—	—	—	12.7	16.0	17.2	16.1	—
Sri Lanka	100.0	93.7	75.4	60.8	35.1	22.7	—	—
Hong Kong	0.6	0.7	0.6	0.9	0.9	0.8	0.9	1.2
India	10.8	15.0	25.4	14.5	25.2	—	—	—
Indonesia	—	97.4	98.9	85.2	74.7	68.5	70.9	6.5
Rep. Korea	21.0	17.4	11.1	6.8	5.3	4.4	4.3	—
Malaysia	89.0	90.4	80.1	57.9	45.8	32.0	30.3	29.0
Nepal	—	—	39.3	—	20.1	15.9	—	—
Pakistan	10.2	10.9	14.0	—	12.9	11.0	10.3	—
Philippines	94.9	86.7	74.9	51.9	44.1	39.5	—	36.2
Singapore	47.9	54.6	51.8	47.0	41.5	31.8	25.0	21.1
Thailand	92.4	89.3	47.3	38.3	16.7	11.2	9.9	—
China	—	—	—	—	20.2	11.7	11.0	—
Papua New Guinea	—	—	100.0	—	90.7	93.1	—	—
Labor-Intensive[b]								
Japan	27.4	21.6	12.2	8.9	6.9	6.6	6.1	5.6
Bangladesh	—	—	—	84.3	81.6	79.6	81.5	—
Sri Lanka	0.0	6.3	12.5	35.3	60.9	72.1	—	—
Hong Kong	78.5	71.0	69.2	53.5	51.6	51.8	52.4	48.8
India	80.0	55.9	45.5	53.6	50.0	—	—	—
Indonesia	--	0.5	0.1	6.9	17.2	23.1	20.8	24.2
Rep. Korea	59.9	68.8	56.5	46.0	37.5	41.2	39.7	—
Malaysia	1.9	2.2	5.5	8.8	8.5	10.3	11.1	11.6
Nepal	—	—	60.7	—	74.0	79.2	—	—
Pakistan	83.6	85.6	80.3	—	78.6	81.2	84.3	—
Philippines	5.1	6.4	19.9	31.5	29.6	30.7	—	31.3

Exhibit IV-23
Changing Sectoral Composition of Industrial Exports in Selected Asian and Pacific Economies (continued)

Economies	1965	1970	1975	1980	1985	1986	1987	1988
China	—	—	—	—	56.9	62.6	61.5	—
Papua New Guinea	—	—	0.0	—	1.4	0.0	—	
Differentiated Goods[c]								
Japan	28.5	26.4	27.4	47.5	42.9	41.4	40.6	38.1
Bangladesh	—	—	—	1.2	1.4	0.8	0.4	—
Sri Lanka	0.0	0.0	5.3	2.3	2.7	3.5	—	—
Hong Kong	12.1	14.3	12.7	13.4	13.2	13.5	12.5	10.7
India	4.6	16.7	10.0	14.6	8.9	—	—	—
Indonesia	—	0.0	0.1	1.9	3.0	4.5	6.4	8.1
Rep. Korea	13.7	3.9	14.5	27.8	36.0	26.8	25.3	—
Malaysia	1.8	2.1	2.1	2.4	6.1	7.4	8.1	7.1
Nepal	—	—	0.0	—	5.9	4.9	—	—
Pakistan	2.2	1.7	3.7	—	4.5	4.6	3.3	—
Differentiated Goods[c]								
Philippines	0.0	6.2	2.3	10.0	9.4	9.9	—	9.5
Singapore	9.3	6.1	5.2	9.5	7.7	9.2	9.3	9.6
Thailand	0.0	2.0	4.5	6.9	9.7	10.1	9.6	—
China	—	—	—	—	13.0	14.1	14.9	—
Papua New Guinea	—	—	0.0	—	1.7	0.5	—	—
Scale-Intensive[d]								
Japan	37.4	46.9	56.3	35.5	39.3	40.0	40.3	42.3
Bangladesh	—	—	—	1.7	1.1	2.5	1.6	—
Sri Lanka	0.0	0.0	3.3	0.5	0.9	1.3	—	—
Hong Kong	7.8	13.2	16.7	28.0	27.5	27.8	27.9	30.9
India	2.8	9.8	16.2	11.1	9.7	—	—	—
Indonesia	—	0.9	0.6	4.4	2.8	1.2	0.7	1.3
Rep. Korea	5.4	9.6	17.5	17.1	17.5	22.7	2.58	—

Exhibit IV-23
Changing Sectoral Composition of Industrial Exports in Selected Asian and Pacific Economies (continued)

Economies	1965	1970	1975	1980	1985	1986	1987	1988
Pakistan	2.5	0.8	1.2	—	1.2	0.6	0.1	—
Philippines	0.0	0.0	2.2	5.9	16.3	19.0	—	21.7
Singapore	21.6	21.5	31.1	30.8	30.9	35.1	37.8	40.2
Thailand	0.0	0.0	7.4	18.4	22.9	26.6	24.1	—
China	—	—	—	—	5.3	7.2	8.4	—
Papua New Guinea	—	—	0.0	—	4.8	3.9	—	—
Science-Based[e]								
Japan	0.8	0.8	0.6	4.7	8.6	9.8	10.9	11.9
Bangladesh	—	—	—	0.0	0.0	0.0	0.4	—
Sri Lanka	0.0	0.0	3.5	1.2	0.4	0.4	—	—
Hong Kong	1.0	0.8	0.8	4.2	6.7	6.1	6.4	8.4
India	1.8	2.7	2.9	6.3	6.2	—	—	—
Indonesia	—	1.2	0.4	1.5	2.3	2.7	1.3	1.2
Rep. Korea	0.0	0.2	0.3	2.3	3.7	5.0	4.8	—
Malaysia	2.5	1.1	0.7	2.7	2.7	2.3	2.3	2.8
Nepal	—	—	0.0	—	0.0	0.0	—	—
Pakistan	1.5	1.1	0.9	—	2.9	2.7	2.0	—
Philippines	0.0	0.8	0.7	0.7	0.7	1.0	—	1.2
Singapore	2.9	2.2	2.4	4.5	12.5	15.1	18.3	20.6
Thailand	0.0	0.0	1.3	1.3	3.6	3.0	4.0	—
China	—	—	—	—	4.7	4.5	4.2	—
Papua New Guinea	—	—	0.0	—	1.4	2.5	—	—

Source: ESCAP Calculations based on trade data obtained from United Nations Statistical Information System.

Notes:
- **a** Includes SITC Categories 41,42,43,61,63,641,251,334,335,661,662,663-669,68.
- **b** Includes SITC Categories 65,691,692,695,696,697,699,84,851,821,898,899.
- **c** Includes SITC categories 71,72,73,74,76,77,881 to 885.
- **d** Includes SITC Categories 51,52,53-533,581,621,625,629,642,633.9,664, 665,666,67,693,694,78,79-792,892,893,894.
- **e** Includes SITC Categories 533,54,55,75,792,87.

For the ASEAN economies, which have recently moved from being primary commodity exporters to exporters of light consumer goods, the concern is to exploit new opportunities for manufactured exports and to induce foreign capital to make a more substantial contribution to raising domestic technology levels and enhancing domestic technological capabilities.

11. **Vietnam**

Since 1987, Vietnam has experienced rapid economic growth as a result of their restructuring (*doi moi*) policy. *Doi moi* was developed to shift Vietnam from central planning to a regulated market economy. There have been numerous positive results of this policy. As an example, Vietnam is now self-sufficient in cereal products and is the third largest exporter of rice after Thailand and the United States.

While the nation experienced very high inflation rates immediately after enactment of the programs, this was reduced by 1992. In addition, its currency, the *dong*, was stabilized. Agricultural products and industry production also experienced growth through the period, as illustrated in Exhibit IV-24. Vietnamese exports grew from $854 million (US) in 1987 to $2.5 billion (US) in 1992. As a result of the growth of exports, the ratio of imports to exports more than halved from 2.87:1 to 1.14:1.

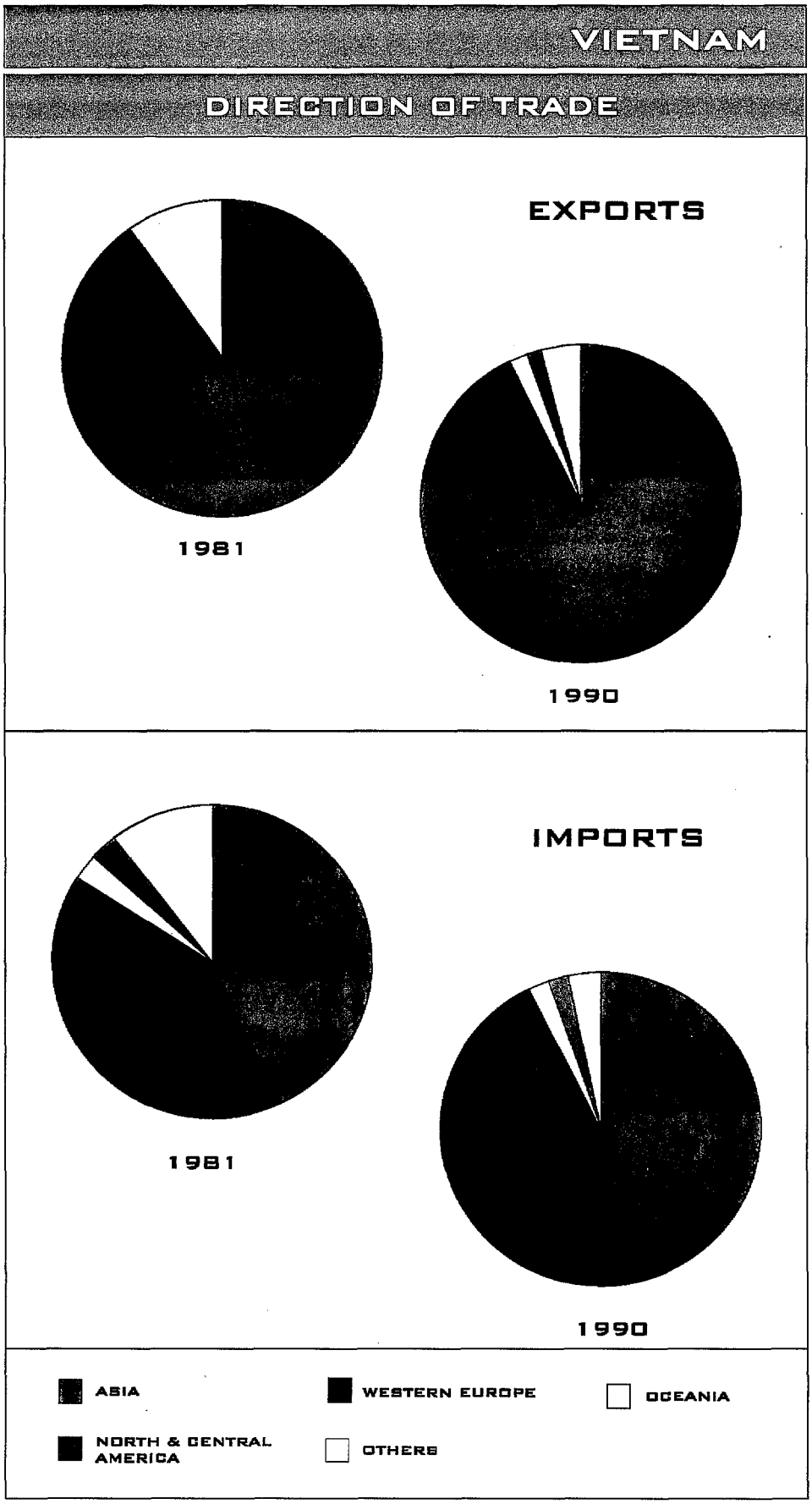
Vietnam's exports continue to be dominated by raw materials. Between 1987 and 1992, the country's leading export, crude oil, increased by 3.9 percent to 5.4 million tons. This export equalled approximately 20 percent of total export earnings. Rice, the second largest export, doubled in volume to 1.9 million tons between 1991 and 1992. The third largest export, sea products, grew from $285 million (US) in 1991 to $350 million (US) in 1992, a 23 percent increase.

In terms of trade direction, Asia was the largest market for Vietnam in 1981, while Western Europe ranked second (see Exhibit IV-25). In 1990, the Asian region accounted for three-fourths of Vietnam's exports. In 1990, Asia and Western Europe were the two leading origins of Vietnam's imports. This situation was based on the existing trade and investment embargo by the United States. With the recent elimination of the embargo, the situation is subject to change.

Exhibit IV-24 Vietnamese Economic Indicators						
	1987	1988	1989	1990	1991	1992
Percent Growth of National Income	2.5	5.8	2.4	2.4	2.4	N/A
Growth of Gross Agricultural Production (%)	0.3	4.3	5.8	1.2	-0.1	4.0
Growth of Gross Industrial Production (%)	9.5	12.5	-4.0	4.5	5.3	14.5
Percentage of Inflation	17.6	19.6	21.4	21.5	21.7	24.0 (est)
Exports ($US Billions)	0.854	1.038	1.946	2.404	1.970	2.475
Imports ($US Billions)	2.455	2.757	2.567	2.752	2.239	N/A

Sources: General Statistical Office, *Statistical Data 1976-1990* (So Lieu Thong Ke 1976-1990), Hanoi 1991; Kimura, 1992; General Statistical Office, *Yearbook 1992* (Nien Gian Thong Ke 1992), Hanoi 1993.

Exhibit IV-25



Kimley-Horn

13

In 1992 Vietnam had the second largest population in South East Asia; an estimated 69 million. This reflected an increase of 4.5 million over the 1989 census. The Centre of Population Information estimated that the annual percentage rise in Vietnam's population between 1992 and 2000 would decline steadily from 2.17 percent to 1.69 percent, while the labor force has been forecast to increase from almost 33 million to 43.5 million[4]. The 1989 census noted that 18.5 million Vietnamese were between the ages of 15 and 29, or about 53 percent of the labor force and nearly 29 percent of the total population. It has also been noted that about 88 percent of the population 10 years of age and older are literate[5]. The combination of these factors and the historic entrepreneurial nature of the Vietnamese means that this nation will continue to expand as a major economic nation in the region.

The strong performance of the country's economy was summarized by the Vietnamese Prime Minister in December 1992, when he announced that foreign investment was some 73 percent higher in 1992 than in 1991, industrial production had grown up by 14.5-15 percent, agricultural production by 4.4 percent, and state revenues by 82 percent. Vietnam was also expected to record a $75 million trade surplus in 1992, its first since reunification occurred in 1975.

An example of the strong interest in Vietnam's property sector is reflected in project proposals received for consideration by the Vietnam Fund, a private fund developed to encourage outside investment in Vietnam. Out of a total of 149 projects received in the 14 months to the end of 1992, 52 percent were proposals for property development or investment. Among the property projects, commercial projects (mostly office buildings) accounted for 40 percent, hotel projects 30 percent, residential 17 percent, and industrial 13 percent.

Vietnam is often placed alongside China at the forefront of the next wave of industrial development in South and East Asia. The attractions of the country as a low cost, resource-rich center for export-oriented production are similar to those that pertained to Thailand, Indonesia, and Malaysia in the 1980s.

However, the rush to invest in Vietnamese industry has not as yet led to many large-scale projects. The largest investments are in oil exploration, while other industrialists have put money into ventures such as textiles and garments and

[4]Patcharawalai Wongboonsin, *Current Indochinese Economies*, Institute of Asian Studies - Chulalongkorn University, Bangkok, December 1992

[5]Le Ngoc Hong & Rondinelli, Dennis A., *Small Business Development and Economic Transformation in Vietnam*, Kenan Institute of Private Enterprise, Chapel Hill, 1993

food processing and packaging, which are mostly small scale, export-related and relatively low risk, because returns are quick. However, with the recent lifting of the U.S. embargo, large-scale investments are more likely.

There is considerable potential for Vietnam's industrial sector to grow rapidly. Taiwan and Hong Kong industrialists have been particularly active investors, and the prospects for more Japanese companies to set up factories have improved with the resumption in November 1992 of overseas development aid from Japan. Vietnam may become attractive to China for many regional industries, and the future benefit of a domestic market has been largely unexplored so far.

The government's economic policy stresses import substitution and manufacture for export. The key sectors for promotion include export-oriented processed and manufactured goods, high technology industries requiring skilled labor, infrastructure development, industries exploiting gas and other natural resources, and services earning foreign exchange (tourism, food processing, ship repair, transport). The government has opted to set up Export Processing Zones (EPZs) as priority areas for promoting foreign investment in production for export. Under a decree issued in October 1991, extra incentives offered to firms operating in EPZs include reduced profit tax (10-15 percent); two- to four-year tax holidays on corporate tax; refund of profit tax paid on funds subsequently reinvested in Vietnam; exemption of import duties on equipment and materials and export duties on products exported; and a flat 5 percent withholding tax on remittance of profits.

12. ASEAN's Major Trading Partners: Current Situation

Despite two decades of rapid economic growth with active promotion of regional economic integration, the ASEAN countries are still significantly dependent on industrialized countries (*ASEAN Info View*, September 1993, Vol.1). These major trading partners include the United States, Japan, German and OECD countries (see Exhibit IV-26). The combination of greater integration of the global economy through advances in transportation and communication technologies, with international trade, policies, and activities implemented in the industrialized countries very quickly has an impact on the ASEAN economies.

Exhibit IV-26
ASEAN's Major Trading Partners' Economic Indicators: Real GDP and Unemployment Rate OECD Forecasts

Country	GDP Percentage of Change			Unemployment Rate To		
	1992	1993	1994	1992	1993	1994
United States	2.1	2.6	3.1	7.4	7.0	6.5
Japan	1.3	1.0	3.3	2.2	2.5	2.6
Germany	2.0	-1.9	1.4	7.7	10.1	11.3
OECD (Europe)	1.0	-0.3	1.8	9.9	11.4	11.9
Table OECD	1.5	1.2	2.7	7.9	8.5	8.6

Source: *The Economist*, June 5-11, 1993

The U.S. economy is shifting into higher speed as the GDP has been estimated to grow by 2.6 percent in 1993 and at an expected rate of 3.1 percent in 1994. With these figures, the unemployment rate of 7.4 percent in 1992 is predicted to decrease to 7.0 percent in 1993, with a further decline to 6.5 percent in 1994 (ASEAN Info View, September 1993, Vol. 1:2). The evidence of increasing demand for consumer durables make the estimated figures credible. Nevertheless, rising inflation figures of more than 4 percent have persisted and, should they continue to rise, would instigate measures to increase interest rates that would have a dampening effect on economic growth.

The recession in German and OECD (Europe) seemed to be more persistent due to pressures of German unification and turmoil in Europe's exchange-rate mechanism. The GDP of Germany was expected to contract by 1.9 percent in 1993, countered with modest growth of 1.4 percent forecasted for 1994. The German economic contraction, together with that of other nations, such as France, resulted in a 0.3 percent negative growth rate for 1993 for European OECD nations. Despite the modest growth expected in 1994, the unemployment rates of Germany and OECD (Europe) are expected to worsen from the high of 10.1 percent and 11.4 percent in 1993 to 11.3 percent and 11.9 percent respectively in 1994. More worrisome is that the projected high unemployment rates come concomitantly with persistent inflationary fears. This situation does not augur well for freer global trade, as it is likely to be translated into more protectionist measures. It could lead to further delays of the successful conclusion of the Uruguay Round by the end of 1993, contrary to the assertion by President Clinton to the Tokyo G-7 Meeting of July. Nearer the ASEAN nations, Japan is expected to register a GDP growth rate of 1.0 percent in 1993, accelerating to 3.3 percent in 1994 with the full impact of stimulative likely to come into effect in the last quarter of 1993. Continued Japanese trade surpluses are likely to raise further Yen appreciations, but these appreciations may not translate into greater FDI in ASEAN as they did after the Plaza Accord of 1985.

The possibility of greater ASEAN exports to the Japanese market is more likely, though not significant in the short run. Political changes in Japan, at least in the short to medium term, could detract from Japan's regional and global economic leadership. The political situation could restrain the confidence and vision of leaders from taking significant economic or political initiatives which would benefit the region.

Since Brunei Darussalam is a new emerging economy with abundant natural resources, especially oil, it currently experiences trade surpluses. However, with its small population, Brunei is not yet attractive as a market for any consumer products.

13. **Economic Trends of Southeast Asia**

It is difficult to forecast the development trends of Southeast Asia; however, it seems likely that countries in the region will have to balance, more effectively, export-oriented and domestic market-oriented growth. Income distribution, through decentralization and urbanization processes, will remain as the crucial issues for sustainable development and political stability of most countries in the region. Competition in the global markets for some export-oriented countries, as well as foreign technology and foreign direct investment, should stimulate the need of these countries to strengthen domestic dynamism. This certainly depends on each member country of this region to learn from the experiences of others and to maximize the benefits from its external economic relations. With industrial production being relocated to countries with abundant natural resources and cheap labor, countries in the same region in different stages of economic growth will become competitive with each other unless an international economic integration plan materializes. In addition, such industrial relocation, transfer, and international production arrangements, in the form of multinational corporations or joint-ventures, will require efficient physical infrastructure, appropriate human resource skills based upon quality, credibility, productivity, and realistic wage levels.

The rapid restructuring of industrial activity in Japan and the Asian NIEs is spreading to the ASEAN-4 countries and China. Foreign Direct Investment by Japan and the Asian NIEs is the primary vehicle for spreading technologies south. Furthermore, as Japan and the Asian NIEs ship their declining industries offshore, their resources are freed up for a higher level of technological development.

On the demand side, alternatives to the United States market must be found. This is due to the fact that the U.S. is now making adjustments in its macroeconomic imbalances throughout the 1990s, leading most likely to a reduction in imports rather than solely to an expansion in exports. Rapid income growth in the region will increase demand for imports and enhance inter-regional trade. Japan and, to a lesser extent, the Asian NIEs, could become the largest market for imports to balance their status as the biggest group of exporting countries in the world.

Indeed, by the year 2000, the emergence of "trading blocs" in Europe and North America could be less of a threat than now perceived, as the region becomes more interdependent (UNESCAP, 1991).

By the year 2000, China will already include Hong Kong, which should match trade and financial expertise and resources with natural and human resources on the mainland. It is expected also that there will be more interdependency among the Southeast Asian countries particularly when the Asian Free Trade Area (AFTA) starts to operate and more member countries in the region are attracted or allowed to join the group.

C. INDUSTRIAL DEVELOPMENT

1. Overview

Manufacturing has been a dynamic stimulus to the growth of most regional economies[6]. The growth rates experienced by industry, particularly manufacturing, have outpaced those of other sectors of various economies, leading to a transformation of their output composition. Among the nations, differences have emerged with respect to the types of commodities that are major generators of export income. Just as the economies have been transformed, so too, the composition of the exports has changed as those goods with higher levels of added value have replaced basic materials.

As shown in Table IV-27, export growth rates from 1980 to 1990 averaged 7.4 percent per annum for the Southeast Asian nations and ranged from a low of an annual 0.7 percent for Indonesia to a high of 14.6 percent per annum for Vietnam. During the same period, the average annual increase in imports exceeded those of exports by 2.2 percentage points. The highest rate of increase in imports was recorded by Thailand at 13.6 percent, while the Philippines trailed at an average annual rate of 3.9 percent.

In total, the Southeast Asian nations exported goods with a total value of $141.2 billion (US) in 1990 and imported goods with a total value of $160 billion (US). With the addition of Hong Kong, these totals increased to $223.3 billion (US) and $242.5 billion (US), respectively.

[6] *Economic and Social Survey of Asia and The Pacific 1991*, UN/ESCAP 1992

Exhibit IV-27
Exports and Imports (1980-1990)

Country	Exports				Imports			
	Value 1990	Annual Rate of Change			Value 1990	Annual Rate of Change		
		1890	1989	1990		1980-1990	1989	1990
	($ Bn. US)	%	%	%	($ Bn. US)	%	%	%
Southeast Asia	**141.18**	**7.4**	**17.2**	**16.1**	**160.03**	**9.6**	**21.4**	**25.3**
Indonesia	25.68	0.7	15.3	15.9	21.84	7.3	23.5	33.5
Malaysia	29.42	8.6	18.8	17.2	29.26	10.5	36.3	29.8
Philippines	8.19	3.5	10.1	5.7	12.21	3.9	22.9	13.7
Singapore	52.73	10.5	13.7	18.0	60.79	9.9	13.2	22.4
Thailand	23.07	13.5	25.7	15.0	33.07	13.6	27.0	28.3
Vietnam	2.10	14.6	67.8	16.6	2.87	8.3	3.3	9.0
Hong Kong	82.16	15.3	15.8	12.3	82.50	13.9	12.9	14.3

Source: *Economic and Social Survey of Asia and the Pacific 1991*, UN/ESCAP 1992

145

The diversification of exports, in terms of commodities and markets, reduces instability. As a wider mix of export commodities are developed, the effect of shifts in demand are lessened. Similarly, as the number of markets increases, the effect of recessions in any nation or group of nations is of less impact to the exporting nation and industry as it can shift product to a stronger economy. Finally, the diversification of export commodities and markets generates a need for a broader range of skills and increases the competitive forces in the exporting industry; this contributes further to a cyclical development of new products and new markets. In Southeast Asia, Indonesia, Malaysia and Thailand stand out as leading examples of countries that have diversified their exports both in terms of speed and breadth.

This section examines the differences among the nations' industrial/ manufacturing structures and their exports. A key element of this examination is the identification of those commodities and industries whose products have a higher likelihood of being transported by air. The review highlights developments between 1989 and 1991.

The section is subdivided by country. A summary review is also included. The countries appear in the same order as used in other sections of this chapter, i.e. Hong Kong, Singapore, Malaysia, Indonesia, Philippines, and Vietnam. There is a very brief discussion regarding Laos and Myanmar. The examination of Thailand appears in the next chapter.

2. Hong Kong

Between 1989 and 1990, the overall export growth rate slowed from 15.8 percent to 12.3 percent. In an examination of this, it was noted that re-export, which accounted for approximately 65 percent of all exports, expanded by 16 percent in 1990. Imports, much of which were subsequently re-exported grew by 12.9 percent in 1989 and 14.3 percent in 1990.

The slowing growth of domestic exports, exports which originated in Hong Kong, was due to the recessionary conditions in the primary markets of United States and the United Kingdom. These two markets consumed approximately 36 percent of the domestic exports. On the other hand, the relative economic strength of the primary markets for the re-exports, China, Japan and Taiwan, supported growth in that sector. Those three markets absorbed nearly 60 percent of all of Hong Kong's re-exports.

The leading export commodities of Hong Kong , for the period of 1984 through 1987, had a weighted average share of the world's exports of 6.8 percent and a weighted average annual rate of growth of 17.2 percent[7]. The leading export commodities, in order of volume, for the period between 1984 and 1987, were manufactured clothes, miscellaneous manufactured products, yarns and cloth, hosiery and knitwear, clocks and watches, footwear and fur, computers, consumer products, telecommunications apparatus, and electronic products. Exhibit IV-28 presents these commodity groups in terms of market share and growth and world export share relative to the combined weighted average of the commodity groups for Hong Kong.

As Exhibit IV-28 illustrates, the majority of the leading exports are high value goods. Those goods that exceed the weighted average for growth and share of world exports, manufactured clothes and hosiery and knitwear, illustrate the strength of Hong Kong and the re-exports from the People's Republic of China in this industry, particularly to markets in the United States and Europe. Those products that have a lower share of exports, but an above average rate of growth, illustrate situations where there are a significant number of other competitors. It is questionable whether the group of commodities that are lagging behind the average in terms of growth and share will continue to be part of the leading exports.

In most cases, the probability of these products being shipped by air is high. They are either perishable in terms of market acceptance, or are small and of high value to justify the higher cost of air transport.

3. **Singapore**

Despite some specific problems within the manufacturing sector, the growth in industrial production increased to 9.6 percent in 1991 from 9.2 percent the previous year. A chronic labor shortage affected all industries. In addition, a reduction in demand, due to worldwide economic slowdowns, particularly in Europe and North America, and a restructuring of capacity as the electronics sector was being changed to high value-added products, contributed to a 5.9 percent fall in the output of electronic goods. Computers, especially peripherals, experienced a weakened level of demand.

[7] D'Cruz, J.R., "Diagnosing National Industrial Portfolios," *The World Competitiveness Report*, 1990, IMD

Exhibit IV-28
Leading Hong Kong Export Commodities (1984-1987)

Commodity Group	Estimated 1987 World Export Share (%)	Growth Rate vs. H.K. Weighted Average	Export Share vs. H.K. Weighted Average
Manufactured Clothes	13	Above	Above
Misc. Mfg. Products	6	Above	Below
Yarn and Cloth	8	Below	Below
Hosiery and Knitwear	14	Above	Above
Clocks and Watches	22	Below	Above
Footwear and Fur	6	Above	Below
Computers	2	Above	Below
Consumer Products	5	Below	Below
Telecommunications	4	Below	Below
Electronic Products	4	Above	Below

Source: *The World Competitiveness Report*, 1990

In spite of these problems, Singapore exports continued to exhibit strong growth, as shown in Exhibit IV-27. In spite of the decline in exports of rubber, other raw materials, electronics and computer products, machinery, transport equipment, telecommunications products and petroleum products supported the growth of exports. Imports, which had grown by less than the rate of exports for the decade, exceeded exports in 1990 in terms of growth and value.

The leading export commodities of Singapore during the period of 1984 through 1987 had a weighted average share of the world's exports of 2.6 percent and a weighted average annual rate of growth of 9.9 percent[8]. The leading export commodities, in order of volume, for that period, were petroleum derivatives, computers, electronic components, miscellaneous goods, consumer products, small electrical components, agricultural products for industry, organic chemicals, other food products, and telecommunications equipment. Exhibit IV-29 presents these commodity groups in terms of market share and growth and world export share relative to the combined weighted average of the commodity groups for Singapore.

As the exhibit illustrates, the leading exports are high value goods. Those goods which exceed Singapore's weighted average for growth and share of world exports, electronic parts and consumer products, illustrate the strength of Singapore's industrial development program to create high technology industry. Those products that have a lower share of exports but an above average rate of growth illustrate the situation where there are a significant number of other competitors. It is questionable whether the one commodity that is lagging behind the average in terms of growth and share, other food products, will continue to be part of the leading exports.

Unlike Hong Kong, there is mix of commodities as they relate to their probability of being transportable by air. The petroleum derivatives and organic chemicals reflect Singapore's strategic location on the major sea lane of Southeast Asia and its proximity to the resource rich, but relatively capital poor nation of Indonesia. Most of the other products, because of their relative size and high value have a high probability of air shipment.

[8] D'Cruz, J.R., "Diagnosing National Industrial Portfolios," *The World Competitiveness Report 1990*, IMD

Exhibit IV-29
Leading Singapore Export Commodities (1984-1987)

Commodity Group	Est. 1987 World Export Share (%)	Growth Rate vs. Singapore Weighted Average	Export Share vs. Singapore Weighted Average
Petroleum Derivatives	7	Below	Above
Computers	4	Above	Below
Electronic Components	6	Above	Above
Miscellaneous	1	Above	Below
Consumer Products	5	Above	Above
Small Electrical Components	2	Above	Below
Agricultural Products for Industry	2	Above	Below
Organic Chemicals	1	Above	Below
Other Food Products	1	Below	Below
Telecommunications	2	Above	Below

Source: *The World Competitiveness Report 1990*

4. Malaysia

In 1989, manufacturing output expanded by 12 percent. This rate increased by over 50 percent to 18.9 percent in 1990. Both export and domestic market related industries participated in this sectoral expansion. Export growth was led by electrical and electronic products (37.2 percent) and wood and wood products (13.1 percent). Transport equipment (30.4 percent) and construction related products (16.6 percent) led the expansion of domestic-market manufacturing industrial growth.

Export value growth actual fell from 1989 to 1990 (18.8 percent to 17.2 percent). The primary reason for the decline came from lower prices and earnings for rubber, palm oil, sawnlogs, and tin. During the same years, while import increase continued to outpace export growth, the value of exports was still higher than imports.

The leading export commodities of Malaysia, during the period of 1983 through 1986, had a weighted average share of the world's exports of 4.1 percent and a weighted average annual rate of growth of 6.2 percent[9]. The leading export commodities, in order of volume, for that period, were crude petroleum, agricultural products for industry, electronic products, edible fats, natural gas, non-ferrous metals, petroleum derivatives, other food products, consumer products and wood products. Exhibit IV-30 presents these commodity groups in terms of market share and growth and world export share relative to the combined weighted average of the commodity groups for Malaysia.

As the exhibit illustrates, the leading exports are a mixture of basic commodities and high-value goods. Those goods that exceed Malaysia's weighted average for growth and share of world exports, electronic parts, edible fats and agricultural products for industry, illustrate a mix of high and moderate level goods. This mix reflects the evolution of the industrial composition of Malaysia. In comparison with Hong Kong and Singapore, Malayasia has many natural resources and thus has developed industries that not only extract basic materials, highlighted by crude petroleum, natural gas and non-ferrous metals, but also process other commodities and the manufacture high-value goods.

[9] D'Cruz, J.R., "Diagnosing National Industrial Portfolios," *The World Competitiveness Report 1990*, IMD

Exhibit IV-30
Leading Malaysia Export Commodities (1983-1986)

Commodity Group	Est. 1986 World Export Share (%)	Growth Rate vs. Malaysia Weighted Average	Export Share vs. Malaysia Weighted Average
Crude Petroleum	2	Below	Below
Agricultural Products for Industry	7	Above	Above
Electronic Products	7	Above	Above
Edible Fats	6	Above	Above
Natural Gas	2	Below	Below
Non-Ferrous Metals	1	Above	Below
Petroleum Derivatives	—	Below	Below
Other Food Products	1	Above	Below
Consumer Products	1	Above	Below
Wood Products	2	Above	Below

Source: *The World Competitiveness Report 1990*

Those products that have a lower share of exports, but an above average rate of growth, illustrate a situation where there is a significant number of other competitors.

There is mix of commodities as they relate to their probability of being transportable by air. Crude petroleum, natural gas, petroleum derivatives and organic chemicals reflect the supplies in Malaysia, as well as Malaysia's location on the major sea lane of Southeast Asia. Many of the other products, because of their relative size and high value, have a high probability of air shipment.

5. **Indonesia**

In 1988, manufacturing experienced a growth of 12 percent. However, this sector experienced lower growth rates in 1989 and 1990, 9.1 percent and 8.7 percent, respectively. A main reason for the decline in growth was based on capital constraints, primarily with respect to electricity, gas and water supplies. While non-oil/liquefied natural gas manufacturing led exports, domestic related manufacturing growth was led by textiles, footwear, electrical goods, and automobile products.

Exports for 1990 were 15.3 percent higher than for 1989, which in turn were 15.9 percent higher than the 1988 level. During the decade, exports grew at an average annual rate of 0.7 percent, while imports climbed an average rate of 7.3 percent each year. In 1990, the value of exports exceeded that of imports by some 15 percent.

The leading Indonesian export commodities, between 1984 and 1988, had a weighted average share of the world's exports of 4.2 percent and a weighted average annual rate of growth of -0.9 percent[10]. The leading export commodities, in order of volume, for that period, were crude petroleum, natural gas, agricultural products for industry, wood products, petroleum derivatives, other food products, non-ferrous metals, non-ferrous ores, manufactured clothes, and meat, fish and poultry. Exhibit IV-31 presents these commodity groups in terms of market share and growth and world export share relative to the combined weighted average of the commodity groups for Indonesia.

[10] D'Cruz, J.R., "Diagnosing National Industrial Portfolios," *The World Competitiveness Report 1990*, IMD

Exhibit IV-31
Leading Indonesia Export Commodities (1984-1988)

Commodity Group	Est. 1988 World Export Share (%)	Growth Rate vs Indonesia Weighted Average	Export Share vs. Indonesia Weighted Average
Crude Petroleum	3	Below	Below
Natural Gas	9	Below	Above
Agricultural Products for Industry	3	Above	Below
Wood Products	15	Above	Above
Petroleum Derivatives	2	Below	Below
Other Food Products	1	Above	Below
Non-Ferrous Metals	1	Above	Below
Non-Ferrous Ores	3	Above	Below
Manufactured Clothes	1	Above	Below
Meat, Poultry & Fish	1	Above	Below

Source: *The World Competitiveness Report 1990*

As the Exhibit illustrates, the leading exports are a mixture of basic commodities and high-value goods. Many are commodities that have undergone limited processing, as exemplified by crude petroleum, natural gas and non-ferrous ores. Other exports, such as wood products, non-ferrous metals, petroleum derivatives, and meat, poultry, and fish, reflect basic processing. Manufactured clothes is the sole example of higher levels of manufacturing. This range of products confirms the fact that the industrial development of Indonesia is behind that of other countries in Southeast Asia.

Only wood products exhibited a higher growth rate and share of world exports than the combined weighted average. Both crude petroleum and petroleum derivatives fell below the combined weighted averages. With the exception of natural gas, the rest of the commodities exhibited strong growth, but fell below the weighted average market share, suggesting that Indonesian exports were in highly competitive markets.

A common characteristic of many of the commodities is their bulk. This in turn suggests the probable use of transport modes such as sea, rail, and pipeline. Manufactured clothes are the exception, as they are highly likely to be transported by air.

6. **Philippines**

Between 1980 and 1985, the only economic sector to enjoy growth was the services sector. Between 1985 and 1990, all sectors experienced growth. However, that trend was reversed for both 1991 and 1992, as only services registered growth, albeit at a very low rate.

Industrial output increase in 1990 was only 1.8 percent, versus a 6.9 percent increase in 1989. Much of this decline was attributed to natural calamities and power shortages. By 1992, the affects of the natural calamities had been overcome and power had become more available, as reflected by a dramatic reduction of power outages. In 1989, exports grew by 10.1 percent, but the effect of these problems nearly halved that rate to 5.7 percent in 1990. While low prices for such products as copra, copper, coffee, and timber drove down the overall export earnings growth rate, merchandise exports grew by approximately 7 percent in 1991, in part due to the depreciation of the Philippine peso, which made trade more profitable for Philippine exporters.

Imports, which between 1980 and 1990 recorded an average annual increase of just under 4 percent per annum, significantly outpaced export growth in 1989 and 1990, as illustrated in Exhibit IV-27. As a result, in 1990 the total value of imports exceeded the value of exports by nearly 50 percent.

As the stability of the nation's political and economic sectors continues, the development of export oriented manufacturing industries can be expected to accelerate. The conversion to civilian use of the former U.S. Navy base at Subic Bay and the introduction of higher stages of processing of the abundant natural resources provide a natural foundation for such developments.

7. **Vietnam**

The difference between state-owned and "local" industries is reflected in the difference in output expansion in 1990. Overall, industrial production grew by an estimated 4.5 percent in 1990. The state-owned companies increased production by 7.4 percent, based on capital injections and improvements in technology and management techniques. In contrast, the privately-owned or "local" companies, which did not have similar inputs, failed to achieve such rates of growth.

Exports, which had grown by over 67 percent in 1989, recorded a significant decline, probably to a more sustainable level of about 17 percent in 1990. As mentioned in Section B of this chapter, the majority of exports have been in the form of primary goods such as cereals, rice, crude petroleum, coal, coffee, and peanuts.

As shown in Exhibit IV-27, the growth rate of imports has lagged behind those of exports. However, in 1990, the value of all imports was higher than exports by some 36 percent, reflecting the difference in value between primary good exports and secondary product imports.

The elimination of the U.S. embargo is expected to result in a rapid increase in trade and investment. Within a few days of the fall of the trade embargo, U.S. firms such as Bank America, Coca Cola, PepsiCo and IBM unveiled operations in Vietnam. While the U.S. companies are playing catch-up to many investors from Europe and Asia, the potential of exports to the United States from Vietnam is expected to be a major force in the expansion of export-oriented industries.

8. Laos and Myanmar

Neither of these countries has enjoyed the benefits of the rapid economic growth of Southeast Asia. This has been primarily due to their insular geopolitical orientation. However, the effects of this political orientation had different results with regards to exports and imports.

The majority of growth in 1990 exports from the Lao People's Democratic Republic, which was only $63 million (US) in total value, was hydro-electric power and wood products. However, in order to protect the diminishing forests, the government established a ban on all logging in August 1991. In the same year, the value of imports was nearly 3 times as large at $185 million (US). Between 1980 and 1989, exports recorded an average annual growth rate of 7.3 percent. This average was affected by the over 22 percent drop recorded in 1989. In contrast, imports only grew by 3.5 percent between 1980 and 1990, including a 10 percent increase in 1990.

Myanmar experienced a very high rate of growth in exports for both 1989 and 1990, 55.8 percent and 51.2 percent, respectively. This reversed the overall trend for the 1980s which averaged an annual decline of 3.6 percent. In 1990, exports from Myanmar totalled $325 million (US) composed mainly of fishery and forest products. Myanmar's imports continually declined, on average, between 1980 and 1990, by 3 percent. In 1989, imports declined by nearly 22 percent, but this was reversed in 1990 with a 36.6 percent increase.

Both Laos and Myanmar have poorly developed economies. While there are some indications of an increase in international trade, the overall short-term prospects do not match those of other nations in Southeast Asia.

9. Summary

With the exception of Laos and Myanmar, the nations of Southeast Asia are exhibiting various stages of industrial and export development. Led by Hong Kong and Singapore, Indonesia, Malaysia, and Thailand are rapidly re-configuring their economies to become major players on the world stage. They are diversifying their industrial base, fueled by a combination of domestic and foreign demand for higher value products, as opposed to primary commodities. While Hong Kong and Singapore are forced to rely on manufactured goods for their exports, the other countries, to varying degrees, have various natural resources that can be used to develop manufacturing industries.

As this region continues to evolve, particularly as Vietnam and the Philippines begin to enjoy a more active role in the world economy, the position of this region in the world trade arena will rise. This in turn will force a demand for more transport facilities and services, particularly to intercontinental destinations.

D. TRANSPORTATION AND INFRASTRUCTURE

1. Overview

Transport services and related infrastructure in Southeast Asia are numerous and varied. The recent economic growth has dictated the need for steady improvements in services and infrastructure. Nations throughout Southeast Asia are faced with funding continuous improvements and expansion of their transportation infrastructure.

Some countries like Thailand, Indonesia, Vietnam, and Malaysia still face a problem in matching transport investments to growing transport demand generated by the growth of their national economies. This problem, which is sometimes occasioned by a lack of financial resources, as in the case of Vietnam, also occurs from a lack of planning implementation skills within the respective governments.

This need could very well strain the financial resources of individual countries and significantly deplete financial reserves, which have been built up over many decades of high savings rates. In addition to the new Hong Kong airport at Chep Lap Kok and related rail and road bridges, Singapore is building an underground highway at an estimated cost of $2.4 billion (US), Malaysia is building a new airport to serve Kuala Lumpur, at a cost of $10 billion (US), and Indonesia plans to spend at least $50 billion (US) on transport and energy projects over the next decade.[11] These significant investments are seen as essential for the continued development of the individual economies.

An example of international cooperation is the Mittaphab (Friendship) Bridge across the Mekong River between Nong Khai, Thailand and Tha Naleng, Laos. It is being funded by Australia and built by a South Korean company. When completed, it will carry both road and rail traffic and provide a direct connection between Singapore and Vientiane.[12]

[11] Brauchli, Marcus W., "For Thrifty Asia, Rainy Day Has Arrived - Infrastructure Needs Could Reverse High Rates of Savings," *The Wall Street Journal*, July 15, 1993
[12] "Bridge to the world," The Economist, October 23, 1993

The following section highlights major transport facilities and infrastructure. It examines the road and rail networks of each country. Descriptions of the major seaports and international airports for each country are also incorporated in the review. In addition, this section includes the observations from a survey of over 3,500 non-stop flights at six major airports within the region.

As illustrated by Exhibit IV-32, a comprehensive road network exists from Singapore in the south to China in the north. The network links these two countries with Cambodia, Laos, Malayasia, Myanmar, Thailand, and Vietnam. Numerous rail lines also serve the region. Singapore, Malaysia and Thailand are linked together, with Laos soon to be connected. Myanmar and Vietnam have their own rail networks.

There are many seaports serving the region. Two, at Hong Kong and Singapore, rank among the largest in the world and possess state-of-the-art facilities to handle all types of seaborne cargo. Likewise, each surveyed country, except Hong Kong and Singapore, has a series of airports serving local, regional, and intercontinental flights. Airports at Bangkok, Hong Kong, and Singapore rank high among the world's airports in terms of passenger and cargo traffic and the number of non-stop international flights.

The survey of over 3,500 non-stop flights at six major regional airports highlights the wide range of international points that are linked by non-stop air services to the region. While the survey highlights the dominance of passenger flight services, it also illustrates the significant role of all-cargo services as a major provider of available air cargo capacity.

2. Road Networks

a. Singapore and Hong Kong

Between 1981 and 1992, Singapore had the highest road density of the study nations (see Exhibit IV-33) with the average annual growth rate of the roadway system only 1.7 percent. The total length of roads by the end of 1989 was 2,826 kilometers (km) (see Exhibit IV-34). This reflected the high rate of development of road infrastructure before 1981. The information from "Transport Policy," published by the Asian Development Bank (ADB) and the Economic Development Institute (EDI) also stated that 7 percent of Singapore's land area, covering 2,760 square kms, was built up with roads, one of the highest rates in the world.

Like Singapore, Hong Kong is a small country with scarce land resources. Its road density as of 1990 was 1,438 km/100 square km. Although much lower than the country of Singapore, it was still greater than those of the other Asian countries. In 1990, there were 1,484 km of road, compared with 1,182 km in 1981. Road building was adding approximately 2 percent annually to the length of the road system; all new roads were paved (see Exhibit IV-35), mainly in the form of high capacity expressways.

b. Malaysia and Indonesia

Unlike Singapore and Hong Kong, the following three countries, Malaysia, Indonesia, and Vietnam, have very long distances in terms of total roads (Exhibit IV-33), but very low road densities. This is because these countries have a large land area while the road infrastructure has been relatively underdeveloped. While Indonesia has a larger average annual growth rate in road density, Malaysia has a relatively well-developed road network. Approximately 50 percent of the total road network is in peninsular Malaysia, of which 66.5 percent is paved. That is the same proportion of paved road network as in Singapore, while the portion of road network that is paved in Indonesia is only about 40 percent. The backbone of the road system in Malaysia consists of three Federal routes; Federal Route I (which is part of Asian Highway Route 2) running north from Johore Baharu to Perlis, Federal Route II running east-west from Kuantan to Port Kelang, and Federal Route III running north-south along the eastern coast of Peninsular Malaysia from Johore Baharu to Kelantan. The main road on the western side of the Peninsula is heavily used. It is supplemented by a dual-carriageway expressway, which parallels the existing road.

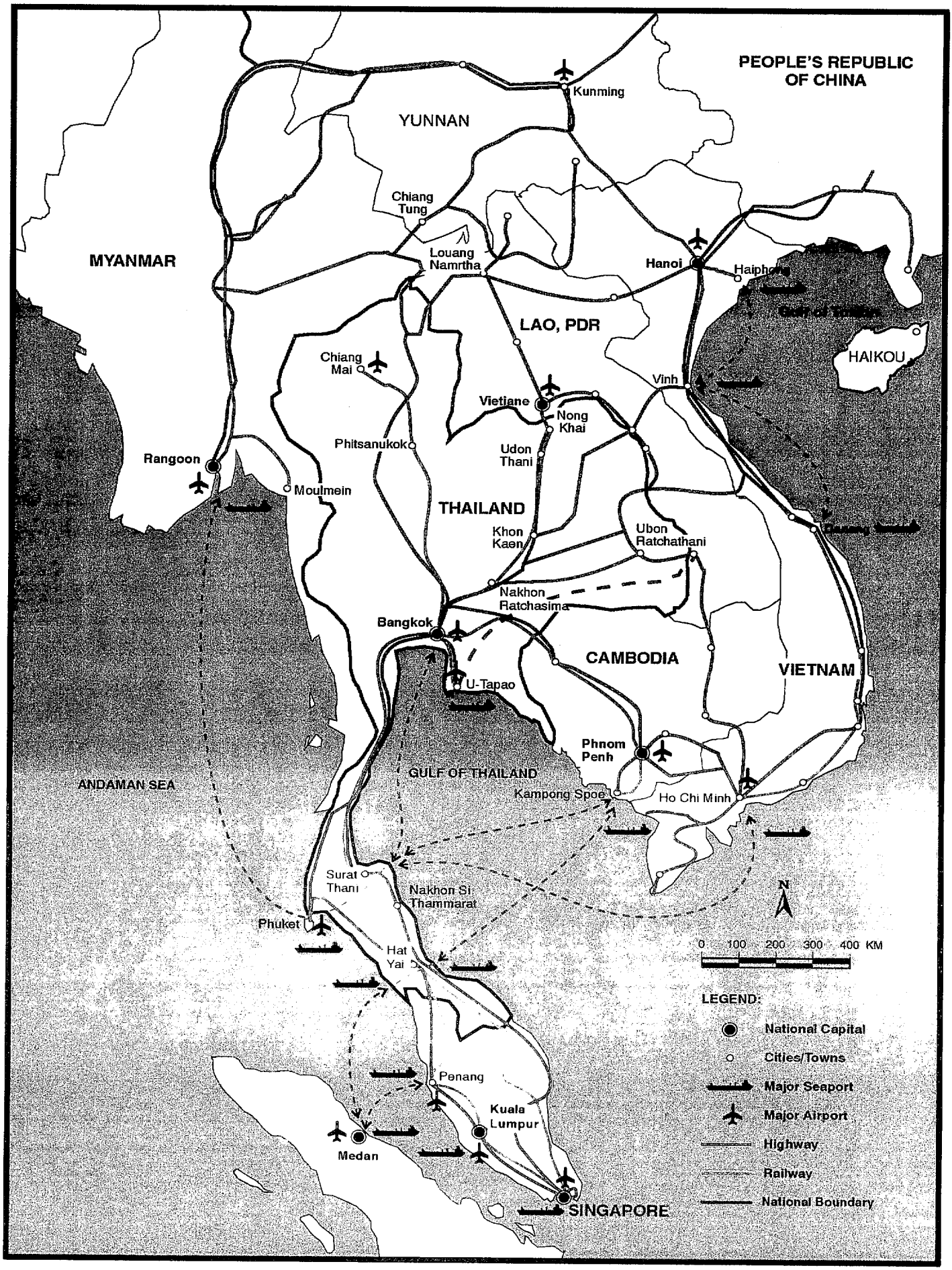


Exhibit IV-32

161

Exhibit IV-33
Road Density (Road km/100 sq. km)

Year	Hong Kong	Indonesia	Malaysia	Singapore	Vietnam
1981	1,145	—	95	4,281	—
1985	1,282	109	118	4,560	—
1986	1,308	112	119	4,631	163
1987	1,352	123	122	4,759	163
1988	1,390	—	123	4,845	163
1989	1,420	—	123	4,872	163
1990	1,438	—	123	4,696	—
1991	1,482	—	—	5,041	—
AAGR (1985-90)	2.3%	6.3%	0.8%	1.7%	0.0%

Source: Survey of Road Transport Statistics in the ESCAP Region, ESCAP, United Nations 1991; "Transportation Capacity by Country by Mode," *Statistical Yearbook for Asia and Pacific.*

Exhibit IV-34 Road Length (km)					
Year	**Hong Kong**	**Indonesia**	**Malaysia**	**Singapore**	**Vietnam**
1981	1,182	—	31,406	2,483	—
1985	1,323	207,237	38,973	2,645	—
1986	1,350	214,033	39,345	2,686	53,845
1987	1,395	234,059	40,305	2,760	53,845
1988	1,434	—	40,520	2,810	53,845
1989	1,465	—	40,756	2,826	53,845
1990	1,484	—	40,520	2,882	—
1991	1,529	—	—	2,924	—
AAGR (1985-90)	2.3%	6.3%	0.8%	1.7%	0.0%

Source: Survey of Road Transport Statistics in the ESCAP Region, ESCAP, United Nations 1991; " Transportation Capacity by Country by Mode," *Statistical Yearbook for Asia and Pacific.*

Exhibit IV-35 Paved Road Length (km)					
Year	**Hong Kong**	**Indonesia**	**Malaysia**	**Singapore**	**Vietnam**
1985	1,323	83,566	25,125	1,797	—
1986	1,350	89,533	25,494	1,828	12,242
1987	1,395	—	26,470	1,855	12,242
1988	1,434	—	26,882	1,891	12,242
1989	1,465	—	27,118	1,896	12,242
1990	1,484	—	34,356	—	—

Source: Survey of Road Transport Statistics in the ESCAP Region, ESCAP, United Nations 1991; " Transportation Capacity by Country by Mode," *Statistical Yearbook for Asia and Pacific.*

c. Vietnam

In 1991, Vietnam's roads totaled over 105,000 kilometers, of which 12 percent, or about 13,000 kilometers, are paved. There had not been any new road construction since 1986. In fact, the state of the existing roads reflects the lack of adequate maintenance. Heavy trucks are prohibited from over one-third of all bridges, and reconstruction and subsequent maintenance had been spotty and inadequate.

Highway No. 1 is the main national highway between Hanoi and Ho Chi Minh City. The highway, which links all major urban centers in Vietnam, runs within a few kilometers of the coastline, except near Hanoi and Ho Chi Minh City. It experiences high vehicle densities, particularly in the vicinity of cities and industrial centers. South of Hue, Highways 14 and 15 run parallel to Highway 1 and the main north-south railway. These two highways provide access to areas with mineral resources and agricultural activities. There is a plan to construct a high voltage electrical transmission line along these road corridors. There are extensions of the main north-south highways, which link Vietnam to China and Cambodia. There is also a series of east-west routes. These routes serve the inland areas of the nation as well as provide links to interior countries, including Cambodia, Laos, and Thailand.[13]

3. **Railways**

a. Singapore and Hong Kong

The variation of development of this transport mode is quite wide among the surveyed nations. In Singapore the mass rapid transit (MRT) system provides the primary passenger rail carriage. Singapore is also served by the KTM (Malaysian rail network), which links Singapore via the causeway to Malaysia at Johore Baharu. This service handles both passenger and freight traffic.

In Hong Kong, the railway system is used for both passengers and cargo. Passenger carriage is served by two heavy rail systems and three

[13] Guidebook to Business and Investment in Central Vietnam, Kinh Doanh Va Dau Tu Vao Mien Trung Vietnam, Phong Thuong Mai Va Cong Nghiep, Vietnam Vietcochamber Danang, 1992, pp. 42-43.

164

tramway/light railways. The longest and busiest network is the 38.6 km subway system of the Mass Transit Railway Corporation (MTRC), an autonomous, government-owned body. Most freight is carried by the Kowloon-Canton Railways, which is a government-owned corporation. It comprises a single 34 km route from Kowloon to the Chinese border. The line is electrified on the 25 Kv AC system. There are also diesel-hauled freight and international passenger services between Kowloon and Guangzhou in China. The freight traffic volume in 1991 was 60 ton-kilometers, an increase of 67 percent over 36 ton-kilometers in 1981.

b. Malaysia

The rail network in Peninsular Malaysia is managed by Keretapi Tanah Melayu (KTM), now structured as a private company (1972) to be completely privatized in 1997. KTM manages a rail network of some 2,075 km. The network, which has not been expanded since 1981, is composed of the west coast main line, an east coast line, and several branch lines. Both the west and east coast lines are linked to the Thai rail system. The only rail system in East Malaysia is the Sabah State Railway. Rail transport is dominated by the carriage of cement, followed by grains, basic food products, petroleum, and logs.

The productivity and efficiency of the Malay service is lower than that of Hong Kong. This is caused by the low availability of mainline and shunting engines and freight wagons, and inadequacies in the rail infrastructure. There are only 92 engines in the entire system. Many of the freight wagons are specialized for specific shipment types; this results in numerous empty return trips. Most of the lines are single tracked, with relatively sharp curves and significant bridge weight limitations. Because of these factors, the net ton-kilometers increased by only 18 percent between 1981 and 1988.

The KTM is looking at numerous ways to improve its operation and financial situation. The second largest infrastructure investment in Malaysia is the proposed "second track" from Singapore to Penang at an estimated cost of M$4-5 billion [$1.4-$1.8 billion (US)]. This particular investment, as well as the proposed conversion of all trackage from the current narrow-gauge to standard gauge, is driven by the recognition of the increasing importance of rail carriage for both passengers and freight. It should be noted that if Malaysia were to convert to standard gauge, then the current compatibility with Thailand would be lost. However, KTM officials point out that by

converting to standard gauge and introducing new trains, the current 6.5 hour trip between Kuala Lumpur and Singapore could readily be reduced to 90 minutes.[14]

c. *Indonesia*

In Indonesia, the railway network only exists on the islands of Java and Sumatra. The cargo transported in 1987 was 8.2 million tons, double the 4.9 million tons of 1980. The annual average rate of growth of 4.2 percent was due to the increase of such bulk cargo as cement, fertilizers, coal, and containers. The low figures reflect the unpopularity of using rail service to deliver cargo in Indonesia.

d. Vietnam

As of 1991, there were a total of 3,059 km of rail track in Vietnam. This was composed of 2,454 km of meter-gauge, 151 km of standard gauge and 230 km of dual gauge trackage. As with most other sectors of transport infrastructure, little in the way of expansion, rehabilitation, and maintenance had occurred in the country during the past decade. As a result, the state of the rolling stock, engines, track, and signal system was hampering industrial and economic growth. Between 1986 and 1992, rail traffic actually declined an estimated 40 percent due to the cessation of government operating subsidies and elimination of government imposed rules governing choice of transport mode.

4. **Seaports**

The bulk of all international cargo moves in ocean vessels. The region boasts a large number of port facilities ranging in scale from those at Hong Kong and Singapore to small riverine ports with limited facilities.

In a study of major container ports, Singapore and Hong Kong were ranked, respectively, as the top two ports in the world, based on the number of containers handled during 1990. Among the top 25 ports, eleven were located in Asia. Collectively, these eleven ports handled over 23,655,000 containers, expressed in terms of Twenty-Foot Equivalents (TEU), or over 60 percent of the combined volume of the top 25 container ports.

[14] Tsuroka, Doug, "Picking Up Steam", Far Eastern Economic Review, October 1993

Three ports, Singapore, Hong Kong, and Bangkok (Khlong Toey) handled 5.22, 4.204, and 0.87 million TEUs respectively, during 1990. In comparison with 1989 volumes, these ports experienced growth rates of 20 percent, 8 percent, and 10 percent, respectively. Collectively, these three ports handled approximately 26 percent of the over 39.113 million TEUs handled by the top 25 international container ports.[15]

a. Singapore and Hong Kong

Singapore and Hong Kong have major global ports. In both countries, the port plays a significant role in the economy. During 1991, more than 81,000 vessels called at the Port of Singapore. The port facilities handled 3.2 million 20-foot equivalent unit containers (TEUs) in 1988 (Exhibit IV-36), making it the world's second largest container port after Rotterdam.

Singapore's rise to become one of the world's main shipping hubs reflects its strategic location. The seaport's high efficiency and productivity, the numerous connections to points around the world, and the high frequency of the mainstream and feeder services, support its world position. While the other major container terminals handle 40 to 50 containers per ship-hour, Singapore's average handling rate is 63 containers. Singapore is linked to some 250 ports all around the world by more than a hundred shipping lines. In order to cope with the demand from outside and inside country's users, Singapore continues to expand its handling capacity beyond the original facilities at Keppel and Telok Ayer, which are now mainly used for handling break bulk general cargo. There are now four additional terminals; Jurong, Sembawang, Pasir Panjong, and Tanjong Pajar. This last terminal has already expanded to nine container berths.

Hong Kong continues to be the primary ocean gateway to China. That traffic, in addition to the production output of the local industry, has created a significant traffic base upon which the port has developed. In 1991, over 6 million TEUs were handled at Hong Kong, the equivalent of over 42.2 million containerized tons.

[15] "Top 25 International Container Ports," *Foreign Trade*, September/October 1993

167

Exhibit IV-36
Ocean Cargo Volumes

	Hong Kong	Indonesia	Malaysia	Singapore
1981				
Containers	1,559,819	140,157	475,789	1,064,504
Containerized Tonnage	10,664,932	986,409	4,805,353	14,673,144
1985				
Containers	2,288,953	382,663	399,618	1,698,803
Containerized Tonnage	15,358,609	3,226,758	6,489,920	23,861,900
1988				
Containers	4,033,427	883,467	N/A	3,216,800
Containerized Tonnage	27,942,323	10,422,907	N/A	48,964,200
1990				
Containers	5,100,637	1,401,143	1,372,422	5,223,500
Containerized Tonnage	33,259,333	13,071,425	24,188,054	76,630,600
1991				
Containers	6,161,912	1,534,884	1,663,385	6,354,000
Containerized Tonnage	42,243,458	15,804,424	31,644,932	90,680,600

Note: Tonnage excludes container tare weight
Source: *Containerization Year Book*, various issues

168

The seaport in Hong Kong consists of two terminals; Kwai Chung Container Port and Ocean Terminal. Almost all of the containerized freight is handled at Kwai Chung Port. It has the longest wharves owned by private enterprise in the world and is the world's busiest container terminal. It consists of ten berths, which are operated by several private operators. Three companies, Modern Terminals Ltd., Hong Kong International Terminal Ltd., and Sea-Land Orient Terminal Ltd. operate sections of Kwai Chung Container Port. Collectively the port covers some 158 hectares and can accommodate over 88,900 TEUs. It is fully equipped with container and gantry cranes, yard tractors and chassis, and a container freight station (CFS) for makeup and breakdown of containers. Ocean Terminal is operated by the Kowloon Wharf Terminal & Warehouse Ltd. This terminal only serves cruise vessels.

b. Malaysia

Malaysia has numerous ports. In 1981, its two primary ports, Penang and Port Kelang, handled 204,644 TEUs equalling 2,178,533 containerized tons. A dramatic increase in throughput, especially in containerized cargo, occurred between 1981 and 1991 (see Exhibit IV-36). In 1991 the throughput increased to 1.5 million TEUs, or 15.8 million tons. This was due to the boost in Asian trade accommodated by an expansion of Malaysia's port capacity from two terminals to eight terminals.

These terminals consist of Johore Baharu, Penang, Kuantan, Port Kelang, Kota Kinabalu, Sandakan, Kuching, and Sibu. With the exception of Kauantan, Sandakan, and Sibu, all of the ports are computerized. Kuching is the only multipurpose terminal in Malaysia. Exhibit IV-37 summarizes the facilities of these ports.

c. Indonesia

Between 1981 and 1991, the number of containers handled at Indonesian ports increased nearly ten-fold from about 140,000 annually to over 1,500,000 per year. Containerized traffic increased from 986,000 tons to over 15,800,000 tons during the same period.

Exhibit IV-37
Malaysian Port Facilities

Location/ Name	No. of Berths	Area (hectare)	TEU Capacity	No. of CFS	CFS Capacity (TEU)	Rail Link Access
Johore Baharu/Pasir Gudang Container Terminal	1	16.2	—	1	220	Yes
Penang	3	15.8	7,845	2	—	No
Kuantan	1	7.2	900	1	1,404	—
Port Kelang	4	51.0	6,852	1	272	Yes
Kota Kinabalu	5	3.6	1,005	1	200	—
Sandakan	3	3.1	550	1	—	—
Kuching/Tanah Puteh & Pending	9	35.3	846	1	—	—
Sibu	5	1.1	618	1	—	—

170

The largest and most important port is Tanjun Priok. In 1991 the port handled 737,323 TEUs, an increase of 14.4 percent over the 1990 level of 643,963 TEUs. Tanjun Priok is fully computerized to manage and track the ever-growing volume through its facilities. Tanjun Perak, near Surabaya City, is the second largest ocean terminal in Indonesia. Information about these two ports and the one at Belawan, which serves Medan on the island of Java, is presented in Exhibit IV-38.

d. Vietnam

The three largest ports of Vietnam, in order of size, are the port of Saigon, port of Haiphong, and port of Da Nang. They respectively serve the southern, northern, and central regions of the country. Information about these three ports is quite limited.

Between 1980 to 1992, cargo traffic at port of Saigon increased from 1 million tons to 5 million tons. Containerized traffic also grew, but only accounted for some 15 percent of the total. In 1990, Haiphong port handled some 2.6 million tons, down from 3.2 million tons in 1986. Da Nang also experienced a loss of traffic, from about 650,000 tons in 1989 to 400,000 in 1991.

Both Saigon and Haiphong ports are riverine. A lack of dredging has reduced the channel depths with a consequent limit on the size of ships. The channel linking Haiphong to the sea is so silted that the port has become a feeder port. As a result, its 135,000 TEU capacity container port is significantly underutilized. Da Nang is located on the Gulf of Sontra with a deep channel. The port of Saigon faces intense competition from eight other ports.

5. Airports

a. Overview

The significant role of commercial aviation in Southeast Asia is reflected by the number of major airports that serve the region. Airport facilities cover a wide range in terms of runway length, passenger and cargo handling facilities, and navigation aids. With the exception of Hong Kong and Singapore, each country has a series of airports that serve internal needs, in addition to those handling regional and inter-continental services.

Exhibit IV-38
Major Indonesian Port Facilities

Location/ Name	No. of Berths	Area (hectare)	TEU Capacity	No. of CFS	CFS Capacity (TEU)	Rail Link Access
Tanjun Priok	6	31.0	23364	1	—	Yes
Tanjun Perak/ Direksi Perusahaan Umum Pelabuhan III	7	4.6	5248	1	260	Yes
Tanjun Perak/ International Container	2	36	—	—	—	—
Belawan	1	8.5	3,500	1	550	—

b. Singapore

In July 1981, Changi International Airport became operational, replacing the previous airport at Paya Lebar. The airport is operated by the Civil Aviation Authority of Singapore (CAAS). Changi has the longest runways of the major regional airports.

Singapore has always been a major stop on services from Europe to Indonesia and Australia. Its strategic position has been augmented by the Republic of Singapore's government's liberalization of air traffic rights. While other countries wait for their national flag carriers to be in a position to match service of foreign flag airlines, Singapore does not. As a result, Changi International Airport is linked to a wide variety of points throughout the world by a combination of non-stop and direct flight services, for both passenger and cargo.

The airport has two runways, one of which is 4,000 meters long. The master plan identifies two additional parallel runways to handle expected traffic increases. The airport provides a complete set of services, including hangar and repair facilities for transit aircraft.

Between 1981 and 1990, passenger traffic, expressed by passenger-kilometers, increased from 17,281 million to 31,600 million. During the same period, cargo ton-kilometers climbed from 667.4 million to 1,694.4 million. The 83 percent expansion of passenger traffic was overwhelmed by the 154 percent growth in cargo traffic during the same period.

Air cargo is handled through the 25 hectare Changi Airfreight Center (CAC). Cargo services are provided by Changi International Airport Services Pte. Ltd. (CIAS) and Singapore Airport Terminal Services Pte. Ltd., (SATS) the latter of which is a subsidiary of Singapore Airlines. Built in 1981, the CAC has a design capacity of 750,00 annual tons. It is composed of five air cargo terminals, three cargo agents' building, an Express and Courier Center operated by SATS, a customs checkpoint and warehouse, an airmail transit center, and an import and export office. There are a total of six parking positions on two aircraft parking aprons dedicated for cargo, capable of handling B747 size aircraft. The CAC is operated as a free-trade zone and is being expanded to handle up to 1.4 million tons by 1995.[16]

[16] Golik, Richard D., "Singapore Sprints To Stay Ahead of Asia's Pack," *Foreign Trade*, September 1993

Additional facilities on and off the airport are available for freight forwarders and airlines. A number of cargo-handling facilities are being developed in the new business/industrial park at Loyang, which is a ten-minute drive from the center of Changi Airport.

c. *Hong Kong*

Kai Tak Airport has served Hong Kong since World War II. The airport is operated by the Civil Aviation Department. Its location in Kowloon limits expansion. In spite of this, Kai Tak is one of the busiest airports in the world. Annual aircraft operations are over 73,000, 80 percent of which are by wide-body aircraft.

Kai Tak has one runway 3,331 meters in length. The aircraft parking apron has recently been expanded to accommodate the increased traffic levels and aircraft operations. There are 65 parking positions on four aprons, including six positions identified for primary cargo use. In spite of the expansion, there is inadequate capacity, and Cathay Pacific, with its operations base in Hong Kong, cannot park its aircraft overnight at Kai Tak.

Between 1981 and 1989, passenger traffic, expressed in terms of passenger-kilometers, increased from 8.3 million to 21.6 million, or by 159 percent. In the same period, cargo, expressed in ton-kilometers, outpaced passenger growth, growing 327 percent from 306.3 million ton-kilometers to 1,307 million ton-kilometers.

Hong Kong Air Cargo Terminal Limited (HACTL) is the exclusive provider of cargo handling at Kai Tak. HACTL is composed of two linked multi-level buildings. The second building, located across the access road from the airside facility, is highly automated and provides truck access to each of the floors. The complex has an annual design capacity of 1.5 million tons. Airlines and freight forwarders operate their own off-airport terminals.

Hong Kong has begun construction of a new airport at Chep Lap Kok. That airport will replace Kai Tak when it opens in the late 1990s. Development of the new airport has been a source of conflict between colonial government and the People's Republic of China, which will take over control of Hong Kong in July, 1997.

d. Malaysia

There are seven international airports in Malaysia. They are managed by the Malaysian Department of Civil Aviation. The primary airport in Malaysia serves the capital of Kuala Lumpur. The others are at Johore-Baharu, Kota Kinabalu, Kuching, Penang, Pulau (Sibu), and Tawau.

As illustrated in Exhibit IV-39, civil air traffic experienced significant growth between 1981 and 1991. Total scheduled passenger traffic increased by 155 percent, while international passenger traffic grew by 171 percent. During the same period, total cargo traffic increased by 327 percent, while international air cargo traffic expanded by 367 percent.

As a result of these differential growth rates, international traffic accounted for an increasing share of total traffic through the study period. These statistics reflected the increasing role of global trade in the Malaysian economy and the consequent increase in international air services. In the 1991-92 financial year, Kuala Lumpur handled 68 percent of all international air cargo flows, while Penang handled 17 percent.

The primary airport is at Subang which serves Kuala Lumpur. The facility has one 3,780 meter-long-runway, with 24 parking bays. In the 1991-92 financial year, the MAS Cargo Complex handled 170,217 tons, of which export traffic comprised 43 percent, imports 33 percent, and 24 percent transit cargo. Transit cargo has become a major aspect of the cargo flows. In the prior two financial years, this component of air cargo increased by 50 and 17 percent, respectively.[17]

To handle the expected traffic growth, construction of a new airport is underway at Sepang, a site 50 kilometers south of Kuala Lumpur. The first phase, to be operational in 1997, will have a capacity of 25 million passengers annually. When the airport is completed in 2020, its total capacity will be approximately 70 million annual passengers, with four runways. One runway is being built for the initial phase.

[17] Golik, Richard D., "Malaysia - Fights For A Seat At Asia's Table," *Foreign Trade*, September 1993.

Exhibit IV-39
Malayasian Civil Aviation

	1981	1985	1988	1990
Passenger Scheduled Traffic (million passenger-kilometers)				
International	3,470	4,842	6,960	9,405
Total	4,674	6,264	8,658	11,909
Int'l Percent	74.2	77.3	80.4	79.0
Cargo Scheduled Traffic (million ton-kilometers)				
International	119.4	191.6	364.9	557.5
Total	137.9	208.6	385.9	588.3
Int'l Percent	86.6	91.9	94.6	94.8

Source: *Statistical Yearbook for Asia and the Pacific*

176

Penang International has a single runway of 3,354 meters. It is situated on Penang Island and serves the expanding electronics industry. In the 1991-92 financial year, a total of 42,603 tons of air cargo was handled at Penang, of which 52 percent was export cargo, 47 percent was imports, and only 2 percent was transit cargo.[17] Both Kuala Lumpur and Penang are open 24 hours a day and have customs service. The other international airport on the Malaysian peninsula is at Johore Baharu, located just north of the Republic of Singapore.

The remaining airports, Kota Kinabalu, Kuching, Pulau (Sibu) and Tawau are located in the provinces of Sabah and Sarawak on Kalimantan Island. The airports of Kota Kinabalu and Kuching are located in east Malayasia and are open 24 hours a day with customs facilities. Kota Kinabalu has one runway of 2,987 meters. Kuching has one runway of 2,454 meters. The fifth airport, Pulau Langkawi (Sibu), is only open for 8 hours each day and has a single, uni-directional runway.

e. *Indonesia*

The natural topography of Indonesia, a combination of the size of the country and the fact it is an archipelago with mountainous terrain, supports the use of air services. There are 20 airports designated to handle international commercial air services. Many are open for a limited time each day or for special purposes such as for the Hadj pilgrimage. Three airports serving Denpasar (Bali), Jakarta (Java), and Medan (Sumatra) are open continuously.

Soekarno Hatta International Airport serves the nation's capital, Jakarta. The airport has two runways, the longest of which is 3,660 meters. There is an air cargo apron with four parking positions. Soekarno Hatta is the main international airport in Indonesia. Indonesian customs accepts cargo for clearance after 1500 hours.

Bali International Airport serves the City of Denpasar. Tourists are the primary traffic at Bali International. The airport has one runway of 2,700 meters, with both approaches over water.

Polonia Airport serves Medan on the island of Sumatra. The airport has one runway of 2,900 meters.

Between 1980 and 1989, domestic passenger traffic increased from 5,907 to 13,912 million passenger-kilometers. Between 1981 and 1988, international passenger traffic grew from 3,007 million passenger-kilometers to 5,740.2 million passenger-kilometers; an average annual growth rate of 11.4 percent. Cargo traffic grew at an average annual rate of 10 percent from 407.7 million ton-kilometers in 1981 to 725.6 million ton-kilometers in 1987.

f. Vietnam

There are two international airports serving Vietnam. They are at Hanoi and Ho Chi Minh City. There are many other airports in the country, of which the facility at Da Nang is the largest. Noibai Airport serves the capitol of Hanoi. The airport has a single runway of 3,200 meters. Tonsonnhat Airport serves Ho Chi Minh. It has two parallel runways, the longest being 3,045 meters. The runways are too close to permit simultaneous IFR approaches. As compared with Noibai Airport, Tonsonnhat has a significant amount of aircraft parking apron, much of which was constructed by U.S. forces during the conflict.

6. **Flight Survey**

Commercial air service is very important in Southeast Asia. The geography of the region dictates the use of sea and air transport to link all parts of the region. Most forecasts point to this world region as one of the leaders in growth for the forseeable future. Flight services by regional and extra-regional carriers have grown to handle the expansion of trade.

Five airports in Southeast Asia handle the majority of both intra-regional and intercontinental flights. They are Bangkok, Hong Kong, Jakarta, Kuala Lumpur, and Singapore. Each is the home base of a major international air carrier and is served by a wide variety of flag carriers from almost every continent. A sixth airport serves the growing industrial activities around George Town on Penang Island.

To understand the scope of air services in the region, we conducted a survey of flights departing from and arriving into the above-mentioned airports. The survey was based on a study of over 3,500 non-stop flights listed in the June 1993 issue of the OAG Air Cargo Guide to the six airports.

With the exception of passenger services using narrow-body aircraft, such as the Boeing B737 or McDonnell Douglas MD80, the OAG Air Cargo Guide only lists

178

those passenger and combi services that employ wide-body aircraft and all-cargo flights. As a result, this survey does not list all flights within the region.

Many of the surveyed flights serve additional points behind the last point of departure. However, in order to determine the actual level of flight activity at the six airports, only non-stop flight arrivals have been included in this survey.

Not surprisingly, the flight operations were dominated by services from points in Southeast Asia and by passenger aircraft. However, while all-cargo flights accounted for about 5 percent of the surveyed flight activity, they equalled over 25 percent of the available weekly payload availability.

This section examines selected characteristics of the surveyed flights, including the regional dispersion of the flights, the ranking of the six airports, and the estimated available cargo payload.

a. Aircraft Technology Impact

The development of ultra-long-haul aircraft such as the Boeing B747SP, B747-400, and McDonnell Douglas MD11 have allowed airlines to operate direct non-stop services on routes over 8,000 miles (13,500 km) in length. As a result, non-stop services from major European and North American points to Southeast Asian centers are routinely operated. These new aircraft also have higher cargo carrying capacity over the longer ranges.

As the ultra-long-range aircraft have entered service, the number of points in Africa, Europe and North America linked by non-stop service to Southeast Asia have increased. These origin points totalled 24 (23 percent of the airports) in the survey.

For example, in the mid-1980s the only non-stop service to Southeast Asia was between Vancouver and Hong Kong. All other services had to transit an intermediate point such as Anchorage, Honolulu, Seoul, Taipei or Tokyo due to the range limitations of the aircraft. With that operational limitation eliminated, many Southeast Asian points are now served by non-stop carriers from major centers on other continents.

b. Regional Origins

Since the initiation of commercial air services in this region, Bangkok, Hong Kong, Jakarta, and Singapore have been the primary points of service. In recent years, they have been joined by Kuala Lumpur and, because of its proximity to a major industrial center, Penang.

The survey identfied 3,510 non-stop flights from 104 different origin airports. Exhibit IV-40, which summarizes the survey, illustrates the fact that over 50 percent of the surveyed flights were from 25 points in Southeast Asia. In fact, flights from Southeast and Northeast Asia points accounted for over 77 percent of all surveyed non-stop flight arrivals at the six airports. Exhibit IV-41 lists all surveyed flights by origin world region.

c. Airport Rankings

As displayed in Exhibit IV-42, Hong Kong handled the highest number of surveyed flights of the six airports. However, the activity levels at Bangkok and Singapore were very similar to that of Hong Kong. These three airports handled over 80 percent of all flights in the survey. With respect to different origins, Bangkok led with 67, followed closely by Singapore with 65, and Hong Kong with 59.

d. Cargo Payload Estimate

An estimate of the cargo payload capcity at the six airports was developed based on the information from the surveyed flights. The estimate of cargo payload capacity was derived by multiplying the number of weekly flights by the capacity estimates for each aircraft type, expressed in terms of metric tons. The capacity estimates were based on aircraft structural limitations and not specific operational criteria, such as airline operating procedures, bilateral limits, or the effects of route assignments, passenger loads, and weather.

Based on these calculations, there was a potential weekly total air cargo payload capacity at the six airports of 55,835 metric tons. Hong Kong had the highest level with 18,356 tons, followed closely by Singapore with 14,610 tons, and Bangkok with 14,169 tons.

Exhibit IV-40
Weekly Non-Stop Arriving Flights at Major Southeast Asian Airports

Origin Area	No. of Origin Points	No. of Weekly Flights	Percent Share of Flights
Southeast Asia	25	1,838	52.4
Northeast Asia	24	867	24.7
Europe	18	295	8.4
South and Southwest Asia and Africa	24	277	7.9
Australasia	10	188	5.4
North America	3	45	1.3

181

Exhibit IV-41
Surveyed Weekly Arriving Flights
Intercontinental/Major Regional Airports

			Destinations						
Origin Airport	**Airport Code**	**World Region**	**Bangkok**	**Hong Kong**	**Jakarta**	**Kuala Lumpur**	**Penang**	**Singapore**	**Total**
Cairo, Egypt	CAI	Africa	2						2
Johannesburg, South Africa	JNB	Africa	4	2		1		5	12
Mauritius	MRU	Africa		1		1		2	4
SUB-TOTAL			6	3	0	2	0	7	18
Adelaide, Australia	ADL	Australasia				2		6	8
Auckland, New Zealand	AKL	Australasia		3				9	12
Brisbane, Australia	BNE	Australasia	2	6		2		10	20
Cairns, Australia	CNS	Australasia						2	2
Christchurch, New Zealand	CHC	Australasia						1	1
Darwin, Australia	DRW	Australasia						6	6
Melbourne, Australia	MEL	Australasia	8	10		4		17	39
Perth, Australia	PER	Australasia	4	2	3	5		23	37
Port Moresby, Papua New Guinea	POM	Australasia		1				2	3
Sydney, Australia	SYD	Australasia	20	15	5	3		17	60
SUB-TOTAL			34	37	8	16	0	93	188

Source: OAG Air Cargo Guide, June 1993

Exhibit IV-41
Surveyed Weekly Arriving Flights
Intercontinental/Major Regional Airports

			Destinations						
Origin Airport	**Airport Code**	**World Region**	**Bangkok**	**Hong Kong**	**Jakarta**	**Kuala Lumpur**	**Penang**	**Singapore**	**Total**
Amsterdam, Netherlands	AMS	Europe	17	5		2		9	33
Athens, Greece	ATH	Europe	6					2	8
Brussels, Belgium	BRU	Europe	4					3	7
Copenhagen, Denmark	CPH	Europe	10	3					13
Frankfurt, Germany	FRA	Europe	29	14				16	59
Hannover, Germany	HAN	Europe	4					2	6
Helsinki, Finland	HEL	Europe	3						3
Istanbul, Turkey	IST	Europe	2						2
London, England	LON	Europe	15	21		10		23	69
Moscow, Russia	MOW	Europe	4	2				2	8
Munich, Germany	MUC	Europe	1						1
Paris, France	PAR	Europe	6	11				9	26
Rome, Italy	ROM	Europe	13	7				2	22
Sofia, Bulgaria	SOF	Europe	2			2			4
Stockholm, Sweden	STO	Europe	4						4
Viennia, Austria	VIE	Europe	5						5
Warsaw, Poland	WAW	Europe	2						2
Zurich, Switzerland	ZRH	Europe	10	6				7	23
SUB-TOTAL			137	69	0	14	0	75	295

Source: OAG Air Cargo Guide, June 1993

Exhibit IV-41
Surveyed Weekly Arriving Flights
Intercontinental/Major Regional Airports

			Destinations						
Origin Airport	**Airport Code**	**World Region**	**Bangkok**	**Hong Kong**	**Jakarta**	**Kuala Lumpur**	**Penang**	**Singapore**	**Total**
Beijing, P.R. China	BJS	NE Asia	5	35	2			6	48
Guangkhou, P.R. China	CAN	NE Asia		7	1	2		5	15
Changsha, P.R. China	CSX	NE Asia		1					1
Chengdu, P.R. China	CTU	NE Asia		1					1
Fukuoka, Japan	FUK	NE Asia	2	5		3		8	18
Haikou, P.R. China	HAK	NE Asia		5					5
Hangzhou, P.R. China	HGH	NE Asia		2					2
Hiroshima, Japan	HIJ	NE Asia		2					2
Kaoshung, Taiwan	KHH	NE Asia	8	40				1	49
Kunming, P.R. China	KMG	NE Asia	2	1				2	5
Kagoshima, Japan	KOJ	NE Asia		2					2
Nagayo, Japan	NGO	NE Asia	6	16		2		6	30
Nanjing, P.R. China	NKG	NE Asia		3					3
Okinawa, Japan	OKA	NE Asia		2					2
Osaka, Japan	OSA	NE Asia	8	24				11	43
Sendai, Japan	SDJ	NE Asia						5	5
Seoul, S. Korea	SEL	NE Asia	25	41	3			10	79
Shanghai, P.R. China	SHA	NE Asia		27				7	34
Xi An, P.R. China	SIA	NE Asia		4					4
Sapporo, Japan	SPK	NE Asia		3					3
Taipei, Taiwan	TPE	NE Asia	46	179	9	14		33	281
Tianjin, P.R. China	TSN	NE Asia		1					1
Tokyo, Japan	TYO	NE Asia	43	91	11	13	1	64	223
Xiamen, P.R. China	XMN	NE Asia		4	2			5	11
SUB-TOTAL			145	496	28	34	1	163	867

Source: OAG Air Cargo Guide, June 1993

Exhibit IV-41
Surveyed Weekly Arriving Flights
Intercontinental/Major Regional Airports

			Destinations						
Origin Airport	**Airport Code**	**World Region**	**Bangkok**	**Hong Kong**	**Jakarta**	**Kuala Lumpur**	**Penang**	**Singapore**	**Total**
Los Angeles, United States	LAX	N. America		17					17
San Francisco, United States	SFO	N. America		14					14
Vancouver, Canada	YVR	N. America		14					14
SUB-TOTAL			0	45	0	0	0	0	45
Calcutta, India	CCU	S Asia	4					3	7
Colombo, Sri Lanka	CMB	S Asia	5			2		12	19
Dhaka, Bangladesh	DAC	S Asia	11	1		2		4	18
New Delhi, India	DEL	S Asia	8	5		2		4	19
Karachi, Pakistan	KHI	S Asia	12			1		4	17
Kathmandu, Nepal	KTM	S Asia	5						5
Madras, India	MAA	S Asia				5	2	14	21
Male, Maldives	MLE	S Asia						5	5
SUB-TOTAL			45	6	0	12	2	46	111
Bangkok, Thailand	BKK	SE Asia		118	6	15		122	261
N. Seri Begawan, Brunei	BWN	SE Asia	3			2		13	18
Cebu, Philippines	CEB	SE Asia		4					4
Chaing Rai, Thailand	CEI	SE Asia	2						2
Chiang Mai, Thailand	CNX	SE Asia	65						65
Denpasar, Indonesia	DPS	SE Asia	6	3	84			19	112
Hat Yai, Thailand	HDY	SE Asia	8					2	10
Hong Kong	HKG	SE Asia	110		16	22	2	65	215
Phuket, Thailand	HKT	SE Asia	68					7	75
Johor Bahru, Malaysia	JHB	SE Asia		1		1			2
Jakarta, Indonesia	JKT	SE Asia	5	16		8		115	144
Kuching, Malaysia	KCH	SE Asia				8		9	17
Kuala Lumpur, Malaysia	KUL	SE Asia	16	22	8		11	89	146

Source: OAG Air Cargo Guide, June 1993

Exhibit IV-41
Surveyed Weekly Arriving Flights
Intercontinental/Major Regional Airports

			Destinations						
Origin Airport	**Airport Code**	**World Region**	**Bangkok**	**Hong Kong**	**Jakarta**	**Kuala Lumpur**	**Penang**	**Singapore**	**Total**
Medan, Indonesia	MES	SE Asia	1		29			12	42
Manila, Philippines	MNL	SE Asia	27	53	4			22	106
Penang, Malaysia	PEN	SE Asia	1	2		15		29	47
Phnom Penh, Cambodia	PNH	SE Asia						1	1
Rangoon, Burma	RGN	SE Asia	5					2	7
Ho Chi Minh, Vietnam	SGN	SE Asia	21	12				8	41
Singapore	SIN	SE Asia	141	63	121	90	35		450
Surabaya, Indonesia	SUB	SE Asia			23			10	33
Ubon Ratchathani, Thailand	UBP	SE Asia	2						2
Ujung Pandang, Indonesia	UPG	SE Asia			21				21
U-Tapao, Thailand	UTH	SE Asia	2						2
Kota Kinabalu, Malaysia	BKI	SE ASia		2		11		2	15
SUB-TOTAL			483	296	312	172	48	527	1838
Amman, Jordan	AMM	SW Asia	2			2		1	5
Abu Dhabia, U.A.E.	AUH	SW Asia	3		2	1	1	5	12
Bahrain	BAH	SW Asia	4	5					9
Bombay, India	BOM	SW Asia	7	4				9	20
Dahran, Saudi Arabia	DHA	SW Asia						2	2
Dubai, U.A.E.	DXB	SW Asia	20	21		10		15	66
Jeddah, Saudi Arabia	JED	SW Asia	2		4	2			8
Kuwait	KWI	SW Asia	3						3
Lahore, Pakistan	LHE	SW Asia	2						2
Muscat, Oman	MCT	SW Asia	2	2					4
Riyadh, Saudia Arabia	RUH	SW Asia	2		4				6
Sharjah, U.A.E.	SHJ	SW Asia	6			1		2	9
Theran, Iran	THR	SW Asia				2			2
SUB-TOTAL			53	32	10	18	1	34	148
GRAND TOTAL			903	984	358	268	52	945	3510

Source: OAG Air Cargo Guide, June 1993

Exhibit IV-42
Origin-Destination Service Matrix

Destination	SE Asia	NE Asia	Europe	SW & S Asia & Africa	North America	Austral-asia
Bangkok	483	145	137	104		34
Hong Kong	296	496	69	41	45	37
Jakarta	312	28		10		8
Kuala Lumpur	172	34	14	32		16
Penang	48	1		3		
Singapore	527	163	75	87		93

187

The figures for Jakarta, Kuala Lumpur, and Penang were 4,200, 3,458, and 1,022 tons, respectively. Exhibit IV-43 summarizes these calculations.

The bulk of the potential available cargo capacity was on the passenger flight services. With the exception of Jakarta and Penang, between 60 and 70 percent of the potential cargo payload was available on passenger flights at the other surveyed airports. Except for Jakarta, which had no published all-cargo service, and Penang, where the majority of listed flights were freighters, all-cargo flights accounted for between 17 and 33 percent of potential cargo capacity at the other airports. For those airports with main-deck wide-body combi services, this flight category accounted for between 6 and 12 percent of potential available cargo capacity.

While all-cargo flight services were only 5 percent of all flights, they accounted for nearly 26 percent of the potential cargo capacity. The main-deck combi flight services equalled 4 percent of the flights and 8 percent of the potential cargo capacity.

e. *Findings*

The survey illustrates the high volume of air traffic in South East Asia, which reflects its importance to the economic development of the individual nations. Commercial air services will evolve in direct reposnse to demand for both passenger and cargo carriage. The level of acitivity at the six study airports are indicative of the level and scope of service throughout the region. In addition to the relatively high frequencies, even on the ultra-long haul routes between Southeast Asia and Europe, the average aircraft size indicates the high traffic volumes.

The figures highlight the dominance of three airports: Bangkok, Hong Kong, and Singapore. These three airports have become major gateways to Southeast Asia. Based on the survey, these three airports handle the majority of passenger and cargo traffic in the region and are quite similar with respect to the number of weekly regional and intercontinental flights, both passenger and all-cargo. In addition, the expansion of air services and traffic at Kuala Lumpur, Jakarta and Penang illustrates the increasing dependence on commercial air services as an integral part of international trade.

Exhibit IV-43
Cargo Payload Estimates

	Bangkok	Hong Kong	Jakarta	Kuala Lumpur	Penang	Singapore
All-Cargo Aircraft						
No. of Flights	42	63	—	10	7	51
Payload (MT)	3,318	5968	—	604	654	3886
Percent of Payload	23.4	32.5	—	17.5	64.0	26.6
Main-Deck Combi Aircraft						
No. of Flights	34	37	11	12	—	38
Payload (MT)	1,153	1254	373	407	—	1288
Percent of Payload	8.1	6.8	8.8	11.8	—	8.8
Passenger Aircraft						
No. of Flights	827	884	347	246	45	856
Payload (MT)	9,699	11134	3847	2,447	367	9436
Percent of Payload	68.5	60.7	91.2	70.8	36	64.6

Hong Kong's position as a major gateway is due to the convergence of a number of characteristics. The *laissez-faire* business environment supports Hong Kong's role as a major trade entrepôt. In addition, Hong Kong continues to be the main gateway to the People's Republic of China. Both of these factors generate significant levels of origin and transit air cargo.

Singapore's strategic location on the great circle air routes between Europe and Australasia has placed it at a natural junction of regional and intercontinental air routes. In addition, the aggressive efforts by the Republic of Singapore to develop manufacturing and to increase trade has added to its attractiveness as a major air hub.

Bangkok's location is closer to Europe and Southeast Asia. As early as 1948, Bangkok was the primary air hub in Southeast Asia, with 11 weekly services from Europe. By 1972, this volume had grown to 84 weekly flights, versus 83 at Hong Kong, of which 41 were via Bangkok, and 50 at Singapore, of which 20 were via Bangkok.[18]

The combined efforts of the freight forwarding community in Thailand to develop a significant level of transit traffic from throughout the region and along the Pacific Rim has resulted in a large number of regional and intercontinental air services.

This same approach is being followed in Kuala Lumpur where transit cargo experienced significant growth levels in the early 1990s as Malaysian Air System has devoted increasing efforts and investments in developing this lucrative form of air cargo traffic. On the other hand, Penang's position has evolved as a result of the development of electronics manufacturing on Penang Island and the distribution of the high value products throughout the world by air.

The potential available cargo payload capacity estimate identifies the importance of air cargo in Southeast Asia. Regionally-based airlines, such as Air Hong Kong and Cathay Pacific of Hong Kong and Singapore Airlines operate growing fleets of all-cargo aircraft. Additional services are provided by a numerous carriers from elsewhere in Asia, Europe, and North America. Integrated air carriers, including Federal Express, TNT, and United Parcel

[18] Trans-Asian Trunk Air Routes, Douglas Aircraft Company, 1973

Service also operate services throughout the region to accommodate the growing demand for expedited air cargo services.

E. SUMMARY

Southeast Asia is a region experiencing dynamic growth. With some exceptions, the economies of individual nations are outpacing the growth of populations. The result is an ever-increasing standard of living, which is creating both a demand for more products and services, as well as a need for higher employment both in terms of numbers employed and the average wage level.

The region surrounding and including Thailand is expected to remain the focus of significant economic growth well into the next century. What began as a shifting of lower-skill/pay jobs from the newly industrializing economies, particularly Japan, is now turning into an evolution of job skills and employment opportunities to satisfy domestic, regional, and international market demands.

Among the surveyed countries, Hong Kong and Singapore are symbols of the leading edge of development. They have some of the most developed industrial economies, significant service sectors, and high literacy and educational achievement levels. Their transport facilities are renowed throughout the world.

On the other hand, Indonesia, the Philippines, and Vietnam represent potential for the future. These countries have significant nonrenewable and renewable resources as well as large labor pools. Their industrial sectors are being slowly developed alng with the service sectors. Transportation facilities vary widely. In the case of Vietnam, an almost total lack of investment has resulted in systems that are in disrepair and incapable of meeting the expected demands of an expanding economy. Both Indonesia and the Philippines have population centers scattered throughout their respective archipelagos, which dictates the use of sea and air transport, in contrast with Vietnam.

Countries such as Malaysia and Thailand, which have benefitted from the relocation of jobs from the higher-wage areas of Korea and Japan, are now turning attention to yet lower-wage countries such as China, Indonesia, and Vietnam. This continual evolution is changing the industrial structure of each country, as well as the region as a whole.

There has been a shift from natural resource based industries, through labor-intensive manufacturing industries, to capital-intensive industries. Some countries have

depleted both nonrenewable and renewable resources in the rapid expansion of their economies. Clocks, watches, electronic components, computers, and machinery have replaced timber, agricultural products, unrefined fuels, and lower value products. Not only has this development contributed to the rising per capita income in the region, but also an increasing competition with other industrialized nations around the world.

The rapid growth of the economies has created stress on both physical infrastructure and the labor pools. The lack of skilled workers and shortfalls in investment in educational facilities have created bottlenecks in the shift from lower technology to higher technology industries. Engineering skills are particularly critical, especially in the new industrial environment where product changes are both rapid and extensive.

While many of the world's largest transport facilities have been developed in Southeast Asia, there are also numerous examples of low or marginal levels of investment and development that are now constraining the rate of growth and requiring substantial levels of investment, which raises the spectre of reduced savings rates and increasing levels of indebtedness.

The seaports and airports of Bangkok, Hong Kong, and Singapore rank at the top of their respective peer groups. These facilities and the numerous smaller ones throughout the region provide critical elements of the comprehensive regional transport infrastructure. However, as volumes continue to increase, the capacities of individual facilities are being stretched. As an example, the riverine port serving Bangkok is physically incapable of serving the larger container ships. Expansion programs for seaports throughout the region are underway or in various stages of planning.

Similarly, many airports, including those serving Bangkok, Hong Kong, and Kuala Lumpur, are near capacity and require replacements to serve expected traffic growth. The region's rate of air traffic growth is the highest around the world. Reflecting this increased demand for air service has been the expansion of the number of flights and the increased use of wide-body aircraft. In recent years, the majority of wide-body air transports has been sold to airlines either based in Asia or having major percentages of their route systems in Asia. Both passenger and cargo air services have grown to meet the increased volume of traffic.

While the survey of 3,500 airline operations did not review all flight operations in the region, it demonstrated the growing importance of Southeast Asia in the world aviation marketplace. The region is linked to a wide variety of centers around the

192

world. Each country has a major airport that serves both intercontinental, regional, and national traffic flows. Most of the air services are flown by wide-body aircraft with significant air cargo carrying capability. While all-cargo flight services only account for some five percent of flight operations, they provide approximately one quarter of the cargo capacity. The survey underscores the need to increase the capacity of airports in the region to handle the expected growth. While air passenger services are a major determinant in the scale of the expansion programs, the role of air cargo in regional and intercontinental flows needs to be recognized and incorporated into any programs and plans.

The rail and road networks of Southeast Asia are varied. The mountainous terrain and islands of Indonesia and the Philippines limit the development of surface links. In most countries, rail transport has been overtaken by truck transport as the primary surface transport mode. Although the reliance on rail is low, there exists a foundation on which to develop a multinational network spanning the region from Singapore to the People's Republic of China. Commonality in rail gauge among most of the countries is in place and provides a means to operate international train services. Service between Singapore and Bangkok already exists. Extension of this service to Laos, Vietnam, and China needs to be examined.

The same is true in regard to roads and highways. While the highest densities are not surprisingly in Hong Kong and Singapore, significant investments are planned in other countries, such as Malaysia and Thailand, or acknowledged as needed, as in the case of Vietnam. For instance, it is now possible to drive from Singapore to China. What is required is a better grade of connected routes to facilitate such flows, such as the Mekong River bridge between Thailand and Laos. At the same time, east-west routes from Vietnam to Myanmar need to be developed.

In looking at these transport components from a world perspective, the major seaports and airports provide facilities to handle major intra-regional and international flows; the smaller ports provide centers to handle trans-shipments to/from the larger ports, as well as handling for local flows of goods, while the rail and road networks provide access to the interior of each country. As the scale of development changes, the role of rail and road networks should change to take on a larger share of traffic within the region and to provide an alternative to the sometimes circuitous routings of the ships. They will also serve as a lower cost alternative to air transport services.

The expansion of the industrial sectors of the region's economies, as well as the shift to higher-technology products, is contributing to a shift in competition from that

based on available natural resources and surplus semi-skilled labor forces to the ability to develop, manufacture, and distribute higher-technology/value products in a global marketplace.

It is within this environment that a Global Transpark must operate. The changing environment demands a shift away from the traditional methods. Not only are new, more efficient manufacturing, assembly, and processing facilities required, but more importantly, the skills of the workers must be raised. At the same time, the transport services and facilities need to be configured to meet the changing demands of international competition and the global marketplace.

As world and regional trade expands, there is a consequent demand for more transport services and facilities to handle the traffic. At the same time, as the volumes increase, the established facilities can compete for the increased volumes by touting their existing facilities, the existing service levels, and their established business and working relationships.

However, at some point in time, the physical limitations of each facility or its location will constrain further growth. For example, the year-on-year 20 percent increase in number of TEUs handled at the Port of Singapore will eventually exceed that facility's ability to handle more traffic, regardless of increases in efficiency and provision of more berths, cranes, etc. Just as Kai Tak International has become overwhelmed by traffic growth and is going to be replaced, other airports will soon face that same situation.

A Global Transpark, however, is not merely a replacement for an overloaded facility. Rather, it is a new concept that addresses the evolving needs of industry and transportation.

Chapter V
Thailand Overview

V. THAILAND OVERVIEW

A. INTRODUCTION

Among Southeast Asian countries, Thailand has emerged as a dominant industrializing country with rapid economic growth and a reasonably large market for consumer products. Since the development of its first National Economic and Social Development Plan in 1961, Thailand has experienced more than an average of 6 percent growth per annum. This rapid growth has no doubt brought about significant structural changes to the economy and the society itself.

Although the fruits of economic growth have been substantial, that growth has not benefitted the rural Thai. Despite excellent efforts by the Board of Investment (BOI), much of Thailand's industrial development is still concentrated in the Bangkok area. Residents of this metropolitan area enjoy most of the benefits resulting from rapid economic development. Ironically, while enjoying benefits such as higher standards of living and social and economic opportunities, this urban population is also suffering negative externalities, such as air and water pollution, traffic problems, and crowded communities.

Thus, it is urgent that Thailand prepare itself for the year 2000 to effectively decentralize and alleviate the urban problems now experienced by those living in the metropolis. It is expected that Thailand will again have to undergo a significant restructuring process. In implementing this transition, Thailand will have to invest more in infrastructure; human capital in terms of education, training and retraining; the financial market and improvements in the savings-investment gap; and its technological capacity. The following section describes and evaluates Thailand's development in the last three decades with respect to these aspects.

B. ECONOMIC GROWTH REVIEW AND TRENDS

1. Changing Trends of Industrial Activities in the 1960s and 1970s

The Thai economy has grown steady and rapidly since its first national five-year plan (1961-1966). The achievements in economic growth and structural diversification during 1960-1980 were impressive. Real GDP quadrupled, and GDP per capita more than doubled. Life expectancy increased from 51 to 61 years. Primary education reached almost the entire population, and the incidence of poverty lowered from 52 percent in 1960 to only 31 percent of the population by 1979.

However, growth since the mid 1970s was accompanied by increasing public sector deficits, accelerating inflation, and deteriorating current account deficits that could not be sustained into the 1980s. Differences in income levels and lifestyles between rural and urban areas were more pronounced by the end of the 1970s. Regional issues became more important. Development patterns and transitions during the 1970s aggravated these regional tensions and added a new dimension to the policy and structural adjustments required by the Thai economy in the 1980s.

At the end of the 1970s, the critical issues facing Thailand included the transformation of agricultural production, the increasing role of industry in sustaining high growth rates, and the creation of enough additional employment for the growing labor force. These issues were an integral part of the dynamics of sustaining rapid growth and modernization.

2. **The 1980s: The Decade of Structural Adjustment and Take-Off**

By 1979, the world experienced its second oil shock. This resulted in another round of world economic recession, high interest rates, and high inflation. Thailand suffered badly in the adverse world economic environment of 1979-1982. Faced with rising interest rates and declining demand and prices for its exports, Thailand's outstanding external debt and debt service increased while the foreign reserves were depleted at an alarming level. The inflation rates in the early 1980s were almost 20 percent and Thailand's economic growth rates slowed down dramatically to 3.5 percent in 1984 with trade and current account deficits on the rise.

3. **Structural Adjustment and Financial Restraints Measures**

The Thai Government recognized the need for structural adjustment, and in 1981 embarked upon a major program to restructure the economy during the Fifth and Sixth Plan periods from 1982-1991. The program, supported by the World Bank under Structural Adjustment Loans (SALs), sought to improve the efficiency of the economy and to raise domestic savings in order to finance high levels of investment required for continued growth.

The structural adjustment measures included maintaining strict fiscal discipline and monetary policy, implementing belt-tightening measures, freezing real public wage rates, imposing a public sector foreign borrowing ceiling, postponing public investments, limiting the role of the public sector, and initiating a

privatization program. The Joint Public and Private Sector Consultative Committee was established and chaired by the Prime Minister to facilitate coordination between the public and private sectors in national economic management.

In addition, the baht was devalued twice, by 8 percent in 1981 and by 14 percent in 1984. The second devaluation in November 1984 was followed by a sharp depreciation of the US dollar, resulting in a 30 percent depreciation of the real effective exchange rate after 1984. So, between 1984 and 1987, the terms of trade improved. This contributed significantly to the improvement in the trade and current account balance during the second half of the 1980s.

In addition to the macroeconomic adjustments in the early 1980s, other domestic changes contributed significantly to laying the ground work for the economic boom and industrial take-off during the second half of the 1980s. First, political stability (under the leadership of General Prem Tinsulanond) was an important factor in enhancing investor confidence; a relatively open political process prevailed. Second, judicious reliance on technocrats in the Government bureaucracy contributed to continuity and stability of economic policies. Third, domestic manufacturers exhausted the easy opportunities for import substitution by late 1970s and shifted their attention to external markets. Fourth, according to the observers of the Thai business community, there was a rapid generation change at the helm of many well-established family businesses. This younger generation of entrepreneurs was more knowledgeable about foreign markets and better equipped to manage export business.

4. The Economic Expansion and Internationalization of the Economy in the Late 1980s

Following a period of short-run structural adjustment and economic slow-down during the first half of the 1980s, the Thai economy has achieved an impressive record of economic expansion since 1986, characterized by surging exports, narrowing fiscal and external deficits, price stability, and investment boom. This economic boom during the second half of the 1980s was taking place against the backdrop of rapid structural shifts in Thailand that made the economy distinctly export-oriented and established manufacturing as the main export sector. Helped by a large influx of foreign direct investment in advanced manufacturing industries, Thai manufacturers were poised to move into higher technology areas.

Following the Plaza Accord of 1985 and the subsequent currency realignments, the value of the Japanese *yen* and the currencies of Newly Industrialized Countries (NICs) greatly appreciated, thus forcing Japan and the NICs to relocate selected production facilities to Southeast Asian countries with relatively low-cost labor. As Japan and the Asian NICs lost competitiveness in certain manufacturing industries, a rare opportunity was created for Thailand and other ASEAN countries to accelerate their industrialization in the second half of the 1980s. Obviously the coincidence of the right domestic structural adjustment programs and environments previously mentioned, together with external conditions, was vital for Thailand to experience an industrial take-off similar to what Korea and Taiwan experienced ten to fifteen years earlier.

By the end of the 1980s, Japanese direct investment in Thailand accounted for 44.5 percent of total Foreign Direct Investment (FDI). It was estimated that during 1986-1990, at least $10 billion (US) of Japanese investment came to Thailand. Investments from other Asian NICs were also high. These helped increase the manufacturing growth rate to 16-18 percent during 1987-1990. Manufactured exports as a share of total exports increased dramatically from 54 percent in 1986 to 72 percent in 1991 (See Exhibit V-1).

5. **Overheating of the Economy and Infrastructure — Bottlenecks Toward the End of 1980s**

Thanks to the enormous inflow of FDI from the mid-1980s, together with the prevailing world economic boom, Thailand was able to respond to these new opportunities and register double-digit growth for several years in the late 1980s. But these high foreign investment inflows and the subsequent demand on Thailand's infrastructure facilities, for high-skilled workers and for higher wages led to overheating, together with human and physical infrastructure bottlenecks. The electricity supply and security reserve was very tight, although blackouts or brownouts have not yet occurred in Thailand as in some other South and Southeast Asian countries. The intra-urban transport services were inadequate. Traffic jams increased in frequency in Bangkok and in other regional urban centers.

Exhibit V-1
Real Growth of Thai Exports Classified by Sector (percent per annum)

	1970-1980	1981-1984	1985	1986	1987	1988	1989	1990
Agriculture	11.54	0.63	-6.88	5.10	0.34	20.35	5.86	-19.63
Fishing	24.18	10.43	21.13	36.27	17.01	7.95	30.86	8.49
Forestry	2.01	60.88	248.61	65.04	26.40	-6.43	-17.89	2.01
Mining	-11.65	-7.61	32.55	-39.71	-10.89	-22.79	-0.10	-11.65
Manufacturing	18.43	14.26	24.81	31.26	39.29	32.05	27.67	18.43
Samples/Other								
Unclassified	27.55	-16.58	15.08	13.27	60.21	-8.61	74.07	27.55
Goods	40.61	-3.99	-44.96	-28.57	-43.32	54.24	-14.74	40.61
Re-export								
Total Export	15.18	4.91	9.61	17.27	22.94	26.71	21.63	8.80

Source: Customs Department cited in Siamwalla and Kaosa-ard (1992): *Thailand's Economic Structure: Toward Balanced Development?* Section II: Manufacturing Growth, A Blessing for All?, pp. 2-12.

By the end of the 1980s, Thailand was the third largest cement consumer in Asia after Japan and Korea. Japan, Korea, and Thailand consumed 50, 37 and 25 million tons, respectively, of cement. These numbers indicated that construction, real estate, and the speculative market in property were booming. Land prices in certain areas and in the new economic zone such as the Eastern Seaboard became artificially high because of the speculative pressure. The labor market also became very tight as wages constantly increased. Therefore, with this economic boom and shortage of resources, Thailand's competitive position in the international market had begun to deteriorate, particularly in labor-intensive and resource-based industries, by the end of the 1980s.

6. Facing New Challenges for Industrial Take-Off

In order for Thailand to turn economic expansion into an industrial take-off situation, it must now overcome constraints in several areas, namely infrastructure requirements and saving-investment gaps, because the share of fixed investment in GDP will rise sharply in the industrial take-off phase.

Thailand's comparative advantage in labor-intensive light manufacturing has been eroding at the same time that Indonesia and China are rapidly moving into those products. The ability of Thai manufacturers to increase their technological capacities to upgrade industrial structure is an important challenge, which must be met.

Lastly, for the Thai economy to compete successfully in the 1990s, Thai industries need to gain competitiveness in the products that have higher skill content. Therefore, it is most urgent that the Government strengthen secondary school programs and encourage the private sector to provide vocational and skill-specific training.

Overall, Thailand's educational system is in respectable condition. It needs to be refocused to prepare for the country's entry into the 21st century on a sound footing. A closer match is needed between the output of the education system and the training needs of greater industrialization. This necessitates the promotion of science education at both the secondary and higher education levels.

C. INDUSTRIAL DEVELOPMENT

Studies on the economic development process of Thailand in the last decade suggest that about one-fourth of the increase in GDP was due to rapid export growth. Furthermore, the export of the manufacturing products was the most crucial factor, explaining about 40-60 percent of the economic growth of Thailand during 1984-1987. However, in 1990, export growth generated only about 11 percent of the country's economic growth.

There are changes in Thailand's production and export structure towards more dependence on the service industry. This seems to reflect the country's advantage over other countries during the course of development. While Thailand still maintains its competitive advantage in agriculture, the advantage in semi-skilled labor-intensive manufactured exports seems to be declining due to newcomers in the labor-intensive industries in the world market, such as Indonesia, China, and Vietnam.

However slowly, Thailand has experienced a decline in agriculture's share of the GDP and a favorable increase in the service sector over the last three decades of the development process. Particularly between 1978 and 1988, the economy underwent a rapid structural transformation. With the industrial sector providing the major stimulus, the GDP grew at an average annual rate of over 6 percent. Reinforced by

a large inflow of foreign capital, manufactured exports increased dramatically. The textile, leather, metal products, and machinery industries expanded at a rapid rate. In 1988, the Thai economy performed well beyond the target plan. Both the rapid expansion of exports and the accelerated investment were expected to continue.

In the past, the manufacturing sector concentrated primarily on consumer goods and the processing of primary products, while the contribution of intermediate and capital goods to manufacturing output had been rather small. Study of industrial branches and the regional industrialization process of Thailand found that there had been an increase of industries in the regional areas when the country experienced an economic boom. The number of industrial factories has increased steadily in all regions except in 1992, when there was a slight decrease in the number of factories in the East, North, and Northeast.

However, it is obvious that most investment is still concentrated in the Central region, which includes Bangkok. This is explained by the fact that there is more existing infrastructure available in this region. The competitive advantages of establishing new factories in regions other than the Central region, and Bangkok in particular, include cheap land price and proximity to sources of raw materials and cheap labor. Yet, being located in the Central region is currently a competitive advantage in terms of having supporting industries, being near the consumers market, having available infrastructure and expedient government services.

When considering the average wage in the manufacturing sector in the Central region (see Exhibit V-2), the rate of increase has been up to two points in 1992. This rapid increase in wage trend will certainly push more industries to other regions of Thailand provided that infrastructure in those regions are improved.

Exhibit V-3 suggests that in 1987, most of the factories in Bangkok and other regions were small in size, i.e., 84 percent of all factories in the whole Kingdom have only 1-19 employees. In 1987, those with 500 employees and over constituted less than one percent of all factories in the country. This certainly reflects, to a large extent, the low technological capacity of these firms, considering that they are of low capital-intensity.

Thailand has a large potential for economic development. A composite index of development was produced by the Nomura Research Institute. Thailand's development level is 82 percent, which is second to that of Malaysia (87 percent) (see Exhibit V-4).

Exhibit V-2
Average Annual Wage of Employees by Size of Establishment and Region 1989-1992 (Unit: Baht)

Year/ Region	Size of Establishment (persons)				
	All Size	1-4	5-19	20-99	100 & Over
1989	3,579.57	2,591.37	2,963.28	3,378.83	3,764.35
1990	3,752.63	2,757.18	3,026.63	3,403.70	3,872.67
1991	4,394.53	2,944.74	3,666.97	4,284.06	4,433.56
Bangkok	5,982.79	4,431.99	4,302.06	5,371.61	6,199.45
5 Provinces around Bangkok	4,076.90	2,432.31	3,274.12	3,510.98	4,113.62
Central	3,642.68	2,569.24	2,666.37	3,653.39	3,505.26
North	2,994.93	2,161.48	3,114.89	3,131.89	3,958.44
Northeast	3,336.21	1,875.00	2,921.89	3,683.64	3,340.71
South	2,976.63	2,006.52	3,895.90	3,610.56	2,843.40

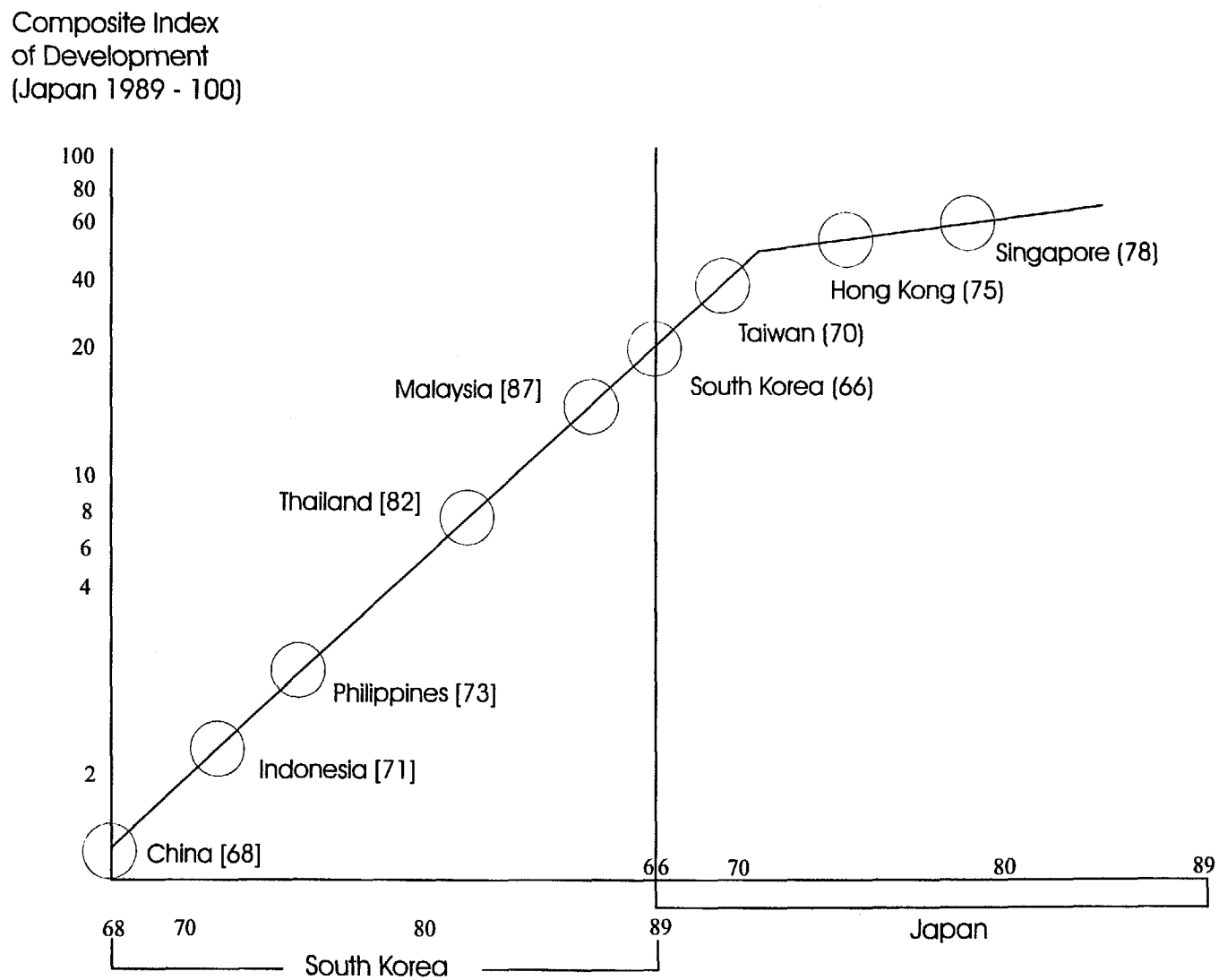
Source: Labor Studies and Planning Division, Department of Labor Protection and Welfare.

Exhibit V-3
Number of Firms by Size of Employment

Size of Employment (person)	1987		1990		Growth Rate 1987-1990
	No. Firms	Percentage	No. Firms	Percentage	
1-9	31,990	71.5	34,991	67.1	8.97
10-19	5,587	12.5	7,470	14.3	29.04
20-49	4,054	9.1	5,224	10.0	25.35
50-99	1,492	3.3	2,126	4.1	35.41
100-299	1,084	2.4	1,774	3.4	49.26
300-499	282	0.6	478	0.9	52.77
500-999	163	0.4	349	0.7	76.13
Over 1,000	92	0.2	200	0.4	77.65
Total	44,744	100.0	52,612	100.0	16.20

Source: Preechametta 1992

Exhibit V-4



Note: Figures in ( ) and [ ] show the respective years when Japan and Korea reached the same level of economic development

Source: Nomura Research Institute

Kimley-Horn

1. Board of Investment (BOI) and Foreign Direct Investment

The main underlying motives for promoting Multinational Companies (MNC) include the objectives of government to industrialize Thailand through import substitution and export oriented production, draw capital inflows by foreign investments, upgrade technological know-how through transfer by MNCs, develop local people's skill through training provided by MNC, modernize production sectors, and create stimulus to other sectors.

The nature of promotion can be characterized by changing the emphasis of a development plan and can be divided into three phases (1) import-substitution phase (1961-1971); (2) export promotion phase (1972-1981); and (3) import substitution of capital goods (since 1982).

In Phase One and Phase Two, there were only a few MNCs operating in Thailand and the nature of their operation was only to produce consumer goods at the final stage with no upstream operation. Thus, no specific location was designated for MNCs. However, in Phase Three as pollution problems intensified and Bangkok became too congested, the location issue emerged and became a strong argument for the selection of specific, low-impact locations for MNCs.

In order to decentralize industries to the regional areas, the Board of Investment overhauled the criteria for granting tax privileges on September 1, 1987 and again on January 1, 1989. The country was divided into three zones:

- Zone One includes Bangkok, Samut Prakan, Samut Sakhon, Nakhon Pathom, Nontaburi, Pathum-thani
- Zone Two includes ten provinces surrounding Zone One (excluding Laem Chabang Industrial Estate)
- Zone Three includes the remainder of the country

Promoted projects which are located in Zone One receive the least tax benefits, while those in Zone Three obtain the maximum tax benefits. Minimum wage rates are decided according to tripartite negotiation comprising representatives of the government, company management, and the labor union. There is no separate wage determination for MNCs in particular.

There is no integrated policy or policy package designed specifically for MNCs. Different issues are addressed by different government agencies including Ministry of Commerce, Ministry of Finance, Bank of Thailand, Board of Investment, Ministry of Industries, and private sector representatives including the Federation of Thai Industries, Board of Trade of Thailand, and other trade associations. The Ministry of Commerce is responsible for company registration, renewal of permits, price controls, import and export regulation, and trade promotion. The Ministry of Finance is responsible for various taxation. The Bank of Thailand monitors remittance of profits. The Board of Investment authorizes special privileges. The Ministry of Industries is in charge of all issues relating to industrial operations, including pollution control. Private sector associations represent private enterprises and local and foreign companies in dealing with issues needing solutions and consideration by the government sectors.

2. **Recent Trends of Foreign Direct Investment (FDI)**

Since the 1960s, the Thai government has had a relatively open policy toward foreign direct investment, clearly stating a policy promoting FDI in every development plan, though with shifting emphasis. To that end, the Board of Investment's restrictions on foreign capital and ownership have been somewhat limited, supporting Thai majority ownership only in manufacturing projects geared primarily toward the domestic market, and those in agribusiness, mineral exploration, mining, and services, in particular.

Until recently the stock of FDI in Thailand was relatively low compared to most other countries. However, the net FDI inflows into Thailand increased dramatically in the late 1980s. Net foreign investment inflows increased from an average of around $260 million (US) a year in the first half of the 1980s to $1.1 billion (US) in 1988. FDI as a share of gross domestic investment rose from an average of 2.4 percent in the 1970s to an average of 3.3 percent in the 1980s with a peak of 6.9 percent in 1988.

The largest share of FDI is concentrated in the service sector (49 percent), followed by the secondary sector (35 percent), and the primary sector (16 percent).

From 1960 until early 1990, most of the investment project applications to BOI were joint ventures. However, when considering the registered capital and employment generated, MNCs were dominant contributors. Electronics was one of the most rapidly growing industries receiving BOI promotional privileges. For

206

example, while the number of projects was only 7 during 1960-1970, in the period of 1987 to June 1990, the number increased to 425 with a total registered capital of 80,787 million baht and employment of 173,321 persons.

In the first quarter of 1993, it has been observed that investment projects for export remarkably decreased. FDI projects have also decreased in number. However, the net capital registered is still higher than the first quarter of the previous year. There is also an increasing trend of project applications for domestic market production as well as a decentralization of industries to regional areas.

3. **Human Resource Development and FDI**

Concerns regarding the availability of skilled manpower in the Thai industrial service sector have become serious in the past decade. Although an abundant supply of cheap and easily trained labor was an important component of Thailand's comparative advantage in the past, this situation is changing rapidly. As Thailand's industrial structure becomes increasingly complex and the economy shifts into more technology intensive sectors, the importance of a well-trained labor pool of engineers and technicians becomes more evident. Generally, unskilled and semi-skilled workers are still in good supply, although shortages may exist in certain areas, while technicians, engineers, and management personnel are more difficult to find. Needless to say, the recent period of rapid economic growth and inflows of foreign investment have placed considerable strains on the capability of the national education system to produce suitably trained science and technology manpower.

Recognizing the various manpower shortages, the government has rapidly initiated a number of policy measures to address the problems, both in the short term and the long term.

In the short term, the following measures have been implemented to alleviate the shortfalls in skilled personnel:

- Concerted efforts by both private and public sectors to reverse the "brain drain" and induce qualified Thai nationals working abroad to return to work in Thailand;

- Relaxation of the immigration rules for foreigners with high level technical skills;

- Expansion of existing enrollment of engineering graduate students;
- Provision of large-scale scholarship programs to finance study abroad in selected engineering fields;
- Introduction of training programs to upgrade technicians to engineers and to assist scientists wishing to shift their field of study to engineering;
- Development of short courses in selected critical areas in both public and private sector institutions;
- Encouragement of private-public sector cooperation in the provision and financing of training programs; and
- Improvement of firm-level human resource development policies.

For the longer run measures, the Royal Thai Government has actively sought cooperation from the private sector in the provision of education and skill training services through various deregulation and privatization measures. The establishment of private sector institutions at the higher education level has been actively encouraged.

The potential for private sector participation in education and manpower training extends to the development of foreign higher education institutions in Thailand. New regulations provide broad opportunities for foreign investment in the field of education.

Other long-term initiatives include the expansion of the coverage of the technical education network to the regional areas of Thailand and the revision and restructuring of curricula at university, secondary and vocational levels to better reflect the needs of the economy and to increase flexibility.

4. **Industrial Structure**

Thailand's economy has undergone significant changes. In 1983, 69 percent of the non-institutional labor force was engaged in agricultural activities. By 1992, that sector's employment only accounted for 59.5 percent. During the same period, while the total non-institutional labor force had increased by 23 percent, from 25.1 million to 40 million, non-agricultural employment had grown by 60.9 percent from 7.8 million to 12.5 million. In 1983, there were 91,214 industrial

factories in the Kingdom. By 1992, that number had increased by nearly 14 percent to 103,822.

As illustrated in Exhibit V-5, the highest growth rates of factories, between 1981 and 1992, were recorded in the Central region (38.9 percent, followed by the North (29.4 percent) and the Northeast (24.8 percent). In 1981, factories in the Central region accounted for 36 percent of the total, followed by the Northeast with 34 percent. In 1992, these two regions accounted for 39 percent and 33 percent of the total facilities.

Exhibit V-5
Number of Industrial Factories

Year	Central	East	North	Northeast	South	Total
1981	28,816	4,164	12,537	27,173	7,500	80,190
1983	33,087	4,619	14,366	31,107	8,044	91,214
1985	29,359	3,802	14,034	30,557	7,269	85,015
1987	30,379	3,980	14,340	31,010	7,520	87,222
1988	32,035	4,248	14,787	32,268	7,754	91,088
1989	34,318	4,406	15,299	32,733	8,017	94,772
1991	38,468	4,884	16,234	33,984	8,753	102,723
1992	40,032	4,811	16,218	33,913	8,848	103,822

Source: Factory Control Division, Industrial Factory Department, Ministry of Industry, Thailand

Between 1985 and 1992, certificates were issued for a total of 1,132,035 new jobs in new factories outside the central region. As shown in Exhibit V-6, while the majority of new jobs were located in Zone 1, an increasing percentage of new jobs, from 1988 onwards, were located in Zones 2 and 3.

Exhibit V-6 New Employment Certificates				
Year	Zone			Grand Total
	1	2	3	
1985	30,640	5,948	5,533	42,121
1986	27,093	8,256	9,355	44,704
1987	79,854	9,778	16,810	106,442
1988	130,053	70,278	42,879	243,210
1989	121,328	59,370	47,009	227,707
1990	104,196	53,654	57,041	214,891
1991	56,386	37,535	49,821	143,742
1992	49,073	21,362	38,783	109,218
Total	598,623	266,181	267,231	1,132,035
% of Total	52.9	23.5	23.6	100

In a detailed examination of the certificates issued in 1985, 1988 and 1991, as presented in Exhibit V-7, many of these new jobs were in higher-value enterprises. In 1985, new jobs in textiles, garments and footwear accounted for 34 percent of the total. The next largest industry groups were electrical and electronics manufacturing (19.5 percent), and food and seafood processing (12.3 percent).

In 1988, electrical and electronics manufacturing jobs were the largest group at 19.5 percent, followed by employment in rubber and plastic products (17 percent), textiles, garment and footwear (16.2 percent), and food and seafood processing (9.8 percent).

The total number of new jobs covered by the certificates declined by 41 percent from the 1988 level. The largest sector was electrical and electronics manufacturing (19.7 percent), followed by textiles, garments and footwear (13.8 percent), basic metal industries (7.5 percent), and food and seafood processing at 6.8 percent.

Based on an examination of Gross Domestic Product, manufacturing accounted for 21.3 percent of GDP in 1980. As of 1991, that share had increased to 26.6 percent. In the same period, trade and services increased from 45.8 percent to 47.8 percent, while agriculture declined from 23.2 percent to 11.8 percent.

Exhibit V-7
Employment at Proposed Industries
By Product and Zone

Product	1985				1988				1991			
	Zone 1	Zone 2	Zone 3	Total	Zone 1	Zone 2	Zone 3	Total	Zone 1	Zone 2	Zone 3	Total
Agriculture												
Frozen & Non-Frozen Seafood	623		449	1,072	2,301	552	2,623	5,476	431		460	891
Frozen & Non-Frozen Food	3,367		760	4,127	2,380	5,454	10,641	18,475	2,722	1,374	4,826	8,922
Other incl. Services	547	161	849	1,557	2,292	3,432	2,221	7,945	4,875	900	9,788	15,563
Manufacturing												
Textiles, Garments & Footwear	13,456	800	22	14,278	16,148	21,331	1,976	39,455	8,222	7,283	4,344	19,849
Electrical & Electronics	4,277	3,931		8,208	31,227	9,706	6,583	47,516	12,071	9,975	6,215	28,261
Wood & Furniture			705	705	5,371	1,830	2,435	9,636		319	790	1,109
Paper & Products	193	278	98	569	810	535		1,345	387	458	836	1,681
Printing & Allied Industries				0				0				0
Chemicals & Products	522	298	139	959	1,724	230	764	2,718	376	394	2,569	3,339
Petroleum & Products				0				0				0
Rubber & Plastic Products	3,064	32	627	3,723	21,971	9,330	10,017	41,318	1,509	2,753	2,006	6,268
Nonmetallic Mineral Products				0				0				0
Basic Metal Industries	571	140	278	989	4,662	1,975	1,862	8,499	539	6,464	3,710	10,713
Metal Products				0				0				0
Nonelectrical Machinery	1,886	58		1,944	7,417	4,107	145	11,669	3,715	675	3,523	7,913
Electrical Machinery & Supplies				0				0				0
Transport Equipment			1,109	1,109		375		375	258	81		339
Miscellaneous	1,653	199		1,852	27,685	9,244	1,312	38,241	5,993	3,120	2,528	11,641
Services & Other	481	51	497	1,029	6,065	2,177	2,300	10,542	15,288	3,739	8,226	27,253
TOTAL	30,640	5,948	5,533	42,121	130,053	70,278	42,879	243,210	56,386	37,535	49,821	143,742

As presented in Exhibit V-8, the major growth areas in manufacturing included leather and leather goods, non-electrical machinery, electrical machinery and supplies, and transport equipment, based on 1972 constant prices. In 1980, machinery and equipment manufacturing accounted for 9.2 billion baht or 3.1 percent of GDP. This same group of industries accounted for 25.2 billion baht, or 4 percent of GDP in 1990.

Simple processing of agricultural goods has grown from 10.5 percent of agriculture to 13.1 percent of that sector, between 1980 and 1990, reflecting a migration of agricultural activities from basic growing and harvesting to higher value processing.

The increase in machinery and equipment manufacturing and the processing of agricultural products reflect the development of the Thailand economy towards higher value sectors.

This progress has resulted in an increase in the Gross Domestic Product as well as the per capita income. As shown in Exhibit V-9, the overall per capita Gross Domestic Product increased from 14,744 baht, in 1981 to 32,028 baht, or by 117.2 percent. The highest rate of growth was recorded in the North (459 percent), while the South lagged behind the rest of the Kingdom with a 60 percent increase.

212

Exhibit V-8
Gross Domestic Product
(Constant 1972 Prices)
(Billion Baht)

Sector	1980 Value	1989		1990	
		Value	Growth %	Value	Growth %
Agriculture	61.8	92.4	4.6	90.7	-1.8
Services	2.3	2.6	1.9	2.6	-1.8
Simple Processing	6.5	11.4	6.5	11.9	4.3
Mining & Quarrying	7.9	15.1	7.8	18.1	20.1
Manufacturing	65.0	137.3	7.8	156.0	13.7
Food & Beverages	15.5	31.9	8.5	34.5	8.4
Tobacco	4.3	5.1	2.4	5.3	3.5
Textiles & Garments	15.3	33.8	9.4	38.0	12.8
Leather Goods & Footwear	1.2	4.2	15.8	4.9	15.8
Wood & Furniture	2.2	2.8	6.5	2.7	-8.0
Paper & Paper Products	1.2	2	6.3	2.2	8.9
Printing & Allied Industries	1.0	1.7	5.8	1.8	6.0
Chemicals & Products	2.7	5.7	8.6	6.3	11.8
Petroleum & Products	3.4	5.3	5.2	5.7	9.4
Rubber & Plastic Products	1.8	3.7	8.8	4.1	11.8
Nonmetallic Mineral Products	2.4	6.2	11.6	7.2	16.8
Basic Metal Industries	1.2	1.6	4.3	1.6	4.6
Metal Products	1.2	2.6	9.4	3.0	13.2
Non-electrical Machinery	2.2	6.1	13.2	7.4	20.4
Electrical Mach. & Supplies	1.9	4.7	11.3	5.6	19.2
Transport Equipment	5.1	9.7	10.4	12.2	25.9
Miscellaneous	2.5	10.3	17.3	13.5	30.5
Construction	13.5	26.9	8.4	33.0	22.7
Utilities & Transportation	25.9	57.2	9.3	64.3	20.8
Trade & Services	110.0	221.7	11.3	245.4	10.7
Public Admin. & Defense	15.4	23.7	5.0	24.1	1.6
Gross Domestic Product	299.5	574.2	7.5	631.6	10.0

Remarks: Average annual growth rate 1980-1989
Source: National Economic and Social Development Board, Thailand

Exhibit V-9 **Regional Per Capita GDP (Constant 1972 Prices)**				
Region	**1980**	**1981**	**1985**	**1989**
Bangkok Metropolitan	41,000	47,705	56,463	96,239
Central	11,517	14,662	12,384	30,857
East	19,220	19,752	27,004	45,751
West	15,332	16,265	13,442	28,434
Northeast	6,012	6,067	7,380	11,981
North	3,366	9,101	12,357	18,803
South	13,745	13,460	15,546	21,995
Whole Kingdom	14,744	15,925	19,627	32,038

Remarks: West includes Kanchanaburi, Prachuab Kirikhan, Petchburi, Supanburi and Samutsongkram
Source: National Economic and Social Development Board, Thailand

5. International Trade

Industrial growth in Thailand has been sustained by an expansion of both the domestic and international markets. As shown in the following exhibit, the growth of total exports between 1980 and 1990 were strong, with the exception of the period between 1981 and 1985. Exports of manufacturers led this growth. Manufactured goods accounted for an increasing share of total exports between 1980 and 1990. Clothing and textiles, machinery and transport equipment, and integrated circuits accounted for an increasing share of manufactured exports, increasing from 17.5 percent of all exports in 1980 to over 40 percent in 1990.

The continued rise in exports was due to the diversification of both products, the increase in manufactured goods, as well as the penetration into new markets.

As illustrated in Exhibit V-10, the continued growth of machinery and transport equipment versus the rise then fall of clothing and textile exports, supports the shift of export industry into higher value products.

Exhibit V-10 Thailand Exports Annual Growth Rates							
	1980	1981-1985	1986	1987	1988	1989	1990
Total Exports	22.8	2.2	24.6	31.4	36.9	25.9	14.8
Manufacturers	34.9	5.5	36.5	52.8	43.9	30.9	27.4
Share of Total Exports							
All Manufactured Goods	34.9	35.0	44.9	52.2	54.9	57.0	63.4
Machinery & Transport Equipment	5.7	6.3	10.7	11.9	15.8	17.8	22.2
Integrated Circuits	4.6	4.1	5.5	5.1	4.7	3.6	3.7
Clothing & Textiles	7.2	9.7	13.4	16.2	14.5	14.3	14.3

Source: Bank of Thailand, Quarterly Bulletin
Economic and Social Survey of Asia and Pacific 1991, UN/ESCAP 1992

Between 1983 and 1986, the ten leading export commodities were, in order of volume: cereals, other food products, other agricultural products, small electrical goods, miscellaneous manufactured products, manufactured clothes, meat, poultry and fish, yarn and cloth, canned meats, and confectionery products. These ten product groups had a combined weighted average growth of 11.2 percent and captured, on a weighted average basis, 1.8 percent of the world's exports.[1] Exhibit V-11 presents the commodities in terms of their share of 1986 world exports and their relationship to the weighted average growth rate and market share of the leading exports.

The share of world exports for all of these export commodities was quite small. This reflected a combination of intense competition and a shift to high value products. With the exception of meat, poultry and fish and canned meats, the other agricultural commodities fell below the weighted average growth rate of the leading exports. This reflected the high level of competition. The non-agricultural exports, recorded above average rates of growth.

[1] D'Cruz, Joseph R., "Diagnosing National Industrial Portfolios," *The World Competitiveness Report 1990*, IMD

Exhibit V-11 **Leading Thailand Export Commodities (1983-1986)**			
Commodity Group	**Est. 1986 World Export Share (%)**	**Growth Rate vs H.K. Weighted Average**	**Export Share vs. H.K. Weighted Average**
Cereals	4	Below	Above
Other Food Products	1	Below	Below
Agricultural Products for Industry	1	Below	Below
Small Electrical Goods	1	Above	Below
Misc. Manufactured Goods	1	Above	Below
Manufactured Clothes	2	Above	Below
Meat, Poultry & Fish	2	Above	Below
Yarn & Cloth	1	Above	Below
Canned Meats, etc.	6	Above	Above
Confectionery Products	2	Below	Below

Source: *The World Competitiveness Report 1990*

D. TRANSPORTATION AND INFRASTRUCTURE

1. Overview

The recent past, particularly the last four to five years, has been marked by Thailand's dramatic success in economic development, as reflected by the rapid expansion of the Thai economy at a rate that is one of the world's highest. This remarkable achievement may be viewed with justifiable pride by all Thais. Nonetheless, there are two sides to every coin. The economic buoyancy and prosperity have also brought in their wake a variety of problems, which, if allowed to continue unresolved, will pose a crippling obstacle, derailing the country's economic development.

The World Competitiveness Report 1990[2] ranked Thailand with the highest level of growth optimism and profit development and in confidence in new employment opportunities. However, with respect to the effective use of information technology, and the capability of existing transport facilities to meet the needs of international trade, Thailand did not fare as well. A summary of the standings are presented in Exhibit V-12. In a comparison with other countries in Southeast Asia, Thailand lagged behind most of its neighbors in all instances.

Exhibit V-12
Infrastructure Capabilities
(0 = inadequate, to 100 = adequate)

Country	Roads	Railroads	Air Transport	Ports	Telecom	Power Supply
Southeast Asia						
Thailand	43.50	39.00	67.50	44.00	42.50	59.00
Hong Kong	71.07	68.93	83.93	92.50	96.43	95.36
Indonesia	47.43	38.86	62.86	55.88	50.86	48.24
Malaysia	78.18	56.97	73.33	73.94	76.36	76.97
Singapore	91.22	50.00	97.62	97.62	99.05	96.67
Northeast Asia						
Japan	60.00	83.90	72.20	79.50	90.24	87.80
Taiwan	55.15	58.79	67.88	72.12	68.48	61.21
U.S. and Europe						
United States	83.93	64.26	89.84	82.62	94.75	89.51
Germany	90.28	78.89	81.39	83.33	81.39	91.39
United Kingdom	51.58	46.67	77.54	73.57	77.86	81.05

[2] *The World Competitiveness Report 1990*, IMD International, June 1990.

20

The following points highlight the main problems in the transport sector:

- The use of the existing transport modes is heavily unbalanced. Road usage is predominant and has increased continuously due to low tariffs and favorable highway quality. Since the early 1980s the Thai government has attempted to implement a policy to create a more balanced transport system which reduces the dominance of the road transport sector and increases the usage of rail and inland waterway transportation. This has not yet been successful. Especially in Bangkok, the roadway imbalance continues to be aggravated by the huge influx of rural population and the concentration of economic activity to create a substantial traffic jam crisis in the city. An efficient, mass transportation system is direly needed in the capital area.

  The modal split for domestic transport of passengers and goods within Thailand in order of importance is: road, rail, coastal shipping, inland waterways, and air. (See Exhibit V-13.) Note that in the case of cargo freight, in 1990 it was found that nearly 90 percent of total freight service was moved by road, followed by rail with 5.8 percent, coastal shipping with 3 percent, and inland waterways and air with less than one percent.

Exhibit V-13
Modal Split of Domestic Freight and Passenger Transport 1990

Mode	Passenger		Freight		Ratio %
	Million	Million Pass.-Km.	Million Tons	Million Ton-Km.	
Road	N/A	N/A	229.0	52,886	90.3
Rail	77.0	11,618	8.0	3,386	5.8
Inland Waterway	N/A	N/A	2.5*	469*	0.8
Coastal Shipping	N/A	N/A	15.4	1,805	3.1
Air	3.2	1,827	0.01	8.2	0.01
TOTAL			**254.9**	**58,534**	**100**

* Excludes freight transported on Pasak Bang Pakong River
Source: Ministry of Transport and Communications, Thailand

- Transport infrastructure has become inadequate, particularly in the metropolis of Bangkok which has become increasingly congested. The transport infrastructure, including highways, airports, railways and ports, are needed to support the development and function of most economic activities. With the country's economy growing rapidly, infrastructure has been taxed to the limit, resulting in a shortfall in its supply in the face of soaring demand. Though the existing government has put high priority on infrastructure expansion and has recently stepped up its efforts to expand the local infrastructure, it has not been able to bridge the demand-supply gap. Moreover, because there is a high priority placed on expanding the infrastructure in the capital and its surrounding areas, the distribution of needed improvement to the outlying regions will be negatively impacted. The following presents information about the capacity and facilities of the key elements of the transport infrastructure.

2. **Roads and Highways**

Thailand has a comprehensive network of roads and highways. The main road network has been rapidly expanded (see Exhibits V-14 and V-15). The total length of the principal interurban network in 1990 was 52,305 kms, 33 percent national and 67 percent provincial highways. Of this total, 76 percent were paved, and 24 percent were unpaved and/or under road construction. Exhibit V-14 also indicates that the number of motor vehicles, both passenger cars and commercial vehicles, has continued to increase since 1981, with passenger cars showing the larger increase of the two.

The present Thai Government has placed high priority on a series of projects which will relieve the severe traffic congestion in Bangkok and also distribute income to other provinces for infrastructure construction. These projects include rapid mass transit projects (such as Skytrain), elevated road projects, and the third stage expressway project (after the completion of the second stage).

These initial projects will be of great importance as a means to alleviate traffic congestion, reduce wasteful usage of fuel, reduce time and transportation expenses, reduce air pollution, and promote the use of public transportation facilities in place of passenger cars.

Another project to improve highway capacity is being undertaken by the Don Muang Tollway Co., Ltd. This private venture is constructing an elevated expressway to link the existing expressway with Don Muang Airport. Total investment is estimated to be 10,000 million baht. The new expressway, 15.4

219

kilometers in length, will run above existing Vibhavadi Rangsit Highway, which is the main artery serving northbound traffic from Bangkok. The Vibhavadi Rangsit Highway is currently one of the most congested roadways in the metropolitan area.

Exhibit V-14
Roads and Road Vehicles

Category	1981	1985	1988	1989	1990
Roads (Kilometers)					
All Types	30,016	36,235	41,794	44,409	45,445
Paved	24,715	31,255	35,874	38,751	39,931
Motor Vehicles (Thousands)					
Passenger	450.5	732.6	1,000.0	1,147.0	N/A
Commercial	293.8	684.7	789.0	835.0	N/A

Source: Ministry of Transport and Communications, Thailand

Exhibit V-15
Department of Highways Jurisdiction
Road Route Lengths (km)

Year	National		Provincial		Other*	Grand Total
	Paved	Total	Paved	Total		
1986	15,282	15,386	17,718	22,338	8,824	46,548
1987	14,833	14,912	19,032	24,457	8,442	47,811
1988	15,822	15,899	20,052	25,895	8,074	49,868
1989	16,726	16,814	22,026	27,595	6,673	51,082
1990	17,401	17,486	22,531	27,959	6,860	52,305

Remarks: *Roads under construction or reconstruction and minimum maintenance minor roads; Multi-lane roads are included as number of lanes times route length.
Source: Department of Highways, Thailand

220

The second stage expressway system, which also has been privatized, was constructed to further expand the existing metropolitan system. At 40.5 kilometers in length, the second stage expressway was constructed at a cost of approximately 27,500 million baht. It links the area north of Bangkok (to the west of Don Muang Airport) with central Bangkok and its eastern suburban area.

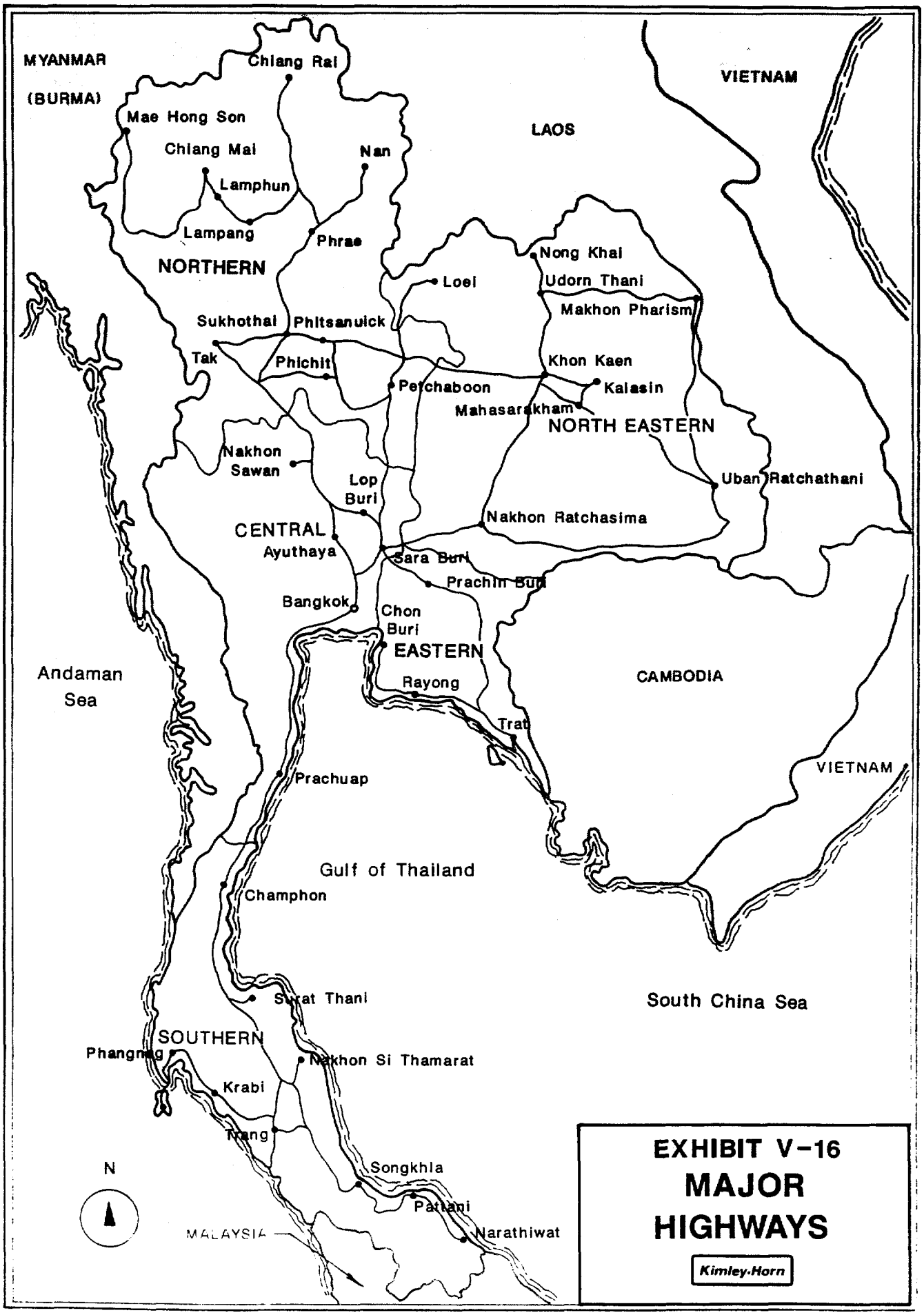
The Department of Highways also has established its own development program to increase highway capacity within the provinces by upgrading and connecting all inter-city highways into a more efficient network. The Department of Highways plans to construct 1,891 kilometers of four-lane highways at a budgeted cost of 45,900 million baht. Exhibit V-16 identifies the location of these major highways. Seven projects will be constructed in the North Region (647 kilometers of highways at a cost of 16,600 million baht; four projects in the Northeast Region (231 kilometers of highways, costing 4,600 million baht; two projects in the East (120 kilometers of highways, costing 3,000 million baht); and six projects in the South (893 kilometers of highways at a cost of 21,700 million baht). All of these projects are scheduled for completion in 1996.

In addition, all highways within a radius of 250 kilometers from Bangkok will be expanded. The Rangsit-Saraburi Highway will be widened from 4 lanes to 10 lanes and the Asian Highway between Bang Pa-In and Nakhon Sawan will be increased from 2 lanes to 4 lanes. Within the Eastern Seaboard project (see Exhibit V-17), the Government plans to build an additional expressway running from Bangkok to Lard Krabang along the Bangkok metropolitan area's eastern edge and then on to Laem Chabang. Another long-range project is the planned construction of a major expressway linking the provinces in the northeastern part of the country directly with Laem Chabang (without passing through Bangkok).

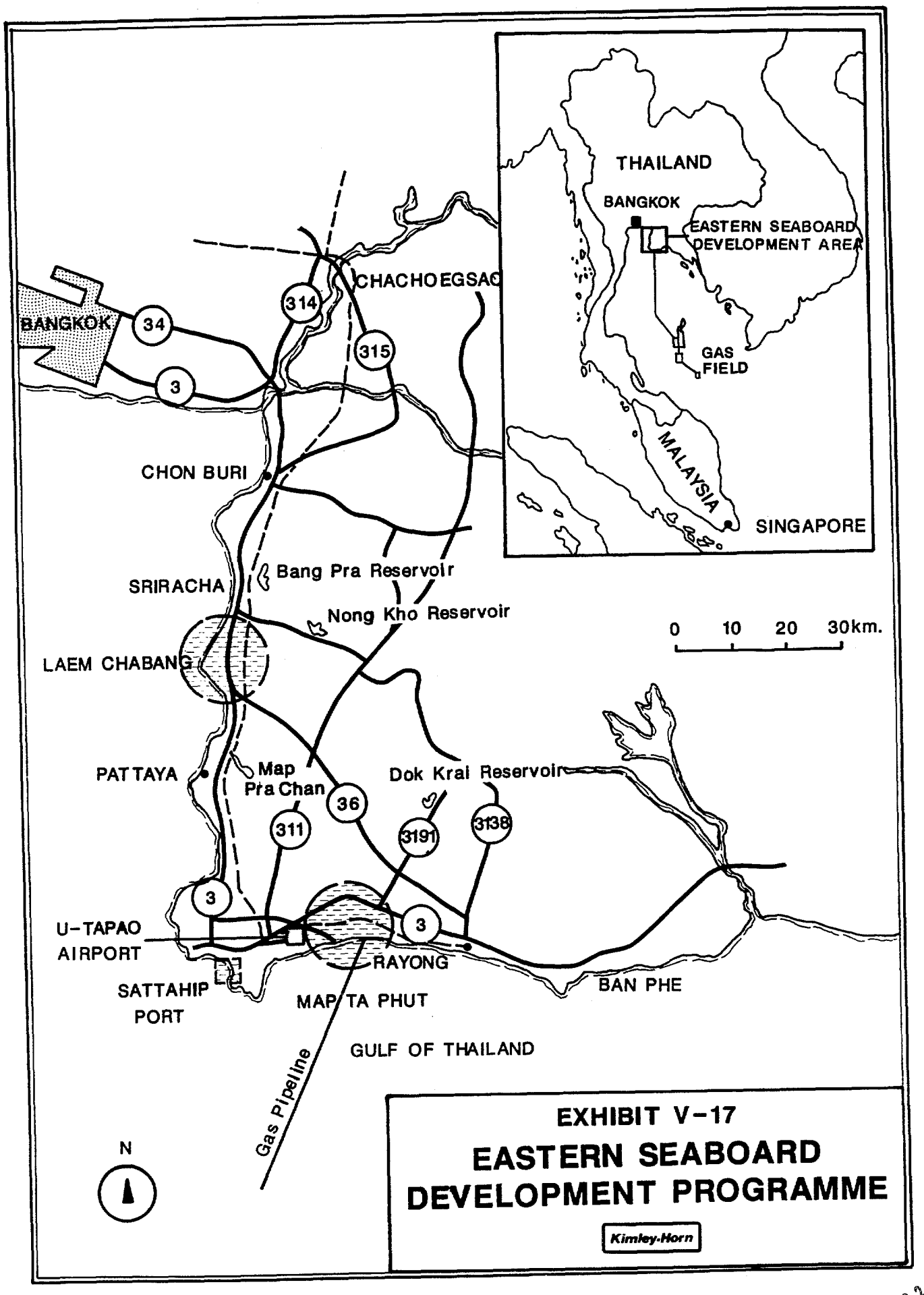
3. **Railway**

The State Railways of Thailand (SRT) own and operate the national rail network throughout Thailand.

221


MYANMAR
(BURMA)
Chiang Rai
Mae Hong Son
Chiang Mai
Nan
Lamphun
Lampang
Phrae
NORTHERN
LAOS
VIETNAM
Nong Khai
Loei
Udorn Thani
Makhon Pharism
Sukhothai
Phitsanulck
Tak
Phichit
Khon Kaen
Petchaboon
Kalasin
Mahasarakham
NORTH EASTERN
Nakhon
Sawan
Lop
Buri
Uban Ratchathani
Nakhon Ratchasima
CENTRAL
Ayuthaya
Sara Buri
Prachin Buri
Bangkok
Chon
Buri
EASTERN
Andaman
Sea
Rayong
CAMBODIA
Trat
VIETNAM
Prachuap
Gulf of Thailand
Champhon
Surat Thani
South China Sea
SOUTHERN
Phangnga
Nakhon Si Thamarat
Krabi
Trang
N
Songkhla
Pattani
MALAYSIA
Narathiwat
EXHIBIT V-16
MAJOR
HIGHWAYS
Kimley-Horn

222


THAILAND
BANGKOK
EASTERN SEABOARD DEVELOPMENT AREA
GAS FIELD
MALAYSIA
SINGAPORE
BANGKOK
34
3
314
315
CHACHOEGSAO
CHON BURI
SRIRACHA
Bang Pra Reservoir
Nong Kho Reservoir
LAEM CHABANG
0 10 20 30km.
PATTAYA
Map Pra Chan
36
311
Dok Krai Reservoir
3191
3138
3
3
U-TAPAO AIRPORT
RAYONG
SATTAHIP PORT
MAP TA PHUT
BAN PHE
GULF OF THAILAND
Gas Pipeline
N
EXHIBIT V-17
EASTERN SEABOARD DEVELOPMENT PROGRAMME
Kimley-Horn

223

Transportation by rail is currently economical, and is thus of considerable importance. Demand for railroad services continues to increase. As indicated in Exhibit V-18, both passenger-kilometers and net ton-kilometers have increased from 9,483 million and 2,601 million, respectively, in 1981 to 11,612 million and 3,291 million in 1990. However, the length of railways, number of locomotives, number of passenger cars, and number of freight wagons providing service have remained relatively constant leaving little capacity for growth. Since 1986 the principal bulk cargoes transported by rail are petroleum products and cement (as shown in Exhibit V-19).

Exhibit V-18
SRT Railway Facilities and Traffic
(Years ending September)

Category	1981	1985	1988	1990
Route Length (km)	3,735	3,735	3,728	3,861
Number of Rolling Stock				
Locomotives	305	284	N/A	N/A
Passenger Cars	1,106	1,111	N/A	N/A
Freight Wagon	9,080	8,904	N/A	N/A
Traffic (Millions)				
Passenger-Kilometers	9,483	9,140	10,301	11,612
Net Ton-Kilometers	2,601	2,718	2,867	3,291

Source: Statistical Yearbook for Asia and the Pacific

224

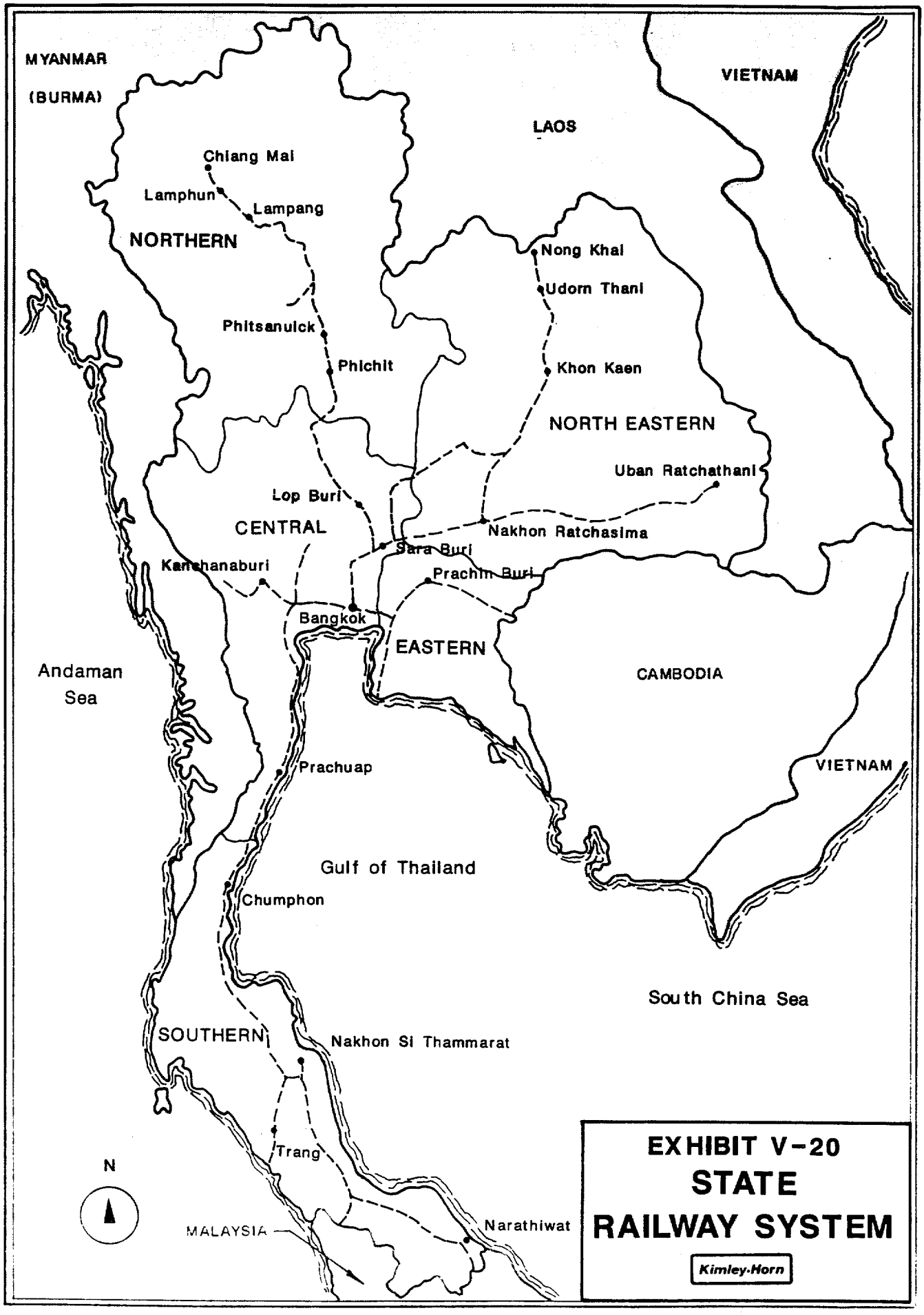
Exhibit V-19
Rail Freight Traffic
(Tons)

Commodity	1986	1987	1988	1989	1990
Petroleum Products	2,523	2,522	2,618	2,897	2,968
Cement	1,159	1,539	1,927	2,320	2,470
Mineral Products	208	220	271	383	645
Rice	386	347	305	325	334
Rubber	142	212	278	209	157
Forest Products	72	119	124	146	122
Other Manufactures	78	85	118	128	117
Other Agriculture	122	111	118	106	114
Maize	199	107	70	127	97
Sugar	51	49	118	114	70
Other Construction	21	39	80	118	128
Fertilizer	2	21	2	5	20
Farm and Fisheries	16	16	26	83	7
Earth, Sand & Gravel	12	14	10	2	3
All Others	227	259	305	403	335
Unknown	—	—	—	—	29
TOTAL	**5,218**	**5,660**	**6,373**	**7,313**	**7,995**

Source: State Railways of Thailand

The main rail lines, as presented in Exhibit V-20, radiate from Bangkok: the Northern line to Chiang Mai (752 kms); the Northeast line to Nong Kai and to Ubon Ratchathani (1,092 kms); and the Southern line to the Malaysian border at Padang Basar and at Sungai Ko Lok (1,200 kms). Eight secondary branch lines, including the Eastern line to Aranyaprthet, add 723 km.

The main lines of the SRT have gradients of less than 1.2 percent (except for the Northern line at Sila and at Chiang Mai Section, with maximum gradients of 2.6 percent and 2.4 percent, respectively, thus restricting capacity to 10 freight wagons). The rail system includes 2,567 bridges, 461 of which are wooden structures. Maximum axle-load permitted is 14 tons (20 tons on the Sattahip line), and maximum design speed is 90 kms/hour. However, this speed is seldom achieved due to various technical restrictions. Most of the existing signaling facilities are mechanical and in need of replacement due to age.


MYANMAR
(BURMA)
LAOS
VIETNAM
Chiang Mai
Lamphun
Lampang
NORTHERN
Nong Khai
Udorn Thani
Phitsanulck
Phichit
Khon Kaen
NORTH EASTERN
Uban Ratchathani
Lop Buri
CENTRAL
Nakhon Ratchasima
Sara Buri
Kanchanaburi
Prachin Buri
Bangkok
EASTERN
Andaman
Sea
CAMBODIA
Prachuap
VIETNAM
Gulf of Thailand
Chumphon
South China Sea
SOUTHERN
Nakhon Si Thammarat
Trang
N
MALAYSIA
Narathiwat
EXHIBIT V-20
STATE
RAILWAY SYSTEM
Kimley-Horn

226

In order to serve the major container transport terminal at the port of Laem Chabang, the State Railways of Thailand plans to improve the railroad system by making it double-track within the country. The cost to improve the existing 3,800 kilometer system is estimated to be 80,000 million baht. Upon completion, the expanded system will be able to handle twice the number of trains at a higher average design speed of up to 120 kms/hour.

In order to improve passenger service in the Bangkok metropolitan area, the government plans to construct a series of mass transit projects. The initial project is the elevated railway that will be constructed as a privitized railway project by Hopewell Holding Co., (Thailand) Ltd., which was granted a concession by the SRT. Total investment in this project is estimated at over 80,000 million baht. The second mass transit project will be the Tanayong elevated electric train project which will be constructed also under a concession given by the Bangkok Metropolitan Administration. The first stage of the Tanayong project will require an initial investment of 18,000 million baht. The Bangkok Bank has a financial advisory role in both of these projects. The third mass transit project will be the elevated electric train project of the Metropolitan Rapid Transit Authority (MRTA). MRTA is a State agency, created by the cabinet in July 1992, to be responsible for mass transit projects implemented in Bangkok and its environs.

4. **Seaports**

Sea transportation is a key factor to Thailand's international trade. As indicated in Exhibit V-21, more than 74 percent of the country's international trade in terms of value travels by sea.

At present, there are three major commercial ports in Thailand. These are Bangkok Port, Laem Chabang Port, and Map Ta Phut Port. Bangkok Port is presently the most important. Its traffic volume, particularly containerized freight, increases more than 60 percent every three to five years (1981-1985, 1985-1988, 1988-1991) (see Exhibit V-22).

Prior to 1986, Bangkok port consisted of several small private wharves on both banks of the Chao-Phaya River, which handled bulk cargoes, and the major commercial Klong Toey port which consists of 16 wharves, 10 for general cargo and 6 for containerized goods. Because of the rapid growth in foreign trade, especially containerized freight, the Klong Toey port became highly congested.

257

Exhibit V-21 International Trade by Mode					
	Sea	**Land**	**Air**	**Mail**	**Total**
1985					
Value (M.Baht)	378,347	7,875	55,304	3,370	444,896
% of Total Value	85.0	1.8	12.4	0.8	100
Weight (Thousand Tons)	39,829	886	185	7	40,907
1988					
Value (M. Baht)	697,928	14,426	200,586	4,049	916,989
% of Total Value	76.0	1.6	21.9	0.5	100
Weight (Thousand Tons)	53,350	1,153	439	2	54,944
1991					
Value (M. Baht)	1,116,489	22,097	300,096	4,090	1,442,772
% of Total Value	77.4	1.5	20.8	0.3	100
Weight (Thousand Tons)	69,432	2274	1,076	73	72,855

Source: Department of Customs

Exhibit V-22 Bangkok Port Container Traffic								
Year	**Inbound**			**Outbound**			**Grand Total (TEU, 000)**	**Percent Change**
	Loaded	**Empty**	**Total**	**Loaded**	**Empty**	**Total**		
	(Thousand TEU)			**(Thousand (TEU))**				
1981	106.1	13.8	119.9	104.9	16.7	121.6	241.5	27.5
1985	133.4	65.9	199.3	194.5	6.6	201.1	400.4	65.8
1988	279.5	118.3	397.7	386.2	6.7	393.9	791.6	97.7
1991	—	—	—	—	—	—	11,170.7	47.9

Remark: TEU - Twenty-Foot Equivalent Unit Container
Source: Port Authority of Thailand

228

In 1986, the Port Authority of Thailand (PAT) issued licenses to construct and operate container terminals to four private operators: the Thai Prosperity Terminal Co., Ltd. (TPT), the Bangkok Modern Terminal Co., Ltd. (BMT), the Thai Maritime Navigation Co., Ltd. (TMN), and United Thai Shipping Co., Ltd. Since that time the first three operators (TPT, BMT, and TMN) have exercised their rights and constructed private facilities. Each private operator is restricted by the PAT license to handling a maximum annual quota of 70,000 TEUs. The TPT and BMT facilities include two berths totalling 455 meters in length and have an annual throughput capacity of 170,000 TEUs.

Klong Toey Port remains the largest Thai port in terms of both throughput and port area. In 1992, the port handled 1.24 million TEUs. In 1993, the present government issued a policy restricting the Klong Toey Port to an annual container throughput of one million TEUs. This policy was developed in order to induce the additional traffic to use the new Laem Chabang deep sea port and to relieve the current road traffic congestion traffic around the existing port area on Rama IV Road.

The anticipated transfer of containerized freight traffic from Bangkok to Laem Chabang has not met expectations. The primary reason has been that until August 1993, the State Railway of Thailand (SRT) had limited rail capacity and could only transport 70,000 TEUs from its container railhead at Bangsue, close to central Bangkok, to Laem Chabang. As a result, over 170,000 TEUs had to be transferred by road. However, this was not economical due to the extra transport costs for the truck haulage. The typical tariff for moving a TEU by road from Laem Chabang to Bangkok is approximately 3,000 baht/TEU, while the sea tariff for containers at Laem Chabang Port was only 500 baht/TEU lower than that charged at Klong Toey. Thus, the movement of containers by road from Laem Chabang to metropolitan Bangkok incurred a 2,500 baht/TEU cost penalty for anyone using the new port. Therefore, there is every likelihood that the container throughput at Klong Toey Port in 1993 will exceed the limit established by the Government.

In order to handle the increasing container traffic, the PAT is planning several port upgrades. Current projects include some repaving, construction of a dedicated storage yard, establishing three dedicated CFS facilities, demolishing sheds 11 and 12 to establish a new marshalling yard, and purchasing two ship/shore cranes to add to the 12 operational Metalna units, as well as 10-14 new rubber tired units. Investment in these upgrades suggests that the government's policy to limit the role of Klong Toey Port are less likely to be achieved in the near future.

The deep seaports at Laem Chabang and Map Ta Phut, have now been in service for more than a year. As discussed, these ports were designed to reduce the congestion of container traffic at Bangkok's Klong Toey Port, and the heavy concentration of industries around the metropolis. Additionally, these ports will be an efficient and competitive gateway to the country's northeastern region for transporting products directly to international markets without having to pass through Bangkok Port.

The government has designated Laem Chabang to be the primary alternative port to Bangkok. An earlier alternative was to develop the Sattahip Port [which, in 1986, was temporarily used by American President Lines (APL) to use in order to help ease the congestion at Klong Toey] into a full-scale commercial port at the suggestion of the World Bank. The decision to eliminate Sattahip was due to 1) the reluctance of the Royal Thai Navy to relinquish more of its nearby base and 2) national security reasons. Therefore, after the completion of Laem Chabang deep seaport in late 1990, the Sattahip Port was closed to commercial use.

Laem Chabang Seaport is located in Chonburi Province. It is 126 kms southeast of Bangkok and 10 kms north of Pattaya (see Exhibit V-17). The total area of the port is 10,000 rai. Space has been reserved for small and medium export-oriented light and labor intensive industries such as electronics, processed foods, and electrical appliances, which will not cause pollution to resort areas nearby. The port is designed to be a commercial deep seaport comprising a multipurpose terminal, a container terminal, and a bulk terminal.

Map Ta Phut Port is further southeast of Laem Chabang in Rayong Province (see Exhibit V-17). The total area of the port is approximately 20,000 *rai*. The purpose of this larger port is to provide space to serve the needs of several planned heavy industries, including a gas separation plant, a chemical fertilizer plant, a petrochemical complex, and a zinc processing plant. Most of the terminals in the port will be single-user terminals for those industries mentioned above, except for a multipurpose terminal that is planned for lease to a private operator.

The selection of Laem Chabang and Map Ta Phut as the locations to construct for the new ports were based on the following factors:

- The area contained a highway and rail infrastructure system superior to those in other alternative areas outside Bangkok. Therefore, a lower development cost was needed to construct additional infrastructure to serve the port and other transport activities.

- The soil in these locations, especially in Map Ta Phut, was unsuitable for agriculture. Therefore, using the land for industry and port operations was a better way to raise the standard of living of the local residents.

- The area was relatively unpopulated, thus reducing the number of relocations to make way for the construction.

Laem Chabang Deep Seaport was completed in December 1991 after four years of construction. It is under the control of the Port Authority of Thailand (PAT). The port consists of 7 terminals that can handle up to 7,253 million tons of cargo per year. The terminals are:

- A multipurpose terminal (terminal no. 1) with a capacity to handle cargo in both conventional form and containers of 510 thousand tons per year. The terminal can berth vessels up to 30,000 tons. The construction of this terminal was completed in December 1990. Operations began in January 1991.

- Three container terminals (terminal nos. 2, 3, and 4) have a combined cargo handling capacity of 4.5 million tons per year. Each terminal can accommodate container vessels of 30,000-50,000 tons (3,000 TEUs) and provides dockside berthing up to 300 meters. The storage yard extends 350 meters back from the wharf edge. The construction of these terminals was completed in August 1991.

- A terminal for coastal vessels and service vessels (terminal no. 5) up to 1,000 tons has cargo handling capacity of 163 thousand tons per year. Construction was completed in December 1991.

- Two agricultural bulk terminals (terminal nos. 6 and 7) have cargo handling capacity of 2.108 million tons. Each can accommodate vessels loaded with tapioca up to 70,000 tons and with sugar up to 40,000 tons. Construction of both terminals was completed in December 1991. They were intended for lease to the private sector.

Although progress in attracting container traffic has been slower than expected, the port at Laem Chabang is now beginning to make a significant impact on Thailand's containerized traffic. The port attracts regular calls from some key regional lines including: American President Lines (APL), Orient Overseas Container Line (OOCL), Regional Container Lines (RCL), and Evergreen Line.

It is expected that Laem Chabang will record container volumes of approximately 150,000-170,000 TEUs in 1993. For 1994, the PAT projects that container throughput will rise markedly to 320,000 TEUs. This dramatic increase is because most shipping companies are now occupying and operating their own terminals at Laem Chabang Port.

Evergreen's recent commitment to the port is reflected in its takeover as the sole lessee of terminal No. 2, which used to be under the operation of the PAT, through Evergreen Container Terminals Thailand (ECTT). ECTT is a joint venture controlled by Evergreen's Thai agent, Green Siam Co. Evergreen has transferred part of its regional feeder services, which should total 30,000-40,000 TEUs for 1993, to Laem Chabang. This service is projected to handle approximately 70,000 TEUs in 1994.

Regional Container Line has joined Mitsui OSK Line and NYK to form Thai International Port Services Co., Ltd. (TIPS) to lease and operate terminal no. 4. This combined operation is expected to generate 72,000 TEUs per year. Terminal no. 3, which is under the control of Eastern Sea Laem Chabang Terminal Co. (ESCO), now handles the container traffic of APL.

The construction of Map Ta Phut Port was completed in February 1992. This port is under the control of the Industrial Estates Authority of Thailand (IEAT).

The Map Ta Phut Port consists of:

- A multipurpose, common-use terminal which can accommodate vessels of 60,000 tons and can handle up to 1.169 million tons of cargo per year. This facility has been leased for 30 years to the Thai Prosperity Terminal Co., Ltd. (TPT), a private terminal operator. The main berth is 350 meters long with a draft of 10 meters. A storage shed covers 4,080 square meters, with open storage area of 75,000 square meters.

- Two liquid bulk terminals, each of which can accommodate vessels of 43,500 tons and can handle liquid cargo of 1.561 million tons per year.

232

- Two small liquid bulk terminals which can accommodate vessels of 8,000 tons. These liquid bulk terminals have been leased out to Thai Tank Co., Ltd. for its own purposes and factory production within the port.

Because most of the terminals at Map Ta Phut Port are privately owned, available data is limited. However, from the data available, it appears that the common-use, multipurpose terminal handled approximately 107,130 metric tons in 1992. The cargo consisted mostly of tin plate, steel coil, and iron scrap.

As a second development phase, the IEAT plans to build three more single- use liquid bulk terminals. These would be leased to Shell Oil Co., Ltd.; the Padaeng Industry Co., Ltd., which produces zinc; and the National Fertilizer Co., Ltd., to serve their own production activities in their factories in the port.

5. **Airports**

Air is a convenient and rapid transport mode. With the Thai economy expanding rapidly, the air transportation system in Thailand has had to expand accordingly in order to service the increased volume of trade, investment, and tourism.

Bangkok International Airport is the international gateway to Thailand and handles one of the largest volumes of air traffic in Southeast and East Asia. During the past six years, the number of passengers at Bangkok International Airport at Don Muang (BKK) has increased an average of 16 percent a year, while international air freight has grown an average of 18.2 percent a year. Annual aircraft movements at BKK have increased from an average of 48,200 in 1986 to 78,800 in 1990. According to an unpublished study for the master plan for the proposed Second Bangkok International Airport, it is predicted that total traffic in 2010 could be as high as 58 million passengers. In the interim, the physical capacity and area for expansion purposes at Don Muang is extremely limited, and can be expected to reach the saturation point by the year 2000. Even when expanded to its maximum capacity, Bangkok International airport will be able to service only 20-25 million international passengers a year.

In order to meet the forecasted demand, the Government has identified a series of projects to improve and develop air transportation capability in Thailand. The program will be implemented in two phases. The first phase calls for improvement and development of Bangkok International Airport to enable it to handle international air transportation needs up to the year 2000. The majority of projects included in this phase are to enhance the airport's existing facilities,

including runways, taxiways, aircraft parking aprons, international and domestic passenger terminals, and freight warehouses.

The second phase includes the government's long-term project to build a Second Bankok International Airport (SBIA). The SBIA will be completed and open when the present Bangkok International Airport reaches its saturation point in the year 2000. The Cabinet approved the construction of the second international commercial airport on May 7, 1991. The site selected is at Nong Ngu Hao, 30 kilometers to the east of downtown Bangkok, and comprises an area of 20,000 *rai*. The SBIA project is expected to take approximately 7.5 years to consruct and initial estimates anticipate a cost of nearly $2.5 billion (US).

Domestic air traffic has also grown rapidly (see Exhibit V-23). Between 1981 and 1990, the number of flights increased by 188 percent, the number of passengers grew by 482 percent, and the amount of air cargo expanded by 734 percent. These dramatic figures are due not only to growth at individual airports, but also to the increase in the number of domestic airports. In 1981, eighteen airports supported domestic air services throughout Thailand; by 1990 that number had increased to 25.

Bangkok is the hub for domestic air services in Thailand. Only a few domestic flights bypass Bangkok. An examination of Bangkok Airport traffic illustrates how fast domestic air services have grown in Thailand. During the same 1981-1990 period domestic flights at Bangkok increased by 341 percent, passenger traffic grew by 568 percent, and air cargo traffic expanded by 972 percent. The growth of air cargo traffic illustrates the development of both the domestic economy and the participation of Thailand in the international marketplace with high-value goods.

While passenger traffic at Hat Yai only increased by 89 percent between 1981 and 1990, air cargo traffic grew by 672 percent, illustrating the growing industrialization of the southern part of the Kingdom. In the north, Chiang Mai recorded an increase of 371 percent in passengers and 868 percent in air cargo traffic in the same period. Even Phuket, long revered as a tourist destination, experienced a growth in passenger traffic of 755 percent and a 1,663 percent increase in cargo traffic. These three airports and Bangkok International Airport are operated by the Airport Authority of Thailand (AAT).

234

The Department of Aviation (DOA) has responsibility for the other 21 domestic airports as listed in Exhibit V-23. Among the 21 airports, 16 have regularly scheduled traffic. A detailed analysis of these facilities is presented in Chapter IX.

The Government plans to develop and improve additional air transport facilities as a means to distribute development throughout the country. The plan includes the upgrading of several provincial airports to support international capability. These include the airports at U-Tapao, Chiang Rai, and Ubon Ratchathani.

Improvements to the airport at Chiang Rai will support tourism between the north of Thailand and southern China and will be a support facility to strengthen the economic integration of the four countries: Thailand, Myanmar, China, and Laos.

Air service continues to become a more important component of the Thai transport sector. The role of Bangkok as a major international airport is well recognized, but, as illustrated in the preceding exhibit, domestic air services are also growing. As this transport sector is increasingly used, the capacity of the airports must be re-examined and augmented to facilitate the continued economic growth of the Kingdom.

Exhibit V-23
Domestic Air Traffic
(1981-1990)

Airport	No. of Flights				No. of Passengers (Thousands)				Freight (Tons)			
	1981	1985	1988	1990	1981	1985	1988	1990	1981	1985	1988	1990
Bangkok	6,956	10,656	17,286	30,657	518,649	921,114	2,114,047	3,466,422	1,209	2,769	10,231	12,956
Chiang Mai	5,104	9,425	8,631	11,676	283,267	554,066	906,707	1,333,102	523	1,870	3,716	5,062
Mae Hong Son	730	1,674	1,738	1,692	22,987	43,038	49,737	95,512	134	183	228	191
Chiang Rai	714	1,662	1,868	2,828	16,182	36,503	52,506	166,931	97	148	197	371
Lampang	912	824	222	732	4,032	2,942	1,213	31,081	74	47	22	68
Phrae	1,450	1,480	1,382	1,430	9,174	8,384	7,651	10,191	59	81	73	49
Nan	818	1,508	1,004	1,408	6,306	9,433	6,434	12,090	41	43	53	59
Tak	-	1,054	799	726	-	3,480	1,876	2,330	-	9	8	7
Mae Sot	-	1,058	808	738	-	7,791	7,226	10,454	-	25	50	51
Phitsanulok	2,164	2,838	2,870	4,202	37,615	95,982	105,847	144,368	210	342	322	275
Khon Kaen	1,310	2,811	1,909	2,883	17,408	78,547	88,591	169,786	81	119	207	241
Udon Thani	840	743	736	947	13,716	34,215	34,719	63,545	56	48	55	74
Ubon Ratchatthani	312	723	726	792	5,602	25,567	29,806	48,872	17	33	55	66
Loei	50	70	290	302	376	703	3,065	3,910	2	1	5	6
Sakon Nakhon	-	72	542	949	-	1,278	7,302	15,862	-	1	22	23
Nakon Ratchasima	-	-	532	1,214	-	-	6,326	33,091	-	-	-	31
Phuket	3,500	5,885	7,718	10,762	159,501	385,098	856,669	1,364,475	204	724	3,287	3,596
Surat Thani	628	2,018	2,847	4,797	11,864	66,942	142,996	176,287	15	125	454	750
Nakhon Si Thammarat	-	752	704	785	-	5,359	8,051	10,675	-	17	70	92
Trang	1,460	1,452	733	884	14,895	13,634	11,318	18,964	84	79	135	134
Hat Yai	4,152	6,761	3,667	4,937	196,847	363,764	271,449	371,793	485	1,263	3,614	3,743
Pattani	358	204	218	276	2,704	1,083	475	1,226	32	34	22	15
Narathiwat	312	408	408	384	4,495	5,099	3,780	5,355	18	29	29	16
Koh Samui	-	-	-	5,010	-	-	-	154,228	-	-	-	-
U-Tapao	-	-	-	208	-	-	-	3,545	-	-	-	-
TOTAL	31,770	54,078	57,638	91,411	1,325,620	2,664,022	4,717,198	7,717,198	3,341	7,990	22,855	27,876

E. GOVERNMENT POLICY

1. Review

During the Sixth Plan period, Thai economic growth skyrocketed with gross domestic product (GDP) expanding at an average of 10.5 percent per year. This rate was twice as high as the Plan target, representing the highest average growth rate in the past 25 years.

Now in its Seventh National Plan period, the Thai economic structure has become more outward-oriented and internationalized, as indicated by the increase in the proportion of international trade contribution to GDP from 60 percent in 1986 to 80 percent by 1991. To a certain extent, while Thailand has become more dynamic in taking up opportunities in the global market, it has also become more vulnerable to the fluctuations taking place in such markets.

Key factors that have brought about the high growth rates include growth of the export sector, investment, and tourism, all of which have grown considerably faster than the projected rates. World economic conditions were also conducive to Thailand's economic expansion, in particular the lower oil prices and lower interest rates. At the same time, the increase in world commodity prices and the realignment of foreign exchange rates of industrialized countries brought further benefits during this period. Comparative advantages in natural and human resources, and reasonably low wages make Thailand highly competitive in the world market, leading to further expansion of investment and exports.

The country's fiscal and monetary position is characterized by stability. However, the overall development pattern is still unbalanced for a number of reasons:

- Income disparities among households of different socioeconomic status and between rural and urban areas have increased to an alarming level.

- Infrastructure bottlenecks have become more severe during the Sixth Plan period. Virtually all types of basic infrastructure services were inadequate to meet the strong demand resulting from the rapidly growing economy. This was the case despite special additional investment programs undertaken during the Sixth Plan period.

  In addition, the policy to promote private sector construction and operation of infrastructure services has not been implemented in an effective and timely manner, impeding both current and future development efforts.

- The savings and investment gap has widened.
- Thai society has had a greater difficulty adjusting to the new economic changes.
- The country has seen a deterioration of natural resources and the environment.
- The Thai bureaucratic system has had difficulty making timely adjustments to change and in responding to national and social transformation.

In summary, the Thai economy has been able to grow with a respectable degree of stability and security, providing a generally better standard of living for the people. However, the exceptionally high economic growth rates have led to the imbalances mentioned above, which will be obstacles and constraints for high quality and sustainable development in the long term. Therefore, the Seventh Plan should define an appropriate direction for development to serve as a firm foundation for well-balanced and sustainable growth.

2. **Main Development Objectives of the Seventh Plan**

An evaluation of past development efforts suggested that the development objectives of the Seventh Plan should be carefully balanced in terms of quantitative and qualitative development dimensions, as well as social equity, in order to bring about more sustainable development for the country. With this in mind, the three main development objectives of the Seventh Plan have been set out as follows:

- To maintain economic growth rates at appropriate levels to ensure sustainability and stability.
- To redistribute income and decentralize development to the regions and rural areas.
- To accelerate the development of human resources and upgrade the quality of life, the environment, and natural resource management.

238

3. **Thailand's Development Strategies to Achieve Sustainable Growth and Competitiveness**

Recent shifts in competitive advantage to East Asia and the emergence of the new economic force of the Chinese Economic Area (CEA) have presented Thailand with a new set of challenges and prospects for the rest of the 1990s.

The most important strategic question at present is how Thailand's current economic growth can be sustained and its competitiveness be retained. To respond to this question, Thailand must overcome constraints in several areas, open new avenues for development, and take advantage of new opportunities. These include:

- East Asian economies are expected to grow at a significantly higher rate than other regions of the world during the rest of the 1990s. China and the CEA are the principal cause of the region's high growth prospects due to their characteristics of growing economic mass. Exports will still be a central driving force behind the high growth rate in the East Asian region, although domestic demand is expected to become more important in high-income countries such as Korea and Thailand. Trade within East Asia is expected to grow in the seven to eight percent range according to recent World Bank projections Thus, there are continued bright prospects in Thailand for further export promotion and trade.

- Opportunities to promote sub-regional economic cooperation among the six Mekong Basin countries, as well as with the Growth Triangle among southern Thailand, northern Sumatra (Indonesia), and northern Malaysia, are now well under way. This should enhance cross-border trade and investment flows with a high probability that these subregions can become new centers of economic growth near the year 2000. Thailand can play a very important role to realize this sub-regional economic cooperation.

- Opportunities to further expand and diversify the Thai industrial base still exist through general deepening and upgrading of industrial structure both in terms of export-oriented and import-substitution industries, especially the six target industries identified in the current Seventh Plan. These include the agro-industry, textiles and garments, automotive and engineering industry, electronics industry, petrochemical industry, and the iron and steel industry.

- There should be greater emphasis on building backward linkages by encouraging the "manufacture" of machinery, parts, and equipment rather

than concentrating on the "assembly" of these components. There must be a shift from simple to higher-technology industries. The Thai economy can no longer depend on cheap labor as the source of industrial growth.

- The promotion of rural industries reflects the latest shift in the Government's priority. Recent changes in the Board of Investment's promotion criteria has emphasized subcontracting to encourage industrial growth in rural areas. These key elements of industrial policy would strengthen backward linkages from the urban to rural manufacturing sectors.

- The economy must accumulate more physical and human capital if Thailand wants to widen and deepen its industrial structure. It needs to be more capital intensive and more skill intensive as well. Thailand faces increased competition from two directions. On one side, modern automated production methods are helping developed economies regain a competitive advantage in some of the more labor intensive products that Thailand is currently exporting. On the other side, less developed economies in this region can provide cheaper labor to compete more intensely in labor-intensive light manufactured products that Thailand currently exports.

- The policies to further liberalize the financial sector and the foreign exchange market, and to develop capital markets, will improve financial and capital market structures and efficiency. This will enhance Thailand's international competitiveness by reducing financing costs and increasing flexibility, and thus promote Thailand as the region's economic and financial center.

F. SOCIAL STRUCTURE

Thailand's current population is approximately 60 million. Forty-seven percent of the population is female. The population growth rate has constantly declined from about 3.0 percent per annum during the 1970s to only 1.4 percent at present and is expected to reach replacement level before the year 2000. The low population growth rate has reduced the proportion of children in the age group of 0-14 years. Hence, the future labor force is expected to grow at a declining rate of 1.6 percent annually, compared with 2.5 percent during the early 1980s, resulting in a reduction of new entrants to the labor market each year of 790,000 in 1989 to 559,000 in 1993 and 420,000 as Thailand approaches the year 2000 (see Exhibit V-24).

240

Exhibit V-24
Projected Population, Labor Force, Employment and Unemployment 1977-2000 (Unit: Thousand)

Category	1977	1980	1985	1990	1995	2000	Avg. Annual Growth Rate 1992-1996 (%)
Population	44,273	49,961	51,796	56,303	60,206	64,110	1.17
Labor Force	21,673	23,916	27,116	31,749	34,512	40,620	1.6
Employed Persons	20,766	23,637	25,853	30,843	34,359	39,400	2.29
Open Unemployment	132	183	280	350	163	153	0.84
Open Unemployment Rate (%)	0.61	0.77	1.03	0.58	0.47	0.42	0.48

Source: Human Resources Planning Division, NESDB.

The high rate of economic growth has led to a corresponding increase in labor demand causing the unemployment rate to continuously decline from 1.2 percent of the labor force in 1982 to only 0.50 percent in 1992. The unemployment rate is expected to drop to 0.42 percent as Thailand moves towards the year 2000. Thus, unemployment will likely cease to be an important issue in the country. However, the shortage of qualified manpower to meet the increasing demand for skilled labor will be a major constraint to sustainable growth and the development of Thailand in the future.

As Thailand approaches the year 2000, it is clear that human resources and technology will be key factors in developing an increase in future production capacity, productivity, and competitiveness in the world economy.

The rapid economic expansion and the changing production structure oriented towards the industrial, service, and modern agricultural sectors has led to severe shortages in science and technology manpower, particularly engineers, technicians, and skilled craftsmen. It is estimated that by the year 2000, more than 70 percent of the country's work force will still have only primary education even if Thailand could achieve universal secondary education.
When considering recent export performance, it is clear that future demand will be for a highly educated work force to produce high technology products for exports. Hence, shortages of skilled manpower, especially in the area of science and technology, which are now already evident, will continue well into the year 2000.

A review of export performance during the recent past indicates that labor-intensive export products such as garments, leather goods, furniture, and canned foods, etc., are now becoming less competitive in the world market, while more capital and technology intensive products like electrical appliances and computer parts still have good prospects. This is an indication that Thailand is now moving towards the final stage of labor-intensive industrial development. In order to strengthen its international competitive position in the future, Thailand will have to rely more on productivity improvements that cannot be achieved without the application of more advanced technology and the development of human resources.

G. SUMMARY

The Kingdom of Thailand has become a major economic power, not only within Southeast Asia, but on a worldwide scale. In spite of many factors which could have reduced growth and expansion, the Kingdom, through unique combinations of public and private agencies and individuals, has continued its growth.

The beneficial location of Thailand, in the middle of Southeast Asia, cannot be overstated. It sits astride both the north-south and east-west transport corridors. Its high literacy level, excellent communications and transport facilities, and stable economy and government, make it an excellent base from which to serve the surrounding markets.

There are many issues to be dealt with in order to continue the economic and social development of the Kingdom. These include increasing the number of technically trained graduates to meet the industrial and service demands of the next century; distributing economic development away from Bangkok to not only spread economic wealth, but to make Bangkok a more attractive and workable city; and the development of higher technology based industries with higher local content, need to be addressed.

The growth which has already occurred has not come without increased burdens. As identified in the 1990 World Competitiveness Report, Thailand is regarded as one of the leading nations for its long term economic growth potential. However, the existing transport, telecommunications and power services and facilities are now limiting further growth.

The increased congestion within the Bangkok metropolitan area is threatening to stifle growth. The expansion of trade is overwhelming existing facilities, particularly Bangkok Port and Bangkok International Airport. In spite of efforts to develop an alternative port at Laem Chabang, surface access, both road and rail, have limited the

242

growth of that port. As a result, special projects have been initiated by the port directors at Bangkok Port to handle the continuing increase in traffic. However, while these new facilities are expected to meet most of the needs, the traffic congestion outside of the port threatens to reduce the value of investments inside the port.

The addition of new roads and the upgrade of rail in the Eastern Seaboard are desperately required in order to facilitate a shift of traffic to Laem Chabang, which will not only relieve congestion at Klong Toey, but will also improve traffic conditions in Bangkok.

The development of the Second Bangkok International Airport at Nong Ngu Hao will relieve congestion at Don Muang. However, as illustrated in an examination of airports elsewhere in the Kingdom, there is a need to continually upgrade facilities throughout the country. While some international traffic now goes to Chiang Mai, Phuket and U-Tapao, that volume should be increased in order to relieve the pressure on Bangkok.

The basis for an excellent rail and road network serving the needs of the Kingdom, and also the region are in place. Numerous programs and plans have been initiated to expand the road network, but there is much work to be done to make the rail system more viable. One rail issue that must be addressed is whether a wholesale conversion of the track gauge from 1.0 meter to standard gauge should be made to make the rail system more viable for handling large volumes of freight and passenger traffic at higher speeds. While such a conversion would be costly, it would shift a considerable amount of traffic off highways, particularly for longer-distance moves. It would also ensure that Thailand would remain a major rail link for the region, particularly if both Malaysia and Vietnam also convert their rail systems.

The headlong rush for economic development also has produced a negative impact on the Thai environment. Fresh water is becoming a scarce commodity due to the uncontrolled logging that has eliminated many of the natural reservoirs in the north. Water and air pollution in the Bangkok area is unfortunately regarded as among the the worst in the world. In the long term, these conditions will have a debilitating effect on the population, and will contribute to higher costs and lower productivity. The environment of Thailand must be given much stronger consideration as industrialization is brought to the other regions of the country.

In spite of these burdens, the real potential for Thailand to continue to develop as a major economic power remains in the spirit of its people, the political leadership, and the entrepreneurial nature of its business leaders.

Chapter VI
Market Forecasts for a Thailand Global Transpark

VI. MARKET FORECASTS FOR A THAILAND GLOBAL TRANSPARK

A. INTRODUCTION

This chapter presents the industrial activity forecasts developed for the proposed Thailand Global Transpark. The primary focus of this analysis is on the projected trends in air cargo production activity in the Southeast Asian region and the potential for attracting such cargo to a Global Transpark.

The forecast process is divided into four sections. The first section examines general economic, industrial, trade and transportation trends for the region. The remaining sections integrate the available data and analysis to produce the forecasts.

B. GENERAL ECONOMIC TRENDS

1. Southeast Asia

Southeast Asia continues to experience extraordinary growth in both economic and demographic terms. From 1985 to 1992, total population grew an average of 1.9 percent per year (Exhibit VI-1). The total labor force grew at a slightly higher rate of 2.0 percent per year with non-agricultural labor expanding at 3.3 percent per year, an indication of increased industrialization.

Total production growth has exceeded population growth as shown in Exhibit VI-2. Average GNP growth from 1980 to 1989 (in current U.S. dollars) averaged 5.2 percent per year for Thailand and other ASEAN countries. Singapore experienced the highest growth at 11 percent per year with Indonesia and the Philippines trailing at 2.8 percent per year. Projected 1993 GNP growth continues to be strong, ranging from 8.0 percent for Malaysia and 7.6 percent for Thailand to 3.6 percent for the Philippines.

245

Exhibit VI-1 **Southeast Asian Population and Labor Force (1985-1992)**			
	1985 (millions)	**1992 (millions)**	**Average Annual Growth**
Population			
Thailand	51.6	57.2	1.3%
Southeast Asia*	108.3	126.2	1.9%
Total Labor Force			
Thailand	26.6	30.6	1.7%
Southeast Asia*	167.5	195.6	2.0%
Non-Agricultural Labor Force			
Thailand	8.6	11.3	3.5%
Southeast Asia*	73.6	95.1	3.3%

*Excludes Brunei
Source: Appendix 3, Table 1

Exhibit VI-2 **Economic Growth Trends for ASEAN Countries**		
GNP (Current $)	**1980-1989**	**1993***
Thailand	9.0%	7.6%
Singapore	11.0%	5.6%
Indonesia	2.8%	6.8%
Malaysia	5.4%	8.0%
Philippines	2.8%	3.6%

*Projected
Source: Appendix 3, Table 2

246

2. Thailand

The strong growth in Thailand's economy throughout the last two decades has resulted from increased development in the manufacturing sector. As shown in Exhibit VI-3, real GDP grew at an average rate of 7.3 percent from 1970 to 1990, while the manufacturing share grew from 16.0 percent to 24.7 percent. The increased industrialized development of Thailand is also indicated by the increased share of private consumption expenditures related to standard of living components such as clothing, furniture and transportation (see Exhibit VI-4). The government's share of consumption declined over the same period.

C. INDUSTRIAL STRUCTURE, GROWTH AND INVESTMENT

1. Southeast Asia

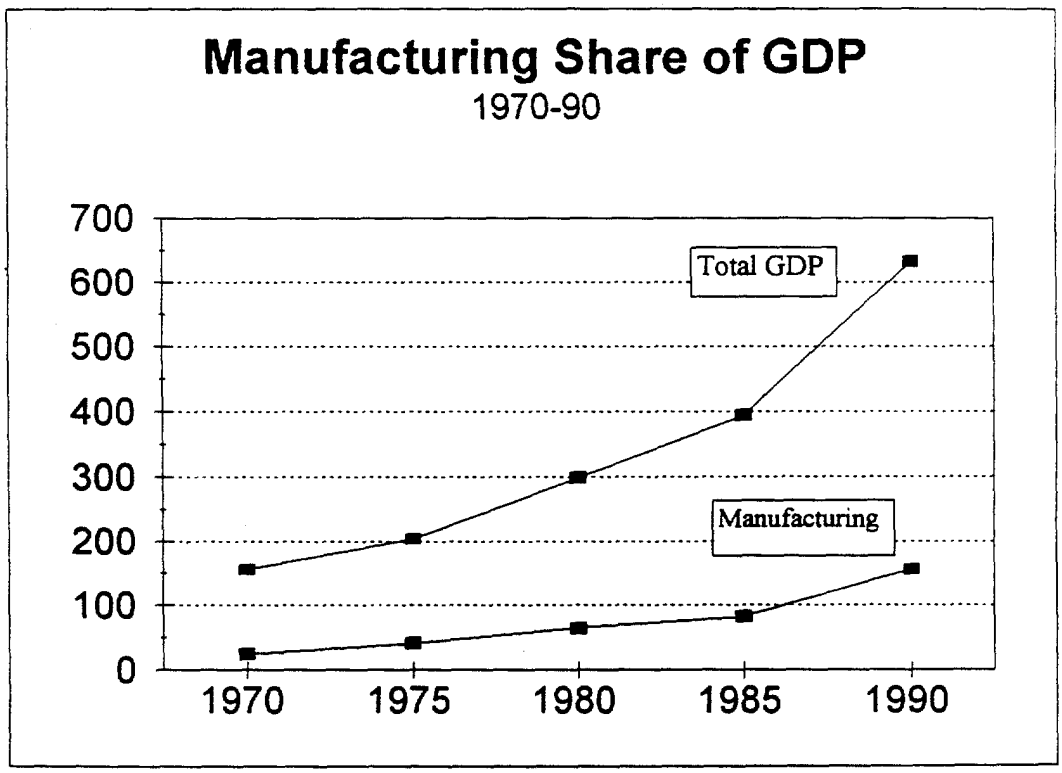
The increasing industrialization of Southeast Asia is reflected by a decreased reliance on agricultural production and by the expansion of the manufacturing activity. Much of the success in economic development for this region has resulted from aggressive policies to attract foreign investment. As shown in Exhibit VI-5, over $35 billion (US) of foreign investment was either approved or committed over the two year period from 1990 to 1991 with about two-thirds of the investment in the manufacturing sector. Indonesia and Malaysia were the leading recipients with nearly $30 billion (US) of the total funds, during that time frame.

The top investing countries have been Japan (22 percent of total) and the newly industrialized countries of South Korea, Taiwan, and Hong Kong. The United States accounted for almost 8 percent of total funding, while Europe and other ASEAN countries were responsible for 5.7 percent and 2.5 percent respectively. While industry-specific data is limited, available information has indicated that the chemical sector accounted for over 10 percent of the Indonesia, Malaysia and Singapore manufacturing investment with electronics and textiles also prominent.

Exhibit VI-3

Thailand's Gross Domestic Product (1970-1990)

	1970	1975	1980	1985	1990	Average Growth 1970-90
GDP (1972 Prices)						
Total	155.7	204.4	299.5	394.1	631.6	7.3%
Manufacturing	24.9	40.7	65.0	81.5	156.0	9.6%
Percent of Total GDP	16.0%	19.9%	21.7%	20.7%	24.7%	



348

Exhibit VI-4

Thailand's Consumption Expenditures (1970-1990)

Consumption Expenditures (% of Total)	1970	1975	1980	1985	1990	Share Chan 1970-90
Private Consumption						
Clothing	7.9%	9.1%	9.8%	11.1%	12.8%	4 9%
Furniture, Furnishings & Household Eq.	3.0%	2.9%	3.9%	4.1%	5.9%	2.9%
Transportation & Communication	6.5%	6.5%	7.8%	8.5%	10.4%	3.9%
Recreation and Entertainment	12.1%	8.5%	9.7%	10.2%	11.7%	-0.4%
All Other	56.7%	60.1%	53.1%	48.4%	45.0%	-11 7%
	86.2%	87.1%	84.3%	82.3%	85.8%	-0.4%
General Government	13.8%	12.9%	15.7%	17.7%	14.2%	0.4%

Foreign investment in the region should expand with the opening of the centrally planned economies of Vietnam, Laos, Cambodia and Myanmar. An estimated $17 million (US) was invested in the manufacturing sector of Myanmar from 1989 to 1992, while there are over 200 proposals totaling $700 million (US) which are under review by the Cambodian government.

Selected major investment projects in Singapore, Burma(Myanmar)and Indonesia during the period of 1989 through 1992 are shown in Exhibit VI-6. Investment amounts range from $4 million (US) to $330 million (US) over a multiyear period. As shown, there is substantial investment in high technology manufacturing and engineering facilities in the region by major multi-national companies. Examples of other major investments in the region include:

- Intel is doubling the production capacity of a semiconductor facility in the Philippines with a $107 million (US) investment.

- A French joint venture has proposed investing $80 million (US) in an Airbus maintenance center in the northeast region of Thailand.

The growth in U.S. direct investment in the region was indicative of general trends in development (see Exhibits VI-7 and VI-8). Total investment in ASEAN countries rose from $7.3 billion (US) in 1982 to $16.6 billion (US) in 1992, averaging growth of 8.5 percent per year. Singapore was the largest recipient with 39.8 percent of regional investment followed by Indonesia and Thailand. The regional share of total U.S. investment abroad rose from 5.8 percent to 6.6 percent over the ten-year period.

Exhibit VI-5

Foreign Investment in Southeast Asia (1990-91)

	Thailand	Singapore	Indonesia	Malaysia	Philippines	Total
Total New Foreign Investment (Mil. US$)	$2,717	$2,648	$17,529	$12,391	$611	$35,897
Manufacturing Total	$1,253	$2,399	$7,926	$12,391	$408	$24,377
Manufacturing Percent of Total	46.1%	90.6%	45.2%	100.0%	66.8%	67.9%
Measurement Type	BOI Applications	Net Commitments	Approvals incl Expan	Approvals (excl O&G)	Equity Investment	
By Country/World Region						
Japan	31.4%	30.3%	18.1%	22.0%	43.1%	21.8%
ASEAN	1.5%	0.0%	0.0%	6.9%	1.9%	2.5%
Other Asia	24.1%	0.0%	22.6%	36.4%	15.9%	25.7%
Europe	NA	24.0%	7.7%	0.0%	10.8%	5.7%
U.S.	11.7%	43.2%	2.5%	6.8%	18.4%	7.9%
Not Specified	31.3%	2.5%	49.1%	28.0%	9.8%	36.4%
				Mfg. Only		
By Manufacturing Industry Group						
Textiles	NA	0.3%	6.1%	3.7%	NA	
Chemicals	NA	18.5%	10.5%	11.9%	NA	
Transport	NA	5.1%	NA	1.5%	NA	
Electronics	NA	50.1%	NA	16.5%	NA	
Machinery & Equipment	NA	15.7%	NA	NA	NA	

Source: U.S. Department of State, Investment Climate Statements

251

Exhibit VI-6

Major Foreign Investment in Selected Southeast Asian Countries

Industry	Investor	Nature of Investment	Investment Value (Mil. US$)		Country
Singapore (1990)					
Pharmaceuticals	Glaxo	Process Development/Technical Support Center	$13		UK
	Glaxo	Multi-Purpose Plant	$110		UK
	Fisons	Chemical Production Facility	$55		UK
			$178		
Engineering	Dowty Aerospace	Repair/Overhaul Plant	$15		
Precision Engineering	Seiko	Watch Movement Manufacturing	$31	*	Japan
	Matsushita Technology	Hi-Tech Automatic Insertion Equipment	$11	*	Japan
	Hellermann ASEAN	Insulation/Protection Product Plant	$6		Germany
	Heraeus Precision Engineering	Integrated Leadframe Plant	$11		Japan
	Possehl Electronic	Leadframe Toolmaking/Stamping	$5		Germany
			$63		
Computer Systems/ Peripherals	Apple Singapore	Automated Storage/Retrieval System	$6	*	USA
	Compaq Asia	Computer Systems Assembly	$30		USA
	Seagate Technology	Disk Drive Production	$110		USA
	Sony	Display Device Automated CPT Facility	$193		Japan
			$338		
Instrumentation	Rosemount	Process Control Systems	$4		USA
PCB Assembly	Dyna-Mech Electronices	SMT Equipment/Factory	$11	*	UK
Semiconductors	Tech Semiconductor	DRAM Production (Multi-Year)	$330		USA
	NEC Electronics	Assembly/Test Facility	$11		Japan
			$341		
	Country Total		$950		
Burma (1989-92)					
Electronics & Other	Siemens	Electronics & Communications Equipment	NA		Germany
	Daewoo	Electronics, Garments & Timber	$14		So. Korea
			$14		
Indonesia (1992 Approvals)					
Miscellaneous		Compressor Factory	$44		Japan
		Electronic Component Subassembly	$121		Singapore
		Polypropolene Factory	$230		UK
			$395		

* Expansion

Source: U.S. Department of State, Investment Climate Statements

252

Exhibit VI-7
U.S. Direct Investment in Southeast Asia
By Country (1982-92)

	1982		1992		Annual Growth 1982-92
	Value (Mil. US $)	% of Total	Value (Mil. US $)	% of Total	
Thailand	$780	0.106	$2,459	0.148	0.122
Indonesia	2295	31.3	4278	25.7	6.4
Malaysia	1221	16.7	1741	10.3	0.034
Philippines	1315	17.9	1565	9.4	1.8
Singapore	1720	23.5	6631	39.8	14.4
Total	$7,331	1	$16,645	1	0.085
% of World Total	0.058		0.066		

Source: Appendix 3, Table 3

Exhibit VI-8
U.S. Direct Investment in Southeast Asia
By Manufacturing Industry (1982-92)

	1982		1992		Annual Growth 1982-92
	Value (Mil. $US)	% of Total	Value (Mil. $US)	% of Total	
Food & Kindred Products	37	2.3%	422	6.9%	27.6%
Chemicals & Allied Products	266	17.0	984	16.0	14.0
Electric & Electronic Equip.	702	45.0	2,486	40.4	13.5
All Other	516	33.1	2,257	36.7	15.9
Total - Manufacturing	1,561	100%	6,149	100%	15.0%
% of All Industries	21.2%		36.9%		

Source: Appendix 3, Table 3

The breakdown of U.S. manufacturing investment by sector shows "electric and electronic equipment" as the leading industry with 40.4 percent of total 1992 investment. Total investment in this industry grew 13.5 percent per year from 1982 to 1992. "Chemicals" and "food and kindred products" accounted for 16 percent and 7 percent of investment respectively. Manufacturing's share of total investment rose from 21 percent in 1982 to 37 percent in 1992.

2. **Thailand**

Industrial policy in Thailand has been directed towards a shift from an agriculture-based economy to an industrialized one. At the same time, policies have have been developed to expand industrial development outside the Bangkok region.

As previously indicated, the manufacturing share of Gross Domestic Product has risen from 16 percent in 1970 to nearly 25 percent in 1990. Since 1985, the non-agricultural labor force has grown an average of 3.5 percent per year as compared to 1.7 percent on the whole. Exhibit VI-9 indicates that 14.1 percent of the total labor force was in the manufacturing sector in 1990, with 51.3 percent of employment still in agriculture.

Exhibit VI-9
Manufacturing Share of Thailand Employment by Region and Area (1990)

	Share of Employment (%)				Regional Share of Employment (%)	
	Manufacturing			Agri-cultural	Manu-facturing	All Sectors
	Combined	Municipal	Non-Municipal			
Bangkok	28.7	28.7	NA	1.7	23.9	10.8
Central Region	21.3	19.8	21.5	41.8	34.2	22.0
Northern Region	8.7	13.7	8.2	60.1	12.6	20.8
Northeastern Region	9.6	12.3	9.5	66.6	21.5	34.0
Southeastern Region	8.1	14.5	7.3	60.0	7.8	12.4
Total	**14.1%**	**23.8%**	**11.9%**	**51.3%**	**100%**	**100%**

Source: Office of the Prime Minister, National Statistical Office, Report of the Labor Force Survey: Whole Kingdom (February 1991)

The Bangkok metropolitan area has the highest concentration of manufacturing activity in Thailand. The area accounts for nearly one-quarter of the country's total manufacturing employment. The Central Region also has a relatively high share of manufacturing activity (21 percent of regional employment; 34 percent of Thailand's manufacturing employment) with a higher concentration in non-municipal areas. The other regions are primarily agriculture-based with less than 10 percent of employment in manufacturing.

Throughout the Kingdom the total number of industrial plants rose 5 percent from 1990 to 1992 with Bangkok accounting for 20 percent of the 1992 total. Thailand had a high share of industrial activity in primary food production (Exhibit VI-10) as rice mills accounted for 44 percent of total plants in 1992. The majority of the rice mills were located outside of the Bangkok metropolitan region, closer to the growing areas.

Exhibit VI-10 **Total Plants in Thailand for Selected Industries (1990-92)**					
	1990	**1992**	**% of 1992 Total**	**% Change 1990-92**	**BKK % of 1992 Total**
Rice Mills	45,956	45,328	43.7	-1.4	0.3
All Other	53,039	58,494	56.3	10.3	35.6
Total - All Industries	**98,995**	**103,822**	**100.0**	**4.9**	**20.2**
Garments	1,896	2,150	2.1	13.4	88.0
Shoes & Footwear	367	425	0.4	15.8	78.6
Vegetables/Fruit	332	381	0.4	14.8	14.4
Electronic Products	331	369	0.4	11.5	60.2
Other Selected Industries	1,653	1,864	1.8	12.8	56.5
Total - Air-Oriented Industries	**4,579**	**5,189**	**5.0%**	**13.3%**	**68.5%**

Note: Covers plants authorized under the Law of 1992.
Source: Appendix 3, Table 4

The concentration for selected air-oriented industries is primarily in the Bangkok area.[1] Top industries include the manufacture of garments, shoes and footwear, processing of vegetables and fruits, and production of miscellaneous electronic products. Growth in these industries from 1990 to 1992 was above average for all plants (excluding rice mills).

As shown in Exhibit VI-11, policies to promote de-centralization of industrial activity away from Bangkok are having an effect. Growth in total plants (excluding rice mills) from 1990 to 1992 was highest in the Central and Northern Regions with Bangkok experiencing net growth of only 5.5 percent.

[1] Air-oriented industries were identified based on trade and transportation data sources and included perishables, non-durables (e.g., garments, footwear), and electronic products.

352

Exhibit VI-11
Total Plants in Thailand by Location (1990-92)
(Excluding Rice Mills)

	% of 1992 Total	% Change 1990-92
Bangkok	35.6	5.5
Central Region	25.5	17.3
Eastern Region	6.0	6.2
Northern Region	10.5	12.2
Northeastern Region	14.7	9.8
Southern Region	7.6	13.1
Total	**100%**	**10.3%**

Note: Covers plants authorized under the Law of 1992.
Source: Appendix 3, Table 5

New plant activity in 1992 included 5,139 new facilities accounting for 186,137 jobs (Exhibit VI-12). Average employment per plant was 36. The air-oriented industries accounted for over 12 percent of total new plants and 16 percent of new employment. The top growth industries included garments, gems and jewelry, shoes and footwear, and electronic products. Average plant size for these industries was 48 employees with selected industries having significantly larger employment levels (e.g., tools and toys, shoes and footwear). That average was 33 percent higher than the overall average.

257

Exhibit VI-12 **New Plants in Thailand for Selected Industries (1992)**			
	No. of New Plants	**Total Employment**	**Average Employment Per Plant**
Garments	300	5,977	20
Gems & Jewelry	90	3,307	37
Shoes & Footwear	74	8,139	110
Electronic Products	44	1,732	39
Misc. Tools & Toys	42	7,062	168
Chemical Products	26	440	17
Total - Air-Oriented	**640**	**30,476**	**48**
Air-Oriented % of Total - All Industries	**12.5**	**16.4**	—
Total - All Industries	**5,139**	**186,137**	**36**

Note: Includes plants authorized under Laws of 1969 and 1992.
Source: Appendix 3, Table 6

D. FOREIGN TRADE

1. Southeast Asia

The economic growth of Southeast Asia has mirrored the expansion of worldwide trade for the region. As shown in Exhibit VI-13, Southeast Asia accounted for about 5 percent of total world export and import value in 1992, and experienced above-average growth (in current dollars) between 1981 and 1991. Singapore was the top regional trading country with 35 percent of export value and 38 percent of import value, having averaged double-digit growth in the last decade. Malaysia and Thailand also were significant trading countries with Thailand leading the region in percentage growth throughout the period.

Exhibit VI-13
1991 Foreign Trade for Southeast Asia Countries

	Export		Import	
	1991 (Bil. US $)	% Avg. Growth 1981-91	1991 (Bil. US $)	% Avg. Growth 1981-91
Singapore	$59.0	11.2	$67.1	9.1
Malaysia	36.2	11.5	30.4	9.3
Thailand	29.0	14.9	35.5	14.1
Indonesia	31.3	2.9	24.8	6.7
Philippines	9.8	5.2	10.5	2.6
Total - Southeast Asia	**170.3**	**8.7%**	**172.1**	**8.9%**
World Total	**$3,600.9**	**6.2%**	**$3,600.9**	**6.2%**

Source: Appendix 3, Table 7

The primary trading regions for Southeast Asia were Northeast Asia (33 percent of export value, 39 percent of import value), followed by North America and Western Europe (Exhibit VI-14). Intra-regional trade activity was significant, accounting for 20 percent of both export and import value in 1991. Bewteen 1981 to 1991 trade with Western Europe experienced the highest rate of growth, for both exports and imports, behind that for intra-regional trade. Trade growth rates from 1989 to 1991 were about double the ten-year averages, with Western Europe and intra-regional trade again leading the way.

Exhibit VI-14 **1991 Foreign Trade For Southeast Asia by Trade Region**						
Trade Region	**Export**			**Import**		
	% of Total	**Average Annual Growth**		**% of Total**	**Average Annual Growth**	
		1981-91	**1989-91**		**1981-91**	**1989-91**
Southeast Asia	0.196	0.117	0.237	0.194	0.117	0.237
Northeast Asia	32.8	6.8	15.8	38.8	10.6	17.9
North America	20.1	10	8.3	14.2	9.3	12.3
Western Europe	17.5	12.8	18.8	15.4	10.8	18.1
Total - All World Regions	**1**	**0.087**	**0.153**	**1**	**0.089**	**0.186**

Source: Appendix 3, Table 8

Exhibit VI-15 shows the top regional trade partners for 1991. Japan and the United States ranked first and second in both import and export value. Canada, Denmark and France were other top importing countries, while Hong Kong, South Korea, and Germany were top exporting countries.

260

Exhibit VI-15 **Top Inter-Regional Trading Partners For Southeast Asia (1991)**			
Importing Countries	**% of Trade Value**	**Exporting Countries**	**% of Trade Value**
Japan	27.2	Japan	23.3
USA	14.0	USA	13.3
Canada	6.2	Hong Kong	4.5
Denmark	4.5	South Korea	4.4
France	3.5	Germany	4.4

Source: Appendix 3, Table 9

The top export commodity groups for Southeast Asia are shown in Exhibit VI-16. Two of the top groups, telecommunications equipment and office machinery, grew at almost double the average for all commodities.

Exhibit VI-16 **Top Export Commodities for Southeast Asia (1991)**		
SITC Group	**% of Trade Value**	**1989-1991 Change %**
77 Electrical Machinery	12	36
76 Telecommunications Equipment	10	72
75 Office Machinery	9	67
84 Apparel & Clothing	9	50
All Commodities	**100%**	**34%**

Source: Appendix 3, Table 10

361

Available air trade statistics for Southeast Asia are primarily limited to airport traffic data and trade activity with the United States.[2] An estimated 111,000 metric tons of air cargo was shipped from the region to the U.S. in 1991 (Exhibit VI-17). Singapore was the leading exporting country followed by Malaysia and Thailand. Average value for regional air exports was $104(US) per kilo with Singapore and Malaysia having significantly higher averages than the other countries. Air transportation accounted for 40 percent of the total export value shipped to the U.S., but less than 1 percent of total weight.

Exhibit VI-17
Southeast Asia Air Exports To The U.S. (1991)

	Air Exports (000 MT)	Average Value ($/KG)
Singapore	35.0	174
Malaysia	22.7	106
Thailand	22.6	68
Philippines	19.0	59
Indonesia	10.9	24
All Other	0.2	31
Total - Southeast Asia	**110.8**	**$104**

Source: Appendix 3, Table 11

The top air export commodities from Southeast Asia to the U.S. are shown in Exhibit VI-18. Apparel and clothing accounted for over one-quarter of total air weight with office, electric and telecommunications equipment also moving in large volumes. Fishery products represented about 5 percent of total weight and had a significantly lower average value than the manufactured items.

[2] Although the United States does not account for a major portion of regional trade and traffic, the composition of air trade activity is thought to be representative of trade activity with the industrialized countries.

Exhibit VI-18
Top Air Export Commodities From Southeast Asia to USA (1991)

SITC Group	Export Weight (000 MT)	Average Value ($/KG)
84 Apparel and Clothing	30.3	21
75 Office Machinery	22.7	188
77 Electric Machinery	20.5	202
76 Telecommunications Equipment	7.5	67
03 Fishery Products	5.8	5
All Commodities	**110.8**	**$104**

Source: Appendix 3, Table 12

2. Thailand

Thailand's foreign trade activity followed general trends in the region (see Exhibit VI-19). From 1970 to 1991, export trade value rose an average of 20 percent per year with imports growing at a slightly lower rate of 19 percent per year. The increasing ratio of export value to import value reflected the maturation of Thailand's economy. The manufacturing sector's share of export trade rose from 36 percent in 1970 to 42 percent in 1985 before soaring to 66 percent in 1991. Between 1980 and 1991, the percentage of total imports accounted by manufactured items doubled. This reflected the expanding industrialization of the domestic economy and rising living standards.

Thailand's top trading regions were similar to those of the Southeast Asian region as a whole (Exhibit VI-20). The Far East, Europe and North America accounted for three-quarters of both export and import value in 1991 with the Far East dominant in the import market. Intra-regional trade with other ASEAN countries accounted for 12 percent of export value and 13 percent of import value in 1991. Over the period 1980 to 1991, Far East and North American exports increased their share of total value while the shares of Europe and ASEAN both fell. For imports, the Far East share rose 13.3 percent over the same period, while "Other Asia" and North American trade was falling 11.2 percent and 6.5 percent respectively.

While mode of transport is not directly captured in Thailand's trade statistics, results are classified by mode based on the point of clearance.[3] Exhibit VI-21 shows trade volumes for airport Customs ports from 1988 to 1990. Bangkok Airport accounted for over 22 percent of total Thai export value and 20 percent of import value in 1990. The other airports indicated (Chiang Mai and Hat Yai) accounted for very little activity.

[3] An examination of "air"-designated traffic revealed little correlation with actual mode of transport. For example, the largest air export commodity by weight in 1991 is shown to be "mineral fuels" followed by "sugar" and "cereals," none of which represent air commodities. The data is summarized here and presented in detailed form in the appendices, but otherwise were not utilized in the forecasts.

264

Exhibit VI-19

Thailand Foreign Trade Trends (1970-1991)

Total Trade Value (Current Prices)

	1970	1975	1980	1985	1991
Exports	14.8	48.4	133.2	193.4	725.
Imports	27.0	66.8	193.6	251.2	959
Export/Import Ratio	0.55	0.72	0.69	0.77	0.76

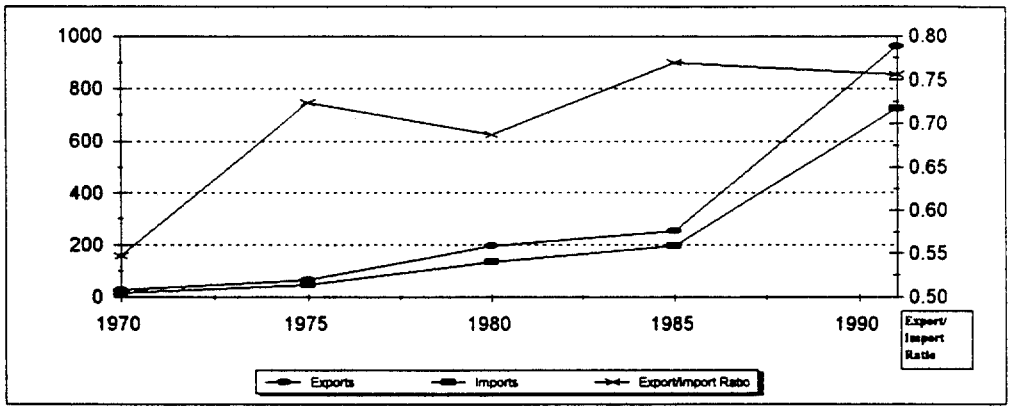


Exhibit VI-20

Thailand Foreign Trade Trends by World Region (1970-1991)

	Trade Value (% of Total Value)								
	1980	1985	1986	1987	1988	1989	1990	1991	Share Change 1980-91
Exports									
ASEAN	16.3%	14.5%	14.4%	13.9%	12.5%	11.5%	11.4%	11.8%	-4.5%
Far East	24.2%	24.8%	25.7%	25.0%	26.3%	26.8%	26.2%	27.3%	3.1%
Other Asia	9.7%	10.4%	9.1%	9.7%	9.1%	8.5%	6.9%	6.5%	-3.2%
Europe	31.5%	22.2%	24.8%	24.9%	23.8%	23.2%	25.3%	25.0%	-6.5%
North America	13.0%	20.9%	19.3%	20.1%	21.5%	23.2%	24.0%	22.7%	9.7%
All Other	5.3%	7.2%	6.7%	6.4%	6.8%	6.8%	6.2%	6.7%	1.4%
Imports									
ASEAN	11.7%	18.2%	14.2%	15.6%	11.6%	12.5%	12.2%	12.5%	0.8%
Far East	30.2%	35.3%	36.8%	37.4%	40.2%	42.6%	43.3%	43.5%	13.3%
Other Asia	18.4%	9.4%	7.2%	7.1%	5.6%	7.3%	7.2%	7.2%	-11.2%
Europe	17.2%	18.9%	20.0%	20.1%	21.8%	18.6%	19.8%	19.5%	2.3%
North America	18.0%	12.6%	15.5%	13.4%	14.9%	12.6%	11.9%	11.5%	-6.5%
All Other	4.5%	5.6%	6.3%	6.4%	5.9%	6.4%	5.6%	5.8%	1.3%

Exhibit VI-21

Airport Share of Thailand International Trade (1988-1990)

	1988		1989		1990		Average	Share
	(Mil. Baht)	% of Total	(Mil. Baht)	% of Total	(Mil. Baht)	% of Total	Growth 1988-90	Change 1988-90
Export								
Total - All Custom Ports	403.57	100.0%	516.32	100.0%	589.81	100.0%	20.9%	
Bangkok Airport	85.68	21.2%	112.16	21.7%	133.51	22.6%	24.8%	1.4%
Chiang Mai	0.22	0.1%	0.34	0.1%	1.01	0.2%	117.1%	0.1%
Hadyai	0.00	0.0%	0.00	0.0%	0.08	0.0%	NA	0.0%
Total - All Airports	85.90	21.3%	112.51	21.8%	134.60	22.8%	25.2%	1.5%
Import								
Total - All Custom Ports	513.11	100.0%	662.68	100.0%	852.98	100.0%	28.9%	
Bangkok Airport	109.92	21.4%	117.45	17.7%	159.43	18.7%	20.4%	-2.7%
Chiang Mai	0.12	0.0%	0.20	0.0%	0.77	0.1%	148.4%	0.1%
Hadyai	0.00	0.0%	0.01	0.0%	0.14	0.0%	NA	0.0%
Total - All Airports	110.05	21.4%	117.66	17.8%	160.33	18.8%	20.7%	-2.7%

Note: The location of clearance does not necessarily indicate mode of transport.

E. AIR CARGO ACTIVITY

1. Southeast Asia

The strong economic growth of Southeast Asian economies is also reflected by trends in air cargo activity. Exhibit VI-22 shows total international cargo (freight and mail combined) for selected Southeast Asian airports amounted to over 1.4 million MT in 1992. (Note that some airports have failed to report recent years' data.) Singapore was the top airport in 1992 with over 720,000 metric tons followed by Bangkok, Manila, and Jakarta. Both Singapore and Bangkok air cargo grew by over 7 percent per year from 1989 to 1992.

Singapore is currently the primary distribution center for Southeast Asian ocean and air freight, and traffic patterns should be representative of regional traffic flows. Exhibit VI-23 shows the share of air cargo weight and 1990 to 1992 growth rates by world area for Singapore's Changi International Airport. Intra-regional traffic accounts for the largest share of export traffic with almost one-third of total weight. Northeast Asia has a slightly smaller share of export flows, followed by Europe and Oceania with 15 percent and 14 percent of traffic respectively. Total export traffic grew an average of 6.9 percent from 1990 to 1992 with Oceania and intra-regional traffic showing the highest growth and Northeast Asia and Europe at below average rates.

Exhibit VI-22
International Traffic for Top Southeast Asian Airports (1989-92)

	1992 Freight & Mail (000 MT)	Average Growth 1989-92
Singapore	720.7	7.1%
Bangkok	422.4	7.3
Manila	193.9	NA
Jakarta	111.4	NA
Total	1,482.4	NA

Note: Includes all airports reporting to Airports Council International
Source: Appendix 3, Table 18

268

Exhibit VI-23
International Air Cargo Activity at Singapore (1992) by World Region

	Export		Import	
	% of Total	1990-92 Avg. Growth	% of Total	1990-92 Avg. Growth
Southeast Asia	32%	9.4%	24%	-1.6%
Northeast Asia	29	1.4	34	9.1
Europe	15	4.5	20	2.0
Oceania	14	18.8	9	2.1
South Asia	6	6.7	4	-1.7
All Other	5	-2.3	9	6.1
Total	**100%**	**6.9%**	**100%**	**2.7%**

Note: 1992 traffic is for 12 months ending September
Source: Appendix 3, Table 19

Import traffic followed similar patterns, although Northeast Asia is the top importing region followed by Southeast Asia and Europe. Import growth from 1990 to 1992 was less than half the export growth, led by Northeast Asia at 9 percent per year. The other world regions experienced small growth or minor decreases in traffic.[4]

The International Civil Aviation Organization (ICAO) provides comparable traffic statistics for selected other countries in the region. Exhibit VI-24 shows the distribution of inbound and outbound air weight for Southeast Asia by world region based on true origin and destination.[5] Northeast and Southeast Asia are the top traffic partners with over half the total weight. Western Europe and the Southwest Pacific are also significant areas.

[4] The relatively low share of traffic to and from North America indicates that this data represents flight stage patterns, as opposed to true origin and destination patterns. Much of the U.S.-Asia air trade is transshipped via Northeast Asia airports.

[5] The ICAO data is based on carrier filings, which are not required for all carriers.

269

Exhibit VI-24 **Air Cargo Traffic For Southeast Asia By World Area (1991)**			
	Outbound	**Inbound**	**Total**
Southeast Asia	27.4%	32.1%	29.6%
Northeast Asia	36.8	29.5	33.5
Western Europe	20.6	18.5	19.6
Southwest Pacific	7.1	11.3	9.0
All Other	8.1	8.6	8.7
Total	**100%**	**100%**	**100%**

Note: Based on ICAO on-flight origin and destination data.
Source: Table 20, Appendix 3

Exhibit VI-25 summarizes the IATA regional cargo forecasts to 1996 based on 1991 traffic. As indicated, total outbound traffic is projected to grow 10.4 percent per year, while inbound traffic will grow at 9.9 percent per year. Northeast Asia and Western Europe are projected to be the highest growth destination regions, while Western Europe and Southwest Pacific lead in inbound flows.

Thailand's air cargo traffic is projected to grow at a slightly lower rate than the region overall with a higher growth rate for outbound intra-regional traffic and a lower rate for Western Europe. Differences for inbound growth include lower projected growth for Western Europe, as well as a substantially higher growth shown for Southeast Pacific.

The Boeing 1993 air cargo forecasts available for Asian traffic are shown in Exhibit VI-26. Intra-Orient traffic is projected to grow 9.3 percent per year (as contrasted with IATA's Southeast Asian rates of 8.3 percent) and European traffic is shown to be much less. The high variance in the "low" and "high" forecasts indicates the potential range of these forecasts.

270

Exhibit VI-25
1991-96 IATA Air Traffic Forecasts For Southeast Asia

	Thailand			Southeast Asia		
	1991 Traffic (000 MT)	% of Total	1991-96 Annual Growth	1991 Traffic (000 MT)	% of Total	1991-96 Annual Growth
Inbound						
Southeast Asia	26.0	19.4%	8.4%	178.9	31.7%	8.3%
Northeast Asia	52.6	39.3	9.3	147.2	26.1	8.8
Western Europe	29.9	22.3	9.3	100.0	17.7	14.4
Southwest Pacific	5.1	3.8	16.1	69.5	12.3%	10.1
Total - All Regions	**133.9**	**100.0%**	**9.6%**	**563.6**	**100.0%**	**9.9%**
Outbound						
Southeast Asia	42.0	17.9%	9.4%	178.9	27.2%	8.3%
Northeast Asia	95.7	40.8	11.4	207.4	31.6	12.0
Western Europe	60.0	25.6	7.9	136.4	20.8	11.2
Southwest Pacific	6.0	2.6	6.9	46.1	7.0	8.7
Total - All Regions	**234.3**	**100.0%**	**10.0%**	**651.1**	**100.0%**	**10.4%**

Source: Appendix 3, Table 22

Exhibit VI-26 Boeing Asian Cargo Forecasts (1992-2010)						
	Inbound			Outbound		
World Area	Low	Medium	High	Low	Medium	High
Intra-Orient	6.1%	9.3%	14.0%	6.1%	9.3%	14.0%
United States	5.0	7.9	11.4	6.7	8.0	10.0
Europe *	6.3	7.4	9.2	6.3	7.4	9.2
Middle East **	—	5.5%	—	—	5.5%	—

Source: The Boeing Company, 1993 World Air Cargo Forecast
*Includes Southwest Pacific
**For all world origins/destinations

Exhibit VI-27 shows the baseline air cargo flow forecasts for Thailand and Southeast Asia based on IATA traffic data supplemented with Singapore statistics and U.S. foreign trade data.[6] Country totals for international traffic include Thailand, Singapore and Other Southeast Asia. The growth rates to 1996 are from IATA with beyond year rates based on selected Boeing rates. As indicated, total Southeast Asian air cargo is projected to grow to 14.5 million tons by 2020 with Thailand accounting for 3.7 million tons, or 26 percent, of that total.

3. Southeast Asia Air Exports by Commodity

Regional air cargo exports by commodity was estimated by matching the trade value flows with U.S. international air cargo data at a detailed commodity level. The UN regional export data, by 4-digit SITC commodity group (which lacks weight and mode information), was linked to U.S. commodity data for imports from Southeast Asia and the world.[7]

[6] The Singapore airport statistics are used for that country's volumes. The U.S. air trade data is used to estimate the "North America" volumes for each country (including Singapore).

[7] The linkage required some re-categorization of commodity data at the 4- and 3-digit level. Also, U.S. air import patterns for all world origins was used for commodity groups with no air activity from Southeast Asia.

272

Total Southeast Asia air export weight by commodity was estimated at the 4-digit SITC level based on one of two methods:

- The air share of total export value (intra- and inter-regional) and average value (per KG) for U.S. trade were applied to total export value. (or)
- The U.S. share of total Southeast Asia export value was used to expand U.S. import air weight to total weight.

The estimated weight for each commodity (inter- and intra-regional) was the minimum of these two calculated values. The estimated weights were summed to derive commodity distribution for total weight. These calculated distributions were then applied to total Southeast Asia weight for intra-regional shipments (194,000 tons) and inter-regional exports (667,000 tons) as estimated in Exhibit VI-27.

Exhibit VI-28 summarizes the baseline Southeast Asian air exports by commodity group. The top commodity groups are apparel and clothing (164,000 tons), electrical machinery (144,000 tons), fishery products (128,000 tons), and office machinery (75,000 tons).[8]

[8] Detailed commodity estimates are contained in Appendix 3.

Exhibit VI-27
Baseline Air Cargo Forecasts to 2020

	Thailand			Southeast Asia		
	Inbound (000 MT)	Outbound (000 MT)	Total (000 MT)	Inbound (000 MT)	Outbound (000 MT)	Total (000 MT)
Intra-Regional						
1991	26	42	68	182	194	377
1996	39	66	105	271	289	561
2005	87	41	234	604	644	1,248
2020	257	434	691	1,788	1,905	3693
Intra-Regional						
1991	118	214	332	535	667	1,202
1996	196	365	562	858	1,123	1,981
2005	400	739	1,139	1,751	2,280	4,032
2020	1,075	1,982	3,058	4,731	6,142	10,874
Total						
1991	144	256	400	718	861	1,578
1996	235	431	667	1,130	1,412	2,542
2005	487	886	1,373	2,356	2,924	5,280
2020	1,332	2,417	3,749	6,519	8,047	14,566
Average Annual Growth %						
1991-1996	10.3	11.0	10.7	9.5	10.4	10.0
1996-2005	8.4	8.3	8.4	8.5	8.4	8.5
2005-2020	6.9	6.9	6.9	7.0	7.0	7.0

Source: Appendix 3, Table 23

274

Exhibit VI-28 **Southeast Asia Export Air Weight Estimate By Commodity Group (1991)**		
SITC Group	**Air Weight (000 MT)**	**% of Total**
84 Apparel and Clothing	164.3	19.0%
77 Electrical Machinery	143.8	16.7
03 Fishery Products	128.4	15.0
75 Office Machinery	75.1	8.7
All Other	349.4	40.6
Total	**861.0**	**100.0%**

Source: Appendix 3, Table 24

3. Thailand

Historical cargo data (1986-91) for Thai airports (Bangkok (BKK) and major airports by region) are presented in Exhibit VI-29 with domestic volumes related to total international traffic. As shown, international traffic grew an average of 12.4 percent from 1986 to 1991 with BKK accounting for over 99 percent of total traffic. Domestic traffic grew even faster at 24.9 percent per year, reflecting the dispersion of industrial and tourist activity away from Bangkok. BKK, the hub for Thai Airways domestic network, accounted for nearly half of the total domestic freight, followed by Chiang Mai, Hat Yai and Phuket.

Exhibit VI-30 presents additional detail on international air cargo flows at Bangkok. Outbound cargo is almost double inbound volumes, and transit freight accounts for 9 percent of total freight.[9] Over three-quarters of total traffic moves on passenger flights with scheduled services accounting for 95 percent of total traffic.

[9] The inclusion of transit cargo is sometimes ambiguous in air cargo statistics. It is assumed that transit cargo is *not* included in the inbound and outbound statistics, and that it is not counted twice based on being both deplaned and enplaned.

Exhibit VI-29
Thailand Airport Statistics (1986-91)

	Domestic Air Cargo (000 MT)			International Air Cargo (000 MT)		
	1991	% of Total	Average Growth 1986-91	1991	% of Total	Average Growth 1986-91
Bangkok	14.4	47%	25.3%	430.6	99.4%	12.5%
Northern Region	7.4	24	22.5	—	—	—
Northeastern Region	0.6	2	21.0	—	—	—
Southern Region	8.0	26	26.9	2.67	0.6	—
Total	**30.4**	**100.0%**	**24.9%**	**433.2**	**100.0%**	**12.4%**

Source: Appendix 3, Table 25

Exhibit VI-30
International Traffic Summary for Bangkok Airport (1991) by Commodity Group (1991)

Type	Percent
Inbound	31%
Outbound	60%
Transit	9%
Flight Type	**Percent**
Passenger	78%
Cargo	22%
Scheduled	95%
Non-Scheduled	5%

Source: Appendix 3, Table 26

376

Exhibit VI-31 shows the allocation of Thailand's forecast international traffic to Bangkok area airports (BKK and SBIA). It is assumed that the share of Bangkok's international traffic will drop to 95 percent by Year 20 as regional development continues. Total air cargo at BKK is projected to grow to 3.5 million tons by 2020 with other international airports accounting for 187,000 tons.

Total domestic traffic is estimated as a percentage of international traffic for the forecast years and allocated by airport/region based on existing patterns. Again, the increased decentralization of the Thai economy should expand demand for domestic air cargo services. Total domestic cargo is projected to grow to 449,000 tons by 2020 with Bangkok accounting for 209,000 tons.

F. INDUSTRIAL FORECASTS

1. Methodology

The forecast methodology estimates the potential location of new export-oriented industrial facilities in the Thailand Global Transpark in three steps:

- Baseline air export activity is estimated for Southeast Asia by detailed commodity group as discussed above.

- "Target" commodities are selected based on the current use of air cargo services, high short-term growth, and current presence in Thailand.[10] Regional air cargo exports are forecast relative to the projected Global Transpark development schedule based on total regional cargo projections and trends in commodity distribution.

[10] It is assumed that the Global Transpark will be designed to attract high growth, logistics-based industries which can compete in world markets from a Thailand location. It is anticipated that industries which already have some presence in Thailand will be most likely to locate at the Global Transpark, as will industries already actively using air cargo services within their distribution systems.

Exhibit VI-31

Thailand Airport Forecasts to 2020 (Baseline)

	Baseline	Forecast		
	1991	1996	2005	2020
		(000 MT)		
International				
Bangkok	397.60	652.49	1,330.18	3,557.25
Other	2.40	13.32	41.14	187.22
	400.00	665.80	1,371.32	3,744.48
BKK Share	99.4%	98.0%	97.0%	95.0%
Domestic				
Share of International Traffic	7.8%	9.0%	10.5%	12.0%
Bangkok	14.41	27.82	66.84	208.60
Chiang Mai	5.96	11.51	27.65	86.28
Chiang Rai	0.53	1.02	2.46	7.67
Phitsanulok	0.24	0.46	1.11	3.47
Other	0.69	1.32	3.18	9.93
Northern - Total	7.42	14.32	34.40	107.35
Ubon Ratchathani	0.09	0.17	0.42	1.30
Khon Kaen	0.29	0.56	1.35	4.20
Other	0.19	0.37	0.88	2.75
Northeastern - Total	0.57	1.10	2.64	8.25
Phuket	3.04	5.87	14.10	44.01
Hat Yai	4.00	7.72	18.56	57.90
Surat Thani	0.70	1.35	3.25	10.13
Other	0.26	0.50	1.19	3.72
Southern - Total	8.00	15.44	37.10	115.76
Domestic Total	31.04	59.92	143.99	449.34

Note: BKK's share of international traffic and domestic ratio to international traff are estimated based on trends towards de-centralization of Thai industry. Domestic airport traffic in forecast years assumes constant distribution among airports.

278

- The production of target commodities is associated with specific industries based on U.S. cargo production patterns. "Target" industries are selected based on the aggregated volume levels. The capture of total new export production activity to the Global Transpark is estimated based on industry type and the proposed phased development of the Global Transpark.

- Average air cargo productivity and plant size factors are used to derive total employment and number of plants from the export production estimates in forecast years.

- Total Global Transpark cargo flow and employment activity are estimated based on assumed patterns of inbound-to-outbound flows and service support requirements.

The following sections detail elements of this methodology.

2. **Target Commodities**

The basic premise of the forecasts is that the selected commodities serve two purposes. The first, is that these are currently significant commodities in international trade, that they reflect leading agricultural and industrial activity in Southeast Asia and a strong demand for those products in the global marketplace. A commodity which is a significant part of the export flow reflects both the competitive ability of the producing nation as well as an appreciation by the marketplace for the product competitiveness, in terms of price, quality, availability, etc.

The second purpose is that the selected commodities are symbols of future traffic. The number of products which are being exported is expanding. Similarly, the number of products which are being shipped by air is increasing. At the same time, new industries are developing every year.

Personal computers, which emerged in the late 1970s have in turn spawned many supporting industries such as the manufacture of keyboards, disc drives, and monitors. It can be expected that similar events will transpire in the forthcoming decades. Thus, the selected commodities should also be considered also as representatives of future industrial developments.

Using the baseline commodity flow results, 34 "target" commodities were selected based on the following criteria:

Criteria	Factor
Thailand Share of Regional Export Market	≥5 percent
1989-91 Regional Export Growth	≥25 percent
Estimated 1991 Air Export Weight	≥100 tons
Air Share of U.S. Import Weight	≥2 percent
Average Value per KG for U.S. Imports (Non-agricultural commodities only)	> $20 (US)

The employment of these criteria reflect characteristics of current and future cargo flows, which are considered indicative of the expansion of international trade and the increasing use of air cargo services. The following is an explanation of each of the criteria and their use in this process. The selected commodities had to meet all of the criteria for inclusion.

- Thailand Share of Regional Export Market

  This selection criteria identified and selected all commodities which accounted for 5 percent or more of the Thailand exports. This factor was introduced because of analysis for the North Carolina Global Transpark. That analysis indicated that it was unlikely that an industry without an existing local presence would locate at a Global Transpark. The factor also eliminated industries, which for whatever reason, were located in Southeast Asia, but not in Thailand. The selection of the relatively low percentage was made to ensure that industries which were being developed were also included in the forecast process.

- 1989-91 Regional Export Growth

  Any commodity with a growth rate equal or in excess of 25 percent was included in the forecast. This criteria was used to identify commodities/industry types which were in a growth phase, as opposed to mature industries. It was presumed that the growing industries would be most likely to consider investments at the Global Transpark as contrasted with the mature industries.

- Estimated 1991 Air Export Weight

  Those exports with significant weights were selected. They represented commodities whose intrinsic characteristics support the selection of air transport and eliminate commodities which are captive to other modes, particularly for intra-regional traffic. It is that mode choice which is an integral part of the development of the Global Transpark concept.

- Air Share of U.S. Import Weight

  This factor, like the previous one, sought to only include commodities which had a significant use of air transport, and eliminate "surface" commodities which infrequently move via air on an emergency basis. This second weight criteria was also included to capture those products which were in initial stages of development or were experiencing a shift to air carriage.

- Average value per KG for U.S. Imports

  The carriage of commodities by air is inherently more expensive than by other modes. This criteria reflects that traditional characteristic. However, the choice of value per weight and the elimination of a minimum value to weight ratio for agricultural goods also reflects the increasing use of air transport for goods which have traditionally been shipped by other modes, especially by sea.

Forecast volumes for individual target commodities are based on growth regressions from the UN data. These growth estimates use data for Southeast Asian export value (1991 constant dollars) for 1981, 1983, 1985, 1987, 1989 and 1991, constrained not to exceed 10 percent maximum growth and -2 percent minimum decline per year. Individual commodity volumes are adjusted to maintain the regional aggregate air cargo forecasts as shown in Exhibit VI-27.

281

Baseline regional air exports were projected to the forecast years of 2005 (Year 5 of operation) and 2020 (Year 20). Regional export weight for the target commodities is estimated to grow from 604,000 tons in 1991 to 7.0 million tons by 2020. The top commodities are shown in Exhibit VI-32.

Exhibit VI-32
Target Commodity Forecasts To 2020

	Air Weight (000 MT)		
	1991	**2005**	**2020**
Articles of Apparel Clothing, NES	163.6	621.1	1,970.4
Fresh Fish	129.2	490.7	1,556.6
Electronic Valves, Tubes and Parts	83.4	316.5	1,004.1
ADP Machinery	74.0	281.2	892.0
Electronic Switches, Relays, etc.	25.4	37.7	55.8
Target Commodities	604.0	2,229.3	7,006.4
Total - All Commodities	**861.0**	**2,924.0**	**8,047.0**

Source: Appendix 3, Table 28

3. Target Industries

Commodity export volumes were assigned to SIC industry categories based on 1991 U.S. import patterns and totaled to the 3-digit level (see Exhibit VI-33). "Target industries" include those with 2020 estimated total export weight of 2,000 tons or more.[11] Exhibit VI-33 shows that regional export weight for these industries is projected to grow from 593,000 tons in 1991 to 6.9 million tons by 2020.

[11] Note that some commodity traffic are excluded from these totals when no match with the U.S. import flows exists or when traffic is assigned to service industries.

282

Exhibit VI-33 **Southeast Asian Export Production For Target Industries (1991-2020)**		
Commodity	**Export Production (000 MT)**	
	1991	**2020**
Fresh Fish	128	1,536
Other Agricultural	3	38
Subtotal	**131**	**1,574**
Apparel and Clothing	151	1,817
Other Non-Durables	16	192
Subtotal	**167**	**2,009**
Electronic Components	115	1,288
Office Machinery	68	819
Communications Equipment	17	200
Other Durables	96	987
Subtotal	**296**	**3,294**
Total - Target Industries	**593**	**6,877**

Source: Appendix 3, Table 29

4. Global Transpark Activity Estimates

For the purposes of this forecast, the commencement of development at a Thailand site has been established as the year 2000 (2543). This year was chosen to reflect the expected time to prepare a master plan, to design and construct the facilities, and to initiate operations.

A share of "new" export activity for the regional target industries is assigned to the Global Transpark by industry based on the following penetration share assumptions:

283

Industry Group	Share of Export Growth	
	0-5 Years	15-20 Years
Agriculture, Forestry & Fishing (SIC 0)	1 percent	1 percent
Non-Durable Manufacturing Industries (SIC 2)	1 percent	1 percent
Durable Manufacturing Industries (SIC 3)	2 percent	5 percent

Total employment by industry type was then estimated using 1991 Colography[12] industry data (at 3-digit SIC) for the base year and the cargo productivity forecasts from the North Carolina Global Transpark master plan forecasts. The number of plants were estimated by using average plant size numbers from the same Colography data. (Industries without a match to the Colography industries used the average productivity and plant size for all of the Colography industries and average productivity growth rate of 8 percent per year through year 20.)

As mentioned previously, business in general and manufacturing in particular is in a constant state of change and improvement. To reflect this, the forecasting process includes a productivity ratio, expressed as the average number of kilograms or tons of cargo produced by each employee in each industry type. This single ratio in fact represents a series of efforts all geared to increasing the profitability of an industry. Improvements in the level of productivity can reflect various combinations of improved labor training and higher education, better designed products which make manufacturing easier and faster, and a substitution of capital investments for labor. However, as noted in research in North Carolina, not all industries enjoy constantly improving levels of productivity, for a variety of reasons. Therefore, the productivity ratios used in this forecasting effort are tailored to specific industries, except as noted above, to reflect the differential changes during the forecast period.

[12] Colography Group, Inc. is a private company which develops and maintains extensive trade and air cargo databases. It's data is employed by most U.S. air cargo forecasters, including the integrated air carriers.

284

Exhibit VI-34 summarizes the industrial forecasts for the Global Transpark by industry. As shown, an estimated 604 plants employing over 48,000 persons will produce over 142,000 tons of air cargo in 2020. Top industries include manufacturers of electronic components and office machinery, as well as the distribution of seafood products.

Exhibit VI-34
Global Transpark Target Industry Forecasts (2020)

	Cargo Production (000 MT)	Employment (000)	Number of Plants
Electronic Components	44.5	1.7	16
Office Machinery	28.5	9.7	61
Fresh Fish	12.4	3.1	43
Non-Durable Manufacturing	16.2	20.8	308
All Other	40.8	13.4	176
Total	**142.4**	**48.7**	**604**

Source: Appendix 3, Table 29

The phasing of development to Year 20 for employment and number of plants is based on development pattern established for the North Carolina Global Transpark (see Exhibit VI-35). As was described in Chapter III, the master plan project for the NC Global Transpark incorporated an extensive study of major industrial parks which identified a common rate of growth. This information was used in the forecasting effort for a Thailand Global Transpark for the following three reasons:

- While economic growth rates in Southeast Asia and Thailand are higher than for North America these are based on rapid industrialization and development from a relatively low base. As the economies mature, it can be expected that the growth rates will moderate to more sustainable levels. Similarly, a Global Transpark in Thailand will be an integral part of a worldwide network and its rate of development will be affected by those of other locations as well as world economic expansion;

285

- The growth rate is a conservative estimate of development. It reflects past history of leading edge types of complexes including the Research Triangle Park in North Carolina; and

- The Global Transpark is new. Acceptance of the concept as well as the challenges faced in developing, designing and constructing the complex can be expected to result in slow initial growth.

Cargo productivity for interim years has been interpolated and applied to employment to estimate cargo production in Years 10 and 15.

Exhibit VI-36 summarizes total industrial cargo and employment activity for the global transpark. Based on the same (or similar) assumptions as used for NC Global Transpark, non-manufacturing and distribution traffic and employment are estimated. Inbound traffic is based on the ratio for total Southeast Asia air trade contained in the baseline forecasts.

The amount of Global Transpark-generated traffic which would be transferred at the Global Transpark airfield was not explicitly estimated, nor is there any provision for non-Global Transpark air cargo transfer. At this stage (without knowledge of the actual location relative to existing industrial and air cargo activity), it was appropriate to assume that any cargo "leakage" to other airports would be equivalent to diversion of non-Global Transpark transshipment cargoes.

G. SUMMARY

A Global Transpark in Thailand can be expected to attract a significant concentration of industrial activity. In approximately twenty years after initial development, the complex can be expected to employ over 48,000 people in manufacturing and nearly 9,000 more employed in non-manufacturing and distribution activities. In terms of types of industries, the types of products which can be expected to be manufactured, assembled and/or processed at the Global Transpark will encompass a broad range including agricultural goods, electronics, and office machinery.

These forecasts are based on a fundamental premise that the type of industry will affect not only the level and type of employment, but also the volume of traffic and the choice of transport mode. As outlined in the description of the forecasting process, these forecasts have taken into account not only the existing situation, but also a multi-dimensional approach to an estimation of future trends. The selection of commodities has reflected not only those products which are major components of export trade from Thailand and Southeast Asia, but also which can be expected to develop in the following decades. Similarly, the selection of commodities has incorporated a reflection of the growing diversity of the economy of Thailand and surrounding countries and the transition of those economies into higher levels of industrialization. Inclusion of productivity levels has reflected the evolutionary changes in industrial process.

While these forecasts focus on types of activity within the precincts of the Global Transpark, the benefits of the creation of such a complex will not be limited to the boundary of the complex. As noted in the following Chapter, establishment of this complex will in turn create additional employment in supporting industries in the surrounding region.

Exhibit VI-35

GTP THAILAND FORECAST SUMMARY
MANUFACTURING EMPLOYMENT AND CARGO ACTIVITY

	Estimate	% of Year 20
GTP Direct Employment (000)		
Year 5	7.4	15.2%
Year 10	18.2	37.4%
Year 15	31.2	64.0%
Year 20	48.7	100.0%
Number of GTP Facilities		
Year 5	104	17.2%
Year 10	235	38.9%
Year 15	392	64.9%
Year 20	604	100.0%
Air Cargo Production per Employee (MT)		
Year 5	0.8	28.7%
Year 10	1.3	43.5%
Year 15	1.9	65.9%
Year 20	2.9	100.0%
Total Air Cargo Production (MT)		
Year 5 (2005)	6,200	4.4%
Year 10 (2010)	23,147	16.3%
Year 15 (2015)	60,083	42.2%
Year 20 (2020)	142,400	100.0%

Phasing Assumptions for Years 10 and 15:

Direct Employment: Based on industrial park development study for North Carolina GTP.

Number of Facilities: Based on phasing of employment from Year 5 to 20.

Cargo Productivity: Interpolated from Year 5 and Year 20 estimates assuming constant annual growth rate.

Cargo Production: Calculated based on employment and productivity estimates.

264

Exhibit VI-36

GTP THAILAND FORECAST SUMMARY
TOTAL INDUSTRIAL CARGO AND EMPLOYMENT

		Forecast Year			
		5	10	15	20
Cargo Impact (Tons)					
New Traffic by Industry Type - Outbound					
Manufacturing		6,200	23,147	60,083	142,400
Non-Manufacturing and Distribution	1	3,100	11,574	30,041	71,200
		9,300	34,721	90,124	213,600
Intra-Regional Percent of Outbound Traffic	2	21%	21%	21%	21%
Ratio of Inbound-to-Outbound Traffic	3	83.4%	80.0%	80.6%	81.0%
New Traffic by Cargo Type - Summary (Tons)					
Intra-Regional					
Outbound		1,953	7,291	18,926	44,856
Inbound		1,629	5,833	15,254	36,333
		3,582	13,125	34,180	81,189
Inter-Regional					
Outbound		7,347	27,430	71,198	168,744
Inbound		6,127	21,944	57,386	136,683
		13,474	49,373	128,584	305,427
Total					
Outbound		9,300	34,721	90,124	213,600
Inbound		7,756	27,777	72,640	173,016
		17,056	62,498	162,764	386,616
Employment Impact (Number of Full-time Jobs)					
Direct Employment					
Manufacturing		7,400	18,214	31,168	48,700
Non-Manufacturing and Distribution	4	1,354	3,333	5,704	8,912
		8,754	21,547	36,872	57,612

1 *Outbound air shipments generated by support industries for new manufacturing plants estimated at 50% of manufacturing cargo. It is useful to note that for the U.S. as a whole, the estimated ratio of total air cargo to air cargo produced by manufacturing industries is 2.3 to 1.0 (see Colography Group, Inc. databases).*

2 *Based on 1991 share of total target commodities (see Exhibit VI-33).*

3 *Based on ratio of inbound to outbound traffic for SE Asia region (see Exhibit VI-27).*

4 *Includes employment directly related to air cargo activity, estimated at 0.183 jobs per manufacturing job, based on a comparison of 1990 total U.S. employment for manufacturing (19.11 million) and transportation/public utility (5.83 million) sectors, and the transportation industry percent of 1988 transportation/public utility sector employment (60%).*

Chapter VII
Social Impact Assessment

VII. SOCIAL IMPACT ASSESSMENT

A. OVERVIEW

This chapter examines the social impact of a Global Transpark. In addition to developing estimates of indirect employment, population, income and housing needs, a sample impact analysis is included. That impact is based on a possible location of a Global Transpark in the Eastern Seaboard region, comprising Chonburi and Rayong provinces.

The chapter is divided into a series of sections. The first section examines the current social structure in the Kingdom, with emphasis on the dominance of Bangkok. The second section examines the social development plans instituted by the Royal Thai Government, particularly those geared to decentralize development. The third section presents the population forecasts, while the fourth section estimates the social impact of a Thailand Global Transpark, using the Chonburi-Rayong location as an illustrative example.

B. CURRENT SOCIAL STRUCTURE

Thailand's rapid economic growth and its transition from a predominantly agricultural economy to an increasingly diversified economy has resulted in a great concentration of population, human resources, and industrial activities as well as income. With the aid of data provided by the National Statistical Office and the Bank of Thailand, as well as internal sources, the National Economic and Social Development Board of the Royal Thai Government has documented the social situation and trends (e.g. *Thailand 2000: A Guide to Sustainable Growth and Competitiveness*). The extreme degree of concentration has been noted by international observers as well (e.g. Mattei Dogan and John D. Kasarda, "How Giant Cities Will Multiply and Grow," in Dogan and Kasarda, eds., *A World of Giant Cities*, Sage, 1988). This chapter reports only on original data analysis performed for the Thailand Global Transpark feasibility study.

With approximately one-fourth of one percent of Thailand's total land area, Bangkok contains almost 11 percent of the country's population. Moreover, despite the rapid increase in population in the provinces surrounding Bangkok, the metropolitan area's share of national population has steadily grown from 8.14 percent in 1960 to 11.78 percent in 1990. Some more distant urban areas, such as Chiang Mai and Khon Kaen, have actually lost population share over the time period. (See Exhibit VII-1.) A series of relative population density maps (normalized to Bangkok's population

241

density in each year) illustrates the continuing dominance of Bangkok. (See Figures VII-1 through VII-4.)

Bangkok's economic dominance, however, is insufficiently documented by population figures. Aside from the concentration of high-level government and professional services that could be expected of any capital city, Bangkok province is home to over 20 percent of the nation's secondary school graduates and to approximately 38 percent of the university-level educated members of the labor force. Bangkok contains approximately 27 percent of the country's professionals and managers. In addition, Bangkok is the location for over a third of those engaged in manufacturing. Despite some evidence of a declining share of Thailand's secondary school graduates, Bangkok appears to have gained somewhat larger shares of the nation's university graduates, professionals and managers, and manufacturing employment during the 1980's. (See Exhibit VII-2 for details.) Not surprisingly, tabulations made from the 1991 and 1992 Labor Force Surveys indicate a substantial income differential between Bangkok (4770 Baht per month) and the Kingdom as a whole (2590 Baht per month).

Despite the recent rapid rates of industrial growth, which have frequently surpassed 10 percent per year, Thailand is still largely an agricultural country. Approximately 60 percent of the labor force is directly engaged in agricultural activities and there are substantial income differentials between that earned by many agricultural workers and that earned in Bangkok.

Employment estimates for 1983 (from NSO Labor Force Surveys) and for 1990-1992 (from the Census of Population and Housing and from Labor Force Surveys) illustrate how labor force concentration varies by area in Thailand. Estimates are provided for the Whole Kingdom, Bangkok, its surrounding ring of provinces (for these purposes, considered to include Nahon Pathom, Nonthaburi, Pathum Thani, Samut Parkarn, and Samut Sakhon), the Eastern Region (for these purposes considered to include Chanthaburi, Chachoengsao, Chonburi, Trat, and Rayong) and for the area surrounding a possible Global Transpark site - a subset of the Eastern Region (Chonburi and Rayong). Bangkok and the Bangkok ring, as here defined, comprise the BOI's "zone 1" for investment purposes, while the Eastern Region and possible Global Transpark site both straddle the "zone 2" and "zone 3" border. Figure VII-5 highlights the geographic areas analyzed.

Exhibit VII-1
Population Distribution in Thailand
For Selected Provinces (1960-1990)

Area	1960	1970	1980	1990
Whole Kingdom	26,257,916	34,397,374	44,806,540	54,532,000
Percentage of National Population Total in Selected Provinces				
Bangkok	8.14	8.95	10.48	10.78
Bangkok Ring				
Nahon Pathom	1.41	1.22	1.17	1.15
Nonthaburi	0.75	0.78	0.83	1.05
Pathum Thani	0.72	0.68	0.71	0.75
Samut Parkan	0.89	0.96	1.08	1.41
Samut Sakhon	0.63	0.58	0.55	0.59
Sub-Total	4.40	4.22	4.34	4.95
Eastern Region				
Chanthaburi	0.60	0.63	0.66	0.72
Chachoengsao	1.23	1.03	0.99	1.01
Trat	0.25	0.27	0.33	0.30
Sub-Total	2.08	1.93	1.98	2.03
Illustrative Global Transpark Site				
Chon Buri	1.49	1.58	1.55	1.56
Rayong	0.56	0.73	0.76	0.83
Sub-Total	2.05	2.31	2.31	2.39
Other Areas				
Khon Kaen	3.22	3.05	2.80	2.97
Nakhon Ratchasima	4.17	4.34	4.35	4.36
Chiang Mai	3.04	2.98	2.58	2.51
Phuket	0.29	0.29	0.29	0.30
Songkhla	1.91	1.81	1.83	2.01

Source: Census Data

243

Exhibit VII-2 **Distribution of Human Resources and Economic Activity**			
	Whole Kingdom	**Bangkok**	**Percent of Total in Bangkok**
1990			
Secondary School Graduates	4,847,558	994,398	20.51
University Graduates	2,528,733	970,937	38.40
Professional and Managers	2,249,741	617,333	27.44
Manufacturing Employment	2,266,912	765,672	33.78
1983			
Secondary School Graduates	2,628,751	761,866	28.98
University Graduates	1,153,328	350,109	30.36
Professional and Managers	1,273,231	343,127	26.95
Manufacturing Employment	2,263,484	684,943	30.26

Source: Census Data

Despite the continued concentration of economic activity in Bangkok, non-agricultural employment grew relatively more quickly in some of the selected areas than it did in Bangkok. (See Exhibit VII-3 for details.) This growth, however, was from a relatively small base and may be more indicative of an expanding Bangkok agglomeration than it is of a slowing rate of overall concentration.

As previously noted, an unfortunate by-product of Thailand's growing industrial presence is the increasing emergence of disamenities in Bangkok and the immediately surrounding areas. Congestion threatens to slow the transportation of goods in the populous areas. In addition, although there are few systematic studies, lengthy commutes increase stress levels and interfere with family life. Moreover, the rapid growth in population in and around Bangkok has outstripped the capacity of basic water and sewerage infrastructure. Concentrated automobile traffic and industrialization also adds to pollution in the congested areas. Moreover, these dis-amenities threaten the competitiveness of Thai businesses by increasing labor and other costs.

244

Population density in Thailand: 1960

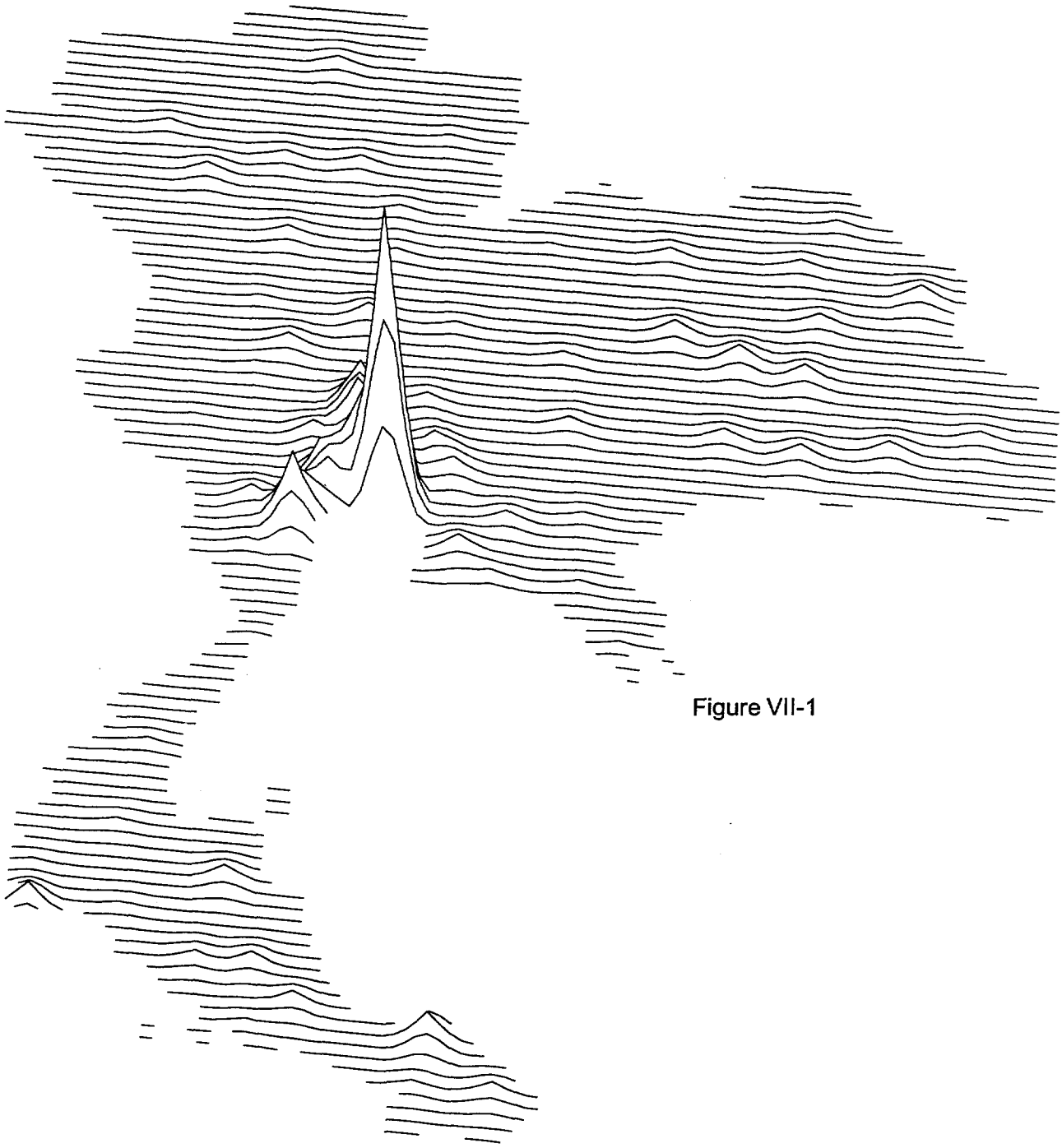


Figure VII-1

Population density in Thailand: 1970

Figure VII-2

Population density in Thailand: 1980

Figure VII-3

Population density in Thailand: 1990

Figure VII-4

Selected Areas of Thailand

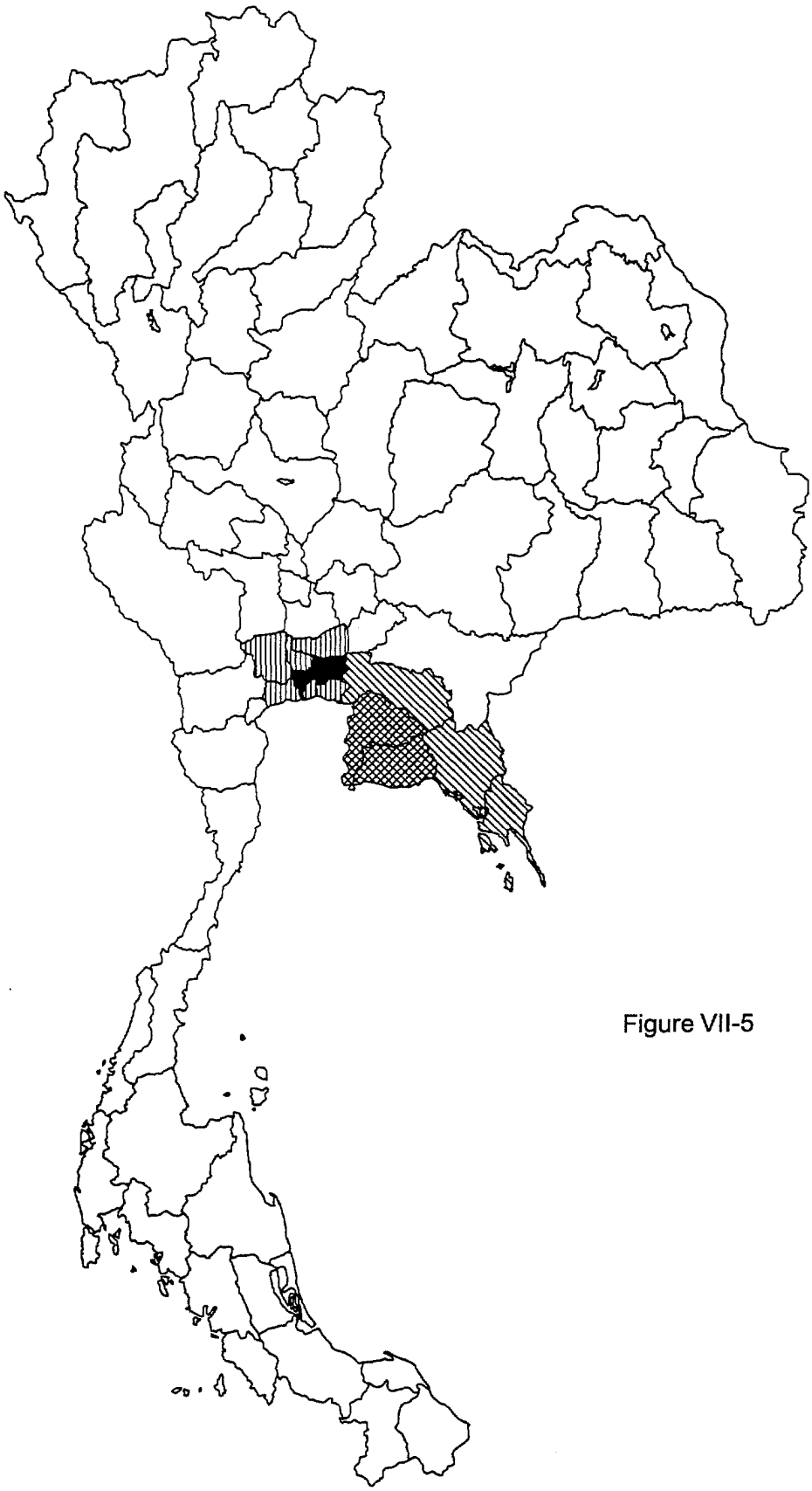


Figure VII-5

Studied Areas
Bangkok
Eastern region
Bangkok ring
Pl. TGTP site

C. ROYAL THAI GOVERNMENT SOCIAL DEVELOPMENT PLANS

The concentration of population and non-agricultural productive activities in Bangkok continues because wage differentials make the province attractive to migrants and new entrants to the labor force alike. However, the fact that a Bangkok location is attractive to individuals does not imply that continuing agglomeration in the primate city is collectively optimal. A more decentralized system of urban centers may extend the benefits of a diversifying economy to a greater proportion of the Thai population, reducing disparities in the distribution of income, and may increase the welfare of individual urban residents, by reducing congestion and, therefore, pollution, by reducing the time spent commuting, and by decreasing housing densities.

In recognition of that fact, the National Economic and Social Development Board has formulated a strategy of decentralized urbanization. Decentralized urbanization can create the critical mass necessary to capture the "urban externalities" necessary for continuing development while relieving the pressure on Bangkok and its residents. A lack of infrastructure and of critical mass has so far prevented non-negligible deconcentration from occurring.

The Seventh National Economic and Social Development Plan (1992-1996) identifies three main development objectives.

- Maintain economic growth rates at appropriate levels to ensure sustainability and stability.
- Redistribute income and decentralize development to the regions and rural areas more widely.
- Accelerate the development of human resources and upgrade the quality of life, the environment, and natural resource management.

The Global Transpark has the potential to support all three objectives by allowing greater access to global markets, by contributing towards a critical mass of industrial activities away from Bangkok, and by providing additional high-skill employment opportunities in an uncongested location.

300

Exhibit VII-3
Employment Levels, Distribution and Growth
1983-1991

	1983		1990-92 Period		
Sector	**Level**	**Percent of Total**	**Level**	**Percent of Total**	**Percent Increase**
Whole Kingdom					
Agriculture	14,435,832	62.85	18,604,443	60.70	28.88
Manufacturing	2,263,484	9.85	3,117,667	10.17	37.74
Commercial Services	5,540,634	24.12	7,879,063	25.71	42.21
Government Services	729,617	3.18	1,048,221	3.42	43.67
Thai GTP Sectors	426,512	1.86	739,539	2.41	73.39
Total	**22,969,567**		**30,649,394**		**33.43**
Bangkok					
Agriculture	195,118	7.81	73,107	2.34	-62.53
Manufacturing	684,984	27.41	865,730	27.70	26.39
Commercial Services	1,417,523	56.73	1,972,383	63.11	39.14
Government Services	200,958	8.04	214,058	6.85	6.52
Thai GTP sectors	116,361	4.66	218,398	6.99	87.69
Total	**2,498,542**		**3,125,279**		**25.08**
Bangkok Ring					
Agriculture	353,661	34.41	383,457	25.27	8.43
Manufacturing	245,355	23.87	472,804	31.15	92.70
Commercial Services	380,081	36.98	596,978	39.33	57.07
Government Services	48,677	4.74	64,453	4.25	32.41
Thai GTP Sectors	44,835	4.36	160,289	10.56	257.51
Total	**1,027,774**		**1,517,693**		**47.67**

301

Exhibit VII-3 (cont.)					
	1983		1990-1992 Period		
Sector	Level	Percent of Total	Level	Percent of Total	Percent Increase
Eastern Region					
Agriculture	553,672	60.88	649,933	45.56	17.39
Manufacturing	101,574	11.17	172,078	12.06	69.41
Commercial Services	232,637	25.58	443,608	31.10	90.69
Government Services	21,495	2.36	160,905	11.28	648.56
Thai GTP Sectors	27,410	3.01	51,822	3.63	89.06
Total	909,378		1,426,525		56.87
Chonburi-Rayong					
Agriculture	227,929	50.29	227,033	31.90	-0.39
Manufacturing	64,551	14.24	82,174	11.55	27.30
Commercial Services	155,050	34.21	254,621	35.78	64.22
Government Services	6,712	1.26	147,782	20.77	2487.32
Thai GTP Sectors	23,628	5.21	26,584	3.74	12.51
Total	453,242		711,611		57.00

Source: Census Data

Of the possible infrastructure mega-projects being considered by the National Economic and Social Development Board (NESDB 1993), only the Global Transpark has the potential to accelerate decentralization. While addressing important development goals, many infrastructure projects may result in increased stress on the Bangkok area. The Second Bangkok International Airport has the potential to relieve capacity constraints on Don Muang Airport but it, of necessity, must be located close to central Bangkok. Further, without steps to provide critical masses of economic activity outside Bangkok, transportation and communication projects, such as improved highway, rail and telecommunications systems, may actually enhance the concentration of certain activities in Bangkok by relieving the need for command and coordination activities to be located near activities which must be located outside

302

Bangkok. Past experience in other countries has often shown that improved transportation and communication can drain economic activities away from outlying areas if provision is not made to "anchor" those activities.

Further, the Global Transpark has the potential to reinforce the success of the New Economic Zone policy by providing the infrastructure necessary to reduce logistics costs, thereby increasing overall productivity. The efficient infrastructure will encourage the creation of industrial and high-level service employment opportunities outside the Bangkok area and will increase the opportunities for high value-added agriculture in the global food market. Further, the logistic efficiency may make the Global Transpark region and Thailand a competitive site for global sourcing, resulting in the attraction of emerging industrial sectors not now operating in Thailand.

D. POPULATION FORECASTS

Preliminary estimates of the employment and population impacts of the Global Transpark were computed using the direct employment estimates reported in Chapter VI, and using multipliers and ratios computed from data provided by the National Statistical Office. Projections are uncertain in a rapidly changing environment such as Thailand where some urban service, particularly informal, employment functions as a "queue" to more secure and more highly paid positions, where rising levels of education may increase labor productivity at all occupational levels and where any efforts toward geographic deconcentration may create strong initial demand for some services, particularly from the government, in the newly developing urban centers that may tend to flatten with time. These factors cause employment multipliers to vary geographically and to shift over time.

On the basis of the direct employment estimates and multipliers computed from Thai Census and Labor Force Survey data, indirect employment was computed. Direct and indirect employment was then used to compute total employment and population. Occupation-industry matrices were used to compute the labor force skill needs as well as total wages generated and the demand for housing.

Small area estimates can be unstable when computed on the basis of sample surveys, as the ones used here are, but the employment multipliers in newly urbanizing areas, such as the Eastern region or a possible Global Transpark site (such as a subset of that region), differ from those of the more urban regions, such as the Bangkok ring. The rapid recent growth in the Eastern Seaboard may be responsible for the relatively high government employment multipliers. Because those rates of employment

303

growth are unlikely to continue, multipliers calculated from the experience of the Bangkok ring, where each additional manufacturing job was associated with .616 additional jobs in the commercial service sector and .350 additional jobs in government services, are used here. Indirect and total employment estimates are provided in Exhibit VII-4.

Utilizing an occupation-industry matrix calculated from the 1990 Census (Whole Kingdom), the number of 1) professional and managerial workers, 2) white collar administrative workers, 3) blue collar manufacturing and service workers, and 4) farm workers (including owners) was computed for several time points after the initiation of Global Transpark service. Since these are computed on the basis of fixed coefficients, the proportions remain stable. Exhibit VII-5 presents the estimates for the direct Thailand Global Transpark employment, as well as the indirect service employment generated and the total employment generated.

Exhibit VII-4
Manufacturing Employment Multipliers for Selected Geographic Areas (1983-1991)

Sector	Multiplier
Whole Kingdom	
Commercial Services	1.118
Government Services	1.157
Bangkok	
Commercial Services	1.483
Government Services	0.247
Bangkok Ring	
Commercial Services	0.616
Government Services	0.350
Eastern Region	
Commercial Services	1.307
Government Services	9.344
Chonburi-Rayong	
Commercial Services	2.352
Government Services	91.110

Source: Census Data

Exhibit VII-5
Generated Employment Estimates
Total and by Occupation

Sector	Percentage	Year of Global Transpark Operation			
		5	10	15	20
Panel A: Total Employment Estimate					
Total Direct Employment		8,754	21,547	36,872	57,612
Indirect Employment					
Commercial Services		5,392	13,273	22,713	35,489
Government Services		3,064	7,541	12,905	20,164
Total Indirect Employment		8,456	20,814	35,618	55,653
Total Employment		17,210	42,361	72,490	113,265
Panel B: Employment by Occupation					
Direct Employment by Occupation					
Blue Collar	82.6	7,231	17,798	30,456	47,588
Farming	1.1	96	237	406	634
Professional and Manager	6.2	543	1,336	2,286	3,572
White Collar	10.2	893	2,198	3,761	5,876
Commercial Service Employment by Occupation					
Blue Collar	39.2	2,114	5,203	8,904	13,912
Farming	2.0	108	265	454	710
Professional and Manager	19.0	1,025	2,522	4,315	6,743
White Collar	39.6	2,135	5,256	8,994	14,054
Government Services Employment by Occupation					
Blue Collar	25.1	769	1,893	3,239	5,061
Farming	1.0	31	75	129	202
Professional and Manager	59.6	1,826	4,495	7,691	12,018
White Collar	14.3	438	1,078	1,845	2,883

306

Exhibit VII-5 (cont.)					
Occupation	**Percentage**	**Years of Global Transpark Operation**			
		5	**10**	**15**	**20**
Panel B: Employment by Occupation					
Total Indirect Employment by Occupation					
Blue Collar		2,883	7,096	12,143	18973
Farming		138	341	583	911
Professional and Manager		2,851	7,017	12,007	18,761
White Collar		2,574	6,335	10,840	16,937
Total Direct and Indirect Employment by Occupation					
Blue Collar		10,114	24,984	42,599	66,560
Farming		235	578	989	1,545
Professional and Manager		3,393	8,352	14,293	22,333
White Collar		3,466	8,532	14,601	22,814
TOTAL		**17,208**	**42,356**	**72,482**	**113,252**

The operation of the Global Transpark will, by changing the industrial composition of the area in which it is sited, alter the occupational composition also, resulting in the need for a different educational mix. Utilizing a current occupation-education matrix for the Whole Kingdom (calculated from the 1990 Census), estimates of the needed labor force at each education level was computed. These estimates are provided in Exhibit VII-6.

Exhibit VII-6 **Labor Force Needs by Education Levels**				
Education Level	**Year of Global Transpark Operation**			
	5	**10**	**15**	**20**
Primary level	9,342	22,995	39,350	61,484
Secondary level	3,301	8,125	13,904	21,725
Post-secondary level	4,565	11,236	19,228	30,043
Total	**17,208**	**42,356**	**72,482**	**113,252**

The Global Transpark can substantially increase the salaries and wages earned in an area. Assuming a constant ratio of .8 times the prevailing salary in Bangkok, Exhibit VII-7 shows the estimated monthly earnings added to an area from total Global Transpark related employment in constant 1991 baht.

Exhibit VII-7 **Monthly Income Generated by Global Transpark (Constant 1991 Baht, Thousands, except Avg. Income)**					
Occupation	**Average Income**	**Year of Global Transpark Operation**			
		5	**10**	**15**	**20**
Blue Collar	2,445.6	19,787.2	48,704.1	83,344.2	130,224.1
Farming	1,807.8	339.6	835.8	1,430.2	2,234.7
Professional and Manager	10,832.9	29,408.3	72,385.3	123,868.3	193,542.5
White Collar	5,493.1	15,233.3	37,495.1	64,162.9	100,253.7
Total		**64,768.4**	**159,420.2**	**272,805.5**	**426,254.9**

Note: Assumes salaries at 80 percent of present day Bangkok levels.

The Global Transpark will generate a need for new homes. Utilizing 1991 labor force participation ratios and making several simplifying assumptions, the number of added households was calculated. Total population added was calculated utilizing the ratio of population to labor force size for municipal areas in 1991. These figures are shown in Exhibit VII-8.

The number of single-family, detached homes that will be needed as a result of the operation of a Thailand Global Transpark was calculated using occupation-specific housing data for the Bangkok ring taken from the 1990 Population and Housing Census. The number of purchase homes and the average number of rooms per housing unit were calculated in a similar manner. These figures are also shown in Exhibit VII-8.

Exhibit VII-8
Population, Households and Housing Needs Generated by a Thai Global Transpark

	Year of Global Transpark Operation			
	5	**10**	**15**	**20**
Total Population Estimate	**35,191**	**86,618**	**148,225**	**231,559**
Number of Households by Householder Occupation				
Blue Collar	5,505	13,550	23,187	36,230
Farming	128	315	538	841
Professional and Manager	1,847	4,546	7,780	12,156
White Collar	1,887	4,644	7,947	12,418
Total Households	**9,367**	**23,055**	**39,453**	**61,644**
No. of Single Family Detached Dwellings Needed	5,909	14,545	24,890	38,891
Average No. of Rooms	2.26	2.26	2.26	2.26
No. of Purchase Homes Needed	6,333	15,589	26,676	41,681

309

E. SOCIAL IMPACT OF THAILAND GLOBAL TRANSPARK ON THE SURROUNDING SITE

The Global Transpark is estimated to directly and indirectly generate permanent employment for over 113,000 individuals by the 20-year point. (Exhibit VII-5.) That is roughly sufficient employment to support the entire present day population of the provinces of Trat or Phuket.

The measured degree of impact of a project, however, on the surrounding area depends to a large degree on the size of the area considered. The combined population of the provinces of Chonburi and Rayong, here being considered as a possible site, is much larger. Moreover, 20 years from now, as two of the most rapidly growing provinces in Thailand, their populations will continue to grow. Therefore, the impact of the Global Transpark will appear to be less dramatic.

Taking these factors into account, if the Global Transpark were to begin operating in these provinces today, it would account for over two percent of all employment in the combined provinces within five years and would account for over four and one half percent of all employment by the twentieth year of operation. In order to arrive at that conclusion, a weighted average of the present NESDB projected rates of population growth was computed and it was assumed that the labor force would grow at the same rate as the population. That rate was applied to an early 1990s base labor force and projected forward 20 years. The total employment generated by the Global Transpark was then added to the local labor force projections. The resulting figures are shown in Exhibit VII-9.

Exhibit VII-9
Impact of Thailand Global Transpark on the Chonburi-Rayong Area Employment Level (Illustrative Case)

	Baseline	Year of Global Transpark Operation			
		5	10	15	20
Absolute Levels of Employment					
Base Labor Force Growth	711,611	800,600	1,013,355	1,443,046	2,311,915
Direct Thai GTP Employment		8,754	21,547	36,872	57,612
Indirect Thai GTP Employment		8,456	20,814	35,618	55,653
Total Thai GTP Employment		17,210	42,361	72,490	113,265
Base Line & GTP Employment		817,810	1,055,716	1,515,536	2,425,180
Global Transpark Employment as Percentage of Total Area Employment					
Direct Thai GTP Employment		1.07	2.04	2.43	2.38
Indirect Thai GTP Employment		1.03	1.97	2.35	2.29
Total Thai GTP Employment		2.10	4.01	4.78	4.67

Despite its measurable effect on total employment, the Global Transpark is expected to generate less overall change in the composition of employment in the combined provinces. Exhibit VII-10 compares the present day occupation mix of the labor force with projections. Because the region has already begun the transition to a diversified economy, with industrial employment already developing in the Eastern Seaboard and advanced services centered in several cities, dramatic changes in labor force composition should not be expected for an area this large. The occupational changes in the immediate locality, however, will be more dramatic.

As incomes rise, housing quality has improved in Thai urban areas. Large-scale planned residential developments are increasing the availability of needed amenities and enhancing the environmental quality of residential areas. A large-scale development, such as the Global Transpark, could be coordinated with residential and commercial service development in multiple nearby "new towns."

311

Exhibit VII-10
Impact of Thai Global Transpark on Chonburi-Rayong Area Employment Composition (Illustrative Case)

	Baseline	Year of Global Transpark Operation			
		5	10	15	20
Base Labor Force Growth	711,611	800,600	1,013,355	1,443,046	2,311,915
Base Labor Force Composition					
Blue Collar	19.4 %	155,316	196,591	279,951	448,511
Farming	33.6 %	269,002	340,487	484,863	776,803
Professional and Manager	35.0 %	280,210	354,674	505,066	809,170
White Collar	12.0 %	96,072	121,603	173,166	277,430
Total Direct and Indirect Global Transpark Labor Force Composition					
Blue Collar		10,114	25,894	42,599	66,560
Farming		235	578	989	1,545
Professional and Manager		3,393	8,352	14,293	22,333
White Collar		3,466	8,532	14,601	22,814
Baseline and Thai GTP Employment					
Blue Collar		165,430	221,485	322,550	515,072
Farming		269,236	341,065	485,852	778,349
Professional and Manager		283,603	363,027	519,359	831,503
White Collar		99,538	130,135	187,766	300,243
Total		817,808	1,055,711	1,515,528	2,425,167
Percentage Composition of the Chonburi-Rayong Labor Force					
Blue Collar	19.4	20.2	21.0	21.0	21.4
Farming	33.6	32.9	32.3	32.1	32.1
Professional and Manager	35.0	34.7	34.4	34.3	34.3
White Collar	12.0	12.2	12.3	12.4	12.4

312

Chapter VIII
Thailand Global Transpark Characteristics/Criteria

VIII. THAILAND GLOBAL TRANSPARK CHARACTERISTICS/CRITERIA

A. INTRODUCTION

The most efficient location for siting the Thailand Global Transpark (TGTP) will be determined by a number of factors, some of which are related and some independent. These include:

1. Economic Considerations

In particular the ability for the TGTP to be a local economic catalyst in an emerging industrial market region must be reviewed against the large financial investment of constructing the airfield and infrastructure facilities. Where possible, a site with existing facilities should be utilized and/or expanded in order to reduce the initial capital investment.

2. Industry Needs

The manufacturing and distribution industry requirement for a location that is convenient to raw materials, transportation, and a large trained labor pool must be considered when siting the TGTP. The financial and taxing incentives offered by the BOI in outlying regions from Bangkok also will be key to attracting private industry users and secondary suppliers to the Global Transpark.

3. Technical Criteria

The actual siting of the TGTP will be dependent on a multitude of technical and engineering criteria. These include the physical size requirements of the property, optimum topographic features for inexpensive construction, soil support parameters, airspace availability and clearances, dual runway capability, access to ground transportation networks, adequate utility availability, and potential environmental impacts.

The follow sections discuss these siting criteria in more detail.

B. ECONOMIC CONSIDERATIONS

The TGTP is an economic development engine. Its value to the Kingdom of Thailand is multi-fold, but its success can be measured in terms of the improvement

314

of the economy of the nation. In siting the Transpark, the following economic considerations need to be addressed:

- Land costs
- On-site construction costs
- Access development costs

The *cost of land* to develop the TGTP is an important factor in the economic analysis and selection of a potential site. However, land costs can not be examined in isolation and must be tempered by such factors as detailed in the following sections.

On-site construction costs are a function of availability of construction materials and labor. These costs will be estimated based on the review of the constructability of each site, as detailed in Section D.

Access development costs will identify the costs related to the extension of rail and road links to the site, as well as the provision of power supplies and utilities. These costs will reflect typical construction costs and estimated distances from the nearest sources to the development site.

C. INDUSTRY NEEDS

The long term success of the TGTP will reflect the success of each of the companies that are located at the complex or which use its facilities and services. The success of individual firms, expressed in such terms as growth of sales and expansion of markets and service areas, will be the basis for the economic stimulation and growth mentioned above. In siting the Transpark, the following considerations must be addressed:

- Access to all transport modes
- Access to communications facilities and services
- Access to support services
- Access to adequate power and other utilities
- Avoidance of Bangkok congestion
- Access to skilled labor pool
- BOI incentives

The role of the TGTP is to provide a physical union of transportation and industry to improve the ability of firms to compete in the regional and global marketplace. In order to support this role, access to all modes of transportation is essential.

315

The review of the transportation access of the site will include:

- *Existing on-site transport facilities.* The presence of on-site transport facilities will not only reduce initial construction costs, but also will indicate an existing level of traffic and transport service that can provide the basis for development at the TGTP.

- *Distance to off-site transport facilities.* The distance to off-site transport facilities will affect the comparative construction costs. A shorter distance will also indicate nearby traffic flow and service that may provide a foundation for further development at the TGTP.

- *Nature of existing on- and off-site transport facilities.* A review of the scope and scale of on- and off-site transport facilities will provide further information about the existing types of transport facilities.

The review of communications facilities and services will include the following:

- *Existing on-site facilities.* The presence of on-site communications facilities will not only reduce initial construction costs, but also will indicate an existing level of traffic and service that can provide the basis for development at the TGTP.

- *Distance to off-site facilities.* The distance to off-site facilities will affect the comparative construction costs.

- *Nature of existing on- and off-site facilities.* A review of the scope and scale of on- and off-site facilities will provide further information about the existing types of facilities and services.

The *review of support services* will concentrate on access to Customs. An existing Customs office will provide an immediate resource for the development of the TGTP as an international port of entry.

The *provision of adequate power supplies and other utilities* such as potable water, treated water, wastewater treatment, and natural gas are essential for the development of industrial activities at the site. It is not expected that the resources necessary to support a full-scale development will be present initially. However, the existence of a level of facilities and services that has some excess capacity will provide a foundation upon which to attract prospective tenants and develop the TGTP.

316

Avoiding the Bangkok area is paramount for the success of the TGTP. A significant percentage of the unparalleled economic growth of the Kingdom has been located within the Bangkok metropolitan area (BMA). This economic expansion has overwhelmed the transport facilities and services contributing to one of the world's highest levels of traffic congestion. In order for the TGTP to operate efficiently and effectively for the benefit of tenants and users, its location must not only be outside the BMA, but must also be served by routes that bypass the greater Bangkok area.

Access to a skilled labor pool is critical. A site that has a population base that can be employed on the site in the construction and initial stages and then supplemented by in-migration to support further industrial development is a critical element in the long-term success of the TGTP.

The ability of prospective tenants to secure *incentives from the Board of Investment* will have a bearing on their decision whether to locate on or near the proposed TGTP. The review of the prospective sites will identify whether incentives are available.

D. TECHNICAL CRITERIA

The technical criteria by which a proposed site will be graded for suitability as the location for a Thailand Global Transpark includes the following major categories:

- Physical property characteristics
- Airfield facilities
- Transportation access
- Utility infrastructure
- Environmental concerns
- Constructability

The physical property characteristics of the site will include a review of the following issues:

- *Availability of adequate property to construct and operate a dual runway airfield.* Assuming a minimum 1,450 m runway to runway separation in order to perform simultaneous dual IFR approaches, the minimum property requirements will range between 6,100 and 10,100 rai. To accommodate runway overruns and safety areas, the best approximate shape is rectangular with ultimate dimensions of approximately 3,500 m by 5,000 m.

317

- *Availability of property to support construction of major industrial and distribution facilities.* Recommended non-airfield area to support a Global Transpark is between 15,000 and 25,000 rai.

- *Topographic relief of the proposed property.* A site with relatively flat gradients will reduce costly cut-and-fill earthwork operations and also facilitate rail access to the site.

- *The horizontal and vertical extent of on-site swamps and wetlands.* The site should contain minimal low areas that could require costly removal of low-strength soils and backfill replacement with clean sand materials.

- *The relative mean sea level (MSL) elevation of the property.* The vertical elevation of the property will have a bearing on both the flooding probability of the site as well as the actual design length of the airfield runway.

- *The geotechnical parameters of the on-site soil materials.* A site that has large deposits of poor soils should not be selected. Good subgrade soil strength must be available to support airfield pavements as well as industrial building loads.

- *Ownership of the proposed property.* Acquisition of the proposed TGTP property will be more easily facilitated if required parcels are not owned by national parks, religious entities, conservation agencies, military services, educational institutions, or other public agencies.

- *Surrounding land uses.* The proposed site will be more socially acceptable if the noisy environment of a 24-hour airport is not located adjacent to residential, educational, or other high density urban land uses. Property located within an existing rural agricultural land use should be actively pursued.

The airfield facilities needed to support a TGTP at ultimate buildout should include the following:

- *Unobstructed airspace.* The selected site cannot be located in an area where obstructions penetrate the imaginary surfaces or has any restricted military operations areas. It will be imperative to TGTP industries that airport access be available in all Visual Flight Rules (VFR) or Instrument Flight Rules (IFR) operating conditions.

- *Dual runways*. The TGTP site must have the physical size to construct two runways in its ultimate configuration, preferably parallel, in order to maintain 24-hour operation capability, even during runway maintenance or aircraft breakdowns on the runway. Just-in-time based industries will be critically dependent on having runway capacity at all times.

- *Adequate runway length*. The selected site must accommodate a runway length and appropriate overruns for the critical aircraft, both passenger aircraft and cargo aircraft. The 747-200 will probably be the critical aircraft for the TGTP. Depending upon the elevation and average temperature of the selected site, the expected runway length will range between 3,200 to 3,800 meters. Overruns of 300 to 500 meters should be planned for each runway end.

- *High speed exits*. The runway for the TGTP will be designed to include appropriately located high speed exits in order to reduce runway occupancy time and increase runway operational capacity.

- *Parallel taxiway(s)*. The airfield for the TGTP will include appropriately spaced parallel taxiways for the reasons noted in the previous items.

- *Airfield lighting*. The TGTP runway will be lighted with high intensity runway lights (HIRL) for 24-hour operations and should include Cat II approach lights, centerline lights, touchdown zone lights, edge lights, threshold lights, and exit taxiway centerline lights.

- *Air traffic control tower*. The TGTP airfield will include an on-site air traffic control tower.

- *Navigation aids*. The TGTP airfield will include the following navigation aids: REIL, VASI, NDB, VOR/DME, Cat II ILS, and approach control radar.

Transportation access, other than air access, will be imperative to the multimodal transport of goods to and from the TGTP. The following modes of transportation should be accommodated at the selected site:

- *Ground access* to the primary highway system, the national highway system, and the secondary highway system should be readily available in order to move materials and products in a timely manner within Thailand and to and from neighboring countries. If a TGTP site cannot be developed near a primary or

national highway then the Highway Plan should be amended to upgrade the local access to at least national highway standard.

- *Access to the national railway system* by means of a rail spur should be available from the selected TGTP site in order to take advantage of that mode of transportation.

- *Access to a deep water seaport* is recommended, but not required, in order to accommodate transfer of some air cargo goods to and from seaport cities in Southeast Asia.

The following types of utility infrastructure must be available to attract industrial users to locate at the Global Transpark:

- *Electric power*. Unlimited power, both primary and secondary, must be available to serve industry at the TGTP site. A location near the existing EGAT power grid would be advantageous.

- *Potable water*. Adequate treated water capacity must be available for domestic and food processing uses at the TGTP.

- *Raw water*. Adequate untreated water capacity must be available for both industrial and fire fighting use at the TGTP.

- *Sanitary sewage treatment*. An on-site sewage treatment and disposal facility must be included for treatment of domestic waste water at the TGTP site.

- *Industrial waste treatment*. A footprint location for an on-site industrial water treatment plant should be planned in order to provide treatment and disposal capacity for industries that produce toxic and other special industrial wastewater.

- *Natural gas*. A source of natural gas should be available at the transpark site in order to provide industries with an alternative power and fuel source.

- *Telecommunications*. Unlimited hard line and cellular telephone and data communications lines must be available at the TGTP. A system of fiber optic cabling would be most advantageous.

- *Satellite communications.* A satellite communications system will be required at the TGTP in order that a reliable means of guaranteeing 24-hour availability of communications and electronic data interchange (EDI) can be provided to industry. The fail safe ability to provide communications to business and industry is a cornerstone to the success of the Global Transpark concept.

The following TGTP environmental issues should be considered when evaluating the technical resources at our alternative TGTP sites:

- *Noise.* The potential effect of aviation noise on adjacent populations and land uses must be considered when siting the TGTP. Residential, educational, and other high density land uses should not be encouraged under airport approach paths.

- *Air quality.* The potential effect of both aircraft and industrial emissions should be considered when evaluating alternative TGTP sites. Sites with sea breezes or frequent winds should be considered for optimum dispersion of aerial pollutants.

- *Traffic.* The potential impact of increased traffic congestion due to the TGTP must be assessed on national and local highways.

- *Water quality.* The potential impact of airport and industrial pollutants on surface water and groundwater aquifers should be considered. The proximity to water-sensitive industries (aquaculture, natural fisheries, etc.) should be taken into account when siting the TGTP.

- *Solid waste.* The disposal site for solid wastes generated by users and tenants of the TGTP should be considered.

- *Animal and plant habitat.* The displacement of existing animal and plant habitat by construction of the TGTP should be considered. Habitat of threatened or endangered species should be avoided or protected when possible. Wetlands should be protected when possible.

- *Land use.* Consideration should be given to developing land use ordinances to preclude the development of incompatible land uses in proximity to the TGTP.

- *Socioeconomics.* The localized impact of increased job opportunities and its increased pressure on housing stock, education, health, and public safety services should be considered.

- *Parks and recreation facilities*. The displacement or secondary impact to national parks, wildlife reserves, forestry preserves, and other recreation and/or tourist related facilities must be examined and assessed.

The constructability of the TGTP site will be affected by its location with respect to the following resources:

- Raw materials (fill, aggregates, wood, etc.)
- Building materials (concrete, asphalt, steel, etc.)
- Construction equipment
- Skilled labor

A remote site without ready access to the above-described resources would escalate both the cost and schedule for completion.

322

Chapter IX
Alternative Site Analysis

IX. ALTERNATIVE SITE ANALYSIS

A. INTRODUCTION

A five-step process was used to identify three alternative sites that each meet the technical criteria for siting a Global Transpark in Thailand. This chapter describes each of the steps and presents the findings of the respective analysis.

The five step alternative site selection process that was used is as follows:

Step 1

An inventory and summary review of all 25 Thai commercial service airports was performed in order to determine whether any of these existing airports have: (1) an existing or expanding air cargo market, or (2) adequate infrastructure or property requirements to support a Global Transpark.

The inventory and summary review was developed from information contained in existing reports and the Airport System Master Plan Study. The market study was performed as a part of this scope of services.

Step 2

The 25 commercial service airports were then analyzed to identify seven candidate airports that warrant further onsite investigation in the form of physical site inspections and interviews with local airport officials.

Step 3

A field site review was performed for each of the seven candidate airport sites and a trip report prepared summarizing the findings of each visit.

Step 4

A matrix of common information was then developed in order to perform a comparative analysis of the merits of the seven candidate sites.

324

Step 5

A listing and recommendation of the three alternative Thailand Global Transpark sites was then prepared.

B. EXISTING COMMERCIAL SERVICE AIRPORTS

At present there are 25 airports that provide commercial services within Thailand. Four of those airports (Bangkok International, Chiang Mai, Hat Yai, Phuket) are identified as Level 1 airports and handle both international as well as domestic services. The four Level 1 airports are operated by the Airports Authority of Thailand (AAT).

The remaining 21 commercial service airports are considered Level 2 airports and provide limited domestic service that directly or ultimately route to Bangkok International. With the exception of Samui, which is a private airport, the Level 2 airports are operated by the Department of Aviation (DOA), often in conjunction with the military. The Level 2 airports are listed as follows:

1. Chiang Rai
2. Khon Kaen
3. Lampang
4. Loei
5. Mae Hong Son
6. Mae Sot
7. Nakhon Ratchasima (Korat)
8. Nakhon Si Thammarat
9. Nan
10. Narathiwat
11. Pattani
12. Phitsanulok
13. Phrae
14. Sakon Nakhon
15. Samui
16. Surat Thani
17. Tak
18. Trang
19. Ubon Ratchathani
20. Udon Thani
21. U-Tapao

325

Figure IX-1 shows the location and dispersion of the Level 1 and Level 2 commercial service airports within Thailand.

Another 55 minor airfields, including grass strips, are classified as Level 3 airports in Thailand. Due to their minor significance, the Level 3 airports have not been considered when developing the list of seven candidate sites.

For an analysis of the selection of the seven candidate airport sites, the reader can proceed to subsection E; the following two sections (C and D) present a summary review of all Level 1 and Level 2 commercial airports.

C. LEVEL 1 AIRPORTS

A Summary Review of the existing Level 1 airports is as follows:

1. Bangkok International/Don Muang

Bangkok International Airport (BKK) is the international gateway airport to Thailand. Annual passenger volume is now approaching 25 million passengers and is forecasted to reach nearly 60 million annual passengers by the year 2010. BKK is the hub of Thailand's domestic and international airport system. Chiang Mai and Phuket, at approximately one million passengers per year each, are the next most active airports in Thailand.

Located 25 kilometers to the north of the central Bangkok Metropolis on Highway #31, BKK is owned and operated by the AAT. The Royal Thai Air Force (RTAF) uses the airfield in a joint use agreement. The RTAF military facilities occupy the area east of the runway facilities while the commercial facilities, including passenger terminals, cargo terminal, and Thai Airways maintenance facilities, are all on the west side of the airfield. See Figure IX-1.

The airfield consists of a dual runway system on an 03/21 orientation. The existing runway centerlines are separated by 395 meters centerline to centerline. The northerly end (21) of both runways originate at the same point. Runway 21L measures 3,500 meters long by 45 meters wide and is constructed of asphalt. Runway 21 R is 3,700 meters long by 60 meters wide and is concrete. The runways are connected by three cross-field taxiways (midpoint and ends of 21L) with no high speed exits or parallel taxiway between them. Both runways are fully lighted for night operations.

326

A full length parallel taxiway (Taxiway T) located on the east of runway 21L provides access to the RTAF aprons and hangar areas.

A dual, parallel Taxiway C/Taxilane B system west of Runway 21R directs aircraft to the commercial apron area extending the full length of the runway system. The westerly Taxiway B is a former runway and operates as an apron-edge taxilane in the area of the International Terminal. A partial parallel Taxiway, Taxiway A, extends from the International Terminal north to an aircraft maintenance area.

There are two terminals at BKK. The International Terminal, a 161,600 square meter four-level structure has 28 gates and three remote aircraft parking positions. The building contains a central block, three boarding gate piers, and a north wing. All processing functions for international passengers are performed in this facility.

A separate three-story, domestic terminal is located 450 meters south of the International Terminal. The recent addition of a boarding gate pier will bring this building to approximately 25,700 square meters and will provide eight gates and three remote aircraft parking positions. All domestic check in and bag claim functions are handled through this terminal.

A separate cargo terminal is located 985 meters north of the domestic terminal near the south end of the aircraft apron. The 70,000-square-meter building provides all cargo handling and inbound cargo staging.

Separate access from Highway #31 (Vibhavadi - Rangsit Highway) is provided via ramps to the International Terminal and to the Domestic Terminal/Cargo Terminal. Parking is located between the two-level arrival/departure curbside roadways and Highway #31. Access and parking at the Bangkok International Airport are extremely congested due to the limited available property.

Cargo volumes at BKK are approximately 800,000 tons per year and are forecast to grow to 2,460,000 tons by the year 2010.

The existing Bangkok International Airport is presently near capacity from both the aircraft operations and landside access standpoints. A reliever, or second Bangkok International Airport, will be needed in the very near future. Ongoing studies have developed potential alternative locations near the Bangkok

327

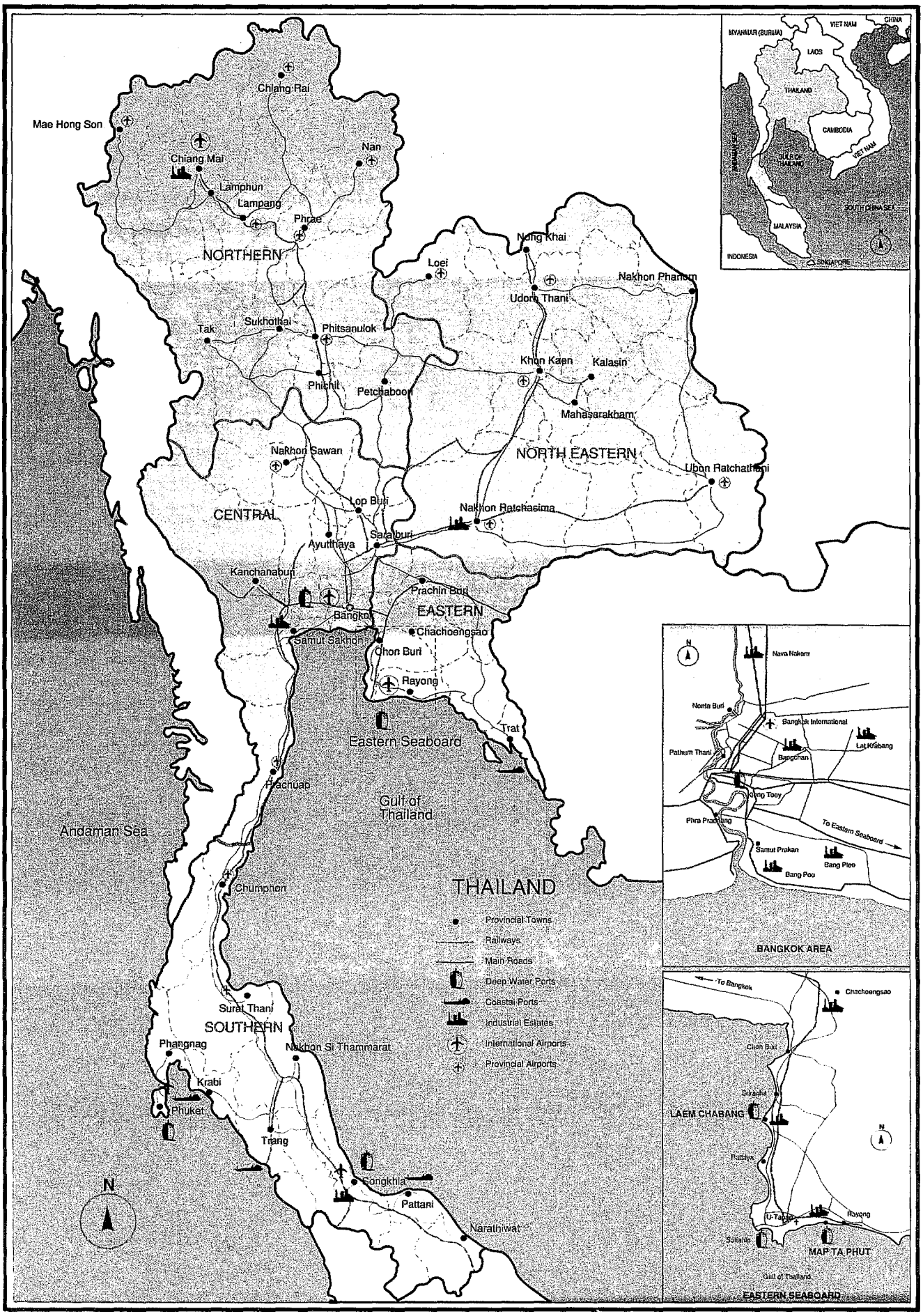


Figure IX-1

328

metropolis. Initial property has been acquired by the Royal Thai Government at the Nong Ngu Hao site and planning efforts continue.

2. **Chiang Mai**

Chiang Mai International Airport, four kilometers southwest of the center of Chiang Mai, is adjacent to the southwest corner of the city. The airport property is composed of 1,905 rai. Commercial facilities at the airport are operated by the AAT. The airport is operated jointly with the Royal Thai Air Force, which has a base at the airport.

The airfield consists of a single asphalt runway 3,100 meters long and 45 meters wide on an 18/36 orientation. The runway is lighted for night operations.

A partial parallel taxiway, 23 meters wide, runs along the northerly 1,050 meters of the runway on the east side. This taxiway is linked to the runway by three connecting taxiways. Taxiway centerline to runway centerline is 240 meters. A second curved taxiway on the east side, 15 meters wide, originates 950 meters north of the 36 Runway end and loops east of the runway to meet a commercial aircraft apron located at the southerly end of the partial parallel taxiway. The curved taxiway is not lighted or suitable for larger aircraft.

The commercial aircraft apron consists of 58,800 square meters of concrete pavement. The passenger terminal and a separate cargo handling facility adjoin the aircraft apron.

The airspace at Chiang Mai is severely restricted. The 1,601-meter-high Doi Suthep mountain west of the airport restricts all traffic patterns to the east side of the airfield. In addition, there are three areas of restricted military airspace in the vicinity, including one adjacent to the west boundary of the airport. The nature and extend of these restricted areas are as follows:

- **R-5** is adjacent to the airport on the west side. It is a circular area with a 5 NM radius centered around the Phu Phing Palace. The area extends from the surface to 12,000 feet altitude.

- **VTD-41** is a large area north and east of the airport, immediately adjacent to the 10 NM radius of the Chiang Mai Terminal Area. VTD-41 is an RTAF flight training area, and extends from the surface to an unlimited altitude. The area is under the jurisdiction of the Chiang Mai control tower.

329

- **VTD-42** is an even larger area south and west of the airport, also immediately adjacent to the Chiang Mai Terminal Area. VTD-42 is an RTAF flight training area and is restricted from the surface to an unlimited altitude. It is active from 0100 to 1400 Z, Monday through Friday, and is also under the jurisdiction of the Chiang Mai control tower.

In addition to airspace restrictions, the Chiang Mai Airport is surrounded by many existing high density land uses. In order to reduce noise over the developed areas to the north of Chiang Mai International Airport, bi-directional operations are normally utilized, with landings to the north on Runway 36 and takeoffs to the south on Runway 18. This procedure will limit the ultimate capacity of the airport.

The commercial passenger terminal has a total floor area of 15,140 square meters, of which 8,220 are used for passenger processing functions. Much of the remaining floor space is devoted to office uses; on the second floor a large circulation space and offices are not heavily used. The passenger processing areas of the terminal are on two floors with separate international and domestic departure hold rooms on the second floor and all other passenger processing on the ground floor. A third floor of the building is occupied by the AAT airport administration offices.

A single-level curbed roadway is nine meters wide and runs the full length of the terminal, serving both the international and domestic areas. The area is frequently congested at flight times because hotel vans and other tourist vehicles park at the limited curb for extended periods. The parking lot in front of the terminal has a capacity of 290 vehicles.

A Thai Airways air cargo terminal of 640 square meters is located just off the commercial apron, north of the passenger terminal. This terminal includes a central storage area for both containerized and non-containerized freight, and space for offices. Landside is a small fenced area for vehicular parking and container storage.

The military base is on the east side of the runway, comprising the former terminal and adjacent area to the north, and including apron/revetment parking areas, a maintenance hangar, and two alert shelters at the north end of the runway. The RTAF unit based here uses Nomad light-utility transport aircraft for parachute training operations, helicopters, and OV-10s.

Commercial aircraft fueling at the airport is available via tanker trucks for delivery to the aircraft. A tank farm located north of the main terminal has a storage capacity of 322,000 liters of jet fuel and 3,000 liters of aviation gasoline.

Chiang Mai International Airport is connected to the city road network by a one kilometer access road that passes the fuel farm and various buildings on the airport property.

There are three principal roads intersecting this access road. The first, Bunruangrit Road, runs north-south along the western boundary of the old city, along the moat. The second, Highway #108, leads southwest to Hod. The third leads east to eventually intersect with Super Highway #11. This Super Highway serves as an arterial beltway around northeastern Chiang Mai, and also provides arterial-route access to Lampang and connecting highways to the central and south of Thailand.

Passenger traffic at Chiang Mai has shown strong growth over the past decade and approaches approximately one million passengers per year. Annual cargo tonnage is approximately 4,000 tons and can be expected to increase.

Expansion of Chiang Mai International Airport will be difficult. The airport is currently surrounded by urban areas to the north, the northwest and the east, and by semi-rural and agricultural areas to the south and the west. The dominant natural feature in the area is Doi Suthep mountain (1,601 meters) to the west of the airport.

To the north, the city of Chiang Mai is becoming a concentrated urban area, including extensive residential development and high-rise buildings. On the west side, two residential developments already exist, and a third is under construction adjacent to the runway. To the south, housing and factories are being developed along Highway 108, and immediately to the west of the Runway 36 threshold. This type of incompatible development has resulted in a growing noise problem that is likely to affect airport operations and expansion in the future.

3. Hat Yai

Hat Yai International Airport is operated by the AAT. The airport is located approximately 12 kilometers southwest of the city of Hat Yai, in the southern region.

331

The Royal Thai Air Force has an installation south of the runway that includes an extensive apron and two hangars. Helicopters, T-33s, and transport aircraft are operated from this base.

The airfield consists of a single asphalt runway 3,050 meters long and 45 meters wide on an 08/26 orientation. The runway is lighted for night operations. A full-length parallel taxiway, 23 meters wide, runs along the north side of the runway. The centerline separation between runway and taxiway is only 120 meters, which is below the ICAO standard (180 M) for instrument operations by Class C, D, and E aircraft. Two high-speed exits provide access to the taxiway in each direction.

An extensive concrete commercial aircraft apron, 430 by 150 meters, is situated north of the parallel taxiway at about the midpoint of the airfield. Access is via four 23-meter-wide connecting taxiways. Although the apron has capacity for simultaneous parking by two wide-body aircraft, two B-737s, and one small turboprop, there is seldom more than one commercial aircraft on the ground at a time.

There are four restricted airspace areas in the vicinity of Hat Yai Airport in various directions; all are at least 15 NM away from the airport itself. Restricted airspace areas are as follows:

- **VTD-48**, west of the airport, is used for RTAF flight training. It extends from the ground to an unlimited altitude, and is active only from 0200 to 0800 Z, Monday through Friday. It is under the jurisdiction of the Hat Yai control tower.

- **VTD-49**, southeast of the airport, is also used for RTAF flight training. It extends from 2,000 feet to an unlimited altitude, and is active from 2300 to 1100 Z, Monday through Friday. It is also under the jurisdiction of the Hat Yai control tower.

- **VTD-50**, northeast of the airport, is used for RTN flight training. It extends from the surface to an unlimited altitude, and is active from 2300 to 1100 Z, Monday through Friday. It is also under the jurisdiction of the Hat Yai control tower.

- **VTR-52** is a small RTAF jettison area south of the airport. It extends from the ground to 8,000 feet, and is in effect from sunrise to sunset.

A two-story, 13,920-square-meter passenger terminal is situated at the north edge of the parking apron. Full services to process both domestic and international passengers, including customs and immigration and automated bag handling devices, are included therein.

A small two-bay cargo building of 346 square meters is located on the ramp west of the terminal. The building was built by DOA and is now operated by Thai Airways. There is a customs inspection office located in the building.

Existing highway access to and from the Hat Yai airport is good. The direct route, via Highways #4153 and trunk route 43, is relatively unencumbered, particularly because traffic to and from the airport is light. Terminal access is at ground level. Curb frontage is 90 meters and the roadway is relatively wide (16 meters). Operational difficulties arise, however, from the system that allows traffic to travel in both directions at the curb.

A large paved parking area is located north of the terminal and has capacity for 110 vehicles. An additional parking area of approximately equal size, unpaved, is located east of the paved parking area.

There is a small fuel tank farm northeast of the terminal. Fuel is delivered to the tank farm by truck and aircraft fueling is handled by a separate fleet of three trucks, each with a 10,000-liter capacity. This means that fueling operations for larger aircraft can be very time-consuming.

Annual passenger volumes have remained constant at about 400,000 per year. Significant cargo tonnage (4,000+ tons per year) is expected to continue.

Uses of lands in the vicinity of the airport are predominantly agricultural, with scattered rural settlements. To the north are low-density settlement clusters. RTAF base facilities, including an apron and hangars, are located to the south.

At 3,468 rai, the Hat Yai International Airport has extensive unused land holdings. Much of the unused property is to the south of the existing runway and is owned and partially occupied by the RTAF.

4. **Phuket**

Phuket International Airport, located at the north end of Phuket Island, about 32 kilometers from Phuket town, is operated by the AAT. No military or privately owned aircraft are based at the airport; there are very few non-commercial operations.

The airfield consists of a single runway 3,000 meters long and 45 meters wide on an 09/27 orientation. The runway is asphalt except for 300 meters at the 09 end and 900 meters at the 27 end which are concrete. The runway is lighted for nighttime operations.

Approaches to the runway are generally clear, with an over-water approach from the west and falling terrain to the east. There are hills rising to both the north and south, causing non-precision approach minimums to be higher than at many other airports. For example, the NDB Runway 27 approach minimum at Phuket is 1,068 feet above ground level (AGL), whereas minimums of less than 500 feet AGL are possible at less-obstructed airports, such as Khon Kaen or Surat Thani. There are no restricted military operation areas in the vicinity.

There is no parallel taxiway at Phuket Airport; expanded turnarounds at each runway end allow aircraft to reverse directions and taxi on the runway.

The present passenger terminal and aircraft parking apron at Phuket are located south of the runway and were put into service in early 1990. The apron at the present terminal is 250 by 160 meters, while the apron at the adjacent original terminal is approximately 400 by 80 meters. The aircraft apron at the new terminal is concrete and is connected to the runway by two 30-meter-wide concrete taxiways. One taxiway exits directly from the 09 runway end and the other ties in 200 meters east of the end. The original asphalt apron is located east of the new apron area and is connected to the runway by two taxiways.

Passenger processing functions in the new 24,180-square-meter terminal take place on two levels—the upper departure level and the lower arrival level. Each level is divided into a domestic and international section. There are two loading bridge-equipped gates on the second level. There are also provisions at each end of the building for ground loading/bus loading.

The international sections of the terminal are designed to provide all international processing requirements, including departure immigration and customs checks and arrival immigration and health and customs inspections. Vertical circulation between levels is provided by escalators (one each down to domestic and international arrivals areas) and stairways. No elevators are provided for passenger circulation.

The terminal building also has a third level, including a balcony overlooking the central atrium, a large restaurant, and offices for the AAT and airport tenants.

The terminal roadways are also built on two levels, with the second level roadway accessed by steep ramps. This arrangement creates curb frontages of 70 meters at both the departure and arrival levels. Each of the frontage roadways is only eight meters in width. A bus staging area is provided beyond the arrival roadway. Both the bus staging area and the parking lot beyond are built at ground level. The parking lot has a capacity of approximately 200 vehicles.

Access to Phuket Airport is provided via a paved three kilometer road along the southern boundary of the airport to Highway #402.

A tank farm is located immediately southeast of the new terminal parking lot. Fueling is performed by a fleet of four trucks, each with a capacity of 15,000 liters. Deliveries to the tank farm are also made by truck.

Phuket Airport continues to serve in excess of one million passengers annually since 1989. Approximately 80 percent of these are domestic and 20 percent international. A high percentage of all travelers are tourism related. Cargo volumes average nearly 3,800 tons per year and are expected to increase. Cargo will continue to be carried as belly cargo in passenger aircraft.

The existing Phuket Airport is somewhat constricted in shape and size (1,447 rai) and does not readily lend itself to expansion of the airfield. Adjacent properties are predominantly private and in rural and agricultural land use. Several natural conservation areas, including Nai Yang National Park and the tops of adjacent hills, currently belong to the Thai government.

335

D. LEVEL 2 AIRPORTS

A Summary Review of the existing Level 2 airports is as follows:

1. Chiang Rai

Chiang Rai Airport is located two kilometers south of the center of the town of Chiang Rai in northern Thailand. There are no military facilities at the airport.

The airfield consists of a single asphalt runway 1,675 meters long and 30 meters wide on an 18/36 orientation. The runway is not lighted for night operations. There is no parallel taxiway; aircraft currently taxi and turn around on the runway. The transition slope at the western side of the runway is obstructed due to a small hill and several religious structures. The runway itself is crossed by an active roadway that is used as access to the adjacent temple.

An asphalt aircraft parking apron, located east of the runway at about the midpoint, measures 90 by 60 meters. It is linked to the runway by a single 22-meter-wide connecting taxiway. The apron is separated from the runway centerline by 70 meters.

A 1,300-square-meter terminal is located adjacent to the aircraft apron. There are no based aircraft and no aircraft fueling facilities at Chiang Rai.

Road access and the curb area at Chiang Rai are very constrained. The access road is a very narrow two lanes, passing through a residential area between the airport and the main road to Chiang Rai. The automobile parking area and passenger loading areas at the terminal are also very small, with tight turning radii.

Both existing passenger and cargo throughput at Chiang Rai are relatively low and are not expected to show significant increases in the near future. The existing airport property (582 rai) is narrow and does not permit construction of a parallel taxiway or significant expansion without significant property acquisition.

2. Khon Kaen

Khon Kaen Airport is located eight kilometers west of the city of Khon Kaen in northeastern Thailand in Khon Kaen Province. There are no military facilities at the airport.

The airfield consists of a single asphalt runway 2,050 meters long and 45 meters wide on an 03/21 orientation. The runway is lighted for night operations. There is no parallel taxiway at Khon Kaen. Extension of the existing runway would be difficult.

The terrain falls rapidly at the south end of Runway 03, so any extension of the runway in this direction would require construction of a large embankment (up to 15 meters in depth). The central portion of the runway is built in a cut through higher adjacent terrain. Terrain off the north end of Runway 21 rises gently but does not infringe on the northerly approach slope.

A new residential development under the 03 approach path is not close enough to the runway to constrain potential future airport expansion, but is close enough to be adversely affected by airport noise in the future. Land north of the 21 end of the runway is owned by the Royal Thai Army.

The aircraft parking apron is located east of the runway, with a separation of 160 meters from the runway centerline. The apron is primarily asphalt, with a portion paved with concrete, and is 180 by 80 meters. The apron is linked to the runway by two connecting taxiways, each 23 meters wide. These two taxiways are separated by 120 meters.

Passengers and cargo are processed through a 2,060-square-meter terminal facility located adjacent to the aircraft apron. There are no permanently based aircraft or fuel storage facilities. Commercial flights are refueled by tanker truck.

A two-lane roadway passes along the 75-meter-long terminal curb, providing access to both the arrival and departure entrances, which are separated. The parking lot provides capacity for 70 vehicles.

Cargo traffic at Khon Kaen is negligible. Passenger traffic (approximately 90,000 to 100,000 annual passengers) is composed mainly of business and government travelers, many associated with the local Khon Kaen University. Tourist travel accounts for about 20 percent of the annual volume.

Because of constraints imposed by the surrounding city and the small size of the existing airport property (854 rai), the long-term plan for Khon Kaen is to relocate the airport to the Nam Phong military base approximately 30 kilometers north of the city. Nam Phong, which is not actively used by the RTAF, has an existing 3,800-meter concrete runway and extensive land holdings (30,000 rai)

337

that could be used for future airport and industrial use. The Royal Thai Army also uses this property for field training.

3. **Lampang**

Lampang Airport is located two kilometers from the center of the city of Lampang in northern Thailand, Lampang Province. There are no military facilities at Lampang Airport at present.

Lampang airfield consists of a single asphalt runway 1,475 meters long and 30 meters wide on an 18/36 orientation. The runway is not lighted for night use. There is no parallel taxiway. There are no obstructions that would prevent future extensions at either end of the runway.

The aircraft parking apron is located east of the runway, with a separation of 80 meters from the runway centerline. The apron is asphaltic concrete, and is 60 by 90 meters. The apron is linked to the runway by a single connecting taxiway 23 meters wide, with four-meter shoulders.

A 471-square-meter terminal provides passenger processing facilities. There are no based aircraft and no aircraft fueling capabilities at Lampang.

Access is via a two-lane roadway to connect to the public road system. The roadway passes along the 24-meter-long terminal curb, providing access to both the arrival and departure areas. A parking lot provides capacity for approximately 60 vehicles.

Passenger and cargo throughput at Lampang is negligible (one flight per day) and is not anticipated to make any significant increase in the foreseeable future.

The existing property (470 rai) could be expanded by acquisition but at this time could not support any modification of the airfield. A new site on a 10,000 rai tract of land owned by the RTG Forestry Department is now being studied as a potential site to relocate the airport. The site is approximately 20 kilometers away from the existing airport alongside Highway 11.

4. **Loei**

Loei Airport is located five kilometers south of the town of Loei in north central Thailand. There are no military facilities at the airport, and very few aircraft movements other than the limited commercial activity.

The airfield consists of a single asphalt runway 1,500 meters long and 30 meters wide on an 01/19 orientation. The runway is not lighted for night operations. There is no parallel taxiway; aircraft turn around on the runway using widened turnaround/runup pads located at each end. Loei Airport is located in mountainous terrain and has obstructions in the southern 01 approach, as well as in the horizontal and conical surfaces to the east and west of the airport.

An asphalt aircraft parking apron, located east of the runway near the 19 end, measures 180 by 60 meters. It is linked to the runway by a single 15-meter-wide connecting taxiway.

A 180-square-meter passenger terminal is located adjacent to the aircraft parking apron. There are no based aircraft and no aircraft fueling facilities at Loei Airport.

Road access is provided to the terminal via a two-lane roadway. Onsite parking is provided for 80 vehicles. Existing passenger throughput at Loei Airport is low, with only three flights per week at present. Cargo tonnage is insignificant. No significant increase is anticipated for either passengers or cargo.

5. **Mae Hong Son**

Mae Hong Son Airport is located in the town of Mae Hong Son and is operated by the Department of Aviation. The airport is located in mountainous terrain in northwest Thailand, surrounded by mountains rising to 1,500 meters.

In recent years, there has been increased tourist activity in the area served by the airport, primarily associated with mountain resort and trekking activities.

The airfield consists of a single asphalt runway 1,630 meters long and 30 meters wide on an 11/29 orientation. The runway is lighted for night operations. There is no parallel taxiway. The local mountainous terrain imposes severe restrictions on operations at Mae Hong Son.

All approaches and departures are to/from the west (takeoffs on Runway 29, landings on Runway 11) due to mountains rising at the east end of the runway. Terrain at the west end of the runway falls rapidly, so that the runway threshold is significantly higher than the surrounding terrain. In addition, there are tall trees north of the runway that should be cut for side-slope clearance purposes, but these trees are protected by government forestry policies. Approaches from the west are also affected by high terrain, with mountains to the right of the approach course four kilometers from the runway, requiring a curved flight path following a river course. This approach brings aircraft at low altitude on final approach over portions of the town.

A 727-square-meter terminal is located at the south edge of the aircraft parking apron. There are no based aircraft and no aircraft fueling facilities at Mae Hong Son.

Road access is via a two-lane local road through the city. A short curb front and parking for approximately 100 vehicles is available.

Existing passenger traffic is low (50,000 to 60,000 per year), but steady. Moderate cargo activity (230 to 260 tons) exists.

Expansion of Mae Hong Son airport will be difficult due to the operational restrictions and physical limitations of the surrounding mountain terrain.

6. **Mae Sot**

Mae Sot Airport is located four kilometers southwest of the town of Mae Sot, in northern Thailand. It is operated by the Department of Aviation.

The airfield consists of a single asphalt runway 1,500 meters long and 30 meters wide on an 9/27 orientation. The runway is not lighted for night operations. There is no parallel taxiway; turn around areas 60 meters wide are provided at each runway end.

An asphalt aircraft parking apron, located north of the runway at about the midpoint, measures 180 by 60 meters. It is linked to the runway by a single 15-meter-wide connecting taxiway. The apron is separated from the runway centerline by 150 meters.

A 1,098-square-meter terminal is located north of the aircraft parking apron. There are several light aircraft and helicopters, belonging to the military and the border police, based on a separate apron located west of the terminal building. There are no fueling facilities at Mae Sot Airport.

Road access consists of a short two-lane roadway to adjacent Highway #105. A short loading curb and parking for 36 vehicles is available at the terminal.

Both existing passenger (less than 10,000 per year) and cargo (50 tons per year) throughput at Mae Sot are minor and not expected to increase significantly.

7. **Nakhon Ratchasima/Korat**

Nakhon Ratchasima Royal Thai Air Force Base, located five kilometers south of the City of Nakhon Ratchasima in northeastern Thailand, is a major Royal Thai Air Force (RTAF) base. Commercial facilities at the airport are operated by the Department of Aviation. Airfield facilities are used jointly by RTAF and the Department of Aviation.

The airfield consists of a single concrete runway 3,000 meters long and 45 meters wide on an 06/24 orientation. The runway is lighted for night operations. There is one parallel taxiway located on the south side of the runway.

Commercial aircraft park on a portion of a very large (120 by 270 meters) concrete apron adjacent to the parallel taxiway. Passengers are picked up and transported by bus over several kilometers of internal military base road to a recently completed new passenger terminal located just outside the gate to the RTAF base. At that point they are reunited with their baggage and have access to public transportation.

Annual passenger volumes are less than 10,000 and annual cargo is not measurable.

Although the existing property is sizeable (4,123 rai) it will be impossible to develop sufficient commercial facilities due to the extensive military use.

The DOA is currently evaluating a new 4,650 rai site 20 kilometers outside of Korat for construction of a new international airport. The property is owned by the RTG Forestry Department and is part of an overall 80,000 rai tract which could be expanded into a Global Transpark.

341

8. Nakhon Si Thammarat

Nakhon Si Thammarat Airport, located three kilometers north of the town of Nakhon Si Thammarat in southern Thailand, is operated by the Department of Aviation. The Royal Thai Army owns the airport and maintains a hangar area and numerous based aircraft at the airport. Additional RTA facilities are also located both north and south of the runway, posing a constraint to expansion of the airport.

The airfield consists of a single asphalt runway 1,100 meters long and 35 meters wide on an 18/36 orientation. The runway is not lighted for night operations. There is a partial parallel taxiway 22 meters wide that joins the runway about 150 meters from each end located on the west side of the runway. Military base concrete block walls, approximately three meters high, are located about 200 meters from each end of the runway. A 68-meter-tall antenna northeast of the airport exceeds the ICAO height clearance surface for the airport. A military golf course is located immediately adjacent to the runway, including areas between the taxiway and runway. Numerous small trees are included as landscaping in the golf course, and are located within the runway strip. The west side of the runway is bordered by a low swamp.

An asphalt aircraft parking apron, located east of the runway at about the midpoint, measures 150 by 70 meters. It is linked to the runway by the partial parallel connecting taxiway. The apron is separated from the runway centerline by 120 meters.

Commercial terminal facilities at the airport are extremely limited. Aside from a small air conditioned VIP waiting room, all passenger processing is performed in a small open-sided covered area, including check-in, security check (hand inspection), and baggage claim. This area appears to have formerly been a military vehicle garage.

Access is via Highway #401 immediately adjacent to the aircraft apron. Parking at the terminal is informal, with capacity for about ten vehicles on the grass north of the terminal. There are no aircraft fueling facilities at Nakhon Si Thammarat.

The concept of a new commercial airport at another site in the vicinity is being discussed by various interested parties, because any expansion of the airport at its present location would require relocation of adjacent military facilities.

9. **Nan**

Nan Airport, located two kilometers west of the town of Nan in northern Thailand, is operated jointly by the Department of Aviation and the Royal Thai Air Force.

The airfield consists of a single asphalt runway 2,000 meters long and 45 meters wide on an 02/20 orientation. The runway is lighted for night operations. The previous runway, oriented on a skewed angle to the existing runway, serves as a partial taxiway. The runway-taxiway separation decreases toward the south end of the runway, where the commercial apron is located, so that at this point the taxiway is only 65 meters from the runway (centerline to centerline). The taxiway and the runway are linked by a series of four connecting taxiways spaced along the length of the runway. Taxiway widths are 22 meters. Commercial aircraft are prohibited from using the parallel taxiway; only military aircraft use it.

An asphalt commercial aircraft parking apron, located east of the runway adjacent to the 02 end, measures 100 by 30 meters. It is linked to the runway by a single 22-meter-wide connecting taxiway. The apron is separated from the runway centerline by only 100 meters.

The 310-square-meter commercial terminal is located near the south end of the runway, on the east side. It is about 100 meters from the commercial aircraft parking apron, to which it is connected by a paved walkway.

Road access to the terminal is via a two-lane access road. The vehicle curb is 30 meters long and an adjacent parking lot has capacity for 20 vehicles.

There are no commercial aircraft fueling facilities at the airport.

The RTAF operations areas occupy the entire eastern side of the airport, except for the small commercial terminal area in the southeast corner of the airport. Military facilities include small buildings, parking aprons, and revetments. Based aircraft include small planes and helicopters, totaling seven aircraft.

Annual passenger throughput is less than 10,000 passengers. Minor cargo throughput (approximately 50 tons per year) should continue.

344

10. **Narathiwat**

Narathiwat Airport is a Department of Aviation airport located 13 kilometers north of the town of Narathiwat in southernmost Thailand. The airport is less than two kilometers from the sea; operations to the east are mostly over water.

Activity at the airport includes use by His Majesty the King and his family during their occasional visits to the nearby palace, and by the military, which maintains a hangar facility and several aircraft at the airport.

The airfield consists of a single asphalt runway 2,000 meters long and 45 meters wide on an 02/20 orientation. The runway is lighted for night operations. There is no parallel taxiway. Both runway approaches are free of obstacles.

An asphalt commercial aircraft parking apron, located east of the runway slightly north of the midpoint, measures 180 by 80 meters. It is linked to the runway by a single 23-meter-wide connecting taxiway. There are no commercial fueling facilities located at the airport.

A 190-square-meter terminal is located adjacent to the aircraft apron. A separate Royal Pavilion is located at the east end of the terminal. The Pavilion has direct apron access and is used infrequently, according to airport personnel.

Road access is via a two-lane roadway to nearby Highway #4136. A parking area with capacity for 30 vehicles is adjacent to the terminal.

The military apron is located to the west of the commercial apron and has a separate access taxiway to the runway. A military hangar is located at the apron. Several military aircraft are based at the airport.

Passenger volume remains low at less than 5,000 passengers per year. Minor volumes (less than 25 tons per year) of cargo are moved through Narathiwat Airport.

11. **Pattani**

Pattani Airport is a Department of Aviation airport located 16 kilometers south of the town of Pattani in southern Thailand. Formerly there was a small military detachment at the airport, but it has been moved elsewhere. A Royal Thai Army camp is located across the highway from the airport.

The airfield consists of a single asphalt runway 1,400 meters long and 40 meters wide on an 08/26 orientation. The runway is not lighted for night operations. There is no parallel taxiway.

An asphalt aircraft parking apron, located north of the runway at the 08 end, measures 60 by 60 meters. It is linked to the runway by a single 15-meter wide connecting taxiway. The apron is separated from the runway centerline by 120 meters.

A 529-square-meter terminal is located 45 meters north of the aircraft parking apron. There are no based aircraft and no aircraft fueling facilities at Pattani Airport.

Road access is via a short two-lane roadway to nearby Highway #42. Parking is adjacent to the terminal building.

Annual passenger volume at Pattani Airport is less than 3,000 passengers. Minor cargo volumes (20 tons per year) are processed through the airport.

12. **Phitsanulok**

Phitsanulok Airport, located three kilometers south of the city of Phitsanulok, is a Royal Thai Air Force/Department of Aviation joint use airport. Commercial operations are restricted to the runway and a small area in the northeast corner of the airport, where the passenger terminal is located. The remainder of the 1,380 rai property is used as an extensive RTAF base.

The airfield consists of a single asphalt runway 2,180 meters long and 45 meters wide on an 15/33 orientation. The runway is lighted for night operations. There is a 23-meter-wide parallel taxiway on the west side of the runway. A connecting taxiway links the parallel taxiway across the runway to the commercial facilities on the east side. The military uses the entire west side of the runway.

An access road to the military area crosses the runway, at a point near the south end of the runway. Traffic at this restricted crossing is controlled by a traffic signal and guard house. Another road crosses the northerly runway approach, approximately 100 meters north of the runway threshold. This crossing is also controlled by a traffic signal.

346

A concrete commercial aircraft parking apron, located east of the runway near the 15 end, measures 155 by 80 meters. It is linked to the runway by two 23-meter-wide connecting taxiways. The apron is separated from the runway centerline by 220 meters. The aircraft apron is sized to accommodate several aircraft simultaneously as Phitsanulok is used as a hub connecting point by Thai Airways linking feeder routes to/from small northern cities to the jet trunk route to Bangkok.

A 1,334-square-meter terminal is located adjacent to the aircraft apron. The terminal processes over 100,000 passengers per year due to the high number of transfer passengers at Phitsanulok.

Road access is via a short two-lane roadway to nearby Highway #12. A 50-vehicle parking lot is adjacent to the terminal.

As previously mentioned, existing passenger traffic is moderate due to the transfer nature of the airport. Cargo volumes (450 to 500 tons per year) are also moderate for the same reason.

13. **Phrae**

Phrae Airport, located two kilometers east of the town of Phrae in northern Thailand, is operated by the Department of Aviation.

The airfield consists of a single asphalt runway 1,500 meters long and 30 meters wide on an 01/19 orientation. The runway is not lighted for night operations. There is no parallel taxiway; 60-meter-wide turnarounds are located at each end of the runway.

An asphalt aircraft parking apron, located west of the runway at about the midpoint, measures 180 by 60 meters. It is linked to the runway by a single 15-meter-wide connecting taxiway. The apron is separated from the runway centerline by 150 meters.

A 380-square-meter terminal is located adjacent to the aircraft apron. There are no based aircraft at Phrae Airport. Aircraft fuel is available from a tanker truck.

Road access is via a two-lane roadway to nearby Highway #1022. Onsite parking for 50 vehicles is located east of the terminal.

Annual passenger volumes are less than 10,000 passengers; cargo volumes are less than 75 tons per year.

14. **Sakon Nakhon**

Sakon Nakhon Airport is located three kilometers west of the city of Sakon Nakhon in northeastern Thailand, and is located within a Royal Thai Army base. The airport is operated jointly by the RTA and the Department of Aviation. The airport is used on occasion by His Majesty the King and his family during their infrequent visits to a royal palace, located 16 kilometers from the airport.

The airfield consists of a single asphalt runway 2,600 meters long and 45 meters wide on an 05/23 orientation. The runway is lighted for night operations. There is no parallel taxiway; 60-meter-wide turnarounds are located at each end of the runway.

A concrete aircraft parking apron, located southeast of the runway 800 meters from the 05 end, measures 200 by 80 meters. It is linked to the runway by two 23-meter-wide connecting taxiways. The apron is separated from the runway centerline by 150 meters.

A 413-square-meter terminal is located 50 meters from the aircraft parking apron. There is one based aircraft and no commercial aircraft fueling facilities at Sakon Nakhon Airport.

Road access is through one kilometer of army base roads to Highway #22. All driving passengers must pass through the RTA gate security process. Unpaved auto parking is available in front of the terminal.

Annual passenger volumes have declined to less than 10,000 per year while cargo volumes remain minor (±20 tons per year).

15. **Samui**

Samui Airport, located 17 kilometers northeast of the main town of Nathon on the offshore island of Samui in south-central Thailand, is owned and operated by Bangkok Airways, and is the only private airport with commercial service in Thailand.

348

The airfield consists of a single laterite runway 1,200 meters long and 40 meters wide on an 17/35 orientation. The runway is not lighted for night operations. There is no parallel taxiway.

An asphalt aircraft parking apron, located east of the runway near the 35 end, measures 175 by 50 meters. It is linked to the runway by a single 23-meter-wide connecting taxiway.

The passenger "terminal," located on a hill to the east of the runway, consists of two open-sided roofed areas of some 200 square meters each, one serving arriving passengers and the other serving departing passengers. Terminal facilities include a check-in counter, a departure hold area, and an arrival/baggage claim area.

An unpaved road extends two kilometers from the terminal, through an undeveloped forested area, to the island's public roadway system. There is no formal parking lot for vehicles, although they are easily parked among the trees remaining in the clearing around the terminal area. Ground transportation is provided by hotel vehicles, taxis, and private automobiles, as well as a Bangkok Airways shuttle bus that runs to/from town for each flight. The frequent intra-island bus service on the main Samui loop road does not pass conveniently close to the airport to be fully effective in serving the facility.

Passenger traffic to Samui is estimated at 50,000 per year and is composed predominantly of international tourists and Thai nationals coming to enjoy the pristine island beaches and resorts. There is no cargo traffic from Samui.

16. **Surat Thani**

Surat Thani Airport, located 25 kilometers west of the city of Surat Thani, in southern Thailand, is owned by the Royal Thai Air Force. Commercial facilities at the airport are operated by the Department of Aviation and the airfield is used jointly by the RTAF and DOA. Commercial and military facilities are located on opposite sides of the runway. The airport property consists of over 3,200 rai.

The airfield consists of a single asphalt runway 2,500 meters long and 45 meters wide on an 04/22 orientation. The runway is lighted for night operations. There is a 23-meter-wide parallel taxiway located on the northwest side of the runway 230 meters from the runway centerline. The military facilities are located along this taxiway.

An asphalt commercial aircraft parking apron, located southeast of the runway at about the midpoint, measures 200 by 90 meters. It is linked to the runway by two 23-meter-wide connecting taxiways. The apron is separated from the runway centerline by 300 meters.

Fueling of commercial aircraft is performed on the ramp by use of tanker trucks.

A 3,100-square-meter terminal is located adjacent to the commercial aircraft parking apron to process arriving and departing passengers.

A two-lane roadway passes the full length of the curb, serving the separate arrivals curb and departures curb areas. The parking lot has a capacity of 350 vehicles, including a special bus staging area directly across from the arrivals curb. This area is used primarily by the Koh Samui connection buses. A two-kilometer asphalt road provides access to Highway #41.

Passenger traffic to Surat Thani is significant with over 150,000 annual passengers. Cargo volumes of over 600 tons per year are now generated. With continued increases in the local fresh seafood industries (fish, oysters, prawns), cargo volumes can be expected to increase at Surat Thani.

17. **Tak**

Tak Airport is a Department of Aviation-operated airport, located about 15 kilometers east of the town of Tak on Highway #12 in northern Thailand. There are no military facilities at the airport.

The airfield consists of a single asphalt runway 1,500 meters long and 30 meters wide on an 09/27 orientation. The runway is not lighted for night operations. There is no parallel taxiway; loop taxiway turnarounds, 15 meters wide, are located at each end of the runway.

An asphalt aircraft parking apron, located north of the runway at about the midpoint, measures 180 by 60 meters. It is linked to the runway by two 15-meter-wide connecting taxiways. The apron is separated from the runway centerline by 150 meters.

A 180-square-meter terminal is located adjacent to the aircraft parking apron. There are no based aircraft and no aircraft fueling facilities at Tak Airport.

Road access is via a two-lane roadway to nearby Highway #12. Onsite parking, north of the terminal, is available for 50 vehicles.

Passenger volumes at Tak Airport are less than 5,000 passengers per year and cargo volumes are negligible.

18. **Trang**

Trang Airport is a Department of Aviation-operated airport located seven kilometers south of the city of Trang in southern Thailand. There are no military facilities at the airport.

The airfield consists of a single asphalt runway 1,500 meters long and 30 meters wide on an 08/26 orientation. The runway is not lighted for night operations. There is no parallel taxiway.

An asphalt aircraft parking apron, located north of the runway at about the midpoint, measures 90 by 60 meters. It is linked to the runway by a single 15-meter-wide connecting taxiway. The apron is separated from the runway centerline by 150 meters.

There are no based aircraft and aircraft fueling at Trang is available from a small tank trailer.

A 472-square-meter terminal is located north of the aircraft parking apron.

Road access is via a two-lane roadway from nearby Highway #404. Onsite parking is available for 22 vehicles adjacent to the terminal.

Annual passenger volumes have declined to approximately 12,000 per year. Minor cargo volumes (150 tons per year) are generated at Trang Airport.

19. **Ubon Ratchathani**

Ubon Airport is a Royal Thai Air Force base located on a 2,225 rai parcel, two kilometers east of the town of Ubon Ratchathani in northeastern Thailand. RTAF fighters such as the A-37, and transport aircraft such as the C-123, are currently based at Ubon. The DOA operates a commercial passenger terminal at the airport, located on the northwest side of the runway. The runway is used jointly for commercial and military operations.

The airfield consists of a single concrete runway 2,743 meters long and 38 meters wide on an 05/23 orientation. The runway is lighted for night operations. A full parallel taxiway system is located on the northwest side of the runway, serving the military facilities.

A new 550-square-meter commercial terminal has recently been completed at the southeast side of the airport outside of the secure military area. Access to a new 3,000-square-meter aircraft apron is via a 23-meter connecting taxiway near the 05 end of the runway.

Ground access to the new terminal is through local residential streets from Highway #2050. Adequate parking and a widened curbfront roadway for enplaning and deplaning passengers has been constructed.

Annual passenger volumes at Ubon Ratchathani are approximately 40,000 passengers. Cargo volumes are insignificant at this time.

Residential and commercial areas of the town have encroached up to the boundaries of the airport. The approach to Runway 05 is directly over heavily populated portions of town; the approach from the northeast is clear.

20. **Udon Thani**

Udon Thani Royal Thai Air Force base, located on a 1,759 rai parcel, two kilometers south of the city of Udon Thani, is a Royal Thai Air Force/Department of Aviation joint use airport. The airport is a key RTAF base in northeast Thailand, with an F-5 fighter aircraft wing based at the field.

Commercial operations are conducted at a reserved area near the mid-point of the runway, which is surrounded by military facilities. The DOA owns the commercial terminal, and is not required to make payments to the military for use of the airport.

The airfield consists of a single concrete runway 3,048 meters long and 38 meters wide on an 12/30 orientation. The runway is lighted for night use. A concrete parallel taxiway runs the full length of the runway, on its south side, and is 23 meters wide with four-meter shoulders. The parallel taxiway is linked to the runway by four connecting taxiways. Separation between the parallel taxiway and the runway centerline is 245 meters.

The concrete commercial aircraft apron is located south of the parallel taxiway, slightly east of the runway mid-point. The apron is 120 by 60 meters and is linked to the parallel taxiway by a single short connecting taxiway.

A 760-square-meter passenger terminal adjacent to the apron provides separate facilities for processing arriving and departing passengers.

Ground access to the commercial terminal is through the RTAF base. This involves passing through the main gate and driving through approximately 2.3 kilometers of base roads. This access procedure is unpopular with passengers, because of the need to pass security checks at the gate, and causes base security concerns for the military.

The curbfront roadway, two lanes wide, passes along the full length of the terminal building, with separate areas for arrival and departure passenger loading and unloading. The adjacent parking lot has a capacity of 70 vehicles.

The RTAF base includes extensive facilities, including basing for a squadron of F-5 fighter aircraft.

Passenger activity at the airport has been relatively stable over the past five years, with an annual total of about 40,000 passengers. Cargo tonnage is negligible at Udon Thani Airport.

21. **U-Tapao**

U-Tapao Airport is a Royal Thai Navy base located about 130 kilometers southeast of Bangkok. It is approximately 40 kilometers east of Pattaya and 32 kilometers west of Rayong, in Rayong Province. The Department of Aviation operates a commercial terminal at the airport under a joint operations agreement with the RTN. See Figure IX-2.

Physical facilities at the 16,700 rai base are extensive, since U-Tapao was a major U.S. Air Force base for B-52 operations during the 1960s and 1970s. Many of the base's original facilities are no longer in use.

The airfield consists of a single concrete runway 3,450 meters long and 60 meters wide on an 18/36 orientation. The runway is lighted for night operations. A full length, 22.5-meter-wide parallel taxiway runs along the west side of the runway and serves both the existing commercial and military operations areas.

353

An area of approximately 750 rai on the east side of the runway is the former site of B-52 parking revetments. Pavements and revetments still exist in this area, but are no longer in use.

The southern boundary of the airport is the Gulf of Thailand, so approaches to the south are over water and free of obstacles. A hill to the northeast penetrates the ICAO clearance surfaces, affecting the decision height of non-precision approaches to Runway 18. Navigation aids at the airport include a VOR/DME, a CAT 1 ILS (Runway 18), a TACAN, an NDB, and military approach radar.

A large, central aircraft parking apron, approximately 1,800 by 200 meters, is offset west of the parallel taxiway. The commercial aircraft operations area is at the south end of this apron, with access via several connecting taxiways. The commercial terminal is located approximately 200 meters from the southwest corner of the main aircraft parking apron. Passengers are bused the short distance from the terminal to the aircraft.

The U-Tapao passenger terminal has a total floor area of 2,050 square meters, of which 1,390 are available for passenger access and processing functions. Full customs and immigration facilities are located at U-Tapao to process international passengers and cargo.

Road access to the commercial terminal is via base roads from Highway #3. Passengers must pass through the military security check at the main gate and then travel over approximately 2.7 kilometers of military roads before reaching the commercial terminal. Almost all passengers travel as members of groups and arrive and depart from the airport by bus. Very few private vehicles travel to the commercial terminal.

A curb-front roadway traverses the full length of the terminal front, with separate canopied areas at the arrival and departure curbs. A large vehicle parking area is located across the street from the terminal, approximately 100 meters away, but it is seldom used except for the group tour buses.

The base has an extensive underground fuel hydrant system which is available for use by commercial aircraft. The nearest fuel pits, however, are approximately 1,000 meters north of the normal commercial aircraft parking area, requiring the aircraft to be parked farther from the terminal when fueling is needed. The hydrant system is served by a large (over 1 million gallons) tank farm located in the southwest corner of the base.

A separate air cargo building is located immediately south of the passenger terminal.

Four squadrons of naval patrol aircraft are based at U-Tapao. Squadron One is located at a separate apron and hangar area at the north end of the runway, adjacent to the base fence and access road outside the fence. The apron is served by a taxiway from the parallel taxiway at the north warm-up apron.

Squadrons Two and Three are located on the main parking apron, with Squadron Two at maintenance hangars near the center of the apron and Squadron Three in a hangar complex near the south end of the apron near the commercial terminal. Squadron Four is located on a separate apron off the south warm-up apron.

Annual passenger traffic exceeds 50,000 passengers per year, most of which is international tourists. Cargo traffic is not measurable at this time.

E. SELECTION OF CANDIDATE AIRPORTS FOR ONSITE SURVEYS

The 25 existing commercial service airports (or their proposed relocated sites) were each reviewed with respect to the recommended GTP characteristics/criteria developed in Chapter VIII. In particular, several specific technical criteria (physical property size, airspace limitations), economic criteria (location relative to expanding growth markets) and financial criteria (cost to construct) were applied to each of the existing/relocated airports in order to identify seven candidate sites for further detailed investigation.

A summary of pertinent data for the existing commercial services airports is presented as Exhibit IX-1.

1. Southern Region

Eight of the existing 25 commercial service airports are located in the southern region of Thailand. See Exhibit IX-2 for a regional distribution of the existing commercial service airports. Of the eight, Hat Yai and Phuket are classified as Level 1 airports providing both international and domestic service, and the remaining six are classified as Level 2 airports.

SUMMARY OF COMMERCIAL SERVICE AIRPORTS (1993)

Airport Name	Level	Province Located	Region	Operating Entity	Owner	Military Use	Passenger Use	Exist/Plnd R/W Length (M)	Size (Rai)	Cargo Services	Night Ops	ICAO Class
Bangkok Intl/Don Muang	1	Bangkok	Central	AAT	AAT	RTAF	DOM/INTL	3500A/3500A 3700C/3700C		Extensive	Y	
Chiang Mai	1	Chiang Mai	Northern	AAT	AAT	RTAF	DOM/INTL	3100A/3500A	1,905	Significant	Y	4D
Hat Yai	1	Songkhla	Southern	AAT	AAT	RTAF	DOM/INTL	3050A/3450A	3,468	Extensive	Y	4D
Phuket	1	Phuket	Southern	AAT	AAT	None	DOM/INTL	3000A/3500A	1,447	Significant	Y	4D
Chiang Rai	2	Chiang Rai	Northern	DOA	RTAF	None	DOM	1675A/1675A	582	Moderate	N	3C
Khon Kaen	2	Khon Kaen	Northeast	DOA	RTAF	None	DOM	2050A/2050A	854	Moderate	Y	4C
Lampang	2	Lampang	Northern	DOA	RTAF	None	DOM	1475A/1775A	470	Minor	N	3C
Loei	2	Loei	Northeast	DOA	RTAF	None	DOM	1500A/1500A	973	Minor	N	3C
Mae Hong Son	2	Mae Hong Son	Northern	DOA	DOA	None	DOM	1630A/1750A	398	Moderate	Y	3C
Mae Sot	2	Tak	Northern	DOA	DOA	Border	DOM	1500A/1500A	599	Minor	N	3C
Nakhon Ratchasima (Korat)	2	Nakhon Ratchasima	Northeast	DOA	RTAF	RTAF	DOM	3000C/3000C	4,123	None	Y	4C
Nakhon Si Thammarat	2	Nakhon Si Thammarat	Southern	DOA	RTA	RTA	DOM	1100A/1100A	350	Minor	N	2B
Nan	2	Nan	Northern	DOA	RTAF	RTAF	DOM	2000A/2000A	1,146	Minor	Y	3C
Narathiwat	2	Narathiwat	Southern	DOA	OA/RTA	RTAF	DOM	2000A/2000A	1,138	Minor	Y	4C
Pattani	2	Pattani	Southern	DOA	RTAF	None	DOM	1400A/1400A	652	Minor	N	3C
Phitsanulok	2	Phitsanulok	Northern	DOA	RTAF	RTAF	DOM	2180A/2180A	1,380	Moderate	Y	4C
Phrae	2	Phrae	Northern	DOA	RTAF	None	DOM	1500A/1500A	516	Minor	N	3C
Sakon Nakhon	2	Sakon Nakhon	Northeast	DOA	RTA	RTA	DOM/INTL	2600A/2600A	950	Minor	Y	4C
Samui	2	Nakhon Si Thammaret	Southern	Private	Private	None	DOM	1200L/1200L	300	None	N	NA
Surat Thani	2	Surat Thani	Southern	DOA	RTAF	RTAF	DOM	2500M/3000A	3,206	Significant	Y	4D
Tak	2	Tak	Northern	DOA	DOA	None	DOM	1500A/1500A	1,314	Minor	N	3C
Trang	2	Trang	Southern	DOA	RTAF	None	DOM	1500A/2000A	1,030	Minor	N	3C
Ubon Ratchathani	2	Ubon Ratchathani	Northeast	DOA	RTAF	RTAF	DOM	2743C/3000C	2,225	Minor	Y	4C
Udon Thani	2	Udon Thani	Northeast	DOA	RTAF	RTAF	DOM	3048C/3048C	1,759	Minor	Y	4C
U-Taphao	2	Rayong	Central	DOA	RTN	RTN	DOM/INTL	3450C/3450C	16,700	None	Y	4D

LEGEND:

AAT = Airports Authority of Thailand
RTN = Royal Thai Navy
RTA = Royal Thai Army
RTAF = Royal Thai Air Force
/C = Concrete

Exist. = Existing
DOA = Dept. of Aviation
DOM = Domestic
/A = Asphalt
R/W = Runway

/L = Laterite
Plnd = Planned
INTL = International
Y = Yes
N = NO

Minor = 1- 200+ Ton/Yr
Moderate = 201 - 500 Ton/Yr
Significant = 501 - 4,000 Ton/Yr
Extensive = >4,001 Ton/Yr

Exhibit IX-1

Exhibit IX-2
Regional Distribution of Existing Commercial Service Airports

Southern Region

Hat Yai
Koh Samui
Nakhon Si Thammarat
Narathiwat
Pattani
Phuket
Surat Thani
Trang

Northeast Region

Khon Kaen
Loei
Nakhon Ratchasima (Korat)
Sakon Nakhon
Ubon Ratchathani
Udon

Central Region

Don Muang
U-Tapao

Northern Region

Chiang Mai
Chiang Rai
Lampang
Mae Hong Son
Mae Sot
Nan
Phitsanulok
Phrae
Tak

Economic growth in the southern region is focused in tourism, minerals, and in the agricultural sector. Agricultural products include fresh seafood (fish, oysters, prawns), rice, fruits, and rubber. With the time-dependent nature to get fresh seafood and fruits to market, the prospect for increased use of air cargo is good in the southern region.

Only two airports, Hat Yai and Surat Thani, appear to have the property and basic airfield infrastructure that could support the initial development requirements of a Global Transpark. Both are operated as joint use airfields with the Royal Thai Air Force; Hat Yai is operated by the AAT and Surat Thani operated by the DOA.

Even though it is located along the national rail line, if selected as a GTP site, Hat Yai's location near the southern extreme of Thailand would make it relatively inaccessible to other industries located throughout Thailand. However, an existing industrial estate at Hat Yai and the deep water port at nearby Songkhla could provide both an industrial base and an intramodal sea transfer point for goods.

Surat Thani is located more northerly in the southern region. Like Hat Yai, it is also located along the national rail system and is on the coast of the Gulf of Thailand in an area that continues to emerge as a major aquaculture area. Surat Thani is located along the route of the Land bridge proposed by the Southern Seaboard Development Program to join the Andaman Sea and the Gulf of Thailand. Because of the construction of a major deep water port at nearby Khanom, the upgrading of local highways and rail, and *the creation of several industrial estates to make use of offshore natural gas deposits, Surat Thani was selected for further investigation as a potential site for a Global Transpark in the southern region of Thailand.*

2. **Central Region**

Although the majority of industry in Thailand is presently located in its central region, it is surprising to note that there are only two existing airports classified as Level 2 or larger in the region. These are Bangkok International/Don Muang and U-Tapao near Rayong.

Bangkok International is near capacity at present. The need for a local reliever, or second Bangkok International Airport, has been recognized and studied now for many years. A new site at Nong Ngu Hao has been considered and a large

358

tract of land has been acquired. *The potential for using the new site as a Global Transpark or of rehabilitating Don Muang as the GTP after construction of a new major passenger airport should be evaluated.*

The existing U-Tapao airport with its vast property resources, existing airfield and infrastructure, proximity to new deep water port and industrial estates *should also be evaluated as a second potential site for a Global Transpark in the central region of Thailand.*

3. **Northeast Region**

The northeast region of Thailand has the largest land mass of all four regions. It is characterized by fairly level land and sandy soils. It also serves as the Thai gateway to Laos and Viet Nam. The route of the proposed Asian Highway, linking the 15 countries of the Economic and Social Commission for Asia and the Pacific (ESCAP), passes through the center of the northeast region.

The 18 million inhabitants of the region provide an excellent source of inexpensive labor, traveling to other parts of Thailand, Malaysia, Singapore, Hong Kong, and the middle east. Excellent technical colleges in both Khon Kaen and Korat produce skilled and professional personnel.

With one of the three main objectives of The Seventh Plan being "to distribute income and prosperity to the regions," consideration should be given to locating the Global Transpark in the northeast region, as it is presently the country's poorest and least developed region.

There are no Level 1 airports in the northeast region. Six Level 2 airports are geographically dispersed around the large region. These are listed on Exhibit IX-1 and shown on Figure IX-1.

Two of the existing airports, *Ubon Ratchathani* and *Nakhon Ratchasima (Korat)*, are composed of significant property holdings and extensive existing airfield infrastructure. Both are operated as joint use bases with the Royal Thai Air Force. Ubon is located near the Laos border while Korat is significantly closer to Bangkok and its existing industrial market. Both locations are served by rail and Korat is presently served by excellent ground highway access to Bangkok. *Both locations should be visited and reviewed as potential GTP sites.*

Khon Kaen, more centrally located within the northeast region, is a major center of education and technology. Current local industries are predominantly agriculture oriented and include rice, a sugar mill, a paper mill, and fruit canning plants. Extensive natural gas deposits nearby at Nam Phong will attract additional industry.

Khon Kaen is located on both the main highway and rail route to northern Indochina. The existing Khon Kaen Airport is small and has been surrounded by the city and other intensive land uses. However, an alternative site at Nam Phong, 30 kilometers north of the city, presently exists. A minimally used RTAF airbase, *the Nam Phong Airport* currently has a 3,800-meter concrete runway and over 30,000 rai of undeveloped property. *This site will also be field investigated as a potential Global Transpark location in the northeast region.*

4. **Northern Region**

The northern region of Thailand is generally more rugged and mountainous than the remainder of the country. Consequently, the airspace and surface area in the northern region tends to have more restrictions than other areas.

Located at the northern entrance of the region, Chiang Mai currently has a Level 1 international airport as well as a direct highway and rail link to Bangkok. There are eight smaller Level 2 airports in the northern region. These are listed on Exhibit IX-2.

The economy in the northern region is driven by tourism and many industries, including mining, wood products, livestock, fruit and vegetable processing, garments, jewelry, and electronics. An industrial estate is located in Lamphun between the airports in Chiang Mai and Lampang. Because the airport at Chiang Mai is restricted from growth by both mountains and surrounding land uses, it was decided that *a site visit would be made to Lampang to consider its expansion capabilities as a potential Global Transpark site in the northern region.*

A summary of the seven candidate sites which were visited and reviewed as potential Global Transpark locations is as follows:

- Surat Thani
- Bangkok International/Don Muang
- U-Tapao
- Ubon Ratchathani
- Nakhon Ratchasima (Korat)
- Khon Kaen (Nam Phong site)
- Lampang

F. DESCRIPTION OF SITE REVIEWS

Trip reports for the seven candidate site reviews are as follows:

1. Surat Thani Airport

On Wednesday, September 15, 1993, Mr. Stephen Oenbrink, an aviation engineer and principal in the firm of Kimley-Horn and Associates, Inc., visited the Surat Thani Airport accompanied by two NESDB counterparts, Ms. Nittaya Kosolkarn and Mr. Vidhayavej Tabtimsri.

Our group was briefed regarding the existing airport and its expansion plans by Mr. Narong Cahavong, the DOA Airport Manager, and five of his key staff. A tour of the terminal facilities, air traffic control tower, and runway pavement followed. In order to better view the airport and local region, an aerial tour on an RTAF helicopter was arranged and conducted. Observations and information obtained are as follows:

The existing Surat Thani airfield facilities appear to be in good physical condition. The 2,500-meter runway was overlaid with new asphalt in 1989 and is designed to support the Boeing 737 as the critical aircraft. The airport director has requested to extend the runway to 3,000 meters to accommodate the Air Force F-5 fighters and strengthen it to support the Boeing 747. No action has been taken on that request, but new military housing planned near one end of the runway may preclude the runway extension if the barracks are built. The runway is lighted, but has no navigation aids. There are trees within the safety zones and small mountains beyond the runway may restrict aircraft approaches. An onsite air traffic control tower provides local approach control to the airfield.

The Royal Thai Air Force has aircraft hangars and aprons on the opposite side of the runway from the commercial terminal. The existing terminal facilities

are adequate to process the existing schedule of commercial flights to and from Surat Thani. There are no customs facilities at Surat Thani. Access to the airport terminal is via a two lane paved road from nearby Highway #31. The highway is planned to be upgraded from two lanes to four lanes in the near future. There is approximately 3,000 rai within the fenced limits of Surat Thani airport.

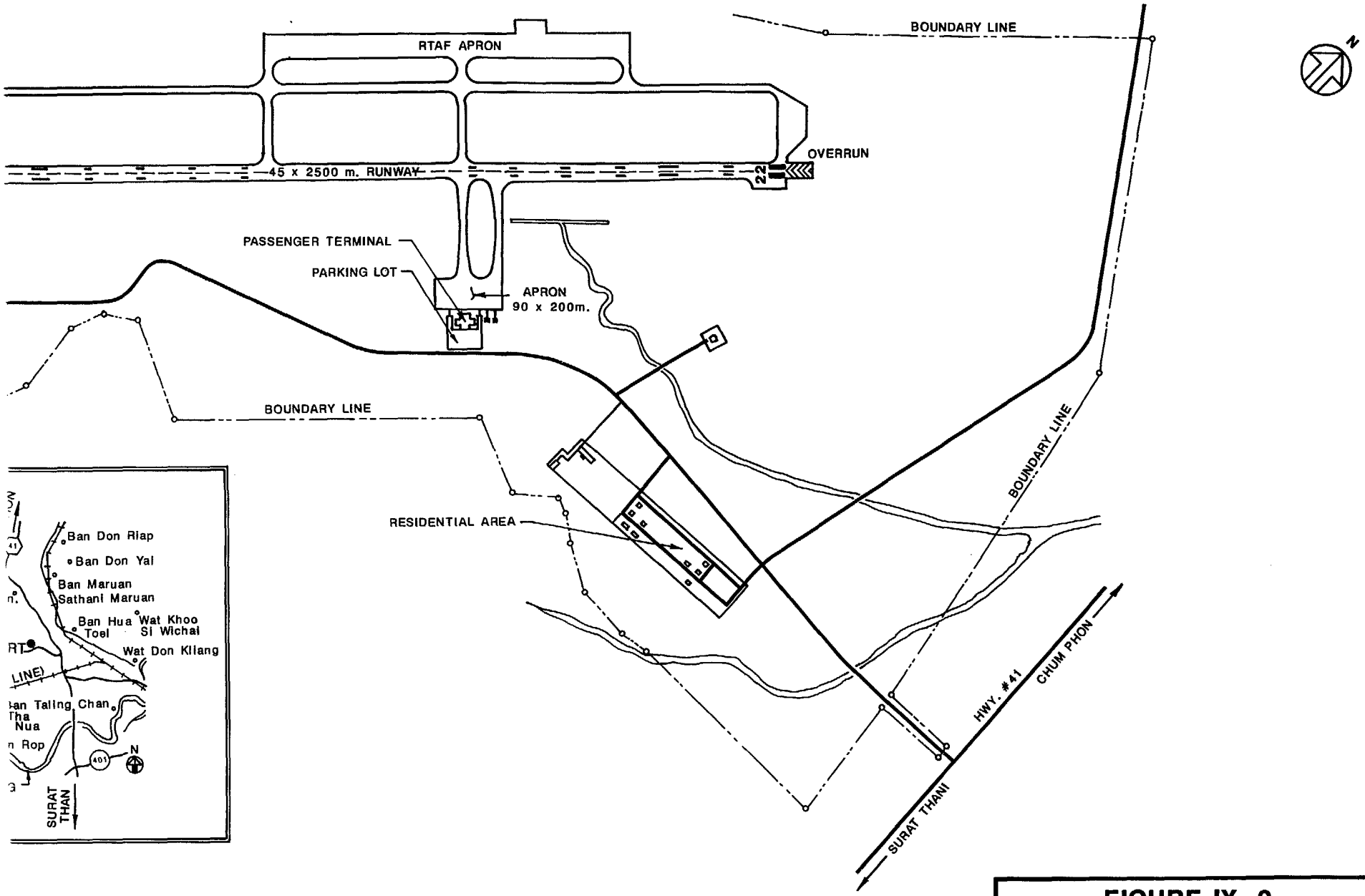
A helicopter overflight of the region revealed that the local industries are predominantly agricultural, consisting of rubber trees, coconut palms and extensive aquaculture of fish, oysters and prawns. A rail line is close by; at a distance of approximately three kilometers. A shallow draft port exists at the coast beyond the city of Surat Thani. There is little residential land use near the airport so noise would not be an environmental problem at this location. The land is generally low and some organic soils can be expected near the marshy areas. Local borrow pits for obtaining sand fill were observed close by from the air. It was reported that the airfield is constructed at about elevation +7 meters above sea level. Although the airport is reported to flood approximately one week during the rainy season, the airfield pavements have never been overtopped. Drainage is by gravity to adjacent canals.

Electrical power is provided by the provincial electrical plant at Surat Thani. Potable water at the airport is obtained from groundwater with chlorine treatment applied. With a significant river only six kilometers away and a dammed reservoir 60 kilometers away, water for industry use should not be a major problem.

Domestic sewage at the airport is collected and treated by a septic tank system. A sewage treatment plant would be needed if major expansion was proposed at Surat Thani. Air quality was clear and fresh at Surat Thani airport. The close proximity to the Gulf of Thailand sea breezes would tend to disperse any air pollutants generated.

Natural gas is readily available in the southern region. However, communications capacity is lacking and in high demand here and elsewhere in Thailand.

There are no apparent wildlife conservation areas or preserves nearby so threatened or endangered species should not be a concern. Some aquatic wading birds and water buffalo were observed in the area. See Figure IX-2 for a sketch of Surat Thani Airport.



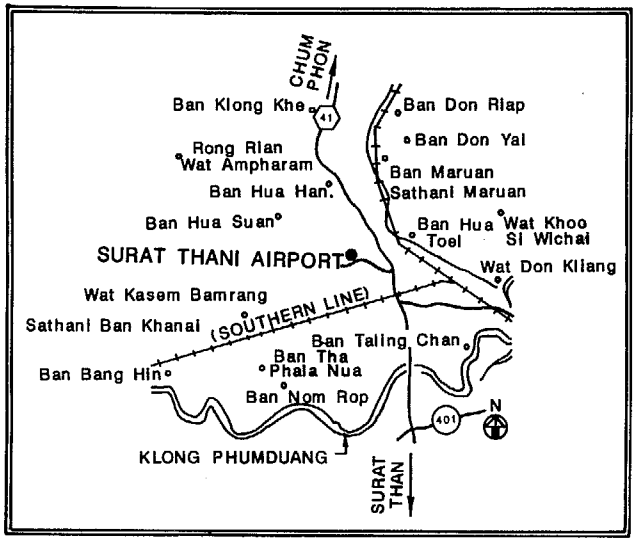
ION MAP

LAYOUT PLAN

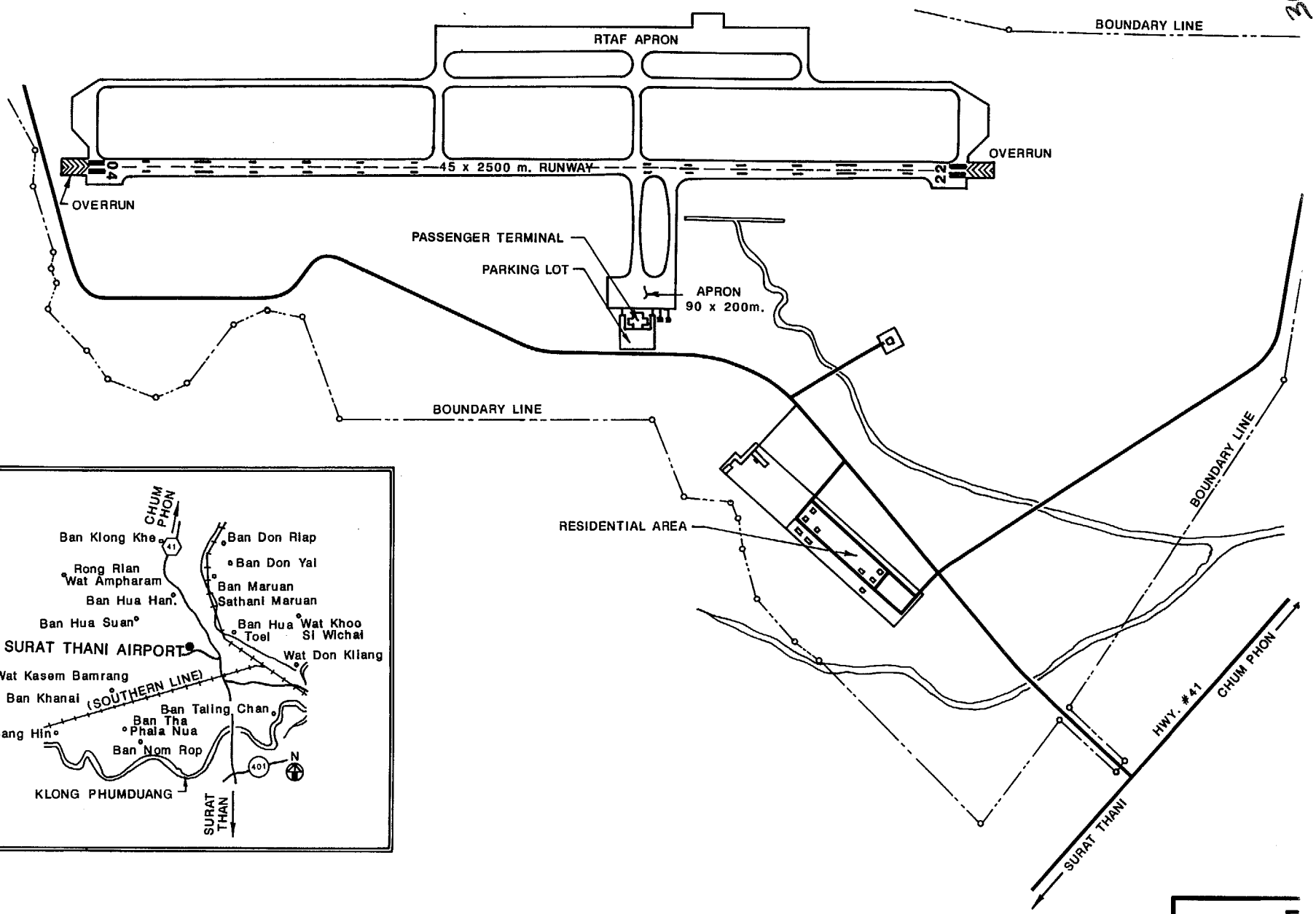
FIGURE IX-2

SKETCH OF SURAT THANI AIRPORT

Kimley-Horn



LOCATION MAP



LAYOUT PLAN

F
S
SURAT

2. Bangkok International/Don Muang

In April 1993, Mr. Charles Edwards, an aviation consultant in the firm of Kimley-Horn and Associates, Inc., visited the Bangkok International Airport accompanied by Ms. Thongkorn Hiranraks of USAID. A ground tour of the existing commercial facilities was conducted and the following observations noted:

The existing Bangkok International Airport (BKK) is the hub of Thailand's domestic and international airport system. The airport is a joint use facility, with an extensive RTAF base located east of the two parallel runways and the commercial facilities are to the west. There is no space for airport facilities between the two north-south oriented runways (03-21) as they are only spaced 395 meters centerline-to-centerline.

Separate public access is available to the commercial facilities (domestic terminal, international terminal, cargo terminal, aircraft maintenance hangars) from the adjacent Vibhavadi-Rangsit Highway. The majority of the existing commercial facilities were opened in the 1985-1988 time frame and are now operating well beyond their anticipated capacity. Over 50 international airlines operate from BKK and Thai Airways provides domestic service to 23 cities in Thailand.

The existing Bangkok International Airport is severely constrained by several components. The parallel runways both have ILS approaches from their 21 end and are now operating near maximum capacity. The addition of a third parallel runway at BKK is unfeasible due to the intensity of the land use surrounding the airport—it would be extremely difficult and expensive to accumulate the needed property.

While the runway capacity is the primary constraint, several other components are also restricting capacity at BKK: the airport access highways are extremely congested, and the property footprint of the commercial terminals area is very small and is limited by the close proximity of the highway and the airfield. A recent Master Plan determined that several major expansion projects were needed to provide airport capacity just to the year 2000. At that point in time, no additional capacity could be accomplished at BKK and a Second Bangkok International Airport (SBIA) must be opened. A site has been selected at Nong Ngu Hau for the SBIA and the selection of design consultants for that project is ongoing now.

365

It is obvious that a Global Transpark could not be accomplished at Don Muang today. In the event that both the existing domestic and the international airline traffic were transferred to SBIA, there is limited potential for Global Transpark development at the vacated sites at BKK. The ability for just-in-time industries to develop adequate facilities with intermodal transportation facilities would still be limited by the existing site constraints and the cost to displace existing land uses. The biggest disadvantage to BKK is that the existing site would not be available until after the year 2000—and the need for a Global Transpark in Southeast Asia will already have been met by some other entrepreneurial country.

A partial sketch of the existing Bangkok International Airport is attached as Figure IX-3.

3. **U-Tapao Airport**

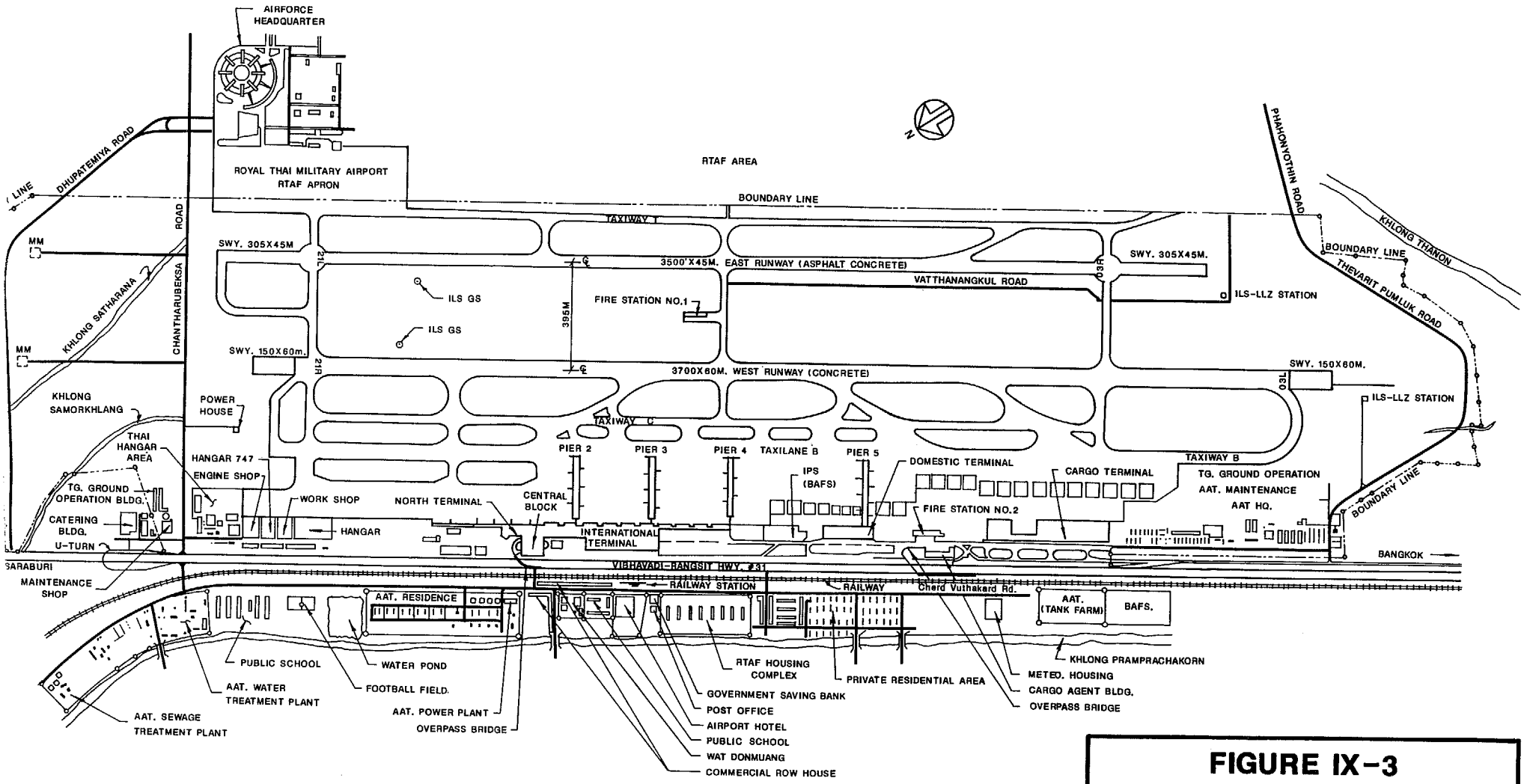
On Monday, July 26, 1993, Mr. Charles Edwards and Mr. Steve Oenbrink, also an aviation consultant with Kimley-Horn and Associates, visited the U-Tapao Royal Thai Navy base accompanied by a representative of USAID and Mr. Kriengsak Rabilwongse and Mr. Vidhayavej Tabtimsri of NESDB.

Our party was briefed by the Base Commander and several members of his key staff. A ground tour of the existing airport facilities followed. Observations and information obtained are as follows:

Access to the U-Tapao Royal Thai Navy Base is from the two-lane Sukumvit Highway (Route 3). All traffic entering the airbase must pass through a manned military security checkpoint. This would be a major inconvenience if significant commercial activity is proposed for U-Taphao. A separate non-secure access would be recommended.

The airport property is large (16,700 rai) and is bounded by the Gulf of Thailand at the south and Sukumvit Highway at the north. The existing single north-south runway (3,450 meters by 60 meters) is located approximately in the middle of the site. An extensive Royal Thai Navy Base uses much of the area west of the existing runway while former aprons and revetments for parking B-52 bombers to the east of the runway have seen little use during the past 20+ years.

3bb

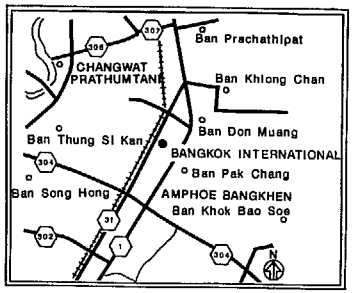


LAYOUT PLAN

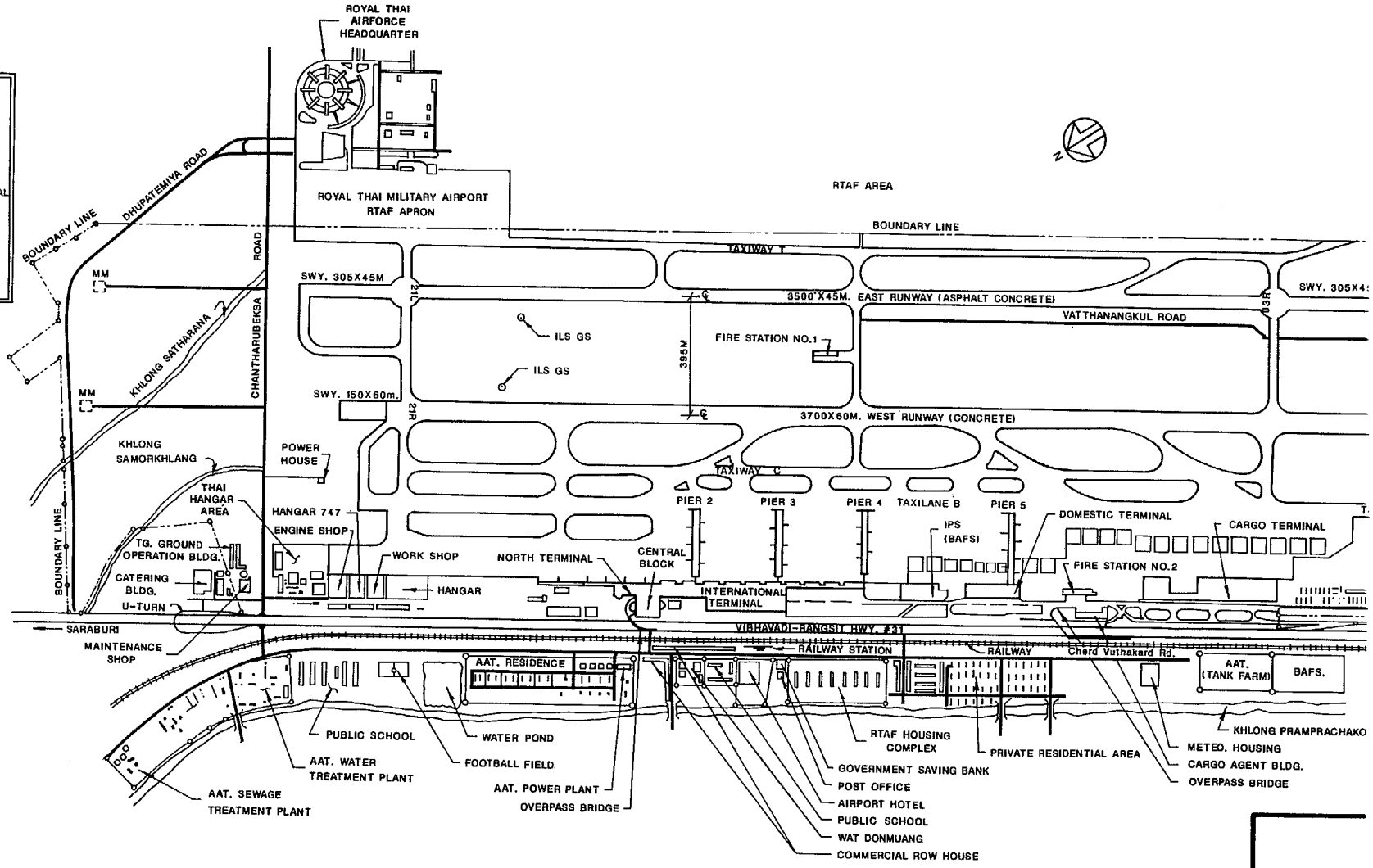
FIGURE IX-3

PARTIAL SKETCH OF BANGKOK INTERNATIONAL AIRPORT

Kimley-Horn



LOCATION MAP



LAYOUT PLAN

PA

Most of the existing buildings were constructed by the United States military during the early 1960s. Many of them are now in disrepair after nearly 30 years of service and would provide little use for commercial industries. Only the buildings which are being actively used by the RTN have been maintained to a reasonably safe condition.

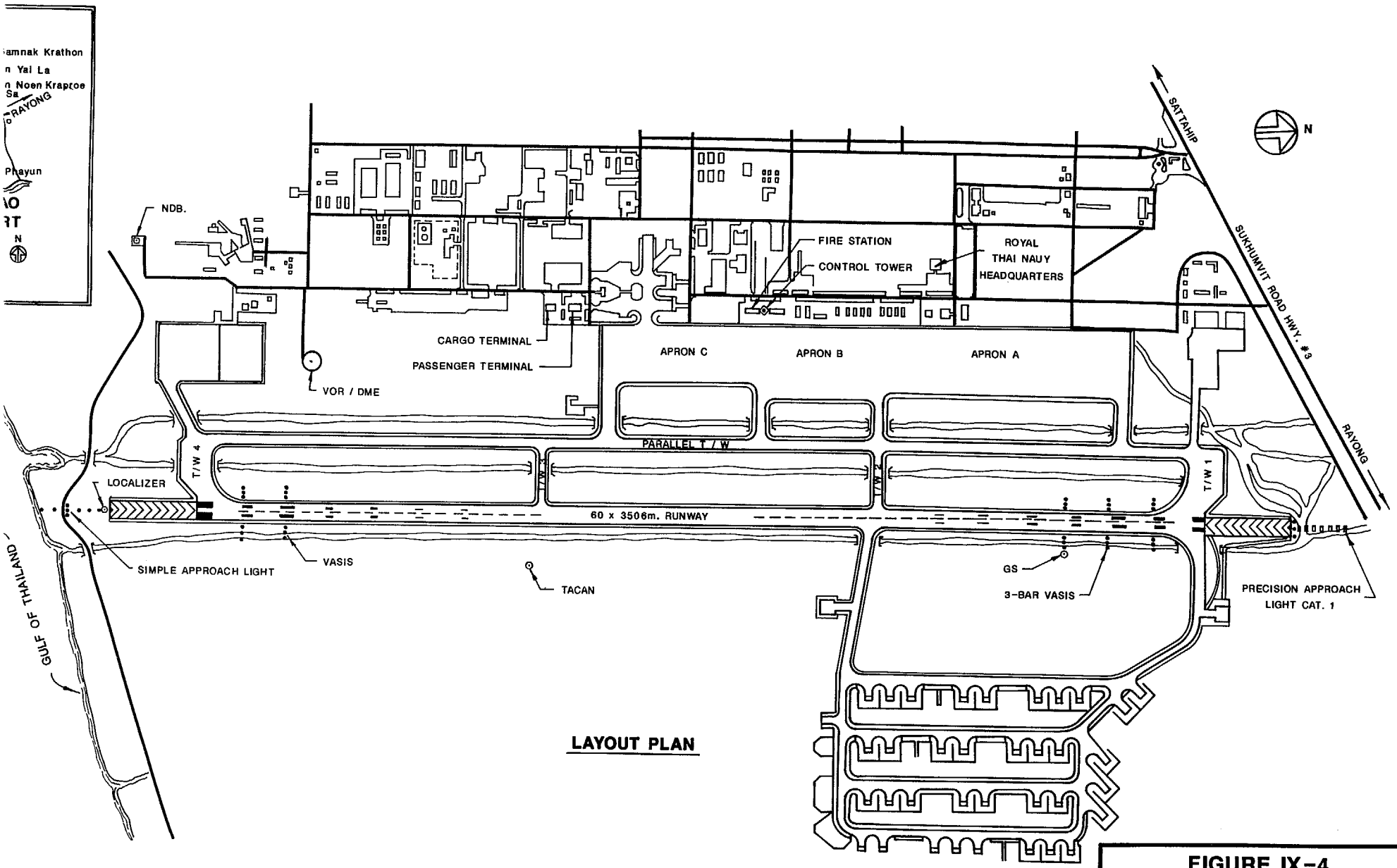
A tour of the runway, taxiway and aprons revealed that the pavements are in reasonably good condition. The existing concrete runway and parallel taxiway were overlaid with asphalt in 1990. There is some cracking of concrete slabs in high use areas of the apron. All of the pavements at the unused east side of the runway appeared to be in good condition.

There are extensive NAVAIDS currently in service at U-Tapao. Runway 18 is equipped with a Category I ILS, a Doppler VHF Omnirange (DVOR) equipped with Distance Measuring Equipment (DME) is near the south end of the runway, a Tactical Air Navigation (TACAN) system is in use, and a non-directional beacon (NDB) is in place. The airfield is lighted for night use.

Onsite water plants (two) and sewage treatment plant provide potable water and sanitary sewage collection to the base facilities west of the runway. Commercial power is provided from the national grid. Standby generators are available in the event of power outages. There are no utilities at the east side of the airfield.

There is some minor residential use adjacent to the base which could be impacted by extensive commercialization of the site. Aircraft noise may necessitate the purchase of some adjacent private lands to protect the long-term land use. Air quality in the area is good and can be expected to remain that way due to the sea breezes.

Much of the area southeast of the runway, adjacent to the Gulf, is low and would require fill to raise it to a constructable level. The existing airfield is at an elevation which does not flood during the rainy season. (See Figure IX-4 for a partial sketch of U-Tapao Airport.)

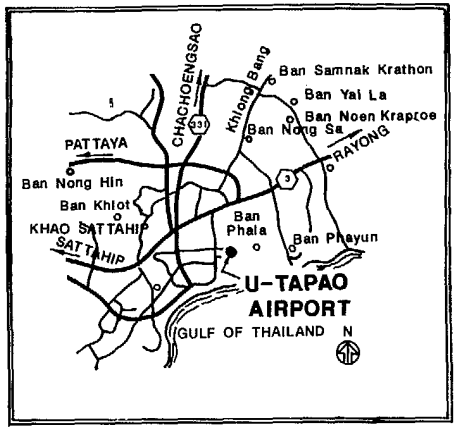


LAYOUT PLAN

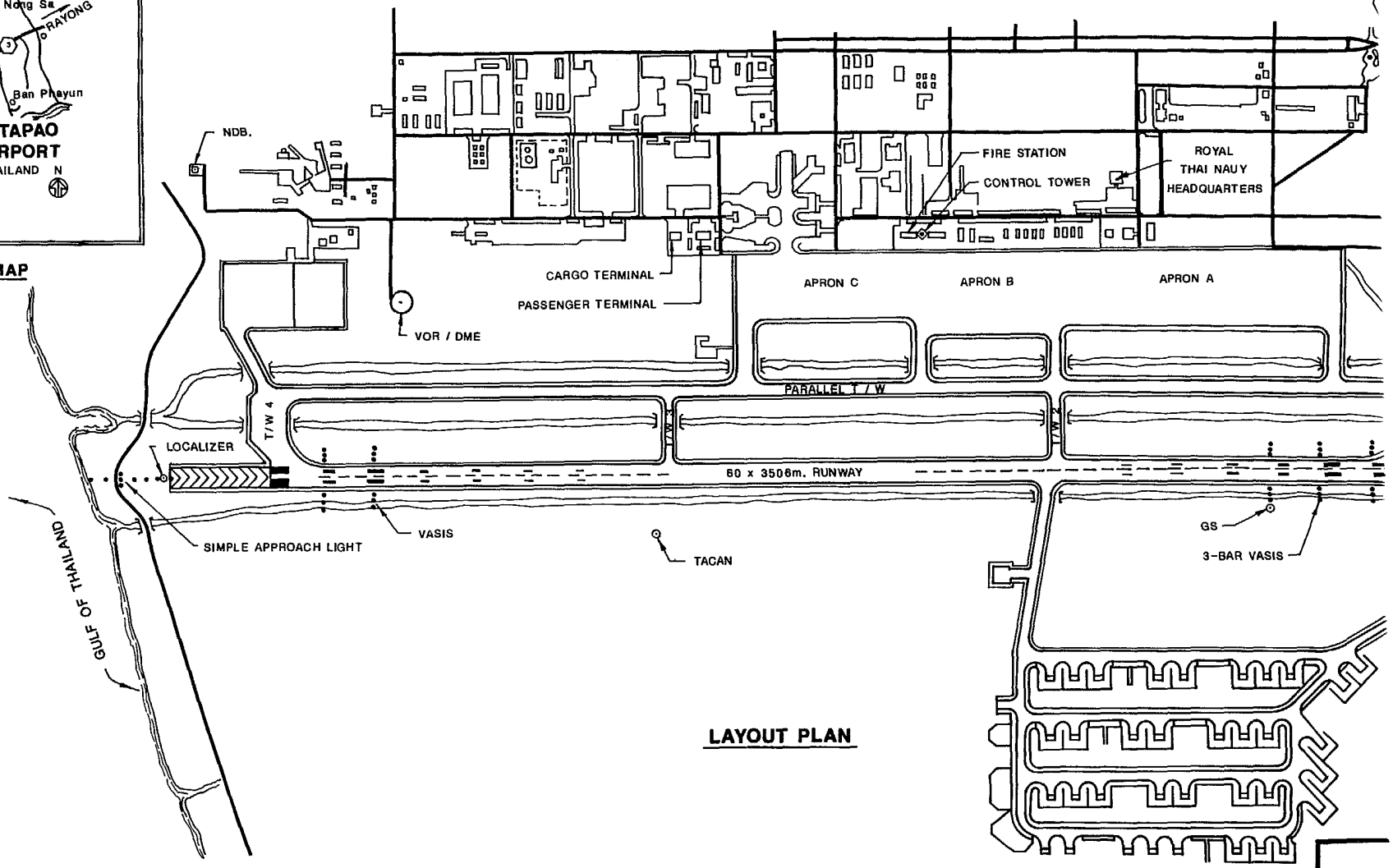
FIGURE IX-4

PARTIAL SKETCH OF U-TAPAO AIRPORT

Kimley-Horn



LOCATION MAP



LAYOUT PLAN

4. **Ubon Ratchathani Airport**

On Saturday, September 18, 1993, Mr. Steve Oenbrink of Kimley-Horn and Associates, Inc., visited the Ubon Ratchathani Airport accompanied by two NESDB counterparts, Mr. Kriengsak Rabilwongse and Mr. Vidhayavej Tabtimsri.

Our group was briefed regarding the existing airport and its recently constructed facilities by Mr. Bancha Kachornbun, the DOA Airport Manager, and four of his key staff. A tour of the new terminal and air traffic control tower followed. At the suggestion of the Airport Manager, we rented a vehicle and traveled to the northeast to view the area for a possible alternative site. Observations and information obtained are as follows:

The existing Ubon Ratchathani Airport is a joint use airport with the Royal Thai Air Force. A new passenger terminal, aircraft apron and air traffic control tower were recently completed at a cost of approximately 600 million baht. The Air Force base facilities at this single runway airport are extensive.

The airport is within the municipal city boundary and is surrounded by residential and business land uses. Expansion at this airport would be extremely costly as land acquisition would be a major cost. Increased aircraft noise would also be a major impact on the adjacent city.

Highway and rail access are available nearby. Adequate power is available from a nearby dam but water supplies are currently stressed in the area. Natural gas is not available and must be brought to the area by rail or by truck.

There is currently no air cargo transiting Ubon Ratchathani. Local industry is primarily composed of agricultural products including rice, leather and some fish.

The airport manager suggested that Ubon Ratchathani Airport could not physically or politically support a complex with the characteristics of a Global Transpark and that an alternative site approximately 20-25 kilometers northwest of the city would be better suited. We traveled to the area and observed that the land is predominantly in rural agricultural use by private landowners.

Several factors are apparent which tend to eliminate Ubon Ratchathani as a viable finalist site:

- The existing airport would be difficult to expand due to surrounding land uses.
- The Royal Thai Air Force has identified the primary mission of Ubon Ratchathani Airport to be a strategic defense base.
- Adequate utilities capacity will be difficult to obtain in the area.
- Ubon Ratchathani is poorly situated geographically with respect to seaports and other existing centers of Thai industry.
- A new greenfield site would be expensive to purchase from private landholders (land costs are about 200,000 baht/rai).

A sketch of Ubon Ratchathani Airport was not prepared, since the existing airport is not practical for a Global Transpark.

5. **Nakhon Ratchasima Airport (Korat)**

On Wednesday, September 29, 1993, Mr. Steve Oenbrink visited the Korat Airport accompanied by two NESDB counterparts, Mr. Kriengsak Rabilwongse and Mr. Vidhayavej Tabtimsri.

Our group was briefed regarding the existing airport and its recently constructed facilities by Mr. Sompong Pomkrit, the DOA Airport Manager, and several of his key staff. A tour of the new terminal and the air traffic control tower followed. Observations and information obtained are as follows:

The existing airport at Korat is a joint use facility between the Royal Thai Air Force and the DOA. It is a major RTAF base; access from the airfield to the existing passenger facility is via a military security checkpoint. This base will not function in joint use with a commercial airport and should not be considered for a Global Transpark.

The DOA is currently preparing a Master Plan for a new commercial airport to be located approximately 20 kilometers outside Korat. A 4,650 rai rectangular tract (1.5 km x 5 km) of land, currently belonging to the Forestry Department, has been identified as the potential site. The airport site is part of a larger, 80,000 rai parcel of land which has been clear cut by the Forestry Department. This site could easily be expanded to include the facilities required

for a Global Transpark. The initial airfield, a 2,100-meter runway, is currently scheduled for construction by 1996. There are no environmental concerns on the 80,000 rai site, and noise would not be a concern at this rural site.

Power and water are readily available in the area. Natural gas must be transported to Korat, if needed. There are no restrictions to aircraft approaches. Ground access is good via highway and rail. The existing local industries (6,000 factories; 60,000 skilled laborers) currently transport their products to market by truck and by rail to Bangkok. A new four-lane highway to Bangkok was recently completed.

Korat is the second largest city in Thailand; Bangkok is first. There is a major technical college in Korat. Korat is considered to be the center for medical and engineering training in Thailand. Korat is the center of the labor force for the northeast region, and exports many people to the labor markets of Singapore, Hong Kong, Malaysia and the Middle-East.

Strong consideration should be given to locating the Global Transpark on the 80,000 rai parcel of Forestry Department land. A sketch of Nakhon Ratchasima/Korat airport was not prepared, since the existing airport is not practical for a Global Transpark.

6. **Khon Kaen Airport**

On Monday, September 20, 1993, Mr. Steve Oenbrink visited the Khon Kaen Airport accompanied by two NESDB counterparts, Mr. Kriengsak Rabilwongse and Mr. Vidhayavej Tabtimsri.

Our group was briefed in the morning by Mr. Sompong Tiplert, the DOA Airport Manager, and several of his key staff. We did not tour the existing airport as it was suggested that the Nam Phong military base, 60 kilometers north of Khon Kaen, would make a more appropriate site for a Global Transpark. A tour of the base was arranged by telephone.

A luncheon meeting with Dr. Vanchai Vatanasapt, President of Khon Kaen University, and several of his department directors, was held to explain and discuss the concept of a Global Transpark.

After lunch two Khon Kaen Airport staff members drove our group to Nam Phong where we were briefed by the Base Commander and given a tour of the

airfield facilities. On our return to Khon Kaen, we stopped to tour a large industrial plant that makes fishing nets and exports them worldwide. Observations and information obtained are as follows:

The existing Khon Kaen airport is a single runway facility (2,050 M x 45 M) with little opportunity for expansion. Highway 12 is near the south end and a major RTAF base facility occupies the entire west side of the runway and wraps around its north end. A significant elevation dropoff (15M±) occurs at the south end of the runway.

The airport has protected its perimeter from land use encroachment by enacting a local height and noise restriction ordinance. The ordinance precludes the construction of either tall buildings or users which are noise sensitive within a 4.5 kilometer radius of the airport. Residential development is occurring under the Runway 03 approach path in spite of the ordinance.

The airport pavements and other facilities at Khon Kaen are in good shape. However, the ability to expand the site to encompass a complex the size of a Global Transpark would be very difficult. The DOA has identified the existing Nam Phong airfield as a potential long-term alternative for commercial expansion at Khon Kaen.

Nam Phong is a former USAF B-52 bomber base which is located 60 kilometers, via a circuitous route, north of Khon Kaen. A new highway planned for the region would reduce the travel distance from the city to 31 kilometers.

The former base consists of a 30,000 rai tract of land which is currently used for training by the Royal Thai Air Force and the Royal Thai Army. The Air Force uses the unlit airfield for touch-and-go night vision training while the Army uses the site for periodic field maneuvers. There is a small force of Air Force personnel posted at the base to perform limited site maintenance. There are no aircraft based at Nam Phong.

The existing airfield consists of a 3,800 M x 45 M concrete runway with 500 M overruns at each end. A full length parallel concrete taxiway with high speed exits is on the west side of the north-south runway. There are no facilities on the opposite side of the runway. A large concrete aircraft apron with seven aircraft hangars is accessed via two turn-offs from the taxiway. The hangars are in poor condition and several did not appear to be used. The

pavement thicknesses were not determined, but the design aircraft was the B-52 bomber.

There is currently no airfield lighting, no NAVAIDS and no control tower at Nam Phong. The topography of the site appears to be constructed on a raised plateau with respect to the surrounding area. This raised elevation provides a very clear approach from the northerly direction.

The concrete pavements appeared to be in excellent condition. The runway at Nam Phong may be the longest runway in Thailand and there is sufficient property available to construct a parallel runway.

The existing base facilities which housed the local garrison were old and would have little salvage value as amenities to a Global Transpark. The primary benefits of the Nam Phong site are the excellent in-place airfield, its unobstructed airspace, and the available large tract of land for development of industries. The surrounding land uses were rural agricultural with no apparent residential areas anywhere near this remote site. However, local people were observed herding and tending small herds of cattle and water buffalo on the military site.

The base site was served by power and had a small elevated storage tank for gravity water service. No water treatment or sewage treatment facilities were observed.

The Nam Phong site should be considered a candidate site for the Global Transpark due to the extensive in-place airfield facilities. An investment in lighting, NAVAIDS, control tower, on-site access roads and utilities could put this site in service very quickly as a Global Transpark.

A sketch of the existing Khon Kaen airport has not been prepared as it is not a viable candidate site. A sketch of the Nam Phong site was not prepared as the local military commander could not provide us with a layout plan of the site for security reasons. An aerial photograph of the site exists at the base.

The city of Khon Kaen is a center of education and technology for the region. Local industries include sugar mills, paper mills, fruit canning, natural gas production and manufacturing of fishing nets.

7. Lampang Airport

On Monday, October 25, 1993, Mr. Charles Edwards visited the Lampang Airport accompanied by two NESDB counterparts, Mr. Kriengsak Rabilwongse and Mr. Vidhayavej Tabtimsri.

Our group was briefed by Mr. Somsak Vichiennan, the DOA Airport Manager, and four of his key staff. A tour of the terminal and airfield facilities followed. Observations and information obtained are as follows:

The existing Lampang Airport is a single runway airport (1,475 M X 30 M) situated on a 470 rai parcel of property. The runway would be difficult to expand to a length which would support international aircraft due to an existing highway off one end and a reservoir near the other.

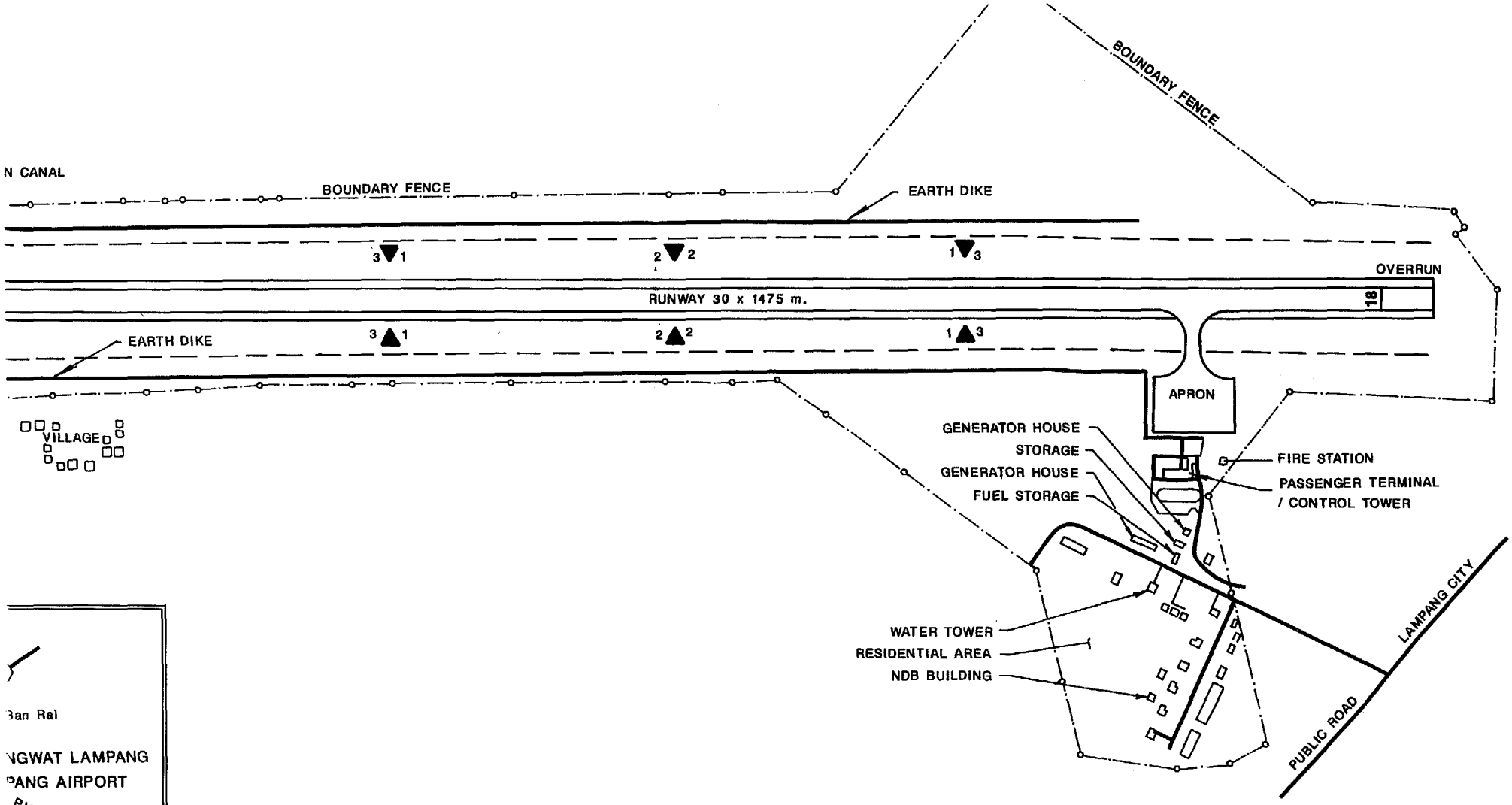
The existing airport is less than two kilometers from the city. There is currently residential land use adjacent to the runway. The airport is not fenced and cattle and children were observed on the runway. The adjacent property is private. Land values in the area are approximately 500,000 baht/rai.

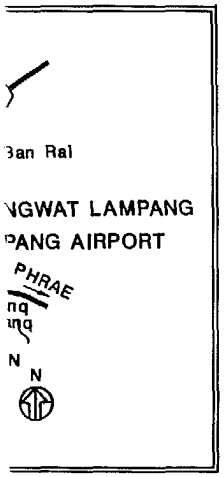
There is some current air cargo traffic on the daily 737 flight to Bangkok via Phitsanulok. Incoming goods are generally electrical goods and automotive spare parts while the outgoing freight consists of ceramics, teak goods and other handicrafts. Local industries are generally agriculture based and include sugar, canned fruits, ceramics and wood products.

The existing airfield pavement and terminal facilities are adequate for their current level of activity. However, the existing airport site should not be considered as a viable site for a Global Transpark.

The Department of Airports is currently reviewing a new site to relocate the Lampang Airport about 20 kilometers to a location beside Highway 11 on the way to Chiang Mai. The site contains approximately 10,000 rai and is owned by the Forestry Department.

The proposed new site could support an international airfield, and both highway and rail transportation are available nearby. The proximity to developing industrial estates and the emerging electronics industry could make the proposed new site attractive as a Global Transpark.A sketch of the existing Lampang Airport is included as Figure IX-5.





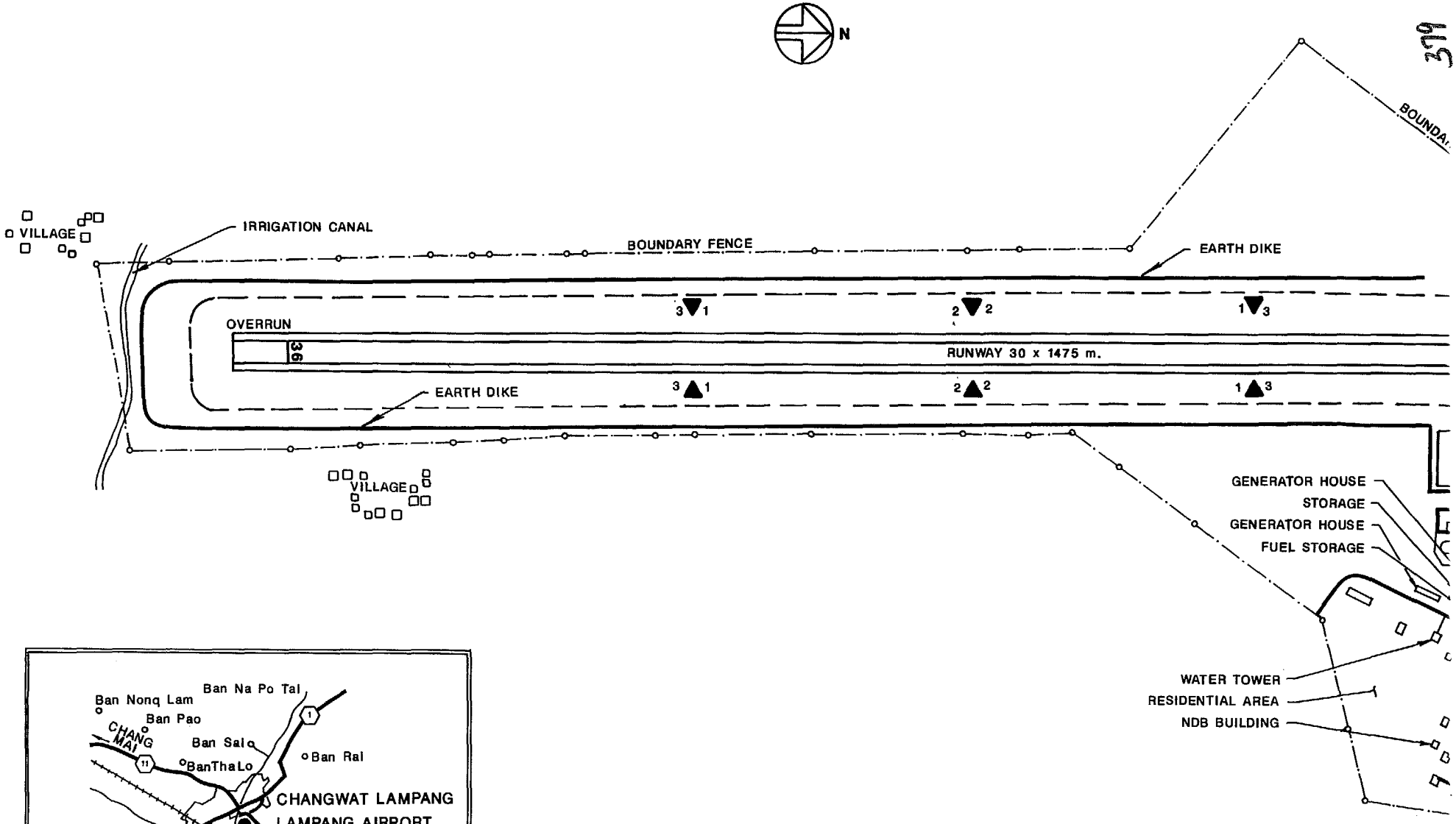
LAYOUT PLAN

FIGURE IX-5

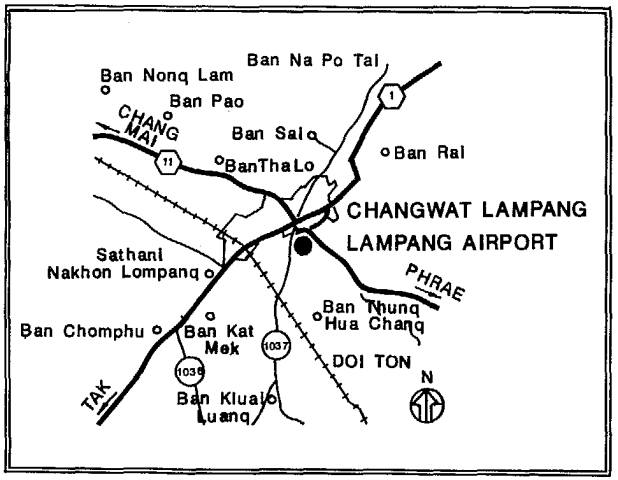
SKETCH OF LAMPANG AIRPORT

Kimley-Horn

P



LAYOUT PLAN



LOCATION MAP

G. COMPARATIVE ANALYSES

The following matrix (Exhibit IX-3) compares the seven candidate sites on the basis of five elements: economic considerations (cost to develop), ability to meet tenant industry requirements, technical site criteria, timing for implementation and adherence to Seventh Plan objectives (particularly regional dispersion of industry).

A qualitative point valuation has been assigned to each of the first four elements using the following as a basis:

1	=	Excellent	3	=	Average
2	=	Good	4	=	Poor

The fifth element, Seventh Plan adherence, assigns a point value on the basis of each candidate site's location with respect to the country's three "investment promotion zones".

1 = Site is in investment zone 3 (outlying provinces)
2 = Site is in investment zone 2 (10 provinces near Bangkok)
3 = Site is in investment zone 1 (Bangkok Metropolitan region)

A review of each of the assigned values for each site and each element follows the summary matrix. No attempt has been made to assign relative weightings to the five elements.

On the basis of total assigned value points, the three finalist sites to consider are: U-Tapa, Khon Kaen (Nam Phong site) and Korat (new airport site). *U-Tapao is the recommended site* on the basis that it will be the least costly to develop, is the only site with excellent access to two seaports (an important regional transport mode), has unrestricted property potential, and can be put into service quicker than any greenfield site due to its existing airfield and its location within the ongoing Eastern Seaboard Development Program.

380

Exhibit IX-3
Candidate Site Evaluation Matrix

Candidate Site	Economic Considerations	Industry Req.	Technical Criteria	Time to Implement	"Seventh Plan" Adherence	Total Points
Surat Thani	3	3	3	2	1	12
Nong Ngo Hav	2	1	3	3	3	12
Bangkok Int/ Don Muang	4	1	2	4	3	14
U-tapao	1	2	1	1	1	6
Ubon (New Site)	4	3	2	3	1	13
Korat (New Site)	4	1	2	3	1	11
Khon Kaen (Nam Phong Site)	2	2	2	2	1	9
Lampang (New Site)	4	3	4	3	1	15

1. Economic Considerations

A site which has existing airfield, transportation and utility infrastructure can be expected to cost significantly less as an initial investment and can be brought into service much quicker than a new site. The candidate sites with existing facilities include:

U-TAPAO
- Existing international scale airfield (NAVAIDS should be upgraded)
- Existing utility infrastructure (will require upgrading)
- Existing highway, rail and seaport transport facilities nearby (and ongoing Eastern Seaboard Development Program)

KHON KAEN (NAM PHONG SITE)
- Existing international scale airfield (requires NAVAIDS and lighting)

SURAT THANI
- Existing airfield (requires significant upgrading to meet international scale)
- Existing highway, rail and coastal seaport transport facilities nearby (will require upgrading)

BANGKOK INTERNATIONAL AIRPORT/DON MUANG (BKK)
- Existing international scale airfield
- Existing utility infrastructure
- Existing highway, rail and seaport facilities nearby

Note: BKK would be costly to renovate as a Global Transpark due to the cost to accumulate adequate property for industries and to reconfigure highway access, rail sidings and on-site infrastructure. The cost would probably exceed that required to develop a new greenfield site.

The candidate sites at Ubon Ratchathani, Nakhon Ratchasima (New Korat) and Lampang are all new greenfield sites and would require the full investment to construct an initial site. A recommended program of TGTP facilities for the initial, intermediate, and ultimate development phases has been compiled in Appendix 4. The approximate cost for the initial development phase of a Global Transpark at a new "greenfield" site has been developed and is also included in Appendix 4. The cost tabulation compares and includes the approximate initial development cost for each of the three alternative sites. On the basis that existing infrastructure at both U-Tapao and Nam Phong can be

382

utilized, and allowance costs are included for needed offsite improvements, the expected initial development costs should be approximately:

- U-Tapao — 2,765 million baht
- Nam Phong — 4,450 million baht
- New Korat site — 5,700 million baht

See Exhibit IX-3 for economic point assignments.

It is reasonable to assume that the property required to develop the initial Thailand Global Transpark (6,750 rai) at any of the three recommended sites can be acquired from either the military (in the case of U-Tapao or Nam Phong) or another Royal Thai Government department (Forestry Department for New Korat) as either a donation or at reduced cost. For purposes of the Appendix 4 cost comparison, no land cost is included for the initial development. If additional private properties are required for expansion of the TGTP complex in future phases the approximate current land values at each location are as follows:

- U-Tapao (Chonburi Province) — 1,550,000 baht/rai
- Nam Phong (Khon Kaen Province) — 75,000 baht/rai
- New Korat site (Nakhon Ratchasima Province) — 500,000 baht/rai

2. **Ability to Meet Tenant Industry Requirements**

Industries will find the Global Transpark attractive as a place to locate if the following elements are available to them:

- Adequate property to construct their facilities
- An adequate labor pool to obtain employees
- Local training facilities to improve personnel skill levels
- All required utilities
- Transportation and communications facilities
- Support industries nearby

The seven candidate sites have all been identified on the basis that they can each provide adequate property, transportation, communications and utilities to support a Global Transpark. The other industry requirements of labor source, in-place training and support industries are more site specific.

363

The large metropolitan population base and excellent secondary and university system of Bangkok indicates that industries' external needs could be met at BKK. Korat, as the second largest city in Thailand, also provides an excellent labor base to all of Southeast Asia as well as major engineering and medical training facilities.

Khon Kaen with its major university and lesser population base would provide good support for new industries. U-Tapao with its location in the developing Eastern Seaboard will also provide good sources of labor and training.

The more remote locations of Surat Thani in the south, Lampang in the north and Ubon Ratchathani in the northeast will provide average capabilities to provide labor, training and support industries.

3. **Technical Criteria**

The seven candidate sites were each evaluated on the basis of five technical elements: physical property characteristics, airfield facilities, transportation access, utility infrastructure and environmental issues. A summary of existing conditions versus minimum recommended conditions for each element follows in Exhibit IX-4.

The U-Tapao site can provide all of the technical criteria after an initial upgrade of its NAVAIDS (ILS to Cat II, Install approach control radar). Long-term sources of unlimited water must also be developed. Industrial waste treatment and satellite communications would be installed as needed to support industry. Excellent seaport transport is available from Laem Chabang, Map Ta Phut and Sattahip (if reopened to commercial).

Bangkok International Airport can meet all of the technical criteria except environmental issues, which are already degraded, and the ability to cost-effectively provide needed property for industry.

The Nam Phong site at Khon Kaen can provide a good technical solution for a Global Transpark. Its primary shortcoming is the distance to seaport transport.

The new greenfield sites proposed near Korat and Ubon can ultimately provide all of the recommended technical criteria but the existing airports cannot. Water capacity could be a long-term limitation at Ubon and natural gas is not

currently available in either locale. Transportation distance to seaports is also excessive.

The Surat Thani site could be expanded through acquisition of private property to meet most technical criteria. The property itself is relatively low and could be prone to flood and storm damage. The major local fishing and aquaculture industries are sensitive to water quality and could be adversely affected by major industries discharging processed water.

The Lampang site, as well as the Surat Thani site, are too remote from the existing business centers of Bangkok. The mountainous nature of the region near Lampang is restrictive to aircraft approaches and to rail and highway travel speeds. Seaports are over 610 kilometers from Lampang.

4. **Time to Implement**

The demand for a network of worldwide Global Transparks is immediate. The preparation of a Thailand site which takes many years to develop could preclude that site from successfully attracting industries. Thus, candidate sites which can be developed quickly are preferred.

The site with the most immediate availability is U-Tapao; the site with the worst availability is Bangkok International Airport, as it can only be accessed after the SBIA is constructed.

The U-Tapao site could be Master Planned, the NAVAIDS upgraded, and site utilities and separate access provided to the easterly development area within a 2-3 year time frame. Early coordination must begin with the Royal Thai Navy to ensure a compatible mission.

Exhibit IX-4
Technical Evaluation Criteria

Category	Recommend	Surat Thani	Don Muang	U-Tapao	Ubon Ratchathani	Nakhon Ratchasima (Korat)	Khon Kaen (Nam Phong)	Lampang
Physical Property Characteristics Availability of adequate property to construct a dual runway airfield	(4,600 Mx) (2,600 M) 7,500 Rai	3,200 Rai	Dual Runway Exists	Adequate 16,700 Rai	2,225 Rai	4,123 Rai	Adequate Nam Phong has 30,000+ Rai	470 Rai
Availability of airfield adjoining property to support construction of major industrial and distribution facility	Minimum 15,000 Rai	Private Property Adjacent	Difficult; Major Urbanization Adjacent	16,700 Rai Available	Difficult, Airport in City and Major RTAF Base	Difficult; Airport is Major RTAF Base	30,000+ Rai Available	Private Property Adjacent
Topographic relief of the existing property	Flat	Flat	Flat	Flat	Minor	Minor	Minor	Hilly
The relative MSL elevation of the property	+10	+7	+3.25	+18	+123	+220	+200	+240
Ownership of the proposed property	Govt. Control	RTAForce	AAT	RTNavy	RTAForce	RTAForce	RTAForce	RTAForce
Surrounding land uses	Rural/Agric	Rural/Agric	Urbanized	Rural/Agric	Urban/Resid	Urban/Resid	Rural/Agric	Residential
Airfield Facilities Unobstructed airspace	Unrestricted	Unrestricted	Congested	Unrestricted	Height Obstruction	Unrestricted	Unrestricted	Mountains
Dual runways	Dual	Single	Dual Exists	Single; Room for Dual	Single; No Room for Dual	Single; No Room for Dual	Single; Room for Dual	Single; No Room for Dual
Runway length	Min 3,350M	2,500M Exist	3,500M Exist 3,700M Exist	3,450M Exist	2,743M Exist	3,000M Exist	3,800M Exist	1,475M Exist
High speed exits	Yes	No	Yes	No	No	No	Yes	No
Parallel taxiway(s)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Airfield lighting	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Air traffic control tower	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes

Exhibit IX-4 (cont.)
Technical Evaluation Criteria

Category	Recommend	Surat Thani	Don Muang	U-Tapao	Ubon Ratchathani	Nakhon Ratchasima (Korat)	Khon Kaen (Nam Phong)	Lampang
Navigation aids								
TACAN	Yes	Yes		Yes	Yes	Yes	No	No
VASI/PAPI	Yes	Yes		Yes	Yes	Yes	No	No
NDB	Yes	Yes		Yes	Yes	Yes	No	Yes
VOR/DME	Yes	Yes		Yes	Yes	No	No	No
Cat II ILS	Yes	No	Yes	Cat+I	No	No	No	No
Approach Control Radar	Yes	No	Yes	No	No	Yes	No	No
Transportation Access								
Distance to Primary Highway (1 digit)	<100km	130k, Hwy. #4	<5k, Hwy. #1	<5k, Hwy. #3	340k, Hwy. #2	<5k Hwy. #2	<5k, Hwy. #2	<5km, Hwy. #1
Dist. to Nat. Highway System (2 digit)	<50km	2k, Hwy. #41	<5k, Hwy. #31	50k, Hwy. #36	<5k, Hwy. #23	30k, Hwy. #24	<30k, Hwy. #12	<5k, Hwy. #11
Dist. to Secondary Highways (3 digit)	<20km	10k, Hwy. #401	<5k, Hwy. #304	<5k, Hwy. #331	10k, Hwy. #217	<5k	45k, Hwy. #208	N/A
Distance to Rail	<20km	<5k	<5k	10k	10k	<5k	<5k	<5k
Distance to Seaport	<200km	260k to Phuket 100km to Khanom	20k to BKK	20k-MAPTA Phut; 55k-Laem Chabang; 20k-Sattahip	580k to BKK	280k to BKK	440k to BKK	610 to BKK
Distance by road to BKK Metropolis	One Day <500km	600km	—	180km	580km	280km	440km	610km
Utility Infrastructure								
Electric Power	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited
Raw Water Source	Unlimited	Unlimited	Unlimited	Limted	Limited	Unlimited	Reservoir	Reservoir
Sanitary Sewage Treatment	Available	None	Available	Avail. Need Capacity	None	None	None	None
Industrial Waste Treatment	Available	None	None	None	None	None	None	None
Natural Gas	Available	Available	Available	Available	Unavailable	Unavailable	Available	Unavailable
Telecommunications	Available	Available	Available	Available	Available	Available	None	Available
Satellite Communications	Available	None	Available	None	None	—	None	None

Exhibit IX-4 (cont.)
Technical Evaluation Criteria

Category	Recommend	Surat Thani	Don Muang	U-Tapao	Ubon Ratchathani	Nakhon Ratchasima (Korat)	Khon Kaen (Nam Phong)	Lampang
Environmental Issues Noise	No Resident in Approaches	No Resident in Approaches	Surrounded by Intense Use	Minor Resid. 1 Approach Only	Intense Residential	Residential Adjacent	No Residential in Approach	Minor Residential Adjacent
Air Quality	Clear	Clear	Poor	Clear	Clear	Clear	Clear	Clear
Water Quality	Good	Good	Poor	Good	Good	Good	Good	Good
Wildlife Preserves/Conservation Areas	None	None	None	None	None	None	None	Elephant Train. 50km
Land Use	Non-Resident Adjacent	Non-Resident Adjacent	Residential Adjacent	Minor Resid. Adjacent	Residential Adjacent	Residential Adjacent	Non-Resident. Adjacent	Residential Adjacent

The Surat Thani airfield could be expanded within a 3-5 year time frame. Development of the Nam Phong site at Khon Kaen could also be compressed to open within the same time frame.

Any of the proposed greenfield candidate sites at Ubon, Korat or Lampang should be expected to take 5-7 years to be open under a high-priority, compressed schedule.

Bangkok International Airport would take 2-3 years *after* the opening of the SBIA.

5. **Adherence to "Seventh Plan" Objectives**

As noted in the introduction to the comparative analysis, the candidate sites are rated on the basis of their relative location with respect to the three "Investment Promotion Zones." All candidate sites, except BKK, are in Investment Zone 3 and comply with Plan objectives. The use of Bangkok International Airport as a Global Transpark would *not* be beneficial in dispersing industry to the outlying provinces.

Chapter X
Regulatory Alternatives

X. REGULATORY ALTERNATIVES

A. OVERVIEW

The Thailand Global Transpark (TGTP) is a multi-faceted project that will combine transportation, industrial, commercial, and service activities. Accordingly, there are a large number of existing Thai governmental regulations that must be followed for both the establishment and the operation of the complex.

This chapter identifies and briefly describes the appropriate current regulations of the Royal Thai Government. Also proposed are possible alternatives for the establishment, administration, and operation of a Global Transpark in Thailand. Recommendations as to which alternative may be the most effective is also provided.

All discussions in this chapter are based upon the current regulations existing in the fourth quarter of 1993 and the typical application of those regulations. No attempt has been made to develop unique regulations for the Global Transpark. The following is a listing of current regulations that are applicable to a Global Transpark in Thailand. The regulations have been divided into two groups: The first addresses the establishment of a TGTP facility; the second applies to the operation of a TGTP complex.

1. Regulations applicable to the construction of a Global Transpark:

   - Construction and operation of a commercial airport
   - Construction and operation of air cargo terminal and ground service facilities
   - Construction and operation of an industrial park
   - Regulation of land use

2. Regulations applicable to the operation of a Global Transpark:

   - Operations of aircraft
   - Customs regulations regarding importation and exportation of goods and materials
   - Immigration regulations for movement of people in and out of the country

A synopsis of each regulatory process follows.

B. CONSTRUCTION AND OPERATION OF A COMMERCIAL AIRPORT

Under present Thai regulations, aircraft can land at and take off only from a "Permitted Aerodrome." Any party (i.e. private enterprise, state enterprise, or government agency) can construct and operate a commercial airport after receiving formal authorization from the Ministry of Communication.

In order to have a new airport/aerodrome established, the applicant begins the permitting process by prepare a description of the proposed project and submitting an application for establishing a commercial airport. These documents are submitted to the Department of Aviation of the Ministry of Communication.

The Department of Aviation will evaluate the proposal, survey the proposed site, and forward its recommendation and the application to the Ministry for official action. Only after the approval of the Ministry, can the proposed airport be built. The application for an aerodrome should specify the following items in detail:

- The proposed site
- Title(s) and deed(s) for the land proposed as the site
- The proposed operating time period
- The type(s) of aircraft expected to use the facility
- The design specifications of the runway(s)
- Details of equipment (navigational aids) to be provided
- The location and size of hospitals and infirmaries in the nearby area
- The name of the proposed aerodrome manager and air traffic control personnel, as well as their license numbers
- The proposed radio frequency and radio operators to be employed and their license numbers

The evaluation of an application for establishing a commercial airport is done on a case by case basis. The Department of Aviation will field review the proposed site to ensure its viability. Then an evaluation of the proposed design, construction and operation is prepared. The evaluation relies on the Convention on International Civil Aviation regarding Aerodrome Design and Operations as published in International Standards and Recommended Practices by the International Civil Aviation Organization (ICAO).

With the exception of two private airports and several "temporary aerodromes," all airports in Thailand are operated either by the Airport Authority of Thailand (AAT) or the Department of Aviation (DOA). The two private airports include the Koh Samui Airport and an aerodrome in Ratchaburi that is being developed by Thai Aerospace Co., Ltd.

The operations of all aerodromes in Thailand, regardless of ownership, come under the regulatory control of the Department of Aviation, Ministry of Communication. According to the current regulations and practices, aviation and air traffic in general Thai airspace are controlled by the Aeronautical Radio of Thailand Ltd., which is owned in majority by the Ministry of Finance.

An aerodrome administration takes over the control only when an aircraft is within a 50-mile radius of the airport. Therefore, the aerodrome administration of the proposed project will have to register and coordinate with the Aeronautical Radio of Thailand Ltd.

C. CONSTRUCTION AND OPERATION OF AIR CARGO TERMINAL AND GROUND SERVICE FACILITIES

Under present regulations, leases for the construction and operation of air cargo ground service facilities are issued under the authority of the Ministry of Communication with guidance and rules set by the Civil Aviation Committee. The application form and proposal to provide air cargo services should be submitted to the Department of Aviation in the same fashion as the application for an aerodrome. The DOA then evaluates the proposal using guidelines, principles and recommendations provided by the International Civil Aviation Organization (ICAO) and the International Air Transport Association (IATA).

There are currently two enterprises operating air cargo terminal and ground service businesses in Thailand. They are Thai Airways International which is a public company, and Thai Airport Ground Services Co., Ltd. (TAGS), which is a private enterprise. Each company provides air cargo terminal and ground services utilizing facilities rented from the Airport Authority of Thailand, which owns many of the airports in Thailand.

D. REGULATIONS APPLICABLE TO THE CONSTRUCTION AND OPERATION OF AN INDUSTRIAL ESTATE (INDUSTRIAL PARK)

Industrial estates in Thailand are defined and treated as the subdivision of land into plots either for sale or rent to industrial tenants. The developer of the industrial estate provides needed infrastructure and services (such as roads, electricity, water, telecommunication, waste collection, etc.) to each plot.

The construction and operation of an industrial estate is a business that any party can engage in. The regulatory role of the government is one of encouragement, rather than of control. Each individual tenant industry will be controlled and inspected according to the Ministry of Industry's Industrial Factory Regulations. The industrial estate itself has few real regulations. Rather, special regulations are established to promote industrial development within the industrial estate. These special incentives can be established by the Board of Investment (BOI) or by the Industrial Estate Authority of Thailand (IEAT), which is a state enterprise operating under the Ministry of Industry. There are a number of options for the development of an industrial estate:

1. Industrial Estates Owned by IEAT

Under the directive of the Ministry of Industry and current government policy, the Industrial Estate Authority of Thailand (IEAT) constructs and operates an industrial estate using government funding.

2. Industrial Estate Constructed by Private Enterprise and Operated by IEAT

A private enterprise can purchase the land and pay for the design and construction of necessary infrastructure and facilities. The private enterprise may then sell the developed land parcels to tenants according to selling prices approved by the IEAT. The IEAT assists the process by approving the estate and licensing it as an "Industrial Estate Zone."

The infrastructure and general facilities are ultimately transferred to the IEAT, which maintains and operates them on behalf of all of the tenants.

The developer is charged a review fee by the IEAT for the review and approval of the development plans and for the construction review. The tenants pay fees to the IEAT for operation and maintenance of the infrastructure.

3. **Industrial Estates Constructed and Operated by a Private Enterprise with Endorsement from IEAT**

   In this option, the developer of an industrial estate is responsible for constructing the estate and operating the infrastructure and facilities for the life of the estate. The IEAT will, upon approval of the estate, license it as an "Industrial Estate Zone," supervise the operation of infrastructure and facilities, and provide services to industrial tenants in the estate in order to establish, expand, and operate factories within the estate.

   The IEAT also will charge a fee to the developer for expenses incurred in providing the above-described services.

4. **IEAT Joint-Venture with Private Enterprise**

   The IEAT and a private enterprise can create a joint-venture. The joint-venture invests in the land and the construction of infrastructure and facilities. Normally the private enterprise is in charge of property sales while the IEAT operates the infrastructure and other tenant services and collects fees for those services.

5. **Privately Owned and Administered Industrial Estate**

   This type of industrial estate is constructed and operated by a private enterprise without any IEAT involvement. There is no "Industrial Estate Zone" designation, no endorsement from the IEAT, and no services provided by the IEAT. The developer is solely responsible for providing infrastructure, facilities and services as promised in the sales contract.

   Because an industrial estate is considered a business, it may apply for and receive special privileges offered by the BOI, if it meets the BOI's criteria. The estate may apply, regardless of whether or not it is endorsed by the IEAT. However, an IEAT endorsement will usually facilitate the receipt of BOI privileges.

At present there are five industrial estates in Thailand owned by the IEAT, and 16 estates that have been constructed privately and are operated by the IEAT, or have an endorsement from the IEAT. Only one industrial estate is privately owned and operated. At present, no private-IEAT joint-venture industrial estates have been established. All of the existing industrial estates have been granted BOI promotional privileges.

E. REGULATIONS ON LAND USE

All land in Thailand is generally categorized as either publically owned or privately owned. Public land is composed of national forest lands, lands for military uses, and lands owned by any government agency. The use of forest lands and military lands is highly restricted except in very special cases as directed by the government. The use of lands owned by government agencies is usually restricted by the policy of the agencies involved and directives from the government. Very few restrictions are imposed on private land holdings, except when national security, safety and city planning are involved.

F. OPERATING AIRCRAFT IN THAILAND

All aircraft based in Thailand must be registered with the Department of Aviation (DOA). Under DOA regulations, any person or organization that applies for aircraft registration must be of Thai nationality or legally registered according to Thai commercial laws. When the applicant is a limited partnership, at least 70 percent of the partnership must be held either by Thai nationals, Thai government agencies, or Thai companies.

Registered aircraft must operate only from permitted aerodromes. Foreign registered aircraft are allowed to operate in Thailand in accordance with current treaties in effect with the corresponding countries.

G. CUSTOMS REGULATIONS ON IMPORTATION AND EXPORTATION OF GOODS AND MATERIALS

All aircraft entering or departing the Kingdom of Thailand shall land or depart from a "Customs Aerodrome." A "Customs Aerodrome" is an aerodrome, identified by the Ministry of Finance, through the Customs Department, for the legal importation and/or exportation of all goods or any class of goods by air.

To be designated as a "Customs Aerodrome," the aerodrome authority must submit an application to the Customs Department that explains the details of the aerodrome operations and the request to be named as a customs aerodrome. After approval from the Ministry of Finance, the aerodrome can be designated as a "Customs Aerodrome." After being so designated, the Customs Aerodrome must establish a customs station staffed with customs officers. The Thai government has to approve the budgets and the personnel assignments.

There are currently twelve Customs Aerodromes in Thailand, including Bangkok International at Don Muang, Pak Kred, Chiang Mai, Udon Thani, Hat Yai, Phuket, Khon Kaen, Chiang Rai, Phitsanulok, U-Tapao, Surat Thani and Ubon Ratchathani airports.

Upon arrival at a Customs Aerodrome, every international flight must submit a report to the Customs Department within 24 hours of landing. The report includes details from the aircraft log book and a declaration of all goods carried. The inbound declaration must be signed by a customs officer from the originating country where the cargo was boarded or last transitted. All imported goods are subject to taxes and tariffs according to rates specified by the Customs Department.

Prior to international departures from a Customs Aerodrome, the aircraft flight crew is required to produce the aircraft log book for inspection by a customs officer and to file a notice of departure for a foreign destination on the form prescribed by the Customs Department. The form, when signed by the officer, serves as clearance for the aircraft to proceed to a foreign destination. If the aircraft carries any goods, a manifest and declaration of all goods loaded must also be delivered to the customs officer. A clearance fee will be charged at a rate set by the Customs Department.

The Customs Department has established specific regulations governing the import and export of goods. Special duty rebate regulations apply to the re-exportation of products that have been imported. These latter rules cover goods that are imported and then assembled or subjected to some industrial process while in Thailand. In all cases, records must be filed with the Customs Department specifying the description, quality, quantity, weight, true market value, and other particulars of the goods, whether they are liable for duty or not. Customs regulations covering those goods that are re-exported have been developed to promote assembly industries. The following information briefly describes how the Customs regulations cover such activities.

When materials or goods are satisfactorily proven to be previously imported, and evidence is shown that duty has been paid, 90% of the import duty paid shall be rebated, subject to the following conditions:

- The goods were not used or modified while in the country.
- The goods are exported within one year after being imported.
- The goods were exported from a proper port designated for exports.
- The application for the import duty rebate is made within six months after exportation.

Furthermore, if the exported goods can be satisfactorily proved to be produced from, mixed, assembled, or packed with the imported goods, the full import duty already paid on such imported goods shall be rebated, subject to these conditions:

- The rebate on such imported goods is not prohibited by ministerial regulations.
- The quantity of imported goods used in producing, mixing, assembling or packing exported goods shall be in accordance with the rules approved or specified by Customs Department.
- The goods are exported through a port or place designated for the exportation of goods.
- The goods are exported within one year from the date of importation of the goods used in producing, mixing, assembling or packing exported goods.
- The claim for import duty rebate is made within six months from the date of exportation.

In addition, upon importation, when the importer expresses his intention to use the imported goods solely in the process of producing, mixing, assembling or packing other goods to be exported, a guarantee may be accepted in lieu of a cash payment of import duty. The guarantee is then returned after the export of the goods.

H. IMMIGRATION REGULATION

Any person entering into, or departing, the Kingdom of Thailand must enter and leave by way of immigration check points, designated landing stations or other areas in accordance with the current regulations published by the Ministry of Interior. Aliens entering the country shall produce a genuine and valid passport or another approved document used in lieu of a passport with visas issued by the Royal Thai Embassies or Consulates in foreign countries, or from the Ministry of Foreign Affairs, except when a visa is not required. The Immigration Bureau is charged with enforcing all of these regulations.

I. ON-SITE SECURITY

On-site security will be a key element for the Global Transpark. Provision of security systems and procedures will not only ensure the efficient operation of the Thailand Global Transpark, but will also serve as an important factor in attracting tenants and users to the site.

The protection of finished and semi-finished goods and raw materials, particularly as they are transported to and from tenants via the on-site transfer system, will be of

paramount importance to attract all types of firms, especially those using high-technology processes. Unlike traditional airport-related facilities, where the air operations area is treated as a secured area with only controlled public access, the design of the Global Transpark should extend the secured areas throughout the site. These additional secured areas will include any intermodal transfer facilities, the routes of the on-site transfer system, and related areas. Access to these secure routes and systems should be available only to pre-cleared and trained personnel—public access will not be permitted. Security standards should be established during he Master Planning process.

The security standards should exceed the current stringent restrictions advocated by the U.S. Federal Aviation Administration and the International Civil Aviation Organization for international airports.

The creation, administration and enforcement of on-site TGTP security standards would benefit from the presence of Royal Thai military forces. One possibility could be the joint-use/operation of the airfield component of the complex. The military force could provide and maintain the needed security as a secondary element of their military mission.

In the changing global economy, the protection of each firm's shipments, copyrights and trademarks is becoming increasingly difficult. Location decisions are being affected by the extent of security. Through the development and provision of a highly secured environment, the TGTP will be an attractive base for firms to serve the markets of Thailand and Southeast Asia.

J. ASSESSMENT OF REGULATORY OPTIONS FOR A THAILAND GLOBAL TRANSPARK

There are several alternatives to create an organizational entity that would build and operate a Global Transpark in Thailand. These alternatives include a private enterprise, a joint-venture between private and public sectors, a state enterprise, or the creation of a special agency of the government. In the synopsis of existing regulations, no restrictions that pertain to the form of organization that may own and/or operate the facilities at the complex have been discovered. However, the development and operation of the TGTP will require close coordination with numerous government agencies:

- Ministry of Communication
  - Department of Aviation
  - Airport Authority of Thailand
  - Highways Department
- Ministry of Finance
  - Aeronautical Radio of Thailand Ltd.
  - Thai Airways International Plc.
  - Customs Department
- Ministry of Interior
  - Immigration Bureau
- Ministry of Industry
  - Industrial Estate Authority of Thailand
- Provincial Electricity Authority
- Provincial Water Authority
- Telephone Organization of Thailand

The early establishment of liaisons with each of the applicable agencies will be critical to the regulatory success of the project. Moreover, depending upon the site selection, there is a high probability that the Global Transpark may require the acquisition of some public lands. This would require the support and clearance of the affected government agencies and of the Royal Thai Government itself. Various branches of the Thai military services may also be involved if a site at a joint-use airfield is selected.

In order for this project to be effective, active participation of the government and the involved government agencies will be required. Their participation can take on various forms, such as financial grants, property donations, technical services, extensions of privileges, or even co-investing.

K. MANAGEMENT AND OPERATING OPTIONS

Six options have been identified for the development and operation of a Global Transpark in Thailand. These options will each be reviewed in terms of the complexity of the organization and an identification of advantages and disadvantages associated with implementing the project listed for each option.

Option 1. Combine Various Government Agencies

In this option, the Global Transpark would be developed and operated by combining the resources of all appropriate government agencies. Related government agencies and/or state enterprises would be assigned their corresponding statutory responsibilities to assist in the overall development and operation of the Global Transpark. The overall management of the project would be vested in a Steering Committee composed of members from each agency.

Given the complexity and multi-faceted nature of the project, numerous agencies would be involved in all aspects of the project. Each agency would include their element of the Global Transpark development into their overall plan and budget and then independently perform their assigned part of the project. For example:

- The Department of Aviation (DOA) and/or the Airport Authority of Thailand (AAT) could be assigned the responsibility of building the aerodrome, the cargo facilities and passenger terminal facilities.

- The Industrial Estate Authority of Thailand (IEAT) could be responsible for planning, construction, and sales of industrial estate properties.

- The Highways Department, Provincial Electricity Authority (PEA), Provincial Water Authority (PWA), etc. would be responsible for building or arranging onsite and offsite infrastructures for the Global Transpark.

The advantages of the "combined agencies" option include the following:

- There is no need to create a new organization.
- The project would be developed using existing technical expertise and structure already available in each agency and state enterprise.
- The development of the project could be constructed in a series of phases which reflect market demands.
- There would be no need to hire or transfer staff.
- The project can be developed utilizing the existing budget and control systems.

The disadvantages of the "combined agency" option include the following:

- There would be a significant requirement for constant and close coordination among all of the agencies and state enterprises. This would require a support staff for the Steering Committee.
- Significant authority must be vested in the Steering Committee to facilitate coordination. The authority may be perceived as a threat to the senior management of the other agencies and state enterprises.
- There is no means of private participation.
- Competition for scarce budget resources within any one agency or enterprise could hamper the overall development of the project.
- Time overruns can be expected in this option.

The Eastern Seaboard Development Program is being performed utilizing this "combined agency" organizational structure. That project has had significant schedule delays due to bureaucratic posturing.

Therefore, if this option is chosen, extreme care should be taken to ensure that the Steering Committee or project coordination office is provided with adequate authority to ensure that all parties are implementing the TGTP project according to the overall project schedule and plans. More often than not, such authority is extremely difficult to provide within the bureaucracy of the Government.

Option 2. Establishment of a Special Government Organization

Option 2 is similar to Option 1 in that the Government implements the project by itself but utilizes a different method of implementation. In Option 2 the Government will statutorily create a new agency or organization to construct and operate the TGTP. The organization would be autonomous and have authority to control and coordinate all development and construction to ensure timely completion of the project.

The advantages of Option 2 include the following:

- A single organization should be better able to coordinate and manage all aspects of the development of the project.
- A single line of authority would perform agency coordination, contact with engineers, designers, construction contractors, construction contractors, tenants, users and suppliers to the Global Transpark.

- The development of the project could be constructed in a series of phases which reflect market demands.
- Flexible operating procedures can be adopted to accommodate unique needs and demands of the project.
- The organization is not constrained by existing budget programs and resource assignments.
- The creation and hiring of staff and management positions can be flexible according to need.

The disadvantages of Option 2 include the following:

- The requirement for special enabling legislation to set up the new organization could take quite a long time.
- The new organization might be staffed by recruiting qualified personnel away from other agencies; this might not be favorable to other agencies because they could lose qualified staff or the staff might be reluctant to leave their existing assignments.
- There is no element of private participation.
- Due to complexity of the project, the new organization could become very large and unmanageable.

Option 3. Private Enterprise Builds, Operates then Transfers the TGTP to Government

A private enterprise could build and temporarily operate the Global Transpark then, in accordance with an agreement with the Government, transfer the project to one or more assigned agencies. This option would eliminate the Government's requirement to undertake the initial project with its own resources. The Government would provide an exclusive contract with a private enterprise to design, build and operate the TGTP complex for a given period of time, after which the project would be transferred to an assigned agency or state enterprise.

In this option the private enterprise could build the Global Transpark using private sector financing with or without Government involvement. The private enterprise would operate the complex, collect income from the operation and pay a limited concession fee to the Government for a period of time before transferring the TGTP to Government agencies or state enterprises such as the AAT and the IEAT.

In this option, onsite construction would be performed by the private enterprise, and offsite infrastructure (i.e. highways, electricity lines) and utilities (i.e. water lines, telecommunications services) would be provided by the appropriate Government agencies and state enterprises in a timely manner. This would require a mandate from the Government to related agencies or state enterprises to provide full cooperation to the project.

The advantages of Option 3 include the following:

- The project would be implemented by private enterprise, which is considered to be more efficient, flexible, responsive and productive than Government agencies.
- This approach meets the current Government policy which encourages privatization.
- The timing of the development of the project could be accelerated to meet market demand.
- The project could be constructed in phases over the term of operation by the private enterprise to accommodate market demands.
- No legislation would be needed and no new organization would have to be established.
- There would be no requirement to appropriate Government financial resources to the project other than to support the provision of offsite services and external infrastructure.

This disadvantages of Option 3 include the following:

- The private enterprise could have difficulty securing adequate financing for development and operating cash flow due to the size and complexity of the project.
- The private enterprise would expect to make an adequate return on its investment prior to the transfer of the complex to the Government.
- Government agencies and/or state enterprises might be reluctant to assist and cooperate with the private enterprise or may not have adequate staff or financial resources to meet expected development schedules.
- The private enterprise could have difficulty in hiring qualified personnel for both development and operation of the facilities.
- The appropriate Government agencies might not be able to provide adequate offsite services to facilitate the operation of the complex.

Option 4. Private Enterprise Builds then Transfers to Government Agencies for Operation

In Option 4, a private enterprise would construct the Global Transpark and, upon completion, transfer it to one or more Government agencies for operation. Option 4 is similar to Option 3 in that the Government would grant the private sector enterprise a concession to build the Global Transpark, but the private enterprise would never operate the complex.

The private enterprise would recover its investment by a combination of reimbursement for its design and construction costs, and participation in a revenue sharing plan derived from the operations over an agreed upon period of time.

The advantages of Option 4 include the following:

- The efficiency, flexibility, relative high productivity and responsiveness of the private enterprise is utilized during the design and construction phase of the project.
- This approach partially meets the Government program encouraging privatization.
- The private enterprise would fund the initial construction but not the initial operating phase cash flow needs.
- No special legislation would be needed, and no new organizational structure would have to be created.
- The Government would not be responsible for financing the development and construction of the Global Transpark.

The disadvantages of Option 4 include the following:

- The Government agencies would have to be organized, trained and prepared to immediately start operating the TGTP complex upon construction completion.
- It would be difficult to construct the project as a phased development. There could be conflict between the private developer and the Government agencies if additional construction continued after transfer.
- The need for close and significant coordination during both the design and construction phase between the private developer and the Government agencies could create delays and added costs, which in turn could create a problem during the transfer process.

Option 5. Government Build and Transfer to Private Enterprise

Option 5 is a reversal to the previous alternative. The Government would be responsible for the construction of the project and would then transfer it to a private enterprise for operation and maintenance. The Government would employ its significant resources to finance the development of the project and would then employ the market-driven expertise and related financial strength of a private enterprise to market and operate the project.

The advantages of Option 5 include the following:

- The significant resources of the Government can be used to design and construct all facilities both on- and offsite.
- This approach meets the Government trend toward privatization.
- No special legislation would be needed and no new organizational structure would have to be set up.
- The private enterprise would not be required to secure significant financing for construction of the project.
- The specific expertise of the appropriate Government agencies and state enterprises would be employed in the design and construction phase.
- The Government would not be responsible for marketing or operating the Global Transpark.

The disadvantages of Option 5 include the following:

- The Government agencies would have to be organized and prepared to coordinate in the completion of planning, design and construction.
- It would be difficult to construct the project as a phased development. There could be conflict between the private developer and the Government agencies if construction continued after transfer.
- The need for close and significant coordination during the design and build phase between the private developer and the Government agencies could create delays and added costs, which in turn could create a problem during the transfer process.
- The efficiency, flexibility, relative high productivity and responsiveness of the private enterprise is utilized only during the marketing and operating phases of the project.

Option 6. Private-Public Joint Venture

In this option a private enterprise and the Government would create a joint venture to develop, construct, market and operate the Global Transpark. This approach is similar to the organization being developed in North Carolina. The option would be based on the creation of defined tasks for each of the parties. It would be functional only in the case of the participation of only a very few Government agencies or state enterprises. In fact, it would be most efficient if only one agency or state enterprise were involved.

The advantages of Option 6 include the following:

- The specific expertise of both the private enterprise and the public agency can be best used to accomplish the goal.
- The financial resources of a private enterprise and the Government can be matched to their participation and the requirements of the project.
- It should reduce confusion and investment recovery problems that occur during the transfer process.
- The regulatory and financial resources of the Government can be best employed to initiate the project and to provide needed infrastructure facilities and services.
- The flexibility of the private enterprise can be employed in the marketing and operation of the project and responding to unique needs of individual tenants and users.
- It meets the Government trend for increased privatization.

The disadvantages of Option 6 include the following:

- Any change in Government policy and level of commitment could hamper the long-term development and/or operation of the project.
- The joint venture requires a continuing close relationship between the parties.
- Any other Government agency or state enterprise could impact the schedule if it is unwilling to cooperate in a manner needed for the success of the project.
- Potential confusion or conflict regarding cost and/or revenue sharing could create insurmountable legal problems.
- The arrangement may require special enabling legislation, particularly if a special agency or state enterprise is formed to participate in the project.

Option Assessment

Although Option 1 and Option 2 take advantage of the traditional Government ability to fund major projects, the first option requires a high level of cooperation among a wide variety of agencies and state enterprises that might be too complex to manage. Option 2 addresses the management question, but would require close and active oversight from senior Government officials in order to ensure coordination and cooperation at all phases of the development and operation of the complex. Both options require a long-term commitment by the Government to provide significant funding and other resource allocations necessary to facilitate the development and operation of the project, regardless of other competing demands.

Option 3 places the initial planning, design, financing, construction and start-up burdens on private enterprise. The Government, by means of a thorough selection process, can secure the services of a well-financed and highly qualified enterprise to develop the project, and with that assurance and continued review of the project will not be faced with the complexities and costs of bringing the facility to operation. Through careful negotiation of the construct-operate-transfer agreement, the Government can be protected from unexpected costs and problems.

Option 4 accelerates the participation of the Government in the project. It requires very close coordination during the design and construction phase to ease the transfer process and does not readily accommodate a situation where the project continues to be under construction as well as in operation.

Option 5 is non-traditional in that a Government-sponsored and -funded project is turned over to a private enterprise to operate. Pursuit of this option would raise a wide range of questions regarding the selection of the successful private enterprise and the compensation paid to the Government for its initial investment. This option matches the typical financial resources of a Government and a private enterprise as well as the accepted kinds of expertise of the two parties.

The private-public joint venture suggested in Option 6 would require extremely close coordination throughout the life of the project. This situation could be remedied in part by initially establishing a series of project guidelines related to assignment of responsibilities. These guidelines could be in the form of geographical separation or functions. Option 6 would tailor the financial resources of the two parties to the numerous and sometimes conflicting demands of the project. It would avoid any conflict arising from a staged construction of the project and thus would allow for the project to be phased to reflect market demands.

Chapter XI
Financial Feasibility

XI. FINANCIAL FEASIBILITY

A. CURRENT THAI FINANCIAL SECTOR

At present, the Thai financial sector consists of 16 commercial banks, a Government Savings Bank, and 31 finance and/or securities companies. All of the financial institutions are privately owned and are public companies, except the Government Saving Bank which is owned by Ministry of Finance. Although the Government holds shares in a few banks, those banks are run as private or public companies as opposed to state enterprises.

As of August 1993 the commercial banks in Thailand had combined total assets of 2,955,890 million baht. The five largest banks were Bangkok Bank Ltd., Krungthai Bank, Ltd., Thai Farmers Bank, Ltd., Siam Commercial Bank, Ltd., and Bank of Ayudhya, Ltd. The combined outstanding loans, as of end of 1992, totalled 2,216,736,684 million baht (listed in Exhibit XI-1). As of 1992, the outstanding loans of the financial/security companies totaled 354,983,808 million baht (see Exhibit XI-2).

In addition to the Thai financial institutions, 14 foreign registered banks operate full-service branches (listed in Exhibit XI-3) in Thailand. Several other foreign banks operate representative offices.

In 1993, the Government established the "Bangkok International Banking Facilities" (BIBF) to facilitate the movement of funds across the border according to International Monetary Fund's (IMF) standards. By November 1993, Thai commercial banks, foreign bank branches, and foreign bank representative offices had provided foreign loans amounting to 175,313 million baht using the BIBF, with Thai commercial banks as the most signficant participants at 112,171 million baht (as shown in Exhibit XI-4).

The operations of all financial institutions in Thailand are controlled and regulated by the Bank of Thailand, Ministry of Finance. As of 1991, the Bank of Thailand had total assets of 580,845 million baht, with foreign assets accounting for 465,106 million baht. The Bank's liabilities included 207,227 million baht of deposits, 106 million baht in foreign liabilities, and 169,180 in notes in circulation.

Exhibit XI-1
Loans from Commercial Banks
(1989-1992)

	1988	1989	1990	1991	1992
Bank					
Bank of Ayudhya Ltd.	55,483,990	74,721,913	101,226,778	122,637,959	144,871,407
The Bangkok Bank of Commerce	28,306,335	37,946,898	54,986,299	68,433,940	85,604,810
Bangkok Bank Ltd.	272,422,335	327,340,560	420,289,515	501,641,576	575,606,223
Bangkok Metropolitan Bank Ltd.	34,027,394	41,106,949	50,265,520	60,006,585	72,852,573
The Bank of Asia Public Co., Ltd.	24,740,298	28,520,366	34,855,591	44,711,698	47,156,597
First Bangkok City Bank Ltd.	33,620,265	43,154,853	61,917,082	82,746,474	106,353,129
The Industrial Finance Corp. of Thailand	13,219,459	17,423,629	22,040,243	27,551,724	37,381,917
Krung Thai Bank Ltd.	112,692,133	147,858,908	206,238,833	267,174,342	307,051,628
The Laem Thong Bank Co., Ltd.	3,487,086	4,377,251	5,397,662	7,761,999	10,809,765
Nakornthon Bank Ltd.	7,816,092	10,624,319	15,263,234	19,077,035	24,927,677
The Siam Commercial Bank	74,199,113	97,266,873	144,049,988	183,496,181	225,945,709
Public Co., Ltd					
Siam City Bank Ltd.	34,491,860	41,672,018	52,830,012	66,181,174	83,918,595
The Thai Danu Bank Ltd.	11,326,784	15,795,244	22,269,841	28,389,978	34,506,553
The Thai Farmers Bank Ltd.	113,394,395	155,579,447	218,846,820	244,027,643	300,228,178
Thai Military Bank Ltd.	50,402,905	66,430,137	83,241,898	103,625,602	129,360,128
The Union Bank of Bangkok Ltd.	14,132,303	17,690,611	24,354,263	26,536,069	30,161,795
TOTALS	**883,762,747**	**1,127,509,976**	**1,518,073,579**	**1,853,999,979**	**2,216,736,684**

411

Exhibit XI-2
Loans from Financial Companies
(1989-1992)

	1988	1989	1990	1991	1992
Finance					
Asia Credit Public Co., Ltd.	9,697,222	15,615,084	22,990,380	26,461,797	34,538,127
Ayudhya Investment & Trust Co., Ltd.	2,746,462	3,512,671	3,766,879	3,927,157	4,070,958
Adkonson Securities Ltd.	6,000	13,000	25,000	60,029	70,354
Asia Securities Trading Co., Ltd.	42,000	—	240,000	30,000	20,000
Bangkok First Investment & Trust Ltd.	1,197,678	1,913,770	2,545,602	3,852,994	4,271,094
Bangkok Investment Co., Ltd..	2,450,487	3,587,778	4,217,929	4,008,379	4,544,235
CMIC Finance & Securities Co., Ltd.	2,907,804	6,240,158	10,839,536	17,680,572	23,176,248
Capital Securities Co., Ltd.	981,918	1,298,251	638,847	60,383	534,177
Dhana Siam Finance & Securities Co., Ltd	5,320,411	8,727,689	16,152,117	22,779,000	32,355,345
Ekachart Finance & Securities Co., Ltd.	—	1,092,005	1,925,755	4,273,667	7,489,938
First City Investment Public Co., Ltd.	3,663,417	5,022,470	5,593,205	6,865,145	8,761,313
Finance One Public Co., Ltd.	3,677,459	7,286,326	14,714,147	22,099,880	31,067,208
General Finance & Securities Co., Ltd.	2,502,358	4,459,371	6,605,850	9,131,905	13,131,197
International Trust & Finance Co., Ltd.	1,887,958	2,636,458	3,095,844	4,573,016	5,619,133
Kiatnakin Finance & Securities Co., Ltd.	1,172,703	1,336,366	1,882,239	3,557,314	7,259,868
Multi-Credit Corp. of Thailand Ltd.	2,907,089	3,865,423	4,510,334	6,131,848	10,426,708

412

Exhibit XI-2 (cont.) **Loans from Financial Companies (1989-1992)**					
	1988	**1989**	**1990**	**1991**	**1992**
The Mutual Fund Co., Ltd.	41,968	84,480	121,492	625,547	729,885
Nava Finance & Securities Co., Ltd.	4,012,216	6,570,499	7,697,465	10,553,512	17,240,528
National Finance & Securities Co., Ltd.	4,065,774	7,426,503	11,609,974	17,038,427	20,983,449
Phatra Thanakit Co., Ltd.	7,304,022	10,797,112	521,656	20,110,459	26,388,652
Prime Finance & Securities Ltd. LOGO	—	786,281	1,709,006	2,979,182	4,617,139
Siam City Credit Finance & Securities Co., Ltd.	—	2,301,640	3,939,782	6,688,858	6,773,013
SCF Finance & Securities Co., Ltd.	—	1,810,091	3,080,035	4,577,934	6,489,466
Sri Dhana Finance & Securities Ltd.	507,847	1,043,186	2,697,440	3,343,318	4,162,010
The Siam Sanwa Industrial Credit Co., Ltd.	3,046,561	3,621,235	5,166,181	10,065,642	12,602,886
Thai Financial Syndicate Ltd.	—	2,988,425	3,764,737	6,019,421	7,701,849
Thai Investment & Securities Co., Ltd.	10,744,321	17,384,105	22,047,599	19,588,082	23,239,325
Thaimex Finance & Securities Co., Ltd.	1,648,801	2,027,801	2,568,727	3,059,790	4,132,851
Thai Tanakorn Finance Co., Ltd.	1,147,025	1,844,192	2,876,862	4,073,785	4,698,354
Union Asia Finance Co., Ltd.	8,070,870	10,278,188	14,729,984	18,185,833	23,207,228
United Finance Corp., Public Co., Ltd.	649,626	912,953	1,542,439	2,557,187	4,681,270
TOTALS	82,399,997	136,483,511	183,817,043	264,960,063	354,983,808

413

Exhibit XI-3 **Foreign Banks in Thailand**
Bank of America, NT&SA
Bank of Tokyo, Ltd.
Banque Indosuez
Bharat Overseas Bank, Ltd.
Citibank, N.A.
Chase Manhattan Bank, N.A.
Deutsche Bank
Four Seas Communications Bank, Ltd.
The Hong Kong & Shanghai Banking Corp.
International Commercial Bank of China
The Sakura Bank, Ltd.
Security Pacific Asian Bank, Ltd.
Standard Chartered Bank
United Malayan Banking Corp.

Exhibit XI-4
BIBF Loans
(As of November 1993)
(Millions of Baht)

	Out/In		Sub-Total	Out/ Out	Total
Thai Commercial Banks	42,206.0	67,654.4	109,860.4	2,311.2	112,171.7
Foreign Bank Branches	48,821.2	1,530.5	50,351.7	397.3	50,749.0
Foreign Bank Rep. Offices	12,202.2	—	12,202.2	190.7	12,392.9
Total	103,229.4	69,184.9	172,414.3	2,899.2	175,313.6

414

Another factor affecting the flow of funds in the Kingdom is Government expenditure. The Government's budgeted spending in fiscal year 1993 was 560,000 million baht, an increase of 21.6 percent over the 1992 level of 460,400 million baht. The Government's annual budget in fiscal years 1992 and 1993 were 17.2% and 18.9% of the nation's gross domestic product (GDP), respectively.

To supplement revenues from taxes and other fees, the Government borrows from domestic and foreign sources. As of December 1991, domestic borrowings by the Government in the form of bonds, promissory notes and Treasury bills totalled 230,108 million baht, while debt to foreign sources was 289,215 million baht.

As of 1991, Gross Domestic Investment (GDI) totalled 1,069,434 million baht. Over 81 percent of the GDI was from the private sector (867,572 million baht), which far outweighed the public sector portion of 180,954 million baht. In the same year, about 53 percent, or 314,232 million tbaht of the Net National Savings (587,744 million baht) came from the private sector, while the remainder was generated from the public sector. Foreign savings contributed 206,597 million baht to domestic investment in the same year.

Thailand's financial structure consists of strong, privately owned commercial financial institutions with Government agencies performing regulatory roles. At the same time, the country's economy is healthy and led by a strong private sector, whose investments and expenditures have helped fuel the economic growth of the country.

B. RECENT MAJOR PROJECT FUNDING

The expansion of the Kingdom's economy has led to the creation of many major development projects. The funding of those projects has reflected a wide range of options. The financing sources have included foreign loans, domestic loans, appropriations from the Government's budget, use of cash flow from Government agency or state enterprise income, and private sector investment. The loans from both domestic institutions and foreign sources have typically been funnelled through the Government. Two exceptions to this process have been the Expressway Phase II and the Telephone Expansion, in which loans were made by the private investor.

Until recently, major development projects in Thailand traditionally have been implemented by Government agencies and/or state enterprises and funded for the most part by foreign source loans made by the Government. Funding sources such

415

as domestic loans, agency income, and appropriation from the Government's budget have played an equally minor role by comparison. There has been little private sector participation.

Recently the Government has developed and enacted policies that support privatization and seek to relieve the government from the heavy burden of investment in major projects. In response to these changes, the private sector has exhibited the capability and financial strength to finance major projects. This growing participation of the private sector has demonstrated the potential for satisfactory returns on investment, as long as the private sector has been granted adequate terms and conditions to implement and reasonably profit from its investments. The following section reviews some of the major projects recently implemented through private funding.

1. **Expressway Phase II**

   This project was implemented by Bangkok Expressway Co., Ltd. (BECL). BECL, a private company, was set up for the purpose of contracting with Expressway and the Rapid Transit Authority of Thailand (ETA), a state enterprise under the Ministry of Interior. The project budget was 51,000 million baht. The company was created to build the expressway, transfer it to ETA for operation, and share in the income with ETA for a period of time in order to recoup its investment. Funding of the project included the company's own equity, foreign and domestic loans, and a sum borrowed from the Government for land reclamation. The borrowing was secured by the Government agency.

2. **Expressway Phase III**

   This project is estimated to cost approximately 50,000 million baht. The business arrangement and funding would follow the same program as Phase II. At present the project is under negotiation between ETA and the private sector.

3. **Thanayong Electric Train Mass Transit**

   The Bangkok Transit System Co., Ltd., a private company led by the Thanayong Group, signed an agreement with Bangkok Metropolitan Administration (BMA) to develop a mass transit system for Bangkok. The Board of Investment (BOI) also participated in the project.

The project cost is estimated to be 20,000 million baht. The private company is to provide financing for the project except for the land, which will be provided by the BMA. The project is now under construction.

4. **Sky Train Mass Transit**

The Sky Train Mass Transit project is another proposed mass transit system for Bangkok. The estimated cost of the project is 30,000 million baht. Construction of the project is to financed by the private sector with the exception of land that will be provided by the BMA. The project is currently under negotiation between the Expressway and Rapid Transit Authority of Thailand (ETA) and the private sector.

5. **Metro 2000 Underground Transit**

This project is proposed to construct an underground mass transit system for Bangkok. The project cost is estimated at 150,000 million baht. It is expected that the project would be implemented and financed by the private sector. The project is still under consideration by the cabinet.

6. **Hopewell Elevated Railway and Highway**

The Hopewell (Thailand) Co., Ltd. has signed an agreement with the State Railway of Thailand (SRT), a state enterprise under the Ministry of Communication, to develop and operate this project. The project is estimated to cost 80,000 million baht. The project is to be financed by a 9,000 million baht domestic loan and a 20,000 million baht foreign loan, both secured by the company, in addition to the company's own equity and income from initial phase. The project is now under construction, although a significant delay is expected.

7. **Railway Track Doubling**

This project, which is to double rail lines throughout the Kingdom, is being implemented by the State Railway of Thailand. The project cost is estimated at 80,000 million baht with funding from the Government. The project is now in progress and is scheduled for completion in 1998.

8. **High-Speed Rail Line: Bangkok - Rayong**

The Ministry of Communication and the National Economic and Social Development Board are studying the establishment of a corridor for high speed

417

train service between Bangkok and Rayong. The estimated project cost is 20,000 million baht. A group of private investors has proposed to undertake the project.

9. **Don Muang Tollway**

This project was developed to ease chronic congestion between central Bangkok and the area around the International Airport. It involves the construction of an elevated tollway above the existing highway. The project is implemented by the Din-Daeng Don Muang Elevated Highway Company. Total project cost is estimated at 10,000 million baht. Financing for the project includes the company's own equity, a 3,880 million baht domestic loan, and a 3,640 million baht foreign loan.

10. **Nong Ngu Hao, Second Bangkok International Airport**

Development of the Second Bangkok International Airport is under the direction of the Airport Authority of Thailand. The project is estimated to cost 100,000 million baht.

11. **Thai Com Satellite**

In December 1993, the Thai Com Satellite was launched. The project was developed by the private company Shinawatr Satellite Co., Ltd. under agreement with the Ministry of Communication. Total project cost was 5,500 million baht. Financing of the project included 1,400 million baht equity investment and the other financing came from private loans.

12. **Three Million Additional Telephone Lines**

This 100,000 million baht program includes a project to build and install 2,000,000 telephone lines in Bangkok at a cost of 62,152 million baht and 37,848 million baht to build and install 1,000,000 lines in the provinces. The Bangkok project is under the direction of Telecom Asia Corp., which is a private enterprise within the CP Group. The provincial program is under the control of Thai Telephone and Telecommunication Co., Ltd. (TT&T). Both projects are being developed under agreement with Telephone Organization of Thailand (TOT), a state enterprise under Ministry of Communication, and are fully financed by the private sector. They are now being installed.

C. REVIEW OF FUNDING ALTERNATIVES FOR A THAILAND GLOBAL TRANSPARK

There are a variety of funding sources for the Thailand Global Transpark. Many of the sources can be combined to take advantage of the best rates, terms, and availability. The following is a list of the possible sources:

- private sector equity investment,
- domestic loan by private investor with or without Government guarantee,
- foreign loan by private investor with or without Government guarantee,
- income generated from initial phase of project,
- domestic loan made by Government agency,
- foreign loan made by Government agency, and
- appropriation from the Government budget through a Government agency.

The viability of a combination of funding sources would be dependent upon the organizational structure of the project's implementing agency. However, at this point any combination is possible. The assessment of alternative funding is made by looking at each individual financing mode as follows:

1. Private Sector Equity Investment

This method is currently the most favored. It is being actively promoted by the Government. The advantages of it include:

- highly flexible, no bureaucratic procedure involved,
- quick and responsive,
- usually more efficient, and
- no burden on the government's borrowing capacity.

The disadvantages of the method include:

- a limitation of available funds related to the borrowing power of the private enterprise and expected payback and return on investment estimates,
- the interest rate may create a problem as the borrower is in the private sector, not the public, and
- the differential between cost of borrowed funds and expected revenues may not be satisfactory to support required return on investment needs.

However, in considering the profitable nature of the AAT airports and IEAT industrial estates, it is reasonable to expect that the global transpark would be able to be meet satisfactory profitability criteria for a private-sector developer.

This funding source may be appropriate to those aspects of a global transpark that have a higher rate of return, cash flow, and a shorter payback period.

2. **Domestic Loan by Private Sector**

Usually, development projects implemented by the private sector under agreement with a Government agency are seen by financial institutions as efficient and quite secure. They are considered highly bankable. Because income is usually based on agreed terms with the Government that are honored highly, the project risks are considered minimal. Financial institutions therefore can afford to allow higher-than-normal debt-to-equity ratios for such projects. Thus, although equity raised may not be very large, debt financing can play a significant role in financing as long as the debt is serviceable by the project.

A domestic loan is also seen as a highly probable means of financing. On the other hand, because the equity of the project might be small compared to the loan, the mortgage coverage within the project might not be adequate and additional guarantee for the loan might be needed. In this case, the project might receive assistance from the Government, which would guarantee the loan for the investor. This would help the investor securitize the loan needed for the project.

3. **Foreign Loan by Private Sector**

With the introduction of Bangkok International Banking Facility (BIBF), private sector can now have convenient access to foreign loans through commercial banks and financial companies. This is helpful to the project because foreign loans have been charging a significantly lower interest rate than domestic financial institutions bearing less burden to the project. Moreover, in order to spread the risk of big loans, domestic financial institutions may prefer to have foreign counterparts share in the lending for big development projects. Thus, foreign loans by the private sector are another source of financing that is seen as highly probable for the Thai GTP. In the same manner as the domestic loan, the Government may help the investor in securing significant loans by giving the guarantee to the investor of the project.

4. **Income Generated from Initial Phase of Project**

In the case of a global transpark that involves an industrial estate, the sale of plots to industrial firms and associated proceeds or deposits from early sales and/or pre-sales could be used to securitize any loan and to finance the development of latter stages. With proper planning and execution, development or construction

420

of facilities in early stages could be made independently operational and earn income in such a way that the income could then be used for financing the development and construction in latter stages of the project. If planning permits, the income generated from initial stages of the project could be a source of financing.

5. **Domestic Loan Made by Government**

If the Government were to implement or participate in the implementation of the project, the Government might choose to use a domestic loan facility from public or financial institutions. This would be quite convenient for the Government.

However, the amount of the loan might be limited, due to the availability of domestic funds. Also the relatively higher cost of domestic loans might prove unworkable for the development project. It should be noted that because of these two factors, the Government usually employs domestic loans only for working capital or only when really needed. Thus, a domestic loan might not be appropriate, especially while other sources are available. A domestic loan facility might be used only as a convenient source of working capital or only when required.

6. **Foreign Loan Made by Government**

Foreign loans made by the Government have been the traditional source for large development projects undertaken by the Government. Such facilities have been used because of the relatively low cost of the loans and the ready availability of a large amount of funds. Moreover, the current healthy economy and high growth rate should foster lending from foreign financial institutions to the Government.

7. **Appropriation from the Government Budget**

The Government could allocate a portion of its annual budget for the implementation of the project. Based on past history, only a small portion of such projects have been financed through the Government's budget.

In large projects like the global transpark, it is quite unlikely for the Government to use is annual budget to significantly finance the development because the requirement of the project would be too high compared to the money available in the budget. Typically, any Government participation in such a project from its own budget, is usually in-kind, such as land and concessions rather than cash. It is thus presumable that none or very little of the financing of the global transpark

could be expected to come from the Government, except for minor contributions in land or land concessions.

D. ASSESSMENT OF FUNDING ALTERNATIVES

The flexible nature of private financing is limited by the borrowing capacity of a private developer. Similarly, such financing usually bears a higher cost, which limits the profitability of the project. Similar constraints are also likely for domestic loans that are made to private organizations. However, guarantees from the Government can be quite helpful in terms of securing better rates and payment terms.

While the borrowing capacity of the Government is superior to that of a private organization, the Government faces similar problems with respect to domestic loans, i.e., higher costs, to those of private organizations. The use of appropriations from the Government budget also appears problematic given past history. However, this alternative does have potential given the possibility of transferring public land or granting land concessions to the project. Access by the Government to foreign sources appears to be the most likely.

The potential for a mixture of funding alternatives is dependent upon the organization that would be created to develop and operate the project. In the case of an ongoing joint-venture or a build-operate-transfer scenario, the use of private and public financing with additional guarantees and land concessions/transfers is highly plausible.

Given the scale of the project, its complexity, and the possibility of it being phased over many years, if not decades, the use of various funding alternatives properly tailored to specific needs appears to be the most reasonable choice. A public-private joint-venture not only creates a dynamic and synergistic operation, but also provides an excellent basis and mechanism through which a variety of funding facilities can be merged to support the design, construction, and operation of a global transpark in Thailand.

Chapter XII
Conclusions and Implementation Recommendations

XII. CONCLUSIONS AND IMPLEMENTATION RECOMMENDATIONS

A. CONCLUSIONS

A Global Transpark in Thailand is a feasible project. Underlying this conclusion is a series of supporting trends and factors that have been arranged in an order that first deals with the global, national, and regional issues. These factors are then followed by those that pertain to the three recommended sites. Specifically, several conclusions can be drawn:

- **A Global Transpark in Thailand is feasible.**
  - Thailand and Southeast Asia are inextricably involved in international trade flows and there is a need to facilitate those flows.
  - Thailand's location within Southeast Asia makes it a natural hub of transport activity within the region.
  - Thailand is a very attractive nation in which to conduct international business.
- **A successfully marketed and developed Global Transpark will create a highly competitive environment for intra-regional and intercontinental trade.**
  - Developments in manufacturing, distribution, and transportation support the closer integration of these components of the logistics chain.
  - The design of existing and planned facilities reflect traditional thought regarding function and relationships. They can not be considered as appropriate answers to the needs of industry and transportation in the next century.
- **The development of a Global Transpark somewhere in Southeast Asia is highly likely.**
  - The economic growth of the region and its increasing dominance of international trade flows support the need for a complex such as a Global Transpark.

429

— The approach to design and capacity limits of major facilities such as the ports of Hong Kong and Singapore support the concept of developing a new complex such as a Global Transpark.

- **A Global Transpark will be a magnet for industrial development not only in Thailand, but also for the surrounding region.**

  — A facility that combines all of the needed elements to support and promote innovative developments in industrial operations will attract industrial development elsewhere in Thailand.

  — A Global Transpark will exert a strong attractive force on foreign direct investment in Thailand.

- **The three finalist sites include U-Tapao, Khon Kaen (Nam Phong site) and the Korat new airport site.**

As a result of the investigation of the seven candidate sites of Surat Thani, U-Tapao, Khon Kaen, Nakhon Ratchasima (Korat), Ubon Ratchathani, Lampang, and Bangkok International Airport, three finalist sites have been selected. Those sites are U-Tapao, Khon Kaen (Nam Phong site), and the Korat new airport site. As will be described in more detail, these sites can readily accommodate all aspects and demands of a Global Transpark.

B. SUPPORTING TRENDS AND FACTORS

There is a wide variety of trends and factors that support the development of a Global Transpark in Southeast Asia, specifically in Thailand. Those trends and factors are related to changes in world economic development and trade, how manufacturing and logistics systems are changing and evolving, the economic development of Thailand, and similar developments within Southeast Asia.

1. World Economic Development and Trade

- The world's average per capita gross national product increased from $860 (US) to $4,010 (US) between 1971 and 1991. This was due to an increase in industrial activity in most regions and increased participation in world trade. The increase in per capita GNP stimulated the demand for manufactured goods, which in turn supported growth in international trade.

- International trade accounts for an ever-increasing percentage of individual country and worldwide economic activity. In 1991 total worldwide trade exceeded $3,600 billion (US), reflecting an average annual rate of growth of 6.2 percent.

- In 1991, Southeast Asian nations exported over $170 billion (US) worth of goods and imported products with a value over $172 billion (US). During the decade between 1981 and 1991, the value of Southeast Asian exports and imports grew by 8.7 percent and 8.9 percent annually, respectively.

- There is a continuing shift away from trade based on the movement of primary goods. An increasing share of trade is related to secondary and tertiary goods, which incorporate varying levels of value-added inputs.

- The emergence of trading blocs such as the European Union and the North American Free Trade Area pose a potential threat to free worldwide trade. Similar proposals in Latin America and Asia are being discussed. However, continued progress under the umbrella of the General Agreement on Tariffs and Trade suggests that these trade groups will continue to participate in worldwide trade activities.

- Reliance on such factors as abundance of natural resources or labour cost differentials to maintain a competitive advantage is being shaken. Competition is increasingly based on the ability to identify a market, develop a quality product to meet the demand, and get the product to market quickly.

- Consumers around the world are becoming more discriminating and more knowledgeable about products, prices, and quality levels. With rising income levels, more consumers can demand higher quality products that reflect the current state of development.

In summary, the broad-based improvement in economic growth is in turn generating an increasing demand for products from around the world. While some countries have banded together and formed trading blocs, the overall trend is for a continuing relaxation of trade barriers under the GATT banner. As the per capita income levels increase, demands are changing from primary goods to manufactured goods.

426

2. **Manufacturing and Logistics Systems**

- Old methods of manufacturing and logistics are being abandoned in order to compete in the changing marketplace.

- The average product life cycle is declining. This is creating a demand to reduce the elapsed time between identification of a product and entry into a market.

- Products are being tailored to specific markets and, in some cases, individual users. This is reducing average production runs and requiring closer integration among all of the components of the logistics chain.

- As products change more frequently, large inventory stocks are being reduced, and direct shipment from factory to consumer is becoming more common.

- Strategic alliances and virtual alliances are being created to respond to specific market needs. This is prompting closer ties among companies around the world, facilitated by the explosion of worldwide telecommunications services.

- Numerous programs are being developed to eliminate the gulf between product and information flows. By bringing these two flows into sync with each other, the flow of products around the world can be accelerated, and the associated logistic costs can be reduced.

- The emergence of services such as Federal Express have not only improved air cargo services, but also have spawned developments in other transport fields aimed at reducing enroute times and providing tailor-made services for individual shippers' needs. A key element of all of these programs has been the improved state of shipment tracking and management facilitated by electronic telecommunications systems.

- There are numerous examples of intermodal and multi-modal transport operations. At the same time, some of the distinctions between the four primary modes of transport, sea, rail, road and air, are blurring due to technological developments. These developments suggest that concentration on any one transport mode is limiting and short-sighted.

In summary, as world trade has grown, there have been numerous changes in business and logistics. Cooperation between suppliers, manufacturers, and distributors has increased through strategic or virtual alliances in order to better serve the more discriminating consumers around the world. All of the elements of the logistics chain, product design and manufacturing, distribution, and transportation, are being brought closer together using information systems as the binding mechanism.

3. **Thailand's Location**

- The Kingdom of Thailand enjoys a strategic location within Southeast Asia. Its location is a natural hub for Southeast Asia.

- As exhibited by the level of international flight activity at Bangkok's Don Muang International Airport, Thailand sits astride the international great circle air routes between Southeast Asia/ Australasia and Europe, as well as intra-regional flight services.

- Thailand is located at the center of Southeast Asia. It maintains contiguous land borders with more nations in Southeast Asia than any other nation.

- Thailand has direct sea access to both the Indian Ocean and the South China Sea (by way of the Gulf of Thailand).

Thailand enjoys a superior geographic location within Southeast Asia. This is based on its numerous land borders, access to both the Indian Ocean and the South China Sea, and its position astride the major international great circle air routes.

4. **Thailand's Economic Development**

- Over the past decade, the programs initiated by the Royal Thai Government have created an environment where domestic and foreign business developments are encouraged and supported.

- Thailand is renowned for its stable economy and political environment. This is reflected in the stable exchange rate between the baht and the U.S. Dollar.

- The domestic economy of Thailand is reducing its dependence on extractive industries as it increases the industrial and service sectors.

428

- Thailand has successfully attracted significant levels of foreign direct investment from other Asian and overseas nations. This investment has been primarily in the form of industrial development for both domestic and international consumption.

- Thailand-based industries are increasingly entering the international marketplace with a wide variety of products, ranging from agricultural products to high-technology components.

- The policies of the Royal Thai Government to disperse economic growth outside of the Bangkok metropolitan area are beginning to take hold.

Thailand has accomplished many successes in the expansion and diversification of its economy. The domestic economy is increasingly composed of manufacturing and service activities and much success has been achieved in the dispersion of industrial activity outside of the congested region of Bangkok. The Kingdom enjoys a reputation for welcoming and supporting business development.

5. **Thailand's Transport Infrastructure**

- The Government is investing significant funds in the expansion of the capacity of the transport infrastructure. Included within these projects are those that introduce high-technology systems, such as high-speed rail, to the overall system.

- The congestion of the Bangkok metropolitan area is being addressed by a combination of investments in expanded transport facilities as well as policies and programs to attract further development to outlying regions.

- The planned expansion of the nation's road and rail systems, as well as the development of improved links to adjacent countries, as exemplified by the Mekong River Bridge at Nong Khai, underscores the plan to improve the nation's ability to support and sustain broad-based economic development. With these improvements, the systems will be better able to satisfy both national and intra-regional traffic flows.

- Development of sea ports at Laem Chabang and Map Ta Phut provides needed additional capacity to serve Thailand in the future as the capability of the Bangkok Port is exceeded.

- Establishment of international air services to airports other than Bangkok, as well as the development of the Second Bangkok International Airport, not only improves international links between Thailand and the rest of the world, but also promotes the dispersion of economic activity away from Bangkok.

The congestion of Bangkok is well known. However, the Royal Thai Government has established and funded numerous projects and programs to reduce the crippling effects of this congestion. The programmed improvements to the road and rail networks are potentially beneficial not only to Thailand, but also to the surrounding region, by providing a less circuitous alternative to sea transport and a lower cost option to air transport.

6. **Southeast Asia**

- Southeast Asia is a center of unparalleled economic growth in the world with a significant component attributable to international trade.

- The economies of Southeast Asia represent a wide range of development. This range creates a variety of market opportunities and a basis for trade within the region.

- Hong Kong and Singapore represent the leading edge of economic development in the region; their economies are inextricably tied into world markets. Their capacity to compete with lower-technology products is being eroded as standards of living and average per capita income levels reach those of more developed nations. This development creates opportunities for less developed nations to take over markets formerly served by Hong Kong and Singapore.

- The economies of Indonesia, Malaysia, and the Philippines are based, to a greater degree, on the extraction and processing of natural resources. In the case of Indonesia and the Philippines, there is tremendous potential associated with tapping their large, relatively cheap labor forces. This suggests that industries currently prospering in Hong Kong, Malaysia, Thailand, and Singapore will shift to these two countries so long as labor cost is a primary determinant of competitiveness.

- An expected expansion of economic growth within the centrally-planned economies of Cambodia, Laos, Myanmar and Vietnam will propel the region's economic development well into the next century. This will

contribute to sustained growth within the region and an expansion of intra-regional trade opportunities.

- The leading transport facilities in the region, such as the ports at Singapore and Hong Kong, are being stretched to their limits as a result of the growth of intra-regional and intercontinental trade.

- A comprehensive, multi-modal transport system is present within Southeast Asia. While the scale of development varies widely, the basic foundation for a coordinated system exists.

- The state of transport facilities in the centrally-planned countries is inadequate to serve the expected demands as their economies transition to a market base. This situation creates an opportunity to influence the routing of goods during the development of the respective transport systems.

Southeast Asia ranks as one of the world's leading regions in terms of economic growth and international trade. As a close examination illustrates, the region incorporates a wide range of economic development. This suggests that further growth is likely. This economic expansion is creating stress on many of the transport facilities. Major airports and seaports are reaching design limits and their numerous plans to establish larger replacement facilities. At the same time, rail and road networks are also being stressed.

C. RECOMMENDED SITES FOR A THAILAND GLOBAL TRANSPARK

The team has identified three sites that could best serve the needs of a proposed Global Transpark in Thailand. As presented in more detail in Chapter IX, the consultants have examined a variety of sites throughout Thailand. Their examination was based on the factors and characteristics identified in Chapter VIII, which fell into the three broad categories of economic considerations, industry needs, and technical aspects of each site.

Initially, Thailand's 25 existing commercial service airports were overviewed and seven candidate sites were identified for evaluation as the potential Global Transpark site: Surat Thani, Bankok International/Don Muang (after construction of SBIA), U-Tapao, Ubon Ratchathani (new site), Nakhon Ratchasima/Korat (new site), Khon Kaen (Nam Phong site), and Lampang (new site).

Site visits were made to all seven sites and a comparative matrix developed. The sites were then compared on the basis of five elements: economic considerations (cost to develop), ability to meet tenant industry requirements, technical site criteria, timing for implementation and adherence to Seventh Plan objectives (particularly regional dispersion of industry).

The resulting analysis indicates that the three finalist sites to consider are: U-Tapao, Khon Kaen (Nam Phong site), and Nakhon Ratchasima/Korat (new site). *U-Tapao is the recommended site* on the basis that it will be the least costly to develop, is the only site with excellent access to two seaports (an important regional transport mode), has unrestricted property potential, and can be put into service more quickly than any greenfield site due to its existing airfield and its location within the ongoing Eastern Seaboard Development Program.

D. IMPLEMENTATION RECOMMENDATIONS

The Global Transpark concept is a multidimensional project. In order to realize the operation of the projection, a series of steps must be implemented. These steps have been organized into time frames of short-, medium- and long-term. The appropriate definitions of each of these terms are one to two years, two to five years, and more than five years. It should be noted, however, that the length of each of these periods is dependent upon the completion of the prior tasks.

In some cases, specific tasks are assigned to one of the periods. This does not necessarily reflect when the work should commence, but rather when the results should be achieved.

1. Short-Term

- Select a site for the Global Transpark.
- Establish a formal relationship with the North Carolina Global Transpark Authority.
- Initiate the master planning effort for the Global Transpark.
- Begin a detailed marketing effort for the Global Transpark. The marketing effort should incorporate industry and company identification, programs to approach and attract companies, and the establishment of economic and other incentives.

432

- Create an organization to manage the development and operation of the Global Transpark. Include in this effort the creation of a comprehensive service and support structure to pool the resources of all ministries and departments of the Royal Thai Government.

- Initiate plans to improve and/or expand surface access to and from the selected site incorporating both road and rail systems.

- Begin expansion of telecommunications links to the site.

- Begin expansion of water service, electrical power, natural gas, and other services to the site.

- Initiate a program to develop a comprehensive information system to serve tenants and users of the Global Transpark.

- Initiate discussions with transport companies to initiate/expand service to the selected site.

- Develop a comprehensive security program that ensures the efficient, protected movement of shipments within the TGTP site.

2. **Medium-Term**

   - Assemble land for the Global Transpark complex.

   - Construct the initial phase of the Global Transpark.

   - Secure tenant industries at the site.

3. **Long-Term**

   - Continue development of the Global Transpark site.

   - Secure tenant industries at the site.

   - Adapt the complex to reflect changes in the marketplace.

Appendix 1

GENERAL STATUTES OF NORTH CAROLINA

Chapter 63A

North Carolina Air Cargo Airport Authority

NOVEMBER 1992

STATE OF NORTH CAROLINA

DEPARTMENT OF JUSTICE

Raleigh, North Carolina

November 1, 1992

I, Lacy H. Thornburg, Attorney General of North Carolina, do hereby certify that the attached recompilation of Chapter 63A of the General Statutes of North Carolina was prepared and published by The Michie Company under the supervision of the Department of Justice of the State of North Carolina.

LACY H. THORNBURG

Attorney General of North Carolina

46439-66

435

Chapter 63A.
North Carolina Air Cargo Airport Authority.

Sec.
63A-1. Short title and intent.
63A-2. Definitions.
63A-3. Creation of Authority and Board.
63A-4. Powers of the Authority.
63A-5. Taxation of property of Authority.
63A-6. Acquisition, disposition, or exchange of real property.
63A-7. Police power.
63A-8. Authority funds.
63A-9. Bonds and notes.
63A-10. Refunding bonds or notes.
63A-11. Special user project bonds or notes.
63A-12. Public hearing requirements.
63A-13. Financing agreements.
63A-14. Security documents.
63A-15. County agreements.
63A-16. Remedies.
63A-17. Status of bonds and notes under Uniform Commercial Code.
63A-18. Zoning power of Authority.
63A-19. Goals for participation by minorities, women, and the disabled.
63A-20. Officers not liable.
63A-21. Conflicts of interest.
63A-22. Cooperation by other State agencies.
63A-23. Annual and quarterly reports.
63A-24. General laws apply to Authority; exceptions.
63A-25. Dissolution.

§ 63A-1. Short title and intent.

This Chapter is the "North Carolina Air Cargo Airport Authority Act." It is enacted in part pursuant to Article V, Section 13, of the North Carolina Constitution with the intent that the body politic and corporate created by this Chapter shall have all power and authority as may be provided to it under that section of the Constitution. (1991, c. 749, s. 1.)

Editor's Note. — Session Laws 1991, c. 749, s. 11 made this Chapter effective July 16, 1991.

Session Laws 1991, c. 749, s. 1.2 provides: "It is the intent of the General Assembly to authorize counties to create an airport district that includes all or part of a cargo airport complex site and to give the airport district the power to support the airport with property tax revenue."

Session Laws 1991, c. 749, s. 2 provides:

"Interpretation of act.

"(a) This act shall not be deemed to exclude additional or alternative methods for executing the provisions of this act, shall be regarded as supplemental to power conferred by other laws, and shall not be regarded as in derogation of any powers now existing.

"(b) This act, being necessary for the health and welfare of the people of this State, shall be liberally construed to effect its purposes.

"(c) Insofar as the provisions of this act are inconsistent with the provisions of any general laws, the provisions of this act shall be controlling.

"(d) Insofar as the provisions of this act are inconsistent with the provisions of any local, special, or private laws, the provisions of those laws are repealed to the extent of the conflict.

"(e) If any provisions of this act or its application are held invalid, the invalidity does not affect other provisions or applications of this act that can be given effect without the invalid provisions or application, and to this end the provisions of this act are severable.

"(f) References in this act to specific acts, sections, or Chapters of the General Statutes are intended to be references to such acts, sections, or chapters as they may be amended from time to time by the General Assembly."

Session Laws 1991 (Reg. Sess., 1992), c. 1044, s. 36, repealed Session Laws 1991, c. 749, s. 2.1, which had provided: "The North Carolina Air Cargo Airport Authority shall reimburse the Highway Fund for amounts appropriated from that Fund to the Authority. The Authority shall make this reimbursement from revenue from fees and other charges imposed by the Authority in connection

436

with a cargo airport complex established by the Authority. The reimbursements shall be made when revenue is available to do so."

Session Laws 1991, c. 749, s. 2.2 provides: "The Legislative Research Commission may study the laws concerning the North Carolina Air Cargo Airport Authority, as enacted by this act. The Commission may determine whether the powers and duties given the Authority are appropriate and if any modifications in the Authority's powers are needed. The Commission may also determine if any changes in the law are needed with respect to local governmental units that may seek the location of an air cargo airport complex within or near the unit. The Commission may make an interim report to the 1992 Session of the 1991 General Assembly and a final report to the 1993 General Assembly."

§ 63A-2. Definitions.

The following definitions apply in this Chapter:

(1) Aircraft. — A contrivance that is used or designed for flight.

(2) Airport project. — Any of the following that is part of or is used in connection with a cargo airport or a facility at a cargo airport complex site and is not a special user project:

a. Land, equipment, or buildings or other structures, whether located on one or more sites.

b. The addition to or the rehabilitation, improvement, renovation, or enlargement of any property described in subpart a.

The term includes infrastructure improvements, such as improvements to railroad facilities, roads, bridges, and water, sewer, or electric utilities even if not located on a cargo airport complex site. An airport project may include a facility leased to one or more entities under a true lease.

(3) Authority. — The North Carolina Air Cargo Airport Authority.

(4) Board. — The Board of Directors of the Authority.

(5) Bonds. — The revenue bonds or other interest bearing obligations authorized to be issued by the Authority under this Chapter.

(6) Cargo airport. — Any area of land or water that is designed for the landing and takeoff of aircraft, any appurtenant area used or suitable for airport buildings or other airport facilities, and any appurtenant right-of-way. In addition to facilities for the transportation of cargo by aircraft, a cargo airport may contain facilities to shelter, service, or repair aircraft and facilities to discharge and receive passengers.

(7) Cargo airport complex. — A cargo airport and all other facilities, including private facilities, related to the cargo airport that are located within the cargo airport complex site.

(8) Cargo airport complex site. — The area designated by the Authority as the location of a cargo airport complex. An area may not be so designated by the Authority unless all or a substantial portion of the land on which the cargo airport is located or is to be located is or shall be owned by the Authority or is or shall be controlled by the Authority pursuant to lease, joint operating agreement, or other contractual arrangements.

(9) Costs. — The capital cost of a project, including:

a. The costs of doing any or all of the following:

437

1. Acquiring, constructing, erecting, providing, developing, installing, furnishing, and equipping.
2. Reconstructing, remodeling, altering, renovating, replacing, refurnishing, and reequipping.
3. Enlarging, expanding, and extending.
4. Demolishing, relocating, improving, grading, draining, landscaping, paving, widening, and resurfacing.

b. The costs of all property, both real and personal and both improved and unimproved, and of plants, works, appurtenances, structures, facilities, furnishings, machinery, equipment, vehicles, easements, water rights, air rights, franchises, and licenses used or useful in connection with the project.

c. The costs of demolishing or moving structures from land acquired and acquiring land to which the structures are to be moved.

d. Financing charges, including estimated interest during the acquisition or construction of a project and for one year thereafter.

e. The costs of services to provide plans, specifications, studies, reports, surveys, and estimates of costs and revenues.

f. The costs of paying any interim financing, including principal, interest and premium, related to the acquisition or construction of the project.

g. Administrative and legal expenses and administrative charges.

h. The costs of obtaining bond and reserve fund insurance and investment contracts, of credit-enhancement facilities, liquidity facilities, and interest-rate agreements, and of establishing and maintaining debt service and other reserves.

i. Any other services, costs, and expenses necessary or incidental to the project.

(10) Credit facility. — An agreement with a banking institution, an insurance institution, an investment institution, or other financial institution located inside or outside the United States of America that provides for prompt payment, whether at maturity, presentment, or tender for purchase, redemption, or acceleration, of part or all of the principal or purchase price, redemption premium, if any, and interest on a bond or note issued by the Authority and for repayment of the institution.

(11) Financing agreement. — A written instrument establishing the rights and responsibilities of the Authority and the operator concerning a special user project financed by the issuance of bonds. A financing agreement may be a lease, a lease and lease-back, a sale and lease-back, a lease purchase, an installment sale and purchase agreement, a conditional sales agreement, a secured or unsecured loan agreement, or other similar contract, and may involve property in addition to the property financed with the bonds.

438

(12) Local Government Commission. — The Local Government Commission of the Department of State Treasurer, established by Article 2 of Chapter 159 of the General Statutes.

(13) Notes. — Revenue notes or revenue bond anticipation notes issued by the Authority under this Chapter.

(14) Obligor. — A person, including an operator, who has entered into a financing or other agreement obligating the person to make payments to the Authority or to holders of bonds issued to finance a special user project.

(15) Operator. — The person entitled to the use or occupancy of a special user project.

(16) Par formula. — A provision or formula to make periodic adjustments in the interest rate of a bond or note, including:

a. A provision for an adjustment to keep the purchase price of the bond or note in the open market as close to par as possible.

b. A provision for an adjustment based on one or more percentages of a prime rate or base rate that may vary or apply for specified periods of time.

c. Any other provision that does not materially and adversely affect the financial position of the Authority and the marketing of the bonds or notes at a reasonable interest cost to the Authority.

(17) Person. — Any person, corporation, partnership, association, trust, or other legal entity.

(18) Project. — An airport project or a special user project.

(19) Revenues. — For a special user project, the term means rents, fees, charges, payments, proceeds, or other income or profit derived from the special user project or from the financing agreement or security document for the special user project. For an airport project, the term means rents, fees, charges, payments, proceeds, or other income or profit derived from the airport project or from any pledge of nontax revenues, appropriation, or payment made by the State or a county in which the cargo airport is located.

(20) Security document. — One or more written instruments establishing the rights and responsibilities of the Authority and the holders of bonds issued to finance a special user project. A security document may provide for, or be in the form of an agreement with, a trustee for the benefit of the bondholders. A security document may contain an assignment, pledge, mortgage, or other encumbrance of part or all of the Authority's interest in, or right to receive revenues from, a special user project or any other property provided by the operator or other obligor under a financing agreement. A financing agreement and a security document may be combined as one instrument.

(21) Special user project. — Any land, equipment, or buildings or other structures located on one or more sites within a cargo airport complex site and the addition to or the rehabilitation, improvement, renovation, or enlargement of a structure located within a cargo airport complex site when the property is to be used as or in connection with any of the following:

a. An undertaking for industry, including an industrial or a manufacturing factory, mill, assembly plant, or fabricating plant, a freight terminal, an industrial research, development, or laboratory facility, or an industrial processing or distribution facility for industrial or manufactured products.

b. A commercial, processing, mining, transportation, distribution, storage, marine, aviation, or environmental facility or improvement.

c. Any combination of items mentioned in subparts a. and b.

A special user project, during its economic life, is to be principally used by one or more for-profit entities other than as lessee under a true lease. A special user project may include all appurtenances and incidental facilities such as land, a headquarters or office facility, warehouses, distribution centers, access roads, sidewalks, utilities, railway sidings, trucking and similar facilities, parking facilities, waterways, docks, wharves, and other improvements necessary or convenient for the construction, maintenance, and operation of any structure.

(22) True lease. — A lease that has a fair market value rental and is not treated as a financing lease or installment sale for federal tax law purposes. (1991, c. 749, s. 1; 1991 (Reg. Sess., 1992), c. 900, s. 108(a).)

Editor's Note. — Session Laws 1991 (Reg. Sess., 1992), c. 900, s. 2, provides: "This act shall be known as 'The Current Operations Appropriations Act of 1992.'"

Session Laws 1991 (Reg. Sess., 1992), c. 900, s. 182 is a severability clause.

Effect of Amendments. — The 1991 (Reg. Sess., 1992) amendment, effective July 15, 1992, added the language beginning "or is or shall be controlled" in the second sentence of subdivision (8).

§ 63A-3. Creation of Authority and Board.

(a) Creation. The North Carolina Air Cargo Airport Authority is created as a body corporate and politic having the powers and jurisdiction as provided under this Chapter or any other law. The Authority is a State agency created to perform essential governmental and public functions. The Authority shall be located within the Department of Transportation, but shall exercise all of its powers, including the power to employ, direct, and supervise all personnel, independently of the Secretary of Transportation and, notwithstanding any other provision of law, shall be subject to the direction and supervision of the Secretary only with respect to the management functions of coordinating and reporting.

(b) Board of Directors. The Authority shall be governed by a Board of Directors. The Board shall consist of at least the following 19 members:

(1) Seven members appointed by the Governor.

(2) Three members appointed by the General Assembly upon the recommendation of the Speaker of the House of Representatives in accordance with G.S. 120-121.

(3) Three members appointed by the General Assembly upon the recommendation of the President Pro Tempore of the Senate in accordance with G.S. 120-121.

440

(4) The State Treasurer, who shall serve as an ex officio nonvoting member.

(5) The President of the North Carolina System of Community Colleges, provided that the President of the North Carolina Community Colleges may instead appoint to the Board of Directors one member of the board of trustees of a community college or one president of a community college. If such an appointment is made, the appointee shall serve at the pleasure of the President.

(6) The President of The University of North Carolina, provided that the President of the University of North Carolina may instead appoint to the Board of Directors one member of the board of trustees of a constituent institution of The University of North Carolina, or one chancellor of a constituent institution of The University of North Carolina. If such an appointment is made, the appointee shall serve at the pleasure of the President.

(7) The Chairman of the State Ports Authority.

(8) One member appointed by the board of county commissioners of any county in which the cargo airport complex site is located.

(9) One member appointed by the city council of the city which is a county seat of any county in which the cargo airport complex site is located.

Within 90 days after the Authority acquires land, either by purchase or condemnation, for development as part of a cargo airport complex site, the board of county commissioners in any county in which a portion of the land is located and the city council of the city which is the county seat of the county shall, by resolution, each appoint a person to serve as a member of the Board. If the board of commissioners or the city council appoints one of its own members to the Board, the county commissioner or the member of the city council who is appointed is considered to be serving on the Board as an ex officio voting member as part of the duties of the office of county commissioner or the office of city council member, in accordance with G.S. 128-1.2, and is not considered to be serving in a separate office. Notwithstanding G.S. 116-31(h), a member of the board of trustees of a constituent institution of The University of North Carolina appointed to the Board of Directors under subdivision (6) of this subsection may concurrently serve on the board of trustees and the Board of Directors. Notwithstanding any other provision of law, the Governor may serve on the Board of Directors by his own appointment on or after July 16, 1991, under subdivision (1) of this subsection.

As the holder of an office, each member of the Board shall take the oath required by Article VI, § 7 of the North Carolina Constitution before assuming the duties of a Board member.

(c) Selection Criteria. In making appointments to the Board, the Governor and the General Assembly shall give consideration to the geographical representation of the Western region, the Piedmont region, and the Eastern region of the State. In addition, at least one member appointed by the Governor shall be representative of business, at least one shall be representative of agribusiness, at least one shall be representative of environmental interests, and at least one shall be representative of industrial interests.

(d) Terms. The terms of the initial members appointed by the Governor or the General Assembly end June 30, 1993. The initial term of a member appointed by a board of county commissioners or by a city council ends on the second June 30 after the appointment. Subsequent appointments by a board of county commissioners or by a city council shall be for terms of four years. The seven members appointed by the Governor for subsequent terms shall be appointed for terms of two years ending on June 30 of each odd-numbered year. The six members appointed by the General Assembly for subsequent terms shall be divided into two classes. The first class shall consist of three persons, two of whom shall be appointed upon recommendation of the Speaker of the House of Representatives and one of whom shall be appointed upon recommendation of the President Pro Tempore of the Senate, to serve an initial term expiring June 30, 1995, with subsequent terms expiring each fourth June 30th thereafter. The second class shall consist of three persons, two of whom shall be appointed upon recommendation of the President Pro Tempore of the Senate and one of whom shall be appointed upon recommendation of the Speaker of the House of Representatives, to serve an initial term expiring June 30, 1997, with subsequent terms expiring each fourth June 30th thereafter.

(e) Chair and Vice-chair of the Board. The Governor shall designate one of the members appointed by the Governor as the Chair of the Board. The Governor shall convene the first meeting of the Board, at which time the members of the Board shall elect from their membership a Vice-chair of the Board.

(f) Vacancies. All members of the Board shall remain in office until their successors are appointed and qualify. A vacancy in an appointment made by the Governor or a board of county commissioners shall be filled by the Governor or the board of county commissioners for the remainder of the unexpired term. A vacancy in an appointment made by the General Assembly shall be filled in accordance with G.S. 120-122. A person appointed to fill a vacancy shall qualify in the same manner as a person appointed for a full term.

(g) Removal of Board Members. The Governor may remove any member of the Board for misfeasance, malfeasance, or nonfeasance in accordance with G.S. 143B-13(d). The person who appointed a member of the Board may remove the member for using improper influence in accordance with G.S. 143B-13(c).

(h) Organization of the Board. The Board shall adopt bylaws with respect to the calling of meetings, quorums, voting procedures, the keeping of records, and other organizational and administrative matters as the Board may determine. A quorum shall consist of a majority of the members of the Board. No vacancy in the membership of the Board shall impair the right of a quorum to exercise all rights and to perform all the duties of the Board and the Authority.

(i) Compensation of the Board. No part of the revenues or assets of the Authority shall inure to the benefit of or be distributable to the members of the Board or officers or other private persons. The members of the Board shall receive no salary for their services but shall be entitled to receive per diem and allowances in accordance with the provisions of G.S. 138-5.

(j) Treasurer. The Board shall select the Authority's treasurer. The Board shall require a surety bond of the appointee in the

442

amount as the Board may fix, and the premium shall be paid by the Authority as a necessary expense of the Authority.

(k) Executive Director and other Employees. The Board shall appoint an executive director, whose salary shall be fixed by the Board, to serve at its pleasure. The executive director or a person designated by the executive director shall appoint, employ, dismiss, and, within the limits of available funding, fix the compensation of other employees as considered necessary.

(l) Office. The Board shall establish an office for the transaction of the Authority's business at the place the Board finds advisable or necessary to implement the provisions of this Chapter. (1991, c. 749, s. 1; 1991 (Reg. Sess., 1992), c. 900, s. 108(b)-(e).)

Editor's Note. — Session Laws 1991, c. 749, s. 1.1 provides: "If the General Assembly does not appoint members to the Board of Directors of the North Carolina Air Cargo Airport Authority by July 19, 1991, as authorized by G.S. 63A-3 of this act, the positions are considered vacant and shall be filled in accordance with G.S. 120-122. The Board of Directors of the Authority may not take any action until the six positions designated for appointment by the General Assembly under G.S. 63A-3, as enacted by this act, are filled."

Session Laws 1991 (Reg. Sess., 1992), c. 900, s. 2, provides: "This act shall be known as 'The Current Operations Appropriations Act of 1992.'"

Session Laws 1991 (Reg. Sess., 1992), c. 900, s. 182 is a severability clause.

Effect of Amendments. — The 1991 (Reg. Sess., 1992) amendment, effective July 15, 1992, in subsection (b) substituted "19 members" for "14 members" in the introductory language, added subdivisions (5) through (9), and in the next to last paragraph deleted the former first sentence which read: "The Board may consist of more than 14 members if more members are appointed by boards of county commissioners in accordance with this subsection", substituted "and the city council of the city which is the county seat of the county shall, by resolution, each appoint" for "may, by resolution, appoint" in the second sentence, in the third sentence inserted "or the city council", "or the member of the city council", and "or the city council member", and added the last two sentences; rewrote subsection (c); in subsection (d) deleted the former first sentence which read: "Except for the terms of the initial Board members, Board members shall serve two-year terms that begin July 1", inserted "or by a city council" in the present second sentence, and added the last four sentences; and substituted "a majority of the members" for "at least eight members" in the second sentence of subsection (h).

§ 63A-4. Powers of the Authority.

(a) The Authority shall have all of the powers necessary to execute the provisions of this Chapter, which shall include at least the following powers:

(1) The powers of a corporate body, including the power to sue and be sued, to make contracts, to adopt and use a common seal, and to alter the adopted seal as needed.

(2) To establish, finance, purchase, construct, operate, and regulate cargo airport complexes and to own, finance, lease, sell, or manage real or personal property.

(3) To charge and collect fees and rents for the use of the cargo airport complexes or for services rendered in the operation of the complexes.

(4) To contract and enter into agreements with the State, local governments, other authorities of North Carolina, and other states for the interchange of business and to facilitate the business of cargo airport complexes.

143

(5) To rent, lease, purchase, acquire, own, encumber, dispose of, or mortgage real or personal property, including the power to acquire property by eminent domain pursuant to G.S. 63A-6.

(6) To establish, construct, purchase, maintain, equip, and operate any structure or facilities to aid commerce associated with a cargo airport complex, including the construction of highways, bridges, shipping facilities, electronic cargo transfer systems, mass transit systems, and other transportation facilities. Before constructing a highway or a bridge, the Authority shall consult with the Department of Transportation.

(7) To create and operate agencies and departments needed to implement this Chapter.

(8) To pay all necessary costs and expenses in the formation, organization, administration, and operation of the Authority.

(9) To apply for, accept, and administer loans and grants of money from any federal agency, from the State or its political subdivisions, or from any other public or private sources available, to expend the money in accordance with the requirements imposed by the lender or donor, and to give any evidences of indebtedness that are required. No indebtedness of any kind incurred or created by the Authority shall constitute an indebtedness of the State or its political subdivisions, and no indebtedness of the Authority shall involve or be secured by the faith, credit, or taxing power of the State or its political subdivisions.

(10) To adopt, alter, or repeal its own bylaws or rules implementing the provisions of this Chapter.

(11) To execute financing agreements, security documents, and other instruments necessary in exercising its power under this Chapter.

(12) To fix, charge, collect, pledge, or assign revenues of the Authority.

(13) To employ consulting engineers, architects, attorneys, real estate counselors, appraisers, and other consultants and employees as may be required in the judgment of the Board and to fix and pay their compensation from funds available to the Authority, and, when approved by the Local Government Commission under G.S. 159-123(e) and (f) as if the Authority were an issuing unit, to select and retain financial consultants, underwriters, and bond attorneys in connection with the issuance of any bonds and to pay for their services out of the proceeds of any bond issue for which their services were performed.

(14) To issue bonds or notes of the Authority as provided under this Chapter to pay the costs of a project.

(15) To issue revenue refunding bonds of the Authority as provided under this Chapter.

(16) To procure and maintain adequate insurance or otherwise provide for adequate protection to indemnify the Authority and its officers, directors, agents, employees, adjoining property owners, or the general public against loss or liability resulting from any act or omission by or on behalf of the Authority.

444

(17) To purchase or finance real or personal property in the manner provided for cities and counties under G.S. 160A-20.

(18) To enter into agreements with counties pursuant to G.S. 63A-15.

(19) To exercise the powers granted political subdivisions under Article 4, Chapter 63 of the General Statutes, and to exercise the powers granted to municipalities and counties under Article 6, Chapter 63 of the General Statutes, governing public airports and related facilities.

(20) To act as agent for the United States of America or any agency of the United States in any matter within the purpose of this Chapter. When acting as agent for the United States or one of its agencies, the Authority shall keep the interest of the State paramount.

(21) With the approval of any unit of local government, to use officers, employees, agents, and facilities of the unit of local government for the purposes and upon the terms as may be mutually agreeable.

(22) To issue obligations, without Local Government Commission approval, to finance the purchase or acquisition of land or options on land. An obligation may be secured by the land purchased or acquired, may be unsecured, or may be made payable from revenues, the proceeds of notes, bonds, or the sale of any lands, the proceeds of any bonds of the State or moneys appropriated by the State, or any other available moneys of the Authority. An obligation to finance the purchase or acquisition of land or options on land may be sold only to the Escheat Fund as an investment of the Fund pursuant to G.S. 147-69.2(b)(11).

(23) To receive and use appropriations from the State, including an appropriation from the proceeds of State general obligation bonds or notes.

(b) To execute the powers provided in subsection (a) of this section, the Board shall determine the policies of the Authority by majority vote of the members of the Board present and voting, a quorum having been established. Once a policy is determined, the Board shall communicate it to the executive director, who shall have the sole and exclusive authority to execute the policy of the Authority. No member of the Board shall have the responsibility or authority to give operational directives to any employee of the Authority other than the executive director. (1991, c. 749, s. 1.)

§ 63A-5. Taxation of property of Authority.

Property owned by the Authority is exempt from taxation in accordance with Article V, § 2 of the North Carolina Constitution. Property that is part of or is located on a cargo airport complex site and is not owned by the Authority, including property that is part of a special user project, is not exempt from tax due to its location. (1991, c. 749, s. 1.)

445

§ 63A-6. Acquisition, disposition, or exchange of real property.

(a) General. The Authority may acquire real property by purchase, negotiation, gift, devise, or eminent domain. Any acquisition by eminent domain by the Authority of real property or an estate or interest in real property must be reviewed and approved by the Council of State before it can become effective. When the Authority acquires real property owned by the State, the Secretary of the Department of Administration shall execute and deliver to the Authority a deed transferring fee simple title to the property to the Authority.

(b) Eminent Domain. To exercise the power of eminent domain, the Authority shall commence a proceeding in its name and may follow any procedure set by law by which a State agency or a political subdivision of the State may exercise the power of eminent domain. The Authority's exercise of the power of eminent domain is subject to review and approval by the Council of State.

The Authority's power of eminent domain applies to all property, including property that is owned by a State agency or a political subdivision of the State and is already devoted to a specific use other than as an airport established under Chapter 63 of the General Statutes. The Authority may acquire by eminent domain property that is owned by a political subdivision and is used as an airport established under Chapter 63 of the General Statutes only after obtaining the approval of the governing body of each political subdivision that established the airport. The Authority may not begin an eminent domain proceeding before it obtains the Council of State's approval for the acquisition of the property to be condemned.

(c) Exchange. The Authority may exchange any property it acquires for other property usable in carrying out the powers conferred on the Authority and also, upon the payment of just compensation, may remove a building, a terminal, or another structure from land needed for its purposes and reconstruct the structure on another location. The Authority may not use the power of eminent domain to acquire property for exchange.

(d) Site Selection. In selecting a site for a cargo airport complex, the Authority shall consider comprehensive plans and land-use regulations adopted by local governments and the capability of local governments to provide services as specified in subdivisions (1) through (3) of this subsection. This subsection shall not be construed to require the Authority to comply with any local ordinance, regulation, or plan except as may be otherwise specifically provided by federal or State law, regulation, or rule. Plans, regulations, and capabilities to be considered are:

(1) Local comprehensive plans, including education, emergency response, law enforcement, water supply, stormwater management, solid waste management, and wastewater treatment.

(2) Local land use regulations, including appearance, floodplain zoning, subdivision zoning, and watershed protection elements.

(3) The capability of local governments to provide services and manage growth and development related to establishment

496

of a cargo airport complex. (1991, c. 749, s. 1; 1991 (Reg. Sess., 1992), c. 900, s. 108(f), (g).)

Editor's Note. — Session Laws 1991 (Reg. Sess., 1992), c. 900, s. 2, provides: "This act shall be known as 'The Current Operations Appropriations Act of 1992.'"

Session Laws 1991 (Reg. Sess., 1992), c. 900, s. 182 is a severability clause.

Effect of Amendments. — The 1991 (Reg. Sess., 1992) amendment, effective July 15, 1992, substituted "by eminent domain" for "or disposition" in the second sentence of subsection (a), and deleted "As with other acquisitions, however" at the beginning of the second sentence of subsection (b).

§ 63A-7. Police power.

(a) The Authority has jurisdiction within a cargo airport complex site. The Board may adopt ordinances regulating traffic and parking within the cargo airport complex site and for the safety and welfare of those using the cargo airport complex. An ordinance adopted under this subsection shall be recorded in the minutes of the Board. A copy of the ordinance shall be filed in the office of the Attorney General of North Carolina and shall be posted at appropriate places in the cargo airport complex site. Any person who violates an ordinance of the Authority is guilty of a misdemeanor and is punishable by a fine of up to fifty dollars ($50.00) or imprisonment for up to 30 days.

(b) The executive director of the Authority may designate employees of the Authority as special police officers. A person designated as a special police officer has jurisdiction within the cargo airport complex site to arrest a person who violates any federal or State law or any ordinance of the Authority and has other powers to the same extent as police officers of incorporated municipalities. An employee designated as a special police officer shall take the oath of a law enforcement officer set out in G.S. 11-11. (1991, c. 749, s. 1.)

§ 63A-8. Authority funds.

All Authority funds shall be deposited in one or more banks to be designated by the Board. Funds of the Authority shall be paid out only upon warrants signed by the treasurer or assistant treasurer of the Authority and countersigned by the chair, the acting chair, or the executive director. No warrants shall be drawn or issued disbursing any of the funds of the Authority except for a purpose authorized by this Chapter and only when the account or expenditure has been audited and approved by the Authority or its executive director. (1991, c. 749, s. 1.)

§ 63A-9. Bonds and notes.

(a) The Authority may provide for the issuance, at one time or from time to time, of bonds and notes, including bond anticipation notes and renewal notes, of the Authority to carry out its corporate purposes including financing the costs of projects. The principal of and interest on the bonds or notes shall be payable from funds provided under this Chapter for their payment. A bond anticipation note may be made payable from the proceeds of bonds or renewal notes or, in the event bond or renewal note proceeds are not available, from any available Authority revenues or other funds pro-

vided for this purpose. Bonds and notes may also be paid from the proceeds of any credit facility.

All bonds, notes, or refunding bonds or notes of the Authority are subject to this section and G.S. 63A-10. All bonds, notes, or refunding bonds or notes to finance or refinance a special user project are also subject to G.S. 63A-11.

The bonds and notes of each issue shall be dated and may be made redeemable prior to maturity at the option of the Authority or otherwise, at one or more prices, on one or more dates, and upon the terms and conditions set by the Authority. The bonds or notes may also be made payable from time to time on demand or tender for purchase by the owner upon terms and conditions set by the Authority.

A bond or note shall bear interest at a rate or rates, including variable rates, as determined by the Local Government Commission with the approval of the Authority. A bond or note may be secured by a reserve fund created for that purpose and funded from proceeds of the bond or note, revenues, or any other source of funds available to the Authority.

(b) In fixing the details of bonds or notes, the Authority may provide that the bonds or notes may:

(1) Be payable from time to time on demand or tender for purchase by the owner of the bond or note if a credit facility supports the bond or note, unless the Local Government Commission specifically determines that a credit facility is not required because the absence of a credit facility will not materially and adversely affect the financial position of the Authority and the marketing of the bonds or notes at a reasonable interest cost to the Authority.

(2) Be additionally supported by a credit facility.

(3) Be made subject to redemption or a mandatory tender for purchase prior to maturity.

(4) Be capital appreciation bonds.

(5) Bear interest at a rate or rates that may vary, including variations permitted pursuant to a par formula.

(6) Be made the subject of a remarketing agreement whereby an attempt is made to remarket the bonds or notes to new purchasers prior to their presentment for payment to the provider of the credit facility or to the Authority.

(c) Notes and bonds shall mature at the times determined by the Authority, not to exceed 40 years from the date of issue. The Authority shall determine the form and manner of execution of a bond or note, including any interest coupons to be attached to the bond or note. The Authority shall fix the denominations and places of payment of principal and interest of the bond or note. The principal of and interest on a bond or note may be paid at any bank or trust company, whether located inside or outside the United States of America.

(d) The validity of a bond, note, or coupon that has the signature or facsimile signature of a person who was an officer when the bond, note, or coupon was signed or the facsimile signature attached but who is not that officer when the bond, note, or coupon is delivered is not affected by the change in officers. A bond, note, or coupon may bear the signature or facsimile signature of a person who will be the proper officer to sign the bond, note, or coupon when

448

it is executed but who is not the officer on the date of the bond, note, or coupon.

(e) The Authority may provide for any of the following:

(1) Authentication of a bond or note by a trustee or other authenticating agent.

(2) Issuance of a bond or note as a certificated obligation, an uncertificated obligation, or both.

(3) Issuance of a bond or note in coupon form, in registered form, or both.

(4) Registration of a coupon bond or note as to principal alone or as to both principal and interest.

(5) The reconversion of a bond or note registered as to both principal and interest into a coupon bond or note.

(6) The interchange of registered and coupon bonds or notes.

(7) A system for registration in accordance with Chapter 159E of the General Statutes.

(8) Replacement of a bond or note that has been mutilated, lost, or destroyed.

(f) The Authority may not issue a bond or note under this Chapter, other than an obligation permitted under G.S. 63A-4(a)(22), unless its issuance is approved by the Local Government Commission, and it is sold by the Local Government Commission. To obtain approval of a bond or note, the Authority shall file an application for approval with the Local Government Commission. The application shall contain the information required by the Local Government Commission.

In determining whether to approve a proposed bond or note issue of the Authority, the Local Government Commission shall consider the following:

(1) For bonds or notes to finance airport projects, the criteria for its approval of revenue bonds under G.S. 159-86.

(2) For bonds or notes to finance special user projects, the criteria used for its approval of industrial bonds under G.S. 159C-8.

(3) The effect of the proposed financing upon any proposed or scheduled sale of obligations by the State, another State agency, or a unit of local government.

The Local Government Commission shall approve the proposed bond or note issue if it determines that the proposed financing for the issue meets the criteria and will effect the purposes of this Chapter.

When the Local Government Commission approves a bond or note issue of the Authority, the Authority may submit a written request to the Local Government Commission to sell the approved bonds or notes. Upon receiving a written request, the Local Government Commission shall consult with the Authority on the manner in which the bonds or notes will be sold and the price or prices at which the bonds or notes will be sold. With the approval of the Authority, the Local Government Commission shall sell the bonds or notes either at public or private sale in the manner and at the prices determined to be in the best interest of the Authority and to effect the purposes of this Chapter.

Bonds or notes may be issued under this Chapter without obtaining, except as otherwise expressly provided in this Chapter, the consent of any department, division, commission, board, body, bureau, or other agency of the State or without any other proceedings

449

or conditions except as specifically authorized by this Chapter or by the provisions of the resolution authorizing the issuance of, or any trust agreement securing, the bonds or notes.

(g) Each bond or note that is represented by an instrument shall contain a statement signed by the Secretary of the Local Government Commission, or an assistant designated by the Secretary, certifying that the issuance of the bond or note has been approved under this Chapter. The signature may be a manual signature or a facsimile signature, as determined by the Local Government Commission. Each bond or note that is not represented by an instrument shall be evidenced by a writing relating to the obligation that identifies the obligation or the issue of which it is a part, contains the signed statement certifying approval of the Local Government Commission that is required on an instrument, and is filed with the Local Government Commission. A certification of approval by the Local Government Commission is conclusive evidence that a bond or note complies with this Chapter.

(h) The proceeds of a bond or note shall be used solely for the purposes for which the bond or note was issued and shall be disbursed in accordance with the resolution authorizing the issuance of the bond or note and with any trust agreement securing the bond or note.

(i) Prior to the preparation of definitive bonds, the Authority may issue interim receipts or temporary bonds, with or without coupons, exchangeable for definitive bonds when the bonds have been executed and are available for delivery.

(j) The Authority may secure a bond or note issued under this Chapter by a trust agreement between the Authority and a corporate trustee. The corporate trustee may be any trust company or bank having the powers of a trust company inside or outside the State. The Authority may secure a bond or note issued under this Chapter by a deed of trust. The trustee of the deed of trust may be an individual who is a resident of the State. A bank or trust company that is incorporated in this State and is a depository of the proceeds of obligations, revenues, or other money of an Authority may furnish indemnifying bonds or pledge securities required by the Authority.

The pledge of any assets, income, or revenues of the Authority to the payment of the principal of or the interest on any obligations of the Authority is binding from the time the pledge is made, and any assets, income, or revenues of the Authority are immediately subject to the lien of the pledge without any physical delivery or other act. The lien created by a pledge is binding against all persons who have claims of any kind against the Authority, regardless of whether they have notice of the lien.

(k) A resolution authorizing the issuance of a bond or note and a trust agreement securing a bond or note may provide that any moneys held under the resolution or trust agreement may be temporarily invested pending disbursement. Any officer with whom, or any bank or trust company with which, the moneys are deposited is considered a trustee of the moneys and must hold and apply the moneys for their stated purpose in accordance with this Chapter and the resolution or trust agreement. The Authority may invest any moneys, other than the proceeds of bonds issued to finance special user projects, as allowed in G.S. 147-69.1 for investments of the State Treasurer or in this subsection. The proceeds of bonds

450

issued to finance special user projects may be invested as provided in the security document for the bonds.

In connection with or incidental to the acquisition or carrying of any investment relating to bonds, program of investment relating to bonds, or carrying of bonds, the Authority may, with the approval of the Local Government Commission, enter into a contract to place the investment or obligation of the Authority, as represented by the bonds, investment, or program of investment and the contract or contracts, in whole or in part, on an interest rate, currency, cash-flow, or other basis, including the following:

(1) Interest rate swap agreements, currency swap agreements, insurance agreements, forward payment conversion agreements, and futures.
(2) Contracts providing for payments based on levels of, or changes in, interest rates, currency exchange rates, or stock or other indices.
(3) Contracts to exchange cash flows or a series of payments.
(4) Contracts to hedge payment, currency, rate, spread, or similar exposure, including interest rate floors or caps, options, puts, and calls.

The Authority may enter a contract of this type in connection with, or incidental to, entering into or maintaining any agreement that secures bonds. A contract shall contain the payment, security, term, default, remedy, and other terms and conditions the Board considers appropriate. The Authority may enter a contract of this type with any person after giving due consideration, where applicable, of the person's credit-worthiness as determined by a rating by a nationally recognized rating agency or any other criteria the Board considers appropriate. In connection with, or incidental to, the issuance or carrying of bonds, or the entering of any contract described in this subsection, the Authority may enter into credit enhancement or liquidity agreements, with payment, interest rate, termination date, currency, security, default, remedy, and other terms and conditions as the Authority determines. Proceeds of bonds and any moneys set aside and pledged to secure payment of bonds or any of the contracts entered into under this subsection may be pledged to and used to service any of the contracts entered into under this section.

(*l*) Bonds and notes and their transfer, including any profit made on their sale, are exempt from all State, county, and municipal taxation or assessment, direct or indirect, general or special, whether imposed for the purpose of general revenue or otherwise, excluding inheritance and gift taxes. The interest on bonds and notes is not subject to taxation as income, and the bonds and notes are not subject to taxation when constituting a part of the surplus of any bank, trust company, or other corporation.

(m) Bonds or notes issued under this Chapter shall not constitute a debt secured by a pledge of the faith and credit of the State or a political subdivision of the State and shall be payable solely from the revenues, income, or assets of the Authority that are pledged for their payment. The face of each bond or note issued shall contain a statement that the Authority is obligated to pay the bond or note or the interest on the bond or note only from the revenues, income, or assets pledged in payment of the bond or note and that neither the faith and credit nor the taxing power of the State or any political

451

subdivision of the State is pledged in payment of the principal of or the interest on the bond or note.

(n) The State pledges to the holder of a bond or note issued under this Chapter that, as long as the bond or note is outstanding and unpaid, the State will not limit or alter the power the Authority had when the bond or note was issued in a way that impairs the ability of the Authority to produce revenues sufficient with other available funds to do all of the following:

(1) Maintain and operate the project for which the bond or note was issued.

(2) Pay the principal of, interest on, and redemption premium, if any, of the bond or note.

(3) Fulfill the terms of an agreement with the holder.

The State further pledges to the holder of a bond or note issued under this Chapter that the State will not impair the rights and remedies of the holder concerning the bond or note.

(o) Obligations issued under this Chapter are made securities in which all public officers and public bodies of the State and its political subdivisions, and all insurance companies, trust companies, banking associations, investment companies, executors, administrators, trustees, and other fiduciaries may properly and legally invest funds, including capital in their control or belonging to them. The obligations are made securities that may properly and legally be deposited with and received by any State or municipal officer or any agency or political subdivision of the State for any purpose for which the deposit of bonds, notes, or obligations of the State is now or may be authorized by law. (1991, c. 749, s. 1; 1991 (Reg. Sess., 1992), c. 1030, s. 16.)

Effect of Amendments. — The 1991 (Reg. Sess., 1992) amendment, effective July 24, 1992, deleted "the" following "any profit made on" in the first sentence of subsection (*l*).

§ 63A-10. Refunding bonds or notes.

(a) Issuance. — The Authority may issue refunding bonds or notes for the purpose of refunding any outstanding bonds or notes issued under this Chapter, including any redemption premium on the bonds or notes and any interest accrued or to accrue to the date of redemption. Refunding bonds or notes shall be issued in accordance with the same procedures and requirements as bonds or notes. Refunding bonds or notes may be sold or exchanged for outstanding bonds and notes issued under this Chapter.

Refunding bonds or notes may have different interest rates and maturities than the bonds or notes being refunded. The proceeds of refunding bonds or notes may be applied to any of the following:

(1) The payment, purchase, and retirement of the bonds or notes being refunded by direct application to the payment, purchase, and retirement.

(2) The payment, purchase, and retirement of the bonds or notes being refunded by the deposit in trust of the proceeds.

(3) The payment of any expenses incurred in connection with the refunding.

(4) For any other uses not inconsistent with the refunding.

(b) Proceeds. — The proceedings providing for the issuance of refunding bonds or notes may limit the investments in which the

452

proceeds of a particular refunding issue may be invested. Unless prohibited by the proceedings, the proceeds of refunding bonds or notes that are deposited in trust for the payment, purchase, and retirement of outstanding bonds or notes may be invested in any of the following:

(1) Direct obligations of the United States of America.

(2) Obligations whose principal and interest are guaranteed by the United States of America.

(3) Evidences of ownership of a proportionate interest in an obligation that is described in subdivisions (1) or (2) of this subsection and is held in a custodial capacity by a bank or trust company organized under the laws of the United States of America or a state.

(4) Obligations of the State or a unit of local government of the State when payment of the principal of and interest on the obligations has been provided for by depositing with a trustee or other escrow agent obligations that meet all of the following:

a. Are described in subdivisions (1), (2), or (3) of this subsection.

b. When due and payable, will provide enough money when added to any other money held in trust for this purpose to pay the principal of, premium, if any, and interest on the State or local obligations.

c. Are rated in the highest category by Standard & Poor's Corporation and Moody's Investors Service, Inc.

(5) Obligations of the State or a unit of local government when payment of the principal and interest on the obligations is insured by a bond insurance company rated in the highest category by Standard & Poor's Corporation and Moody's Investors Service, Inc.

(6) Full faith and credit obligations of the State or a unit of local government of the State that are rated in the highest category by Standard & Poor's Corporation and Moody's Investors Service, Inc.

(7) Any obligations or investments in which the State Treasurer is then authorized to invest funds of the State.

(c) Scope. — This section does not limit any of the following:

(1) The period for which the proceeds of refunding bonds or notes may be held in trust to retire the bonds or notes that are being refunded and have not matured, are not redeemable or, if redeemable, have not been called for redemption.

(2) The power to issue bonds or notes for the combined purpose of refunding outstanding bonds or notes and of providing funds for any other corporate purpose. (1991, c. 749, s. 1.)

§ 63A-11. Special user project bonds or notes.

(a) The Authority may, subject to the provisions of this section, G.S. 63A-9, and, if applicable, G.S. 63A-10, issue, at one time or from time to time, bonds and notes to finance or refinance special user projects. Bonds and notes to finance or refinance special user projects may be sold irrespective of the interest limitations in G.S. 24-1.1.

(b) Bonds or notes issued by the Authority under this section are special, limited obligations of the Authority payable solely from the following:

453

(1) The Authority's revenues, income, or assets that it specifically assigns or pledges for payment.

(2) The funds, collateral, and undertakings of a private party that are assigned or pledged by that party.

(c) Bonds and notes issued under this section may be secured by one or more agreements, including forecloseable deeds of trust and other trust instruments. An agreement may pledge and assign to the trustee or the holders of its obligations the assets, revenues, and income provided for the security of the bonds or notes, including proceeds from the sale of any special user project or part thereof, insurance proceeds, condemnation awards, and third-party agreements, and may convey or mortgage the project and other property and collateral to secure a bond issue.

The Authority may subordinate the bonds or notes or its rights, assets, revenues, and income derived from any special user project to any prior, contemporaneous, or future securities or obligations or lien, mortgage, or other security interest.

(d) Notwithstanding any other provision of law, the Authority may agree that all contracts relating to the acquisition, construction, installation, and equipping of the special user project shall be solicited, negotiated, awarded, and executed by the private parties for which the Authority is financing the special user project or any agents of the private parties subject only to approval by the Authority as the Authority may require. The Authority may, out of the proceeds of bonds or notes, make advances to or reimburse the private parties or their agents for all or a portion of the costs incurred in connection with the contracts.

(e) The provisions of G.S. 25-9-104(e) and G.S. 25-9-302(6) to the contrary notwithstanding, the provisions of Article 9 of the North Carolina Uniform Commercial Code, G.S. 25-9-101 to G.S. 25-9-607 inclusive, shall apply to transactions under this section, but not to transactions involving the issuance of bonds for airport projects, to the same extent the provisions of Article 9 would apply were G.S. 25-9-104(e) and G.S. 25-9-302(6) repealed. (1991, c. 749, s. 1.)

§ 63A-12. Public hearing requirements.

To the extent federal tax law requires public hearings to be held with respect to the issuance of bonds to finance projects, the hearings may be called for by the executive director and held before one or more members of the Board of the Authority. The hearings may be held at any place within the State pursuant to public notice given in accordance with current federal tax regulations. To the extent federal tax law requires approval following the hearing of the issuance of bonds to finance a project, the approval shall be sought from the Governor following a report to the Governor of the results of the public hearing accompanied by information relating to the purposes for the proposed bond issue. (1991, c. 749, s. 1.)

§ 63A-13. Financing agreements.

Every financing agreement shall contain provisions ensuring all of the following:

(1) That the amounts payable under the financing agreement are sufficient to pay, when due, the principal of, redemption premium, if any, and interest on the bonds issued to pay the costs of the special user project.

454

(2) That the operator pays all costs incurred by the Authority in connection with the financing and administration of the special user project, except costs paid out of the proceeds of bonds or otherwise, including, but without limitation, insurance costs, the cost of administering the financing agreement and the security document, and the fees and expenses of the fiscal agent or trustee, paying agents, attorneys, consultants, and others.

(3) That the operator pays all the costs and expenses of operation, maintenance, and upkeep of the special user project.

(4) That the operator's obligation to provide for the payment of the bonds in full is not subject to cancellation, termination, or abatement until the payment of the bonds or provision for their payment is made.

The financing agreement, if in the nature of a lease agreement, shall either provide that the obligor shall have an option to purchase, or require that the obligor purchase, the special user project upon the expiration or termination of the financing agreement subject to the condition that payment in full of the principal of, and the interest and any redemption premium on, the bonds, or provision therefor, shall have been made.

The financing agreement may provide the Authority with rights and remedies in the event of a default by the obligor including, without limitation, any one or more of the following:

(1) Acceleration of all amounts payable under the financing agreement.

(2) Reentry and repossession of the special user project.

(3) Termination of the financing agreement.

(4) Leasing or sale of foreclosure of the special user project to others.

(5) Taking whatever actions at law or in equity may appear necessary or desirable to collect the amounts payable under, and to enforce covenants made in, the financing agreement.

The Authority's interest in a special user project under a financing agreement may be that of owner, lessor, lessee, conditional or installment vendor, mortgagor, mortgagee, secured party, or otherwise, but the Authority need not have any ownership or possessory interest in the special user project.

The Authority may assign all or any of its rights and remedies under the financing agreement to the trustee or the bondholders under a security document.

The financing agreement may contain additional provisions as in the determination of the Board are necessary or convenient to effectuate the purposes of this Chapter. When, as provided in G.S. 63A-9 and G.S. 63A-11, the Local Government Commission approves the issuance of bonds by the Authority, the Commission shall also approve all financing agreements and security documents. (1991, c. 749, s. 1.)

455

§ 63A-14. Security documents.

Bonds issued under the provisions of this Chapter may be secured by a security document which may be a trust instrument between the Authority and a bank or trust company or individual within the State, or a bank or a trust company outside the State, as trustee. The security document may pledge and assign the revenues provided for the security of the bonds, including proceeds from the sale of any project, or part thereof, insurance proceeds and condemnation awards, and may convey or mortgage the project and other property to secure a bond issue.

The revenues and other funds derived from the project, except for any part as may be necessary to provide reserves therefor, if any, may be set aside at regular intervals as may be provided in the security document in a sinking fund which may be pledged to, and charged with, the payment of the principal of and the interest on the bonds as the same shall become due and the redemption price or the purchase price of bonds retired by call or purchase as provided. The pledge shall be valid and binding from the time when the pledge is made. The revenues pledged and received by the Authority shall immediately be subject to the lien of the pledge without any physical delivery or further act, and the lien of any pledge shall be valid and binding as against all parties having claims of any kind in tort, contract or otherwise against the Authority, irrespective of whether the parties have notice. The use and disposition of money to the credit of the sinking fund shall be subject to the provisions of the security document. The security document may contain provisions for protecting and enforcing the rights and remedies of the bondholders as may be reasonable and proper and not in violation of law, including, without limitation, any one or more of the following:

(1) Acceleration of all amounts payable under the security document.

(2) Appointment of a receiver to manage the project and any other property mortgaged or assigned as security for the bonds.

(3) Foreclosure and sale of the project and any other property mortgaged or assigned as security for the bonds.

(4) Rights to bring and maintain such other actions at law or in equity as may appear necessary or desirable to collect the amounts payable under, or to enforce the covenants made in, the security document.

It shall be lawful for any bank or trust company incorporated under the laws of this State which may act as depository of the proceeds of bonds, revenues, or other funds provided under this Chapter to furnish indemnifying bonds or to pledge securities as may be required by the Authority. All expenses incurred in carrying out the provisions of the security document may be treated as a part of the cost of the project in connection with which bonds are issued or as an expense of administration of the project.

The Authority may subordinate the bonds or its rights under the security document or otherwise to any prior, contemporaneous, or future securities or obligations or lien, mortgage, or other security interest. (1991, c. 749, s. 1.)

§ 63A-15. County agreements.

Any county in which all or part of a cargo airport complex site is located may enter into an agreement with the Authority providing for payments to be made by the county to the Authority. A county may not enter into an agreement to make payments to the Authority until after the Authority designates the cargo airport complex site. The county's obligations under the agreement shall not constitute a pledge of its faith and credit. (1991, c. 749, s. 1.)

§ 63A-16. Remedies.

Any owner of bonds or notes issued under the provisions of this Chapter or any coupons appertaining thereto, and the trustee under any trust agreement securing or resolution authorizing the issuance of such bonds or notes, except to the extent the rights given may be restricted by the trust agreement or resolution, may either at law or in equity, by suit, action, mandamus, or other proceeding, protect and enforce any and all rights under the laws of the State or granted hereunder or under the trust agreement or resolution, or under any other contract executed by the Authority pursuant to this Chapter; and may enforce and compel the performance of all duties required by this Chapter or by the trust agreement or resolution by the Authority or by any officer of the Authority. (1991, c. 749, s. 1.)

§ 63A-17. Status of bonds and notes under Uniform Commercial Code.

All bonds and notes and interest coupons, if any, issued under this Chapter are made investment securities within the meaning of and for all the purposes of Article 8 of the Uniform Commercial Code, as enacted in Chapter 25 of the General Statutes. (1991, c. 749, s. 1.)

§ 63A-18. Zoning power of Authority.

(a) The Authority has exclusive zoning jurisdiction within a cargo airport complex site. The Authority has zoning jurisdiction within six miles of the boundaries of a cargo airport complex site.

(b) No State agency and, in accordance with G.S. 63-31, no political subdivision may adopt, without obtaining the approval of the Authority, an airport zoning provision or other land use regulation that affects real property within six miles of any cargo airport complex site if it conflicts with a zoning provision or land use restriction adopted by the Authority.

A zoning provision or land use restriction adopted in violation of this subsection is not effective. (1991, c. 749, s. 1; 1991 (Reg. Sess., 1992), c. 900, s. 108(h).)

Editor's Note. — Session Laws 1991 (Reg. Sess., 1992), c. 900, s. 2, provides: "This act shall be known as 'The Current Operations Appropriations Act of 1992.'"

Session Laws 1991 (Reg. Sess., 1992), c. 900, s. 182 is a severability clause.

Effect of Amendments. — The 1991 (Reg. Sess., 1992) amendment, effective July 15, 1992, rewrote this section.

457

§ 63A-19. Goals for participation by minorities, women, and the disabled.

(a) The Authority shall verify its efforts to achieve the goals established in this section for participation by minority business enterprises, women's business enterprises, and disabled business enterprises in the total value of contracts awarded by the Authority in each of the following categories:

(1) Contracts for capital construction or repair projects.
(2) Contracts for goods.
(3) Contracts for professional and other services.

(b) The goals for the Authority are as follows:

(1) Ten percent (10%) participation by minority business enterprises.
(2) Five percent (5%) participation by women's business enterprises.
(3) Two percent (2%) participation by disabled business enterprises.

In determining participation in contract awards, a contract shall be counted as participation by a minority business enterprise without regard to the gender of the owner, but only if the business does not qualify as a disabled business enterprise. A contract shall be counted as participation by a women's business enterprise only if the business does not also qualify as a disabled business enterprise. A contract shall be counted as participation by a disabled business enterprise without regard to the race or gender of the owner. The goals in this section, instead of any goals in Article 8 of Chapter 143 of the General Statutes, apply to the Authority. With respect to projects for which the Authority would not receive federal funds if it adhered to the goals in this section because the goals are contrary to or are inconsistent with 14 C.F.R. Part 152, Subpart E, Nondiscrimination in Airport Aid Program, the federal law and regulations supersede this section to the extent it is contrary to or inconsistent with the federal law and regulations.

(c) The following definitions apply in this section:

(1) Disabled business enterprise. — A legal entity, other than a joint venture, that is organized to engage in commercial transactions and is at least fifty-one percent (51%) owned and controlled by one or more disabled persons.
(2) Disabled person. — A handicapped person as defined in G.S. 168A-3.
(3) Minority business enterprise. — A legal entity, other than a joint venture, that is organized to engage in commercial transactions and is at least fifty-one percent (51%) owned and controlled by one or more minority persons.
(4) Minority person. — A member of one of the following groups: African-Americans, Hispanic-Americans, American Indians, or Asian-Americans.
(5) Women's business enterprise means a legal entity, other than a joint venture, that is organized to engage in commercial transactions and is at least fifty-one percent owned and controlled by one or more women. (1991, c. 749, s. 1.)

458

§ 63A-20. Officers not liable.

No member or officer of the Authority shall be subject to any personal liability or accountability by reason of his execution of any bonds or notes or the issuance of any bonds or notes. (1991, c. 749, s. 1.)

§ 63A-21. Conflicts of interest.

If any member, officer, or employee of the Authority shall be interested either directly or indirectly, or shall be an officer or employee of or have an ownership interest in any firm or corporation, not including units of local government, interested directly or indirectly, in any contract with the Authority, the interest shall be disclosed to the Board and shall be set forth in the minutes of the Board. The member, officer, or employee having an interest shall not participate on behalf of the Authority in the authorization of any contract. Other provisions of law notwithstanding, failure to take any or all actions necessary to carry out the purposes of this section may not affect the validity of any bonds or notes issued under this Chapter. (1991, c. 749, s. 1.)

§ 63A-22. Cooperation by other State agencies.

All State officers and agencies shall render the services to the Authority within their respective functions as may be requested by the Authority. (1991, c. 749, s. 1.)

§ 63A-23. Annual and quarterly reports.

The Authority shall, promptly following the close of each fiscal year, submit an annual report of its activities for the preceding year to the Governor, the General Assembly, and the Local Government Commission. Each report shall be accompanied by an audit of its books and accounts. The costs of all audits, whether conducted by the State Auditor's staff or contracted with a private auditing firm, shall be paid from funds of the Authority.

The Authority shall submit quarterly reports to the Joint Legislative Commission on Governmental Operations. The reports shall summarize the Authority's activities during the quarter and contain any information about the Authority's activities that is requested by the Commission. (1991, c. 749, s. 1.)

§ 63A-24. General laws apply to Authority; exceptions.

Except as provided in this section, the general laws that apply to State agencies apply to the Authority. The following general laws, to the extent provided below, do not apply to the Authority:

(1) Article 3 of Chapter 143 of the General Statutes does not apply to contracts for services listed in 49 U.S.C. § 2210(a)(16) or contracts for special user projects. That Article also does not apply to other contracts for projects, but, with respect to these other contracts, the powers and duties established in that Article shall be exercised by the Authority and the Secretary of Administration, and other

454

Appendix 2

EXHIBIT B

SITE ALTERNATIVES[1]

	Charlotte	Piedmont-Triad (Greensboro)	Bladen County	Laurinburg/ Maxton	Southern Piedmont	Hamett/ Cumberland (Fayetteville)	New Hanover (Wilmington)	Wayne County	Duplin County	Kinston	Pitt County
SITE ENGINEERING											
Size	-4,000 acres available (CDIA) - Nearby industrial/ commercial zoned land - Currently 2 runways with 3rd in planning - 1400 acres needed for 3rd runway - 500-600 acres south of airport are being acquired through airport's noise compatibility program The land is suitable for manufacturing, industrial, and distribution activities -Additional 11,800 acres suitable for industrial development	- 2,800 acres (PTIA) - 5,000 acres in close proximity to proposed airport boundaries - Rezoning of agricultural land could yield 22,000 acres (including the airport) in vicinity of airport -1,200 acres to be sought to meet minimum of 4,000 acres - Can accommodate runways of 10,000-13,000 ft. by extending current	- 28,194 acres,18 miles long, 5 miles wide - Private owners represented by Goldsboro Milling Co. (agent).	- Established site with 3,200 acres in airfield and 800-acre industrial park - 3,000 additional acres available for airfield - Expansion capability to 20,000 acres - 17 landowners or businesses own the 20 parcels of land comprising the additional 2,940 acres	- Montgomery Co 8,949 47 acres with 69 owners - Richmond Co 874 65 acres with 9 owners - Total 9,824 12 acres with 75 owners - Total ultimate bounded site 12,223 acres	- 30,000 acres available in Cumberland and Hamett counties	- Airport currently owns 1,647 acres and has 200-acre industrial park - 4 000-5,000 acres of land adjacent to existing airfield can be immediately developed	- 60,000 acres available in southeast Wayne County (49,000 acres potentially for site and 11,000 acres of "greenway" on Neuse River)	- Core land area of 4,700 acres immediately available are owned by two major land owners and controlled by a single development entity - Expansion capability to 32,000 acres	- 10,000 to 40,000 acres available for acquisition - Existing airport 1 255 acres - 1 200 additional acres adjacent - 400 state-owned acres immediately southwest of the airport that includes Dobbs correctional school campus	- 15,248 13 acres (expandable) - Weyerhaeuser is principal landowner mg of property under timber mgmt program - 34 total landowners
Cost	- Can build GTP for $76 million	- $56,000,000 for initial development, including cargo facility building, soil areas, and truck docks - Runways built as justified: cost to improve and lengthen $25,000,000, 5,000,000 for land for each of 2 runways - New runway cost $131,000,000	- No $ figure stated - Property represented by sole owner - Property required for Authority to be conveyed to State for non-cash consideration, the adjacent industrial development to be pursued by landowners in compliance with Authority's master plan and zoning.	- Major expense: cost of fill - 3,200 acres comprising "core site" along with LMA owned infrastructure (value $80- $100 million) will be deeded to Authority at no cost to the Authority - Estimated cost for 2,940-acre "second tier" is valued at $6,820,000.	- The estimated land acquisition cost for full site development will be less than $20,000,000 - Site preparation cost $42 million. - The first phase land cost is expected to range from $7.8 to $9.90 million. - $2,000 per acre - Total project: $291,716,000	- 28,000 acres, $75 million - 20,000 acres, $50 million	- $7,924 per acre cost at site (mean average)	- No information provided	- Current land cost estimated from $2,300 to $2,400 per acre	- Existing facility replacement value of $140 million - Control tower in place at existing facility - General cost for agricultural property between $3,000 $5,000 per acre	- $1,250/acre average Range $650 $2,200/acre
Shape	- Would have to be adapted to Charlotte/Douglas Airport operation.	- To be built along current airport facilities. - Industrial areas on airport site would require change in enabling legislation. - PTIA would pursue change if deemed necessary.	- Within site there are 3 zones capable of accommodating Air Cargo Complex, other zones would be for industrial development	- Site close to SC border	- Greenfield site.	- Would be adjacent to Pope AFB and would include land in both Cumberland and Hamett counties - Majority of land in Hamett	- Site is adjacent to New Hanover International Airport - Airport owns 1,647 acres, balance required would come from individual property owners	- Four conceptual master plans provided - Two proposals are for joint use with Seymour Johnson Air Force Base (one with expansion) - Two proposals are for Greenfield sites south of SJAFB	- Greenfield site - Adjacent to I-40	- Existing Kinston regional airport is to be expanded for project - Site is owned by City of Kinston and Lenoir County and can be easily expanded without significant impact to other development	- Greenfield site - Located northwest of Greenville
Misc. (topo, soils, etc.)	- No topo maps provided (report states maps provided upon request).	- 900 ft. MSL - Gently rolling hills - Topography steepens along drainage ways	- Flat, Wicomico soils - 72 ft MSL - Numerous oval, slightly sunken ground formations ("Carolina bays") where current crop and tree farming is conducted.	- Extending runway 5/23 would require fill depths of 15 to 20 feet. - Extending runway 13/31 would require 5- to 10-ft fill - Fill used to raise the grades for the runway approaches will most likely have to be obtained from off-site – a "major" expense for developing the project. - 200-210 ft. MSL	- Site terrain ranges from flat areas to gentle slopes, separated by relatively steep stream valleys - Slopes on upland surfaces (1-5%). - Slopes on stream valleys (5-20%). - 400-680 ft. MSL - Potential for rock formations at site.	- Located north of Fayetteville - Northeast of Fort Bragg Military Reservation - Coastal plain, rich soil with large areas of mixed pine and hardwood forests - Gentle hills and valleys	- Coastal area, low terrain with elevation above sea level of less that 40 ft - Gently rolling land with rivers, creek, and lakes Also considerable swamps and marshlands - Large wooded areas with cultivated fields	- Site is within coastal plain geologic formation and is largely underlain by Norfolk Sandy Loam soils, which have provided excellent subgrade material for SJAFB (when properly compacted) - Site is about 50 or more feet higher than Neuse River and should drain well	- Sandy areas of Eastern NC coastal plain - Sandy clays - Some measures to ensure proper drainage may be required - Flat or gently sloped - 36 ft MSL	- Flat terrain, solid foundation soil will lower costs - Good drainage from farmland off gradient slopes to creeks	- Coastal plain with flat terrain and vast pine/hardwood forest mix

[1]Except for wetlands data, all entries are taken from the written proposals submitted for the sites. Wetlands data was estimated from U.S. Fish and Wildlife Service National Wetland Inventory Maps.

1 of 1

EXHIBIT B

SITE ALTERNATIVES (continued)

	Charlotte	Piedmont-Triad (Greensboro)	Bladen County	Laurinburg/ Maxton	Southern Piedmont	Harnett/ Cumberland (Fayetteville)	New Hanover (Wilmington)	Wayne County	Duplin County	Kinston	Pitt County
Distance to Other 4-lane Highways	- Billy Graham Parkway (1 mile)	- US 421 - adjacent - US 29 - US 220 - NC 68 (1 mile) - Airport Parkway - Bryan Parkway	- US 74 (15 miles) - US 76 (15 miles)	- US 74 Bypass (TIP 1999) - US 15-501 - US 15-401 - US 501 South - Bordered by SR 1427, SR 1403	- US 220 adjacent - NC 73 - NC 731 - 20 miles south of site, US 220 intersects with US 74	- NC 210 (2 miles) - NC 27 (north end) - NC 87 (west side) - Proposed Fayetteville Outer Loop (3 miles) - Proposed Spring Lake Loop (south end)	- Wilmington Bypass (proposed) - Smith Creek Parkway (proposed)	- US 70 (1 mile) - US 117 (3 miles)	- NC 24 (8 miles) - NC 11 (10 miles) scheduled to be widened 1998	- US 258 (through site) (proposed) - NC 58 (through site) - US 70 (south 6 miles) 4-lane - NC 11 (proposed to be upgraded to 4 lanes) - NC 55 to Newton Grove (proposed)	- US 13/NC 11 (4 lanes by 2000) - US 64 (4.6 miles) - US 264 (2.0 miles) - US 70 (30 miles)
Proximity to Railways	- Served by Norfolk & Southern whose mainline runs immediately adjacent to the north perimeter. - Intersects with CSX railroad 4 miles from the site.	- Norfolk & Southern Railway serves area and extends to coastal ports	- 8.5 miles to CSX connection to port in Wilmington, NC	- CSX and Norfolk & Southern offer service to general vicinity of the site. Existing owns and leases to CSX a 1.8 mile spur 2 miles to Norfolk & Southern	- Existing but unused track runs 3 miles north - Links to ports	- CSX through site - East/west and north/south rail links - CSX, Norfolk & Southern, Aberdeen, Rockfish railroads - Amtrak service	- CSX Railroad adjacent to existing airport	- CSX - Norfolk & Southern is adjacent	- CSX 8 miles from site - Norfolk & Southern is adjacent	- Both CSX and Norfolk & Southern are within 6 to 8 miles of the airport	- CSX runs along northern boundary - Norfolk & Southern is 1 mile from site
Proximity to Seaports	- Wilmington (192 miles). - Sunny Point (212 miles). - Charleston (201 miles) - Morehead City (277 miles).	- Wilmington, Morehead City, Sunny Point by rail corridors - Wilmington (184 miles)	- Wilmington (35 miles) - Sunny Point (45 miles) - Morehead City (116 miles) - Barge travel from site by Cape Fear River navigable to Wilmington, NC (50 mi.)	- Wilmington (104 miles) - Sunny Point (124 miles) - Morehead City (229 miles)	- Morehead City (150 miles) - Wilmington (140 miles) - Sunny Point (150 miles)	- Morehead City (146 miles) - Sunny Point (112 miles) - Wilmington (90 Miles)	- 5 miles from the deep water seaport in Wilmington - Sunny Point (15 miles)	- Morehead City (88 miles) - Wilmington (104 miles)	- Morehead City (68 miles) - Wilmington (40 miles) - Sunny Point (60 miles)	- Morehead City (75 minutes) - Wilmington (90 minutes)	- Morehead City (80 miles) - Wilmington (120 miles) - Sunny Point (150 miles)
Airspace	- 9th busiest commercial airport in the US in 1991. - "Capacity Enhancement Plan" - goal to create advanced airport and air space environment. (Study began in Sept. 92) Will serve as basis for future air space optimization.	- 4 other airports are within 10-15 miles of PTIA - Proposal states these airports don't affect PTIA operations	- New Hanover (40 miles) - Elizabethtown (10 miles) - Proposed site has no restrictions on flight by "military operations areas"	- Lumberton (25 miles) - Fayetteville (45 miles), minor impacts - Richmond Co (30 miles) - Monroe Co (30 miles) - No airspace restrictions	- 5 air carrier airports are located within 100 miles - Piedmont Triad Int (70 miles) "Proposed site considered excellent." However, proposed site's airspace would overlap with 3 other IFR (instrument flight route) airport patterns, thorough review required for new airport to be accepted. Also, 3 military instrument routes penetrate traffic pattern proposed. Military routes would have to be revised	- Next to Pope AFB - RDU Airport (50 miles) - Charlotte Airport (113 miles) - Fayetteville (15 miles) - Location next to Pope AFB would require coordination of airspace - Would use established air corridors	- No current airspace constraints	- Seymour Johnson AFB - Kinston (30 miles) - Wayne County (8 miles)	- Camp Lejeune Marine Corps Base (30 miles) - Seymour Johnson AFB (40 miles) - Ft. Bragg (60 miles) - Cherry Point (60 miles) - No military operations areas to intersect flight lines	- Seymour Johnson AFB (18 miles west) - 4 major military installations are located within 75 minutes	- 10 miles NW of Greenville - Pitt-Greenville Airport (35 miles) - Kinston Airport (32 miles) - Rocky Mount (24 miles)
Other Transportation Considerations	- 11th largest trucking employer in US. - 188 trucking companies operate in area.	- Efficient system of interior roadways at PTIA already in place	- Strategically located to most military installations in southeast US	- 10 motor freight carriers within 5 minutes of Laurinburg-Maxton Airport	- US 220 to be improved to multi-lane, full-access control facility	- Plan to widen NC 87 - Plan to build a loop by Spring Lake for US 13/NC 24 - Other developments depend on Global Transpark placement	- No information given	- Seymour Johnson air Force Base is adjacent to site (potential of shared benefits for military objectives)	- I-40 and site area are capable of carrying 7 times more traffic than current (Highway Capacity Manual) - Free traffic flow without congestion found at metropolitan areas	- 8 trucking firms located in area - Bus service Trailways - USAir service	- More than 40 freight carriers service area - 12 carriers with local terminals - Fastest growing service center east of Raleigh

EXHIBIT B

SITE ALTERNATIVES (continued)

	Charlotte	Piedmont-Triad (Greensboro)	Bladen County	Laurinburg/ Maxton	Southern Piedmont	Harnett/ Cumberland (Fayetteville)	New Hanover (Wilmington)	Wayne County	Duplin County	Kinston	Pitt County
SITE ENVIRONMENTAL											
Wetlands See Footnote, Page 1	4,250 acres	1,440 acres	16,780 acres	2,290 acres	2,600 acres	7,800 acres	2,760 acres	17,450 acres	7,580 acres	3,500 acres	4,880 acres
- Floodplain **- Watershed**	- Floodplain, minimal on site - 400 acres of off-site drainage onto airport	- PTIA does lie within several municipal watershed zones, water quality considerations during development	- Detailed floodplain information not provided - Several creeks on site, tributaries of South River - No watershed protection areas	- Floodplains occur along Shoshoe Creek and Lumber River - Small watershed protection area near Lumber River - 8 water wells within proposed tract, (6 part of water system, 2 irrigation), all owned by LMAC	- The site does not fall within an EMC "critical" area - No 100-year flood impacts on the proposed development	- Southwest area within watershed protection area	- No portions are within watershed protection areas - Smith Creek area on south side - Floodplain confined to Smith Creek area on the south side of proposed tract	- No portions are within watershed protection areas - Floodplain locations shown along Neuse River	- Small floodplain	- Detailed floodplain information not provided	50% (western half) is located within the proposed protected area of the Tar River Watershed Class IV lowest [illegible] does not inhibit [illegible] devel but does require 24 2 building to land [illegible] w/o stormwater detention and 70 1 wastewater detention None of site in floodplain
- Hazardous Materials **- Landfill** **- UST (underground storage tanks)**	- "No on-site contaminants"	- Believed to be minimal	- No Superfund site - No UST - No landfills	- No Superfund site - 5 UST locations (15 tanks) - 1 landfill west of site (unconfirmed/ abandoned) - 1 landfill southwest of site (unconfirmed/ abandoned) - 3 UST and a gasoline storage area with 6 UST that have been removed from the ground and placed in an adjacent field. One of these tanks has leaked, DEM has considered soils in the pit contaminated (not extensive), no groundwater testing has been done - Site is on former Laurinburg-Maxton Air Base, and there is evidence of environmental hazards due to DOD use	- No known or recorded sites - 9 UST locations (26 tanks) - No known landfill in or near site	- No Superfund sites - Not sure of UST - Harnett Co operates a landfill near vicinity	- 1 Superfund site located on the west side of the existing airport Site cleanup completed (4-acre site) Several UST to be removed - 2 closed landfills near airport 1 may have potential environmental concerns	- 1 Superfund site - Presence of UST has not yet been determined	- No information given	- Presence of UST's not determined in original proposal, subsequent information disclosed 4 UST's – no information to indicate that they are leaking USAIR has five AST's, ground has been contaminated – USAIR responsible for remediation	No superfund sites No landfills near site

463

EXHIBIT B

SITE ALTERNATIVES (continued)

	Charlotte	Piedmont-Triad (Greensboro)	Bladen County	Laurinburg/ Maxton	Southern Piedmont	Harnett/ Cumberland (Fayetteville)	New Hanover (Wilmington)	Wayne County	Duplin County	Kinston	Pitt County
Air Quality Non-attainment	- Charlotte is a non-attainment area for carbon monoxide and ozone pollutants - Existing complex source air quality permit w/ Mecklenburg (Meck.) Co D E P. would need modification - In last 3 years no carbon monoxide violations, 6 ozone violations per year	- No information provided	- None known	- None known - Scotland, Hoke, and Robeson counties not affected by any restrictions associated with violations of the National Ambient Air Quality Standards. - Not non-attainment areas.	- 50 miles from any area regulated for difficulties with air pollution - Outside any non-attainment areas	- None known	- None known	- None known	- None known	- None known	None known
Threatened and Endangered Species	- None found at airport to date	- No information provided	- None known.	- None known - "Brief" T&E field reconnaissance; area has low likelihood for direct impacts to T&E	- No T&E have been recorded within the proposed project boundaries	- Under investigation	- None known	- Under investigation by the Natural Heritage Association (results are pending)	- None known	- None known	None known
Farmland	- No information provided	- No information provided	- None known	- No area on site is protected under the Farmland Protection Policy Act.	- No area within site is protected under the Federal Farmland Protection Agency Act	- None known	- No known lands are protected under the Farmland Protection Policy Act	- None known	- Mostly sparsely populated farmland, true cultivation	- Area for facility is mostly farmland - Sparsely populated	None known
Historic/ Archaeology	- No information provided	- No information provided	- 1 cemetery	- High likelihood of archaeological; 17 sites within 1-2 mile radius.	- No sites listed on the National Register of Historic Places - No National Register Historic Properties within the proposed site - Various archaeological sites in area.	- No archaeological sites - 1 historic site (southwest portion of the site)	- None known	- None known	- No historic or archaeological sites are known to exist	- Under investigation - 9 structures of historical or architectural importance have been located within the general study area	None known
Population Density within 5-mile radius (noise)	- Charlotte metropolitan area: 1.6 million people - City 417,600 - 5 mile radius population not provided	- Greensboro: 196,003 in 1990 - Guilford Co 348,000 - Based on recent analysis, no problems for immediate future. - More study needed - 5 mile radius population not provided	- No concentration or population within 5 miles - Low noise impact.	- No concentration of population within 5 miles - Noise deemed minimal. - County population: 33,754 in 1990.	- Rural areas within 5 miles yield 66 to 100 persons. - Total within 5 miles is between 500 and 600 persons. - Low noise impact.	- Use same noise buffer zone as military - 1992 population within a 5-mile radius: 9,497. - 98 people per sq. mile - Cumberland County 261,839 in 1990 - Harnett County: 67,014 - Low noise impact	- New Hanover Co 120,284 in 1990 - Approx 100,000 - 150,000 within 5 miles - Medium noise impact	- Wayne Co 104,636 in 1990 - Goldsboro 41,858; 3rd highest growth rate (1980s). - Population within a 5-mile radius 86,658 - Medium noise impact	- Small population - Less than 50 persons per sq mile - Low noise impact - 5 mile radius population not provided	- 400,000 people within 30 minutes from Kinston - 930,000 within 1 hr in 1990 - County 57,274 - City 25,296 - Medium noise impact - 5 mile radius population not provided	Population density 65 persons per sq mile - Low noise impact - 5 mile radius population not provided
TRANSPORTATION											
Distance to Major Interstate Highways	- I-485 (outer belt) Future (1 mile). - I-77 (5 miles) - I-85 (1 mile) - I-40 (43 miles north)	- I-40 (1 mile). - I-85 (10 miles) - I-85 (115 miles) - I-77 (60 miles)	- I-40 (21 miles). - I-95 (35 miles).	- I-95 (19 miles)	- I-95/I-77 (90 miles) Charlotte - I-40/I-85 (60 miles) Greensboro - I-95 (80 miles) Fayetteville	- I-95 (15 miles) - I-40 (25 miles) - I-20 (78 miles)	- I-40 (1 mile)	- I-95 (25 miles west) - I-40 (25 miles south)	- I-40 (4.5 miles) - I-95 (55 miles)	- I-95 (48 miles) - I-40 (64 miles)	I 95 (30 miles)

EXHIBIT B

SITE ALTERNATIVES (continued)

	Charlotte	Piedmont-Triad (Greensboro)	Bladen County	Laurinburg/ Maxton	Southern Piedmont	Harnett/ Cumberland (Fayetteville)	New Hanover (Wilmington)	Wayne County	Duplin County	Kinston	Pitt County
LABOR											
50-Mile Radius	- Largest single manufacturing region in the Carolinas within 50-mile radius - Nation's 5th largest urban region - Regional population of 5.4 million people. - 243,800 people devoted to manufacturing - Within 50 miles, 1,584,198 population in recruiting area, labor force population within that area is 888,381.	- 34% of employed workers are in manufacturing - 2nd largest labor force exceeding 520,900 - Military personnel - 1990 work force 689,420 Triad area unemployment 3.2%.	- 1.4 million people within 50-mile radius - Largest concentration of retired US military personnel Discharged military personnel provide trained employee base - NC Employment Security Commission Unemployment region 7.7%, Unemployment Bladen Co 7.6%	- 336,865 people within 50-mile radius - 1,568,642 within 100-mile radius - 1991 unemployment 9.3% - Kasarda's vision that site should be within 1 hr driving distance of at least 1 major metropol area of NC is not met (1 3/4 hrs to Raleigh)	- 635,000 people (from 17 counties within 50-mile radius) - Unemployment 7.1% 1/92 - Kasarda's vision that sight should be within 1 hr driving distance of at least 1 major metropolitan area of NC is not met. 1 3/4 hrs to Raleigh.	- Harnett Co employment 14,827 - Cumberland Co employment. 59,925, unemployment 7.0% - Harnett pop in 1990 67,822, unemployment 7.2% - 275,000 people in Fayetteville metropolitan area. - 9,497 people within 5-mile radius - 14% pop increase in Harnett in 1980s	- New Hanover Co employment 64,730 (1989) - Columbus Co 16,670 (1988) - Brunswick Co 15,060 (1988) - Pender Co 5,800 (1988) - Total Pop 1990 120,284 - Unemployment rate 1989 4.0%	- Wayne Co employment 30,835 - County Labor Force 45,980	- 302,000 employment within a 50-mile radius (1987) - 328,250 employment in 50-mile radius expected by 1995	800,000 to 1,000,000 people live and work within 60 miles of Kinston 929,702 people within 60-mile radius (1990) 182,745 employed within 30-minute radius (1990) 401,470 employed within 60-minute radius (1990) 918,360 employed within 90 minute radius Lenoir Co pop in 1990 57,274 1990 unemployment 5.0%, 1991 6.5%	324,980 people within 35 mile radius Labor force 165,331 400,000 people live within 30 minutes of Kinston
Cost (Wage/Salary)	- Accountants $14.26 - Computer Programmers $21.17 - Secretaries $8.26 - Machinists: $9.77 - Truck Driver $7.31 - Hand Packers & Packagers: $6.36	- Forklift Operators $8.76 - Mechanical Assembler $8.64 - Machinist $12.49 - File Clerk $7.10 - Data Entry $7.13 - Shipping Packer (B) $6.39 - Welder (ARC) $11.71	- Regional* Average hourly wages - Manufacturing: $10.38 - Food $8.75 - Textiles $7.97 - Apparel $5.17 - Agriculture. $8.93 - Services $7.57 - Transportation/Utilities. $11.31 - Wholesale Trade $10.33 - Retail Trade $4.94 - Finance/Retal Estate: $8.98 *Bladen, Brunswick, Columbus, Cumberland Duplin, New Hanover, Pender, Robeson, and Sampson Counties.	- Wages in Laurinburg/ Maxton area range from $2.00 to $5.00 per hour less than state average in all major categories - Manufacturing. $8.50 - Textile: $8.00 - Apparel $8.00 - Agriculture: $6.50 - Transp./Utility $11.00 - Services: $8.50 - Wholesale Trade: $10.75 - Retail Trade $7.50 - Finance/Real Estate. $10.00	- Average labor costs are below state and national averages. - Annual wage avg for the 17 counties within the 50-mile radius $16,840. - NC average. $19,920 - Manufact Tech. $8.95 - Shipping/Receiving. $6.61 - Stock Clerk. $7.21 - Mechanics. $10.53 - Assemblers: $7.28 - Truck Drivers: $7.08	- Harnett Co mean family income is $16,600, 15% below state average - Average weekly manufacturing wage is $210, 25% below state average - Shipping/Receiving $7.76 - TQM Tech $10.98. - Material Handlers $8.70 - Forklift Operator $6.30	- New Hanover County average weekly wages Mfg / Non-Mfg 1988 $478 / $290 NC $397 / $331	- Wayne County 1990 average annual wage is $15,634 (ranked 58th in NC) - Unemployment rate is 7.6% (Feb 1992) 1992 (Feb.) labor force 44,170 - 1990 annual average wages (by trade). - Manufacturing $17,699 - Construction $18,004 - Trucking and Warehousing $17,551 - Wholesale $21,003 - Retail $10,040 - Finance, Insurance, and Real Estate $19,252 - Agriculture $16,406 - Services $14,941	- Duplin Co average annual wage $15,196 - Secretaries $6.85 - Computer Programmers $11.74 - Shipping/Receiving $7.86 - Truck Drivers $7.64	- Agricul. property around airport is projected to be $3,000-$5,000 - Median family income $29,100	No information provided
Training (Technical)	- CPCC is largest of NC with 58 community and technical colleges.	- Office of Veterans Employment and Training directs discharged trained military personnel to skill jobs - Guilford Tech. Comm College is building a new aviation school at PTIA	- 11 universities, community colleges, and technical schools in the area	- Seven community colleges and technical schools in the area.	- Richmond Comm. College Montgomery Comm. College - Five other campuses are within 30 min. of site. - 3 more campuses are located "farther out", but within commuting distance.	- Central Carolina Comm College; 91/92 total students 2,420 - Fayetteville Tech College - Sampson Comm College, 9/1/92 total students 1,016 - Campbell Univ., 5,728 full-time students	- Cape Fear Comm College - UNC-Wilmington	- Wayne Community College - Mount Olive College - Atlantic Christian College (25 miles from Goldsboro) Seven colleges offer higher education programs at Seymour Johnson AFB	- Large number of out-processed trained military personnel Nine community colleges and tech schools UNC Wilmington	Lenoir Community College is prepared to locate a facility within the park for on site training Over 1,000 military discharges per month from area bases good source of trained personnel	Five community colleges and technical schools in the area East Carolina University

EXHIBIT B

SITE ALTERNATIVES (continued)

	Charlotte	Piedmont-Triad (Greensboro)	Bladen County	Laurinburg/ Maxton	Southern Piedmont	Harnett/ Cumberland (Fayetteville)	New Hanover (Wilmington)	Wayne County	Duplin County	Kinston	Pitt County
UTILITIES											
- Electric - Natural Gas	- Duke Power 23 9 kV - Existing gas lines adequate for expansion	- Duke Power 100 kV. - Piedmont Natural Gas currently serves PTIA. NC Gas Company and Transcontinental Gas provide service to the 12-county region.	- Natural Gas (14 miles from site). - 12" line	- CP&L (2 feeders located within 1 mile of the existing airfield), 115 kV. - 2 additional substations within 4 miles - NC Natural Gas presently serves 4" line - Airport (Main Line - 1/2 mile). - Lumber River Electric	- CP&L 23 kV - NC Natural Gas (8 miles) - PeeDee Electric	- South River Electric (115 kV) Membership serves some of the area - NC Natural Gas (10-inch line 11 miles from site) - CP&L	- CP&L - North Carolina Natural Gas (on site)	- CP&L to Tri County Electric Corp 23 kV - NC Natural Gas (off site)	- Four-county electric membership corporation buys from CP&L - NC Natural Gas - 10-inch high pressure line 41 miles north of the site	- CP&L - NC Eastern Municipal Power Agency owns and operates its own electric distribution system 115 kV - NC Natural Gas currently serves site 6" feed line on site, main line 3 miles away - Served on site by water sewer, electricity, and natural gas - Other fuels oil, coal, LP gas	Electric adjacent to site - NC Natural Gas
- Wastewater - Water - Solid Waste Disposal	- City of Charlotte provides water and wastewater treatment. Current Rates $1 32 per cf for wastewater treatment, and $0 91 per CF for water - Wastewater average monthly discharge is 30 MGD System capacity is 40 MGD (48 MGD by 1996). Water usage is 68 MGD (capacity is 87 MGD). - Plans for building incinerators and recycling facilities. - Incinerator: 236 tons per day - Landfill in Cabarrus County.	- City of Greensboro provides water and sewer service - Sewage capacity is 38 MGD with a 5 5 MGD surplus Land and resources are available for expansion as needed. - Water capacity is 44 MGD Available water can immediately serve site development.	- 3 wells on site (4" diameter). - Wastewater (none) - Water (abundant) - Proposal to build solid waste burner for power at Dupont plant and reduce landfill load. - Landfill 1 mile south of Elizabethtown.	- Wastewater 4 MGD excess existing airport system capacity - Water 1.8 MGD excess capacity in airport system, 18 MGD excess capacity in all adjacent systems. - Landfill in Scotland County 1 mile from Maxton City limit. - 8 wells on site	- Would have to build sewage plant Richmond Co no sewage treatment or collection operation Montgomery Co too far to use - Water currently expanding from 2 MGD to 6 MGD - Solid waste regional site outside Troy is 18 miles No known landfill in or near site.	- Expand wastewater treatment plant to 8 MGD from 3 33 MGD by 1995 Paid for by tax and long-term bonds - Water 2 4 expandable to 5 6 MGD - Solid waste capacity is 1,200-1,500 tons per day 7-day week	- New Hanover County/Water Sewer District 8 MGD capacity (sewer) - Water from Cape Fear River - Incinerator/landfill in New Hanover Co - Numerous wells on site	- Goldsboro capacity 6 7 MGD wastewater Water plant 10 MGD - Source Neuse and Little River - Numerous wells	- Water capacity 8 64 MGD (10 municipalities) surplus of 4 3 MGD - Wastewater 2 4 MGD - Current surplus of water capacity of 4,299,400 GPD - Good water abundance and quantity - Initial wastewater treatment could be provided by Wallace & Rose Hill	- City of Kinston operates 2 wastewater treatment facilities, one treating 75 MGD, capacity 4 5 MGD - On-site 750,000 gallon overhead storage - Neuse river could be used in future - Lenoir Co has 1 landfill life expectancy of 4 years Proposed landfill south of site - Sewer presently serves 20% of TransPark	Wastewater 10 5 MGD capacity, planned to be designed to 21 MGD Water 12 MGD capacity 4 wells (expand to 24 MGD) Landfill life expectancy to 2008
Telecommuni-cations	- Southern Bell.	- Southern Bell, AT&T, North State Telephone.	- Star Telephone Membership Corp. out of Kelly, NC office.	- Carolina Telephone and Telegraph Co	- CENTEL has cable running along US 220 adjacent to site Cable is close to maximum and additional cable would need to be added	- Carolina Telephone and Telegraph Co	- Southern Bell currently served on fiber	- Three carriers in Goldsboro (names not provided)	United Telephone System	Carolina Telephone is the primary provider in area	No information provided

EXHIBIT B

SITE ALTERNATIVES (continued)

	Charlotte	Piedmont-Triad (Greensboro)	Bladen County	Laurinburg/ Maxton	Southern Piedmont	Harnett/ Cumberland (Fayetteville)	New Hanover (Wilmington)	Wayne County	Duplin County	Kinston	Pitt County
FACILITY SUPPORT											
Industry	- Existing Charlotte area industry list of about 80 companies (potential tenants). - Center for International Business, over 360 companies within 13-county region. - Currently 6 air cargo bldgs totaling 162,000 sq.ft. and 32 acres of aircraft parking. - In 1991 Charlotte shipped 121,631 tons of air cargo. - Southern Bell on site office for airport and its tenants.	- Handling more than 20,807 tons of air cargo - PTIA currently served by Tradewinds Int Airlines Airborne Express Federal Express Air Express Int Air Cargo Service Mountain Air Cargo - Industry would pay for industrial sites - Major employers in Greensboro (over 3,000 employees). Sears AT&T Cone Mills - Major employers in Winston-Salem (over 3,000 employees) R J Reynolds Sara Lee US Air Carolina Medicorp Wachovia	- Major employment areas (1990): Manufacturing (2,954) Government (2,014) Retail Trade (1,186)	- 800-acre industrial park - 13 manufacturing plants on industrial park site - 1,262 people work at plants in industrial park - Letters from various industries supporting Laurinburg/Maxton site	- Non-Manufacturing: approx 800 industries less than one hour from proposed site approx 4,000 industries approx 1 hour away - Manufacturing: approx 150 nearby approx 1,000 within 1 hour of proposed site - Support Service Industries: approx 1,200 in nearby counties	- Harnett County 200,000 acres devoted to farming - 28% of labor force is employed in manufacturing - 21 major trucking firms serve Harnett County	- Major employers (over 500 employees) Century Mills, Inc Corning Glass Works	- Major Crops $93 million poultry (annual) $36 million tobacco (annual) - Major Distributors Keebler Company Nabisco Southco Distributing Co - Major Employers (over 500 employees) AP Parts Barry of Goldsboro Universal Bedroom Furniture Carolina Turkeys Seymour Johnson AFB	- 37 major freight carriers serve Duplin Co	- 10 industries within 1/4 mile of airport entrance - 12 Fortune 500 companies are located in Lenoir Co - Major employment areas (1990) Manufacturing (8,024) Government (6,507) Retail Trade (4,543) Services (4,347)	- Greenville Industrial Park. 58 industries listed in the industrial park directory
Public (Police/Fire)	- Fire station at airport with 13 firefighters. - Other fire stations 2 and 4 miles away. - CDIA has its own police force. - Plan to add 2nd fire station.	- Excellent police, fire, medical. - Fire: professional and volunteers. - Police: 450 (Greensboro), 200 (Guilford Co.).	- Fire. 15 fire tax and fire service districts - Volunteer rescue squad.	- Scotland County Police - 25 officers - Laurinburg Police - 28 officers. - Maxton Police - 8 officers - Firemen: 5 full-time, 55 volunteer. - Area surrounding the airport is in both the Maxton and Wagram fire districts, however, the City of Laurinburg responds to fires in vicinity	- Montgomery Co. Sheriff's Dept. 1 sheriff 20 officers 11 support staff and dispatcher 3 detectives - Richmond County Sheriff's Department: 1 sheriff 27 officers 6 support staff - Emergency Medical Services: Montgomery Co - paid/volun: 32 paramedics, 43 trained Richmond Co - paid/volun 45 personnel (1/3 EMTs) - Montgomery Co - 9 fire departments, 1 currently planned, 25 firefighters - Richmond Co - 10 fire departments (8 volunteer/2 paid).	- Harnett Co: 60 road deputies - Cumberland Co fire personnel: 900 fire fighters and 200 vehicles - Cumberland Co Sheriff's Dept: 250 deputies. - Fayetteville: 200 full-time officers	- New Hanover Co 175 sworn and civilian support personnel - 134 deputies, 41 civilians, 2 fingerprint experts, 3 canine units, 5 arms specialists, 12-person emergency response team - Wilmington Police Dept 132 certified officers 35 full-time civilian personnel; 10 part-time - Carolina Beach: 19 officers - Wrightsville Beach: 19 officers.	- Police (Goldsboro) 80 City Officers 37 County Officers - Fire (Goldsboro) 66 Full-time firefighters 900 volunteer firefighters - Fire Insurance Rating is 3	- Duplin Co: 23 uniformed police officers - 6 fire stations within 10 minutes	- Kinston Police Department: 91 personnel - County: 31 personnel Full-time firefighters: 73 18 fire vehicles - Ambulance service to City and County - Area counties would contribute $ to infrastructure development. They have endorsed Lenoir Co/Kinston proposal	- Pitt Co Sheriff Dept Exec officers: 3 Uniformed Services Bureau: 36 Investigative Services Bureau: 21 Admin Serv Bureau: [illegible] Jail Serv Bureau: [illegible] - City of Greenville Police Dept 148 personnel (111 sworn) - Other municipalities [illegible] personnel Pitt/Greenville Crime Stoppers - Pitt Co municipalities and unincorp areas served by 20 volunteer fire depts - City of Greenville Fire/Rescue Dept [illegible] personnel

EXHIBIT B

SITE ALTERNATIVES (continued)

	Charlotte	Piedmont-Triad (Greensboro)	Bladen County	Laurinburg/ Maxton	Southern Piedmont	Harnett/ Cumberland (Fayetteville)	New Hanover (Wilmington)	Wayne County	Duplin County	Kinston	Pitt County
QUALITY OF LIFE											
Crime	· Crimes per 100,000 is 12,472	· Low crime rates	· No information provided	1989 1990 Crime Rate 5,430 5,522 Violent 332 350 Non-violent 5,098 5,171	· Crime rate less than 1/4 of state crime avg /100,000 · Violent crime in 5-county area is 149 4 per 100,000 (state avg 625). · Property crime rate avg 1,067 6 - 5-county area 4,893 8 - statewide	· No information provided	· No information provided	· Crime stoppers program has received international recognition for its success · 6,201 crime incidents per 100,000 population	· No information provided	· Violent crime less than 1 per 100 persons · Property crime between 3 5 to 5 5 per 100 persons	· Low crime rate 68% below national average
Housing	· Over 6,000- homes available for purchase at any time within commuting distance	· Relatively low cost of living · Single family home prices vary · Typically 7,000 homes are on market at any time	· Homes cost 3/4 national average	· 1989-average house price $62,482 · 1990 average house price. $64,954. · The housing supply in the city and county is adequate for present needs.	· Homeowner vacancy rate: 1 2-1 7% · Rental vacancy rate: 6 8-8 3% · Median home figure for the counties: $40,000-43,900 (homes) $188-198 (rent)	· Well below national average · Steady increase in housing unavailability in Harnett. · Average cost for 3-bedroom, 2,000 - sq - ft house $85,000-112,000, depending on location	· No information provided	· April 1992 · 372 Homes listed · Cost of average single family home is $50-70,00 · Cost of housing is lower than most cities in NC	· No information provided	67% is single family homes Average cost of owner occupied home is $52,400 (Lenoir Co)	1990 avg house price $79,596 Cost per sq ft $40 $60 130 apartment developments in the Greenville area
Cultural/ Recreational	· Charlotte Symphony · Children's Theater · Mint Museum · Spirit Square · Discovery Place · NBA Hornets · Carowinds · 2 hrs. from Blue Ridge Mountains	·100 miles to mountains · 300 miles to coast · 3 professional golf tournaments · Coliseum. · Minor league baseball (Greensboro)	· Many golf courses · 9 miles of Lumber River as canoe trail · Lakes for recreation (thousands of visitors annually). · Beaches 1 hr away	· Theater, Symphony (Fayetteville). · Robeson Co Museum of Art.	· Museum of Traditional Pottery-Seagrove. · Nat. Railroad Museum-Hamlet. · House in the Horseshoe-Moore Co. · Twin Creek Indian Mound State Historic Site-Mt. Gilead. · "Metropolitan" Charlotte-30 min. away. · Uwharrie National Forest · Morrow Mountain State Park. · NC Motor Speedway-Rockingham, NC	· 5 golf courses in Harnett Co. · Raven Rock State Park - canoeing, riding, fishing. · 10 shopping centers · 2 to 3 hrs from any beach in NC.	· USS North Carolina Battleship · Golf and tennis year-round · Carolina Beach State Park. · Numerous special events and festivals	· Recreational opportunities include · Kinston Indians Baseball · 6 Golf courses · Numerous lighted tennis courts. · 80,000 sq. ft. family YMCA. · Cliffs of the Neuse State Park · Waynesborough State Park	· Close to beaches (>1 hr away) · Close to Wilmington, New Bern · State parks and national forests	· Arts Center (Kinston) · Kinston Indians Baseball, Class A · CSS Ram Neuse Civil War Park	School of the arts music, theater ECU Summer Theater
Health Services	· Air ambulance service is available. · Five general acute care facilities. · 7 specialty care facilities · 14 long-term care facilities.	· Bowman Gray School of Medicine. · High Point Regional Hospital · NC Baptist Hospital · Forsyth County has 4 hospitals (1,852 beds).	· Over 3,000 beds in 9 hospitals are located in the area. · Bladen Co. - 62 beds.	· Within 40-miles: 1,800 hospital beds 2,000 nursing home beds 225 beds (mental retardation) 125 psychiatric beds	· Montgomery Memorial, Richmond Memorial, and Hamlet Memorial have 338 beds, within 30 min. are 4 additional hospitals with 800 beds. Specialties acute care, long-term, home health, psychiatric treatment alcohol/chemical depend	· 2 hospitals Dunn: 117 beds, 20 doctors Erwin. 75 beds, 13 doctors	· New Hanover Memorial Hospital - 142 beds · Cape Fear Memorial Hospital - 162 beds · Pender Memorial Hospital (Burgaw) - 80 beds	· Wayne Memorial Hospital (330 - Bed and lowest average charges for hospitals its size east of I-95) · Cherry Hospital and O'Berry Center · More than 10 physicians and dentists	· Duplin General Hospital 101 beds · Cape Fear Memorial and New Hanover Memorial Hospitals in Wilmington	· Lenoir Memorial Hospital 317 private rooms · Greenville - 30 miles northeast · Goldsboro - 30 miles west	Regional health care center serving 35 county region Air ambulance service

EXHIBIT B

SITE ALTERNATIVES (continued)

	Charlotte	Piedmont-Triad (Greensboro)	Bladen County	Laurinburg/ Maxton	Southern Piedmont	Harnett/ Cumberland (Fayetteville)	New Hanover (Wilmington)	Wayne County	Duplin County	Kinston	Pitt County
Colleges	- CPCC - developing aviation related programs - 6 technical colleges in region - UNC - Charlotte	- 8 technical colleges - City public school system - 38 schools - County public school system - 40 schools. - 4 UNC campuses in Triad region - Wake Forest University - Winston-Salem State - UNC-G NC A&T - Forsyth Tech Comm College	- 2 private colleges - 3 public universities Forsyth, Wilmington, and Pembroke - 8 community colleges or technical colleges	- Pembroke State University (15 miles) - Fayetteville State University (45 miles) - St. Andrews Presbyterian. - Laurinburg College - Methodist College - Fayetteville - 4 technical colleges	- Most major NC universities are within 100 miles of site - Richmond Community College - Montgomery College	- Campbell University - Central Carolina Technical College located in Lee County. - Methodist College - Fayetteville Technical College	- UNC-W - Cape Fear Community College (Wilmington) - Brunswick Community College (on US 17 in Supply) - Southeastern Community College in Columbus County	- Community college enrolls 12,000 per year	- James Sprunt Community College -UNC-Wilmington - 9 community colleges within 50-mile radius	- 9 community colleges within 60 miles Lenoir Community College (local) Aviation Program offered - ECU - 30 minutes away	ECU 5 community/technical college - Pitt Community College
Schools	- K-12 city/county system over 74,000 students - $4,500 per pupil expenditure - Magnet school program - 30 private K-12 schools - 101 schools - fully accredited	- 2/3 of its general fund to public schools, colleges, and universities - 24,000 students in Guilford Co - 38,200 students in Forsyth Co /Winston-Salem - 38 private schools	- 3 private schools in Bladen Co Bladenboro Clarkton Elizabethtown	-1967 - Library - Scotland Co - Grades K-5 = 8 schools - Grades 6-8 = 4 schools - Grades 9-12 = 1 school - Sped. Ed = 1 school - 1 private elementary school	- Public Schools Mont. Co 4 elementary 2 jr. high 2 high schools Rich. Co 7 elementary 8 jr. high 1 high school - Private Mont. Co. - 2 private (2-12, K-12) Rich. Co - 2 private (K-12)	- Harnett 3 high schools 17 other - Cumberland Co. 8 high schools 1 private high school	- No information provided	- Wayne Co 26 public schools - Schools serve 18,500 students - In 1988, $13 million referendum for public schools	-16 public schools, 2 private	- 3 high schools (public) 1 private high school 1 parochial high school	- 31 Pitt Co schools 6 private schools 1 [illegible] students ECU School of Medicine

EXHIBIT B

SITE ALTERNATIVES (continued)

	Charlotte	Piedmont-Triad (Greensboro)	Bladen County	Laurinburg/ Maxton	Southern Piedmont	Harnett/ Cumberland (Fayetteville)	New Hanover (Wilmington)	Wayne County	Duplin County	Kinston	Pitt County
ZONING/PERMITTING											
Responsible Authorities	- City of Charlotte or Mecklenburg County have zoning authority near airport - Charlotte-Mecklenburg Planning Commission responsible for land use planning. - All land use plans and policies must be approved by Charlotte City Council or Meck. Co. Board of Commissioners - 2005 generalized land plan for managing growth in Meck. Co. adopted in 1985. Airport part of SW district plan, which was adopted in 1991. - Charlotte-Meck. Building Standards Dept. responsible for issuing building permits. Permits available in 4-12 weeks for major projects.	- Zoning jurisdiction of various governmental agencies of the 12-county region - Guilford Co. - City of Greensboro - Low density zoning within a 65dBA contour - Area around airport currently is mostly industrial or distribution - Zoning geared toward commerce	- No zoning in the unincorporated areas. No authority has responsibility for zoning - "Therefore the North Carolina Air Cargo Airport Authority will have no local constraints in its land use planning."	- Airport Authority 4-mile radius, may amend to 6-mile radius - Some Scotland Co jurisdiction. - Current airport lies entirely w/in the zoning of Scotland Co. Government - 52% of 5,940-acre site is already zoned appropriately.	- Richmond Co. does not administer zoning regulations at present time - Richmond Co. does administer various building codes for new construction and for expansion - Mont. Co. does not zone except for major thoroughfares which are automatically zoned residential on each side of road for 1/2 mile. However, local planning board will approve commercial applicants in zone	- Harnett Co. Planning Department. No zoning exists in the county - Cumberland Co. would work with zoning requests	- Growth and development policies have been jointly adopted by the Wilmington City Council and the New Hanover County Board of Commissioners - Zoning for the proposed Global TransPark site is controlled by the New Hanover Co. Planning and Zoning Commission	- Goldsboro Planning jurisdiction is only a small portion	- Site can be zoned for industrial development	- No comprehensive land use regulations administered by Lenoir Co. Planning Department - Kinston - City of Kinston. Unincorporated portions of County are within Vance and Kinston Townships authority	Pitt Co. Planning Department land use and zoning The county currently does not have a zoning ordinance, but is working with the Pitt Co. Planning Board to develop ordinance - target adoption date Jan. '91 Pitt Co. Engineering Department - building code enforcement. Site dev. regulations Greenville not involved
Willingness to Cooperate with Authority	- Meck. Co. and Charlotte City both included letters supporting the park. - No mention of surrounding counties	- Site falls under jurisdiction of Guilford Co. and the City of Greensboro	- No zoning	- Scotland Co., Robeson Co., Hoke Co. have no objections. - Each of the following has expressed support of and willingness to cooperate on project: City of Hamlet Chesterfield County Moore County City of Rockingham Richmond County Cumberland County	- Both Richmond and Montgomery Counties express willingness to work with project.	- Harnett and Cumberland Co. support would work for zoning needed.	- City and county jointly adopt growth and development policies	- City of Goldsboro and Wayne County both support park and plan to work together to "guarantee coexistence of the complex and Wayne County residential and business communities."	- No information provided	- Disadvantage: No development regulations to control type, density, timing, location	- Only Pitt county involved with zoning

EXHIBIT B

SITE ALTERNATIVES (continued)

	Charlotte	Piedmont-Triad (Greensboro)	Bladen County	Laurinburg/ Maxton	Southern Piedmont	Harnett/ Cumberland (Fayetteville)	New Hanover (Wilmington)	Wayne County	Duplin County	Kinston	Pitt County
FINANCIAL PARTICIPATION											
Level	- Charlotte could build and operate cargo complex as an airport facility, financing it with revenue bonds when there is market demand - Charlotte can provide necessary land rent-free - State could construct and operate complex, State could contract with CDIA to operate complex, State could contract with 3rd party to operate complex, or use combination of above	- Airport airfield improvements developed based on 90% to 10% using federal matching funds - Improvement costs paid for by Airport Authority using FAA-AIP, State, and Authority funds	- No defined form or amount	- Laurinburg/Maxton will deed to the Authority 3,200 acres of airport property valued at $60 to $100 million	- Airport airfield infrastructure funds could come from FAA 90%, State Aviation Funds 5%, and NCDOT funds 5% - Fueling System - private funding $16,075,000 - Roadway infrastructure - NCDOT $2,850,000	- Revenue Bonds Revenue bonds should be issued by State as provided by Chapter 143 of General Statutes	- No information provided	- Commitment from region to provide up to $75 million	- Duplin Co has authority to issue industrial revenue bonds - Nine Community Development Block Grants have been obtained for development of industry in the County	- $1.5 million dollars in committed emplacement funds from the Airport Improvement Program - Already $100 to $135 million in replacement value - Turn airport (1,255 acres) over to NC Air Cargo Airport Authority ($140 million replacement cost) - State and federal economic development grants available	- Land could be bought from Weyerhaeuser at below market value in return for continued right to harvest trees until land is needed - Pitt Co help fund railroad extension to industrial site with multiple clients - Pitt Co also help with sewer and water energy supply and industrial site access - Industrial Revenue Bonds
Cooperative Efforts	- No mention of Mecklenburg County participating in financing with Charlotte	- Community in favor - Cargo buildings and sort center paid for by private investors or Authority revenue bonds	- No defined form or amount	- Counties in NC and SC in area of site have pledged support. Amount unknown	- Montgomery and Richmond Counties through resolution have committed to provide Phase I infrastructure for water and wastewater - Also agreed to primarily fund Central Cargo Facility and Electronic Transfer Vehicle System through revenue bonds and general obligation bonds	- Major manufacturers could purchase tracts individually or - Private investors would purchase the tract and lease it out - Harnett and Cumberland support	- A facility needing more than 4,500 acres would interrupt well-established surrounding neighborhoods	- Financial support is committed from "all sources" within the region for the purchase of land and other requirements of building the complex	- Water and sewer excess capacity of Wallace and Rose Hill will be provided - Town of Greenevers would help with development funds and federal grant opportunities	- EPA fund for wastewater treatment expansion could be granted to project - Majority of community in favor	- Industrial Revenue Bonds - SBA 504 Loans to companies - $2 million or less loans
ADDITIONAL INFORMATION											
Accommodates Essential GTP Requirements	NO Proposed expansion of existing Air Cargo Operations	NO Offered dispersed sites	YES	YES	YES	YES	NO Insufficient land with public support	YES	YES	YES	YES
Proximity to Military Installations											
Camp Lejeune	240 miles	190 miles	70 miles	125 miles	185 miles	105 miles	50 miles	65 miles	27 miles	45 miles	75 miles
Fort Bragg/ Pope AFB	140 miles	80 miles	50 miles	45 miles	30 miles	Adjacent	95 miles	65 miles	68 miles	80 miles	115 miles
Cherry Point	280 miles	210 miles	120 miles	175 miles	215 miles	130 miles	95 miles	80 miles	60 miles	55 miles	65 miles
Seymour Johnson AFB	180 miles	130 miles	70 miles	95 miles	115 miles	65 miles	90 miles	Adjacent	40 miles	30 miles	55 miles
Sunny Point	220 miles	200 miles	70 miles	110 miles	170 miles	115 miles	25 miles	115 miles	70 miles	110 miles	115 miles
Economic Development Potential	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES

Appendix 3

Population and Labor Force Trends for Southeast Asia (1985-92)

	1985	1986	1987	1988	1989	1990	1991	1992	Average Growth 1985-91
Population (000)									
Indonesia	167,332	170,680	174,043	177,428	180,840	184,283	187,758	191,259	1.7%
Malaysia	15,677	16,104	16,541	16,986	17,438	17,891	18,344	18,791	2.3%
Philippines	55,121	56,551	57,994	59,451	60,924	62,413	63,916	65,428	2.2%
Singapore	2,558	2,586	2,613	2,647	2,685	2,723	2,756	2,788	1.1%
Thailand	51,604	52,479	53,319	54,131	54,923	55,702	56,474	57,247	1.3%
	292,292	298,400	304,510	310,643	316,810	323,012	329,248	335,513	1.7%
Vietnam	59,902	61,204	62,530	63,884	65,270	66,693	68,156	69,664	1.9%
Cambodia	7,284	7,485	7,668	7,846	8,035	8,246	8,477	8,717	2.3%
Laos	3,594	3,692	3,794	3,902	4,017	4,139	4,266	4,398	2.6%
Myanmar	37,544	38,335	39,142	39,968	40,812	41,675	42,558	43,461	1.8%
	108,324	110,716	113,134	115,600	118,134	120,753	123,457	126,240	1.9%
SE Asia (excl. Brunei) - Tota	400,616	409,116	417,644	426,243	434,944	443,765	452,705	461,753	1.8%
Total Labor Force (000)									
Indonesia	63,817	65,471	67,153	68,867	70,614	72,314	72,396	74,206	1.9%
Malaysia	6,128	6,298	6,476	6,659	6,845	7,032	7,219	7,407	2.4%
Philippines	19,871	20,370	20,872	21,383	21,912	22,466	23,046	23,649	2.2%
Singapore	1,226	1,241	1,255	1,270	1,286	1,299	1,308	1,315	0.9%
Thailand	26,640	27,228	27,823	28,416	28,993	29,548	30,080	30,600	1.7%
	117,682	120,608	123,579	126,595	129,650	132,659	134,049	137,177	1.9%
Vietnam	28,000	28,756	29,516	30,291	31,097	31,945	32,840	33,782	2.4%
Cambodia	3,602	3,647	3,683	3,711	3,736	3,758	3,777	3,794	0.7%
Laos	1,757	1,788	1,821	1,855	1,891	1,929	1,970	2,012	1.7%
Myanmar	16,422	16,722	17,052	17,405	17,769	18,134	18,495	18,850	1.7%
	49,781	50,913	52,072	53,262	54,493	55,766	57,082	58,438	2.0%
SE Asia (excl. Brunei) - Tota	167,463	171,521	175,651	179,857	184,143	188,425	191,131	195,615	2.0%
Non-Agricultural Labor Force (000)									
Indonesia	30,091	31,444	32,842	34,288	35,780	37,237	37,092	38,696	3.2%
Malaysia	3,878	4,044	4,220	4,402	4,588	4,777	4,967	5,159	3.6%
Philippines	10,091	10,448	10,808	11,176	11,559	11,963	12,389	12,835	3.1%
Singapore	1,211	1,226	1,241	1,256	1,273	1,286	1,295	1,303	0.9%
Thailand	8,613	8,981	9,366	9,762	10,161	10,558	10,951	11,346	3.5%
	53,884	56,143	58,477	60,884	63,361	65,821	66,694	69,339	3.2%
Vietnam	10,056	10,523	11,010	11,516	12,046	12,601	13,183	13,797	4.0%
Cambodia	999	1,028	1,055	1,079	1,104	1,128	1,152	1,175	2.0%
Laos	462	478	495	512	530	549	569	591	3.1%
Myanmar	8,247	8,499	8,767	9,048	9,339	9,634	9,931	10,229	2.7%
	19,764	20,528	21,327	22,155	23,019	23,912	24,835	25,792	3.4%
SE Asia (excl. Brunei) - Tota	73,648	76,671	79,804	83,039	86,380	89,733	91,529	95,131	3.3%

Source: FAO 1993 Country Tables (Basic Data on the Agricultural Sector)

Economic Production Trends for Southeast Asia (1980-89)

	1980	1985	1988	1989	Average Growth 1980-89
GNP (Current US$ - Billions)					
Indonesia	$70	$89	$84	$89	2.8%
Malaysia	$23	$31	$33	$37	5.4%
Philippines	$33	$32	$38	$43	2.8%
Singapore *	$11	$19	$24	$28	11.0%
Thailand	$31	$41	$56	$68	9.0%
	$169	$213	$235	$265	5.2%
Per Capita GNP (Constant US$)					
Indonesia	$470	$540	$480	$500	0.7%
Malaysia	$1,690	$1,970	$1,930	$2,160	2.8%
Philippines	$680	$570	$630	$700	0.3%
Singapore *	$4,540	$7,600	$9,090	$10,450	9.7%
Thailand	$670	$800	$1,030	$1,230	7.0%
	$648	$731	$759	$844	3.0%
Population (Millions)					
Indonesia	148.00	165.00	175.00	178.00	2.1%
Malaysia	13.76	15.68	16.92	17.34	2.6%
Philippines	49.25	55.82	59.85	61.22	2.4%
Singapore *	2.42	2.56	2.65	2.68	1.2%
Thailand	46.70	51.68	54.47	55.20	1.9%
	260.13	290.74	308.89	314.45	2.1%

Source: The World Bank, World Tables 1991

U.S. Direct Investment in Southeast Asia (1982-1992)

	All Industries	Manufacturing: Food & Kindred Products	Chemical & Allied Products	Electric & Electronic Equipment	All Other	Total
		(Millions of U.S. Dollars)				
1982 U.S. Investment						
Thailand	$780	$8	$23	$105	$25	$161
Indonesia	$2,295	*	$38	*	$96	$134
Malaysia	$1,221	$6	$20	$161	$58	$245
Philippines	$1,315	$23	$153	$123	$67	$366
Singapore	$1,720	*	$32	$313	$270	$615
ASEAN Total (excl. Brunei)	$7,331	$37	$266	$702	$516	$1,521
Asia & Pacific (excl. Japan, Aust. & NZ)	$12,142	$108	$642	$951	$1,004	$2,705
World Total	$207,752	$7,630	$18,274	$7,292	$50,256	$83,452
Percent of ASEAN Total (1982)						
Thailand	10.6%	21.6%	8.6%	15.0%	4.8%	10.6%
Indonesia	31.3%	NA	14.3%	NA	18.6%	8.8%
Malaysia	16.7%	16.2%	7.5%	22.9%	11.2%	16.1%
Philippines	17.9%	62.2%	57.5%	17.5%	13.0%	24.1%
Singapore	23.5%	NA	12.0%	44.6%	52.3%	40.4%
ASEAN Share of Asia & Pacific	60.4%	34.3%	41.4%	73.8%	51.4%	56.2%
ASEAN Share of World Total	5.8%	1.4%	3.5%	13.0%	2.0%	3.2%
1992 U.S. Investment						
Thailand	$2,459	$63	$168	$213	$339	$783
Indonesia	$4,278	*	$54	*	$84	$138
Malaysia	$1,714	$9	$77	$654	$7	$747
Philippines	$1,565	$350	$366	$179	$126	$1,021
Singapore	$6,631	*	$319	$1,440	$1,701	$3,460
	$16,647	$422	$984	$2,486	$2,257	$6,149
Asia & Pacific (excl. Japan, Aust. & NZ)	$32,245	$861	$2,176	$5,003	$3,800	$11,840
World Total	$486,670	$18,411	$43,821	$17,001	$108,043	$187,276
Percent of ASEAN Total (1992)						
Thailand	14.8%	14.9%	17.1%	8.6%	15.0%	12.7%
Indonesia	25.7%	NA	5.5%	NA	3.7%	2.2%
Malaysia	10.3%	2.1%	7.8%	26.3%	0.3%	12.1%
Philippines	9.4%	82.9%	37.2%	7.2%	5.6%	16.6%
Singapore	39.8%	NA	32.4%	57.9%	75.4%	56.3%
ASEAN Share of Asia & Pacific	51.6%	49.0%	45.2%	49.7%	59.4%	51.9%
ASEAN Share of World Total	6.6%	4.7%	5.0%	29.4%	3.5%	6.3%
1982-1992 Annual Growth						
Thailand	12.2%	22.9%	22.0%	7.3%	29.8%	17.1%
Indonesia	6.4%	NA	3.6%	NA	-1.3%	0.3%
Malaysia	3.4%	4.1%	14.4%	15.0%	-19.1%	11.8%
Philippines	1.8%	31.3%	9.1%	3.8%	6.5%	10.8%
Singapore	14.4%	NA	25.9%	16.5%	20.2%	18.9%
	8.5%	27.6%	14.0%	13.5%	15.9%	15.0%
Asia & Pacific (excl. Japan, Aust. & NZ)	10.3%	23.1%	13.0%	18.1%	14.2%	15.9%
World Total	8.9%	9.2%	9.1%	8.8%	8.0%	8.4%

* Included in "All Other Manufacturing" total for confidentiality reasons.

Source: U.S. Dept. of Commerce, Bureau of Economic Analysis, U.S. Direct Investment Abroad

Total Plants in Thailand for Selected Industries (1990-92)

		Total Plants (Law of 1992)					Bangkok		
		1990	1991	1992	% of Total 1992	% Change 1990-92	1992	% of Country Total	% of BKK Total
	Rice Mills	45,956	45,690	45,328	43.7%	-1.4%	126	0.3%	0.6%
06	Fishery Products	294	329	331	0.3%	12.6%	23	6.9%	0.1%
08	Vegetable/Fruit	332	364	381	0.4%	14.8%	55	14.4%	0.3%
28	Garments	1,896	2,041	2,150	2.1%	13.4%	1891	88.0%	9.0%
33	Shoes & Footwear	367	388	425	0.4%	15.8%	334	78.6%	1.6%
46	Pharmaceuticals	306	309	307	0.3%	0.3%	213	69.4%	1.0%
48	Chemical Products.	257	267	274	0.3%	6.6%	109	39.8%	0.5%
69	Computers & DP Equipment	93	98	97	0.1%	4.3%	77	79.4%	0.4%
74	Electronic Products	331	349	369	0.4%	11.5%	222	60.2%	1.1%
81	Scientific Equipment	62	67	97	0.1%	56.5%	64	66.0%	0.3%
82	Optical Equipment	20	24	26	0.0%	30.0%	19	73.1%	0.1%
83	Watch & Clock	23	25	23	0.0%	0.0%	19	82.6%	0.1%
84	Gems & Jewellry	291	215	354	0.3%	21.6%	339	95.8%	1.6%
85	Musical Instruments	18	19	17	0.0%	-5.6%	13	76.5%	0.1%
86	Sports Equipment	38	42	44	0.0%	15.8%	25	56.8%	0.1%
87	Miscellaneous Tools & Toys	251	272	294	0.3%	17.1%	154	52.4%	0.7%
		4,579	4,809	5,189	5.0%	13.3%	3,557	68.5%	17.0%
	Total	98,995	102,723	103,822	100.0%	4.9%	20978	20.2%	100.0%

Excludes Industrial Estate and provincial-authorized plants

Source: Department of Industrial Factory, Industrial Factory Statistics (2535)

Appendix 3
Table 4

Appendix 3
Table 5

Total Plants in Thailand by Region for Non Rice-Mill Industries (1990-92)

	Total Plants (Law of 1992)				
	1990	1991	1992	% of Total 1992	% Change 1990-92
Bangkok	19,756	20,248	20,852	91.8%	5.5%
Central Region	12,728	14,260	14,930	65.7%	17.3%
Eastern Region					
Cholburi	1,248	1,344	1,299	5.7%	4.1%
Other	2,056	2,213	2,209	9.7%	7.4%
	3,304	3,557	3,508	15.4%	6.2%
Northern Region	5,476	6,046	6,145	27.1%	12.2%
Northeastern Region	7,849	8,581	8,617	37.9%	9.8%
Southern	3,926	4,341	4,442	19.6%	13.1%
Total - All Regions	20,555	22,525	22,712	100.0%	10.5%

Excludes Industrial Estate and provincial-authorized plants

Source: Department of Industrial Factory, Industrial Factory Statistics (2535)

New Plants in Thailand for Selected Industries (1992)

Law of 1969

		Number of New Plants				Total Investment		Employment				Average Employment per Plant			
		Bangkok	Eastern Region	Total Regional	Total	Mil. Baht	Mil. US$	Bangkok	Eastern Region	Total Regional	Total	Bangkok	Eastern Region	Total Regional	Total
06	Fishery Products	0	NA	0	0	0.00	$0.00	0	NA	0	0	NA	NA	NA	NA
08	Vegetable/Fruit	0	NA	0	0	0.00	$0.00	0	NA	0	0	NA	NA	NA	NA
28	Garments	88	NA	12	100	12.70	$0.50	4,263	NA	1,486	5,749	48	NA	124	57
33	Shoes & Footwear	20	NA	2	22	80.70	$3.16	333	NA	245	578	17	NA	123	26
46	Pharmaceuticals	0	NA	0	0	0.00	$0.00	0	NA	0	0	NA	NA	NA	NA
48	Chemical Products	3	NA	3	6	82.53	$3.24	24	NA	102	126	8	NA	34	21
69	Computers & DP Equipment	3	NA	2	5	29.93	$1.17	30	NA	64	94	10	NA	32	19
74	Electronic Products	7	NA	10	17	1,814.03	$71.14	115	NA	632	747	16	NA	63	44
81	Scientific Equipment	2	NA	1	3	4.28	$0.17	12	NA	8	20	6	NA	8	7
82	Optical Equipment	1	NA	1	2	10.30	$0.40	18	NA	7	25	18	NA	7	13
83	Watch & Clock	0	NA		0	0.00	$0.00	0	NA	0	0	NA	NA	NA	NA
84	Gems & Jewellry	35	NA	1	36	294.20	$11.54	1,073	NA	10	1,083	31	NA	10	30
85	Musical Instruments	0	NA		0	0.00	$0.00	0	NA	0	0	NA	NA	NA	NA
86	Sports Equipment	2	NA	0	2	7.40	$0.29	22	NA	0	22	11	NA	NA	11
87	Miscellaneous Tools & Toys	9	NA	5	14	195.70	$7.67	347	NA	2,306	2,653	39	NA	461	190
	Total - Selected Industries	170	NA	37	207	2,531.77	$99.29	6,237	NA	4,860	11,097	37	NA	131	54
	% of All Industries	22.5%	NA	4.5%	13.2%	4.4%	4.4%	42.9%	NA	13.0%	21.4%	190.9%	NA	288.1%	162.8%
	Total - All Industries	756	NA	818	1,574	57,224.66	$2,244.10	14,532	NA	37,289	51,821	19	NA	46	33

New Plants in Thailand for Selected Industries (1992)

Law of 1992

		Number of New Plants				Total Investment		Employment				Average Employment per Plant			
		Bangkok	Eastern Region	Total Regional	Total	Mil. Baht	Mil. US$	Bangkok	Eastern Region	Total Regional	Total	Bangkok	Eastern Region	Total Regional	Total
06	Fishery Products	1	1	12	13	443.99	$17.41	3	110	1,918	1,921	3	110	160	148
08	Vegetable/Fruit	0	0	20	20	236.27	$9.27	0	0	1,262	1,262	NA	NA	63	63
26	Garments	181	1	19	200	1,418.91	$55.64	228	134	0	228	1	134	0	1
33	Shoes & Footwear	38	4	14	52	918.96	$36.04	1,084	2,333	6,477	7,561	29	583	463	145
46	Pharmaceuticals	2	0	2	4	186.33	$7.31	100	0	125	225	50	NA	63	56
48	Chemical Products	10	2	10	20	1,243.51	$48.77	102	82	212	314	10	41	21	16
69	Computers & DP Equipment	4	0	0	4	23.38	$0.92	62	0	0	62	16	NA	NA	16
74	Electronic Products	10	3	17	27	1,551.32	$60.84	116	183	869	985	12	61	51	36
81	Scientific Equipment	2	1	2	4	13.15	$0.52	19	3	11	30	10	3	6	8
82	Optical Equipment	2	0	0	2	5.40	$0.21	35	0	0	35	18	NA	NA	18
83	Watch & Clock	1	0	0	1	3.20	$0.13	12	0	0	12	12	NA	NA	12
84	Gems & Jewellry	52	0	2	54	438.29	$17.19	2,005	0	219	2,224	39	NA	110	41
85	Musical Instruments	0	0	0	0	0.00	$0.00	0	0	0	0	NA	NA	NA	NA
86	Sports Equipment	4	0	0	4	50.75	$1.99	111	0	0	111	28	NA	NA	28
87	Miscellaneous Tools & Toys	16	1	12	28	1,203.05	$47.18	522	160	3,887	4,409	33	160	324	157
	Total - Selected Industries	323	13	110	433	7,736.51	$303.39	4,399	3,005	14,980	19,379	14	231	136	45
	% of All Industries	20.9%	6.9%	5.4%	12.1%	8.4%	8.4%	12.1%	23.8%	15.3%	14.4%	58.0%	343.9%	280.7%	118.8%
	Total - All Industries	1,543	188	2,022	3,565	92,402.74	$3,623.64	36,213	12,636	98,103	134,316	23	67	49	38

New Plants in Thailand for Selected Industries (1992)

Combined

	Industry	Number of New Plants				Total Investment		Employment				Average Employment per Plant			
		Bangkok	Eastern Region	Total Regional	Total	Mil. Baht	Mil. US$	Bangkok	Eastern Region	Total Regional	Total	Bangkok	Eastern Region	Total Regional	Total
06	Fishery Products	1	NA	12	13	443.99	$17.41	3	NA	1,918	1,921	3	NA	160	148
08	Vegetable/Fruit	0	NA	20	20	236.27	$9.27	0	NA	1,262	1,262	NA	NA	63	63
28	Garments	269	NA	31	300	1,418.91	$55.64	4,491	NA	1,486	5,977	17	NA	48	20
33	Shoes & Footwear	58	NA	16	74	918.96	$36.04	1,417	NA	6,722	8,139	24	NA	420	110
46	Pharmaceuticals	2	NA	2	4	186.33	$7.31	100	NA	125	225	50	NA	63	56
48	Chemical Products	13	NA	13	26	1,243.51	$48.77	126	NA	314	440	10	NA	24	17
69	Computers & DP Equipment	7	NA	2	9	23.38	$0.92	92	NA	64	156	13	NA	32	17
74	Electronic Products	17	NA	27	44	1,551.32	$60.84	231	NA	1,501	1,732	14	NA	56	39
81	Scientific Equipment	4	NA	3	7	13.15	$0.52	31	NA	19	50	8	NA	6	7
82	Optical Equipment	3	NA	1	4	5.40	$0.21	53	NA	7	60	18	NA	7	15
83	Watch & Clock	1	NA	0	1	3.20	$0.13	12	NA	0	12	12	NA	NA	12
84	Gems & Jewellry	87	NA	3	90	438.29	$17.19	3,078	NA	229	3,307	35	NA	76	37
85	Musical Instruments	0	NA	0	0	0.00	$0.00	0	NA	0	0	NA	NA	NA	NA
86	Sports Equipment	6	NA	0	6	50.75	$1.99	133	NA	0	133	22	NA	NA	22
87	Miscellaneous Tools & Toys	25	NA	17	42	1,203.05	$47.18	869	NA	6,193	7,062	35	NA	364	168
	Total - Selected Industries	493	NA	147	640	7,736.51	$303.39	10,636	NA	19,840	30,476	22	NA	135	48
	% of All Industries	21.4%	NA	5.2%	12.5%	5.2%	5.2%	21.0%	NA	14.7%	16.4%	97.7%	NA	283.1%	131.5%
	Total - All Industries	2,299	NA	2,840	5,139	149,627.40	$5,867.74	50,745	NA	135,392	186,137	22	NA	48	36

Source: Department of Industrial Factory, Industrial Factory Statistics (2535)

1991 Trade Summary by Country/IATA World Area (UN Data)

Country	Export						Import						Total					
				% of 1991	Average Annual Growth					% of 1992	Average Annual Growth					% of 1991	Average Annual Growth	
	1981	1989	1991	Total	1981-91	1989-91	1981	1989	1991	Total	1981-91	1989-91	1981	1989	1991	Total	1981-91	1989-91
	(Billions of U.S. Dollars)																	
SINGAPORE	20.5	45.1	59.0	1.6%	11.2%	14.4%	28.0	46.6	67.1	1.9%	9.1%	20.0%	48.5	91.6	126.1	1.8%	10.0%	17.3%
MALAYSIA	12.2	26.0	36.2	1.0%	11.5%	18.0%	12.5	22.4	30.4	0.8%	9.3%	16.5%	24.7	48.4	66.6	0.9%	10.4%	17.3%
THAILAND	7.2	20.7	29.0	0.8%	14.9%	18.3%	9.5	24.1	35.5	1.0%	14.1%	21.3%	16.8	44.8	64.5	0.9%	14.4%	20.0%
INDONESIA	23.5	24.3	31.3	0.9%	2.9%	13.6%	12.9	16.2	24.8	0.7%	6.7%	23.8%	36.4	40.4	56.1	0.8%	4.4%	17.8%
PHILIPPINES	5.9	8.6	9.8	0.3%	5.2%	7.0%	8.1	10.4	10.5	0.3%	2.6%	0.3%	13.9	19.0	20.3	0.3%	3.8%	3.4%
BRUNEI	4.2	2.0	2.7	0.1%	-4.5%	13.9%	0.7	1.4	1.6	0.0%	9.1%	6.5%	4.9	3.4	4.2	0.1%	-1.4%	11.0%
VIETNAM	0.2	1.0	1.6	0.0%	24.7%	27.7%	0.5	0.6	1.3	0.0%	9.5%	43.4%	0.7	1.6	3.0	0.0%	15.2%	34.1%
MYANMAR	0.5	0.4	0.6	0.0%	1.8%	22.9%	0.7	0.6	0.8	0.0%	0.4%	16.7%	1.3	1.0	1.4	0.0%	1.0%	19.2%
LAOS	0.0	0.1	0.1	0.0%	17.2%	-5.5%	0.1	0.1	0.1	0.0%	5.9%	8.2%	0.1	0.2	0.2	0.0%	9.1%	1.9%
CAMBODIA	0.0	0.0	0.0	0.0%	28.0%	65.5%	0.1	0.0	0.0	0.0%	-6.6%	9.4%	0.1	0.0	0.1	0.0%	1.0%	32.6%
Southeast Asia	74.1	128.2	170.3	4.7%	8.7%	15.3%	73.1	122.4	172.1	4.8%	8.9%	18.6%	147.3	250.5	342.4	4.8%	8.8%	16.9%
North America	327.7	507.7	579.6	16.1%	5.9%	6.9%	331.5	592.5	642.0	17.8%	6.6%	4.1%	659.2	1,100.2	1,221.7	17.0%	6.4%	5.4%
Caribbean	20.8	11.0	11.5	0.3%	-5.7%	2.1%	17.9	24.9	17.1	0.5%	-0.4%	-17.0%	38.6	35.9	28.6	0.4%	-2.9%	-10.7%
Central America	25.1	31.2	47.0	1.3%	6.5%	22.7%	37.7	45.3	62.2	1.7%	5.1%	17.2%	62.7	76.5	109.2	1.5%	5.7%	19.5%
Upper South America	26.8	26.4	31.7	0.9%	1.7%	9.6%	25.8	19.6	22.4	0.6%	-1.4%	7.0%	52.6	46.0	54.2	0.8%	0.3%	8.5%
Lower South America	40.3	58.1	59.2	1.6%	3.9%	0.9%	41.7	33.3	35.9	1.0%	-1.5%	3.8%	82.0	91.5	95.1	1.3%	1.5%	2.0%
Central/Western Africa	33.9	27.0	29.7	0.8%	-1.3%	5.0%	32.6	18.6	21.2	0.6%	-4.2%	6.6%	66.5	45.6	50.9	0.7%	-2.6%	5.7%
Eastern Africa	3.7	4.3	4.5	0.1%	2.0%	2.6%	6.8	7.7	7.5	0.2%	1.0%	-1.4%	10.5	12.0	12.0	0.2%	1.4%	0.1%
Northeastern Africa	19.4	12.3	15.2	0.4%	-2.4%	11.3%	22.6	14.7	15.8	0.4%	-3.5%	3.7%	42.0	27.0	31.0	0.4%	-3.0%	7.2%
Northwestern Africa	18.1	15.7	21.0	0.6%	1.5%	15.7%	19.2	19.9	18.4	0.5%	-0.4%	-3.8%	37.3	35.5	39.4	0.5%	0.5%	5.2%
Southern Africa	26.0	29.5	33.8	0.9%	2.7%	7.1%	19.1	16.4	17.2	0.5%	-1.0%	2.6%	45.1	45.8	51.0	0.7%	1.2%	5.5%
Western Europe	778.6	1,416.6	1,644.8	45.7%	7.8%	7.8%	823.6	1,409.1	1,687.1	46.9%	7.4%	9.4%	1,602.2	2,825.8	3,332.0	46.3%	7.6%	8.6%
Eastern/Central Europe	87.4	103.7	91.3	2.5%	0.4%	-6.2%	88.1	74.8	70.8	2.0%	-2.2%	-2.7%	175.5	178.4	162.1	2.3%	-0.8%	-4.7%
Middle East	204.1	88.9	124.7	3.5%	-4.8%	18.4%	109.7	80.2	95.5	2.7%	-1.4%	9.1%	313.8	169.1	220.2	3.1%	-3.5%	14.1%
South Asia	12.4	24.7	33.3	0.9%	10.4%	16.1%	23.8	30.7	27.8	0.8%	1.5%	-5.0%	36.2	55.4	61.0	0.8%	5.4%	4.9%
Northeast Asia	248.2	538.4	646.7	18.0%	10.1%	9.6%	220.7	416.8	522.8	14.5%	9.0%	12.0%	468.9	955.2	1,169.5	16.2%	9.6%	10.7%
Southwest Pacific	29.7	49.9	56.6	1.6%	6.6%	6.5%	32.7	50.7	49.1	1.4%	4.2%	-1.6%	62.4	100.6	105.7	1.5%	5.4%	2.5%
All Other	0.0	0.0	0.0	0.0%	N/A	N/A	49.7	95.7	115.9	3.2%	8.8%	10.1%	49.7	95.7	115.9	1.6%	8.8%	10.1%
	1,976.2	3,073.4	3,600.9	100.0%	6.2%	8.2%	1,976.2	3,073.4	3,600.9	100.0%	6.2%	8.2%	3,952.5	6,146.9	7,201.8	100.0%	6.2%	8.2%

Source: UN Trade Data

Appendix 3
Table 7

1981-91 Southeast Asia Trade Summary by Country/IATA World Area (UN Data)

Country	Export 1981	Export 1989	Export 1991	Export % of 1991 Total	Export Average Annual Growth 1981-91	Export Average Annual Growth 1989-91	Import 1981	Import 1989	Import 1991	Import % of 1991 Total	Import Average Annual Growth 1981-91	Import Average Annual Growth 1989-91	Total 1981	Total 1989	Total 1991	Total % of 1991 Total	Total Average Annual Growth 1981-91	Total Average Annual Growth 1989-91
							(Millions of U.S. Dollars)											
MALAYSIA	6,843	15,581	23,678	13.9%	13.2%	23.3%	3,328	7,063	11,662	6.8%	13.4%	28.5%	10,171	22,643	35,340	10.3%	13.3%	24.9%
SINGAPORE	711	1,849	3,607	2.1%	17.6%	39.7%	4,373	9,489	14,352	8.3%	12.6%	23.0%	5,084	11,337	17,960	5.2%	13.5%	25.9%
INDONESIA	1,224	2,327	3,748	2.2%	11.8%	26.9%	1,054	1,709	2,518	1.5%	9.1%	21.4%	2,278	4,036	6,267	1.8%	10.6%	24.6%
THAILAND	22	216	130	0.1%	19.7%	-22.6%	1,127	2,395	3,510	2.0%	12.0%	21.0%	1,149	2,612	3,640	1.1%	12.2%	18.0%
PHILIPPINES	2,170	1,711	2,005	1.2%	-0.8%	8.2%	442	596	455	0.3%	0.3%	-12.6%	2,612	2,308	2,461	0.7%	-0.6%	3.3%
MYANMAR	78	139	239	0.1%	11.9%	31.0%	117	141	278	0.2%	9.0%	40.4%	195	280	517	0.2%	10.3%	35.8%
BRUNEI	1	2	4	0.0%	12.0%	37.9%	592	263	373	0.2%	-4.5%	19.1%	593	265	377	0.1%	-4.4%	19.3%
VIETNAM	0	0	0	0.0%	N/A	N/A	15	109	204	0.1%	29.5%	36.6%	15	109	204	0.1%	29.5%	36.6%
LAOS	0	0	0	0.0%	N/A	N/A	2	50	47	0.0%	37.2%	-3.1%	2	50	47	0.0%	37.2%	-3.1%
CAMBODIA	1	1	1	0.0%	-7.9%	-12.0%	0	11	12	0.0%	82.7%	5.5%	1	12	13	0.0%	25.3%	4.4%
Southeast Asia	11,051	21,826	33,412	19.6%	11.7%	23.7%	11,051	21,826	33,412	19.4%	11.7%	23.7%	22,101	43,653	66,824	19.5%	11.7%	23.7%
North America	13,218	29,206	34,252	20.1%	10.0%	8.3%	10,037	19,316	24,371	14.2%	9.3%	12.3%	23,255	48,522	58,623	17.1%	9.7%	9.9%
Caribbean	1,289	150	191	0.1%	-17.4%	12.8%	64	79	95	0.1%	4.0%	10.0%	1,354	229	286	0.1%	-14.4%	11.8%
Central America	320	472	822	0.5%	9.9%	31.9%	151	95	227	0.1%	4.1%	54.8%	472	567	1,049	0.3%	8.3%	36.0%
Upper South America	61	68	103	0.1%	5.4%	23.2%	22	59	183	0.1%	23.6%	75.3%	82	127	285	0.1%	13.2%	49.8%
Lower South America	398	274	454	0.3%	1.3%	28.8%	388	1,519	1,699	1.0%	15.9%	5.8%	786	1,793	2,154	0.6%	10.6%	9.6%
Central/Western Africa	807	620	964	0.6%	1.8%	24.6%	35	299	254	0.1%	22.1%	-7.8%	842	919	1,218	0.4%	3.8%	15.1%
Eastern Africa	198	380	495	0.3%	9.6%	14.1%	230	89	82	0.0%	-9.8%	-4.0%	427	469	577	0.2%	3.0%	10.9%
Northeastern Africa	125	305	388	0.2%	12.0%	12.8%	68	123	138	0.1%	7.3%	6.2%	194	428	527	0.2%	10.5%	10.9%
Northwestern Africa	132	258	145	0.1%	1.0%	-24.9%	91	100	144	0.1%	4.7%	20.0%	222	357	289	0.1%	2.7%	-10.1%
Southern Africa	148	148	188	0.1%	2.4%	12.7%	123	338	388	0.2%	12.2%	7.1%	271	486	576	0.2%	7.8%	8.9%
Western Europe	8,990	21,150	29,865	17.5%	12.8%	18.8%	9,492	18,975	26,477	15.4%	10.8%	18.1%	18,482	40,126	56,342	16.5%	11.8%	18.5%
Eastern/Central Europe	1,272	1,090	1,275	0.7%	0.0%	8.2%	477	881	1,087	0.6%	8.6%	11.1%	1,750	1,971	2,363	0.7%	3.0%	9.5%
Middle East	2,256	3,267	4,139	2.4%	6.3%	12.6%	13,496	5,099	8,372	4.9%	-4.7%	28.1%	15,752	8,365	12,511	3.7%	-2.3%	22.3%
South Asia	1,876	3,180	2,858	1.7%	4.3%	-5.2%	566	1,284	2,065	1.2%	13.8%	26.8%	2,443	4,464	4,923	1.4%	7.3%	5.0%
Northeast Asia	28,962	41,687	55,881	32.8%	6.8%	15.8%	24,349	48,017	66,727	38.8%	10.6%	17.9%	53,312	89,705	122,608	35.8%	8.7%	16.9%
Southwest Pacific	2,621	3,429	3,943	2.3%	4.2%	7.2%	2,477	4,284	6,371	3.7%	9.9%	22.0%	5,098	7,713	10,314	3.0%	7.3%	15.6%
All Other	412	644	931	0.5%	8.5%	20.2%	0	0	0	0.0%	N/A	N/A	412	644	931	0.3%	8.5%	20.2%
	74,137	128,154	170,306	100.0%	8.7%	15.3%	73,118	122,383	172,094	100.0%	8.9%	18.6%	147,255	250,538	342,400	100.0%	8.8%	16.9%

Source: UN Trade Data

Appendix 3
Table 8

462

1981-91 Southeast Asia Trade Summary (UN Data) - Top 40 Trade Partners

Country	Export 1981	Export 1989	Export 1991	Export % of 1991 Total	Export Average Annual Growth 1981-91	Export Average Annual Growth 1989-91	Import 1981	Import 1989	Import 1991	Import % of 1991 Total	Import Average Annual Growth 1981-91	Import Average Annual Growth 1989-91	Total 1981	Total 1989	Total 1991	Total % of 1991 Total	Total Average Annual Growth 1981-91	Total Average Annual Growth 1989-91
							(Millions of U.S. Dollars)											
JAPAN	25,770	34,280	46,323	27.2%	6.0%	16.2%	16,283	28,035	40,096	23.3%	9.4%	19.6%	42,053	62,315	86,419	25.2%	7.5%	17.8%
USA	9,703	20,311	23,763	14.0%	9.4%	8.2%	9,508	18,055	22,856	13.3%	9.2%	12.5%	19,211	38,366	46,619	13.6%	9.3%	10.2%
MALAYSIA	6,843	15,581	23,678	13.9%	13.2%	23.3%	3,328	7,063	11,662	6.8%	13.4%	28.5%	10,171	22,643	35,340	10.3%	13.3%	24.9%
SINGAPORE	711	1,849	3,607	2.1%	17.6%	39.7%	4,373	9,489	14,352	8.3%	12.6%	23.0%	5,084	11,337	17,960	5.2%	13.5%	25.9%
HONG KONG	929	3,370	4,873	2.9%	18.0%	20.2%	2,878	6,064	7,741	4.5%	10.4%	13.0%	3,807	9,434	12,614	3.7%	12.7%	15.6%
CANADA	3,515	8,895	10,489	6.2%	11.6%	8.6%	529	1,261	1,515	0.9%	11.1%	9.6%	4,044	10,156	12,004	3.5%	11.5%	8.7%
SOUTH KOREA	1,222	2,043	2,043	1.2%	5.3%	-0.0%	1,291	4,268	7,635	4.4%	19.4%	33.8%	2,513	6,311	9,678	2.8%	14.4%	23.8%
AUSTRALIA	2,523	3,253	3,785	2.2%	4.1%	7.9%	2,026	3,670	5,660	3.3%	10.8%	24.2%	4,549	6,924	9,445	2.8%	7.6%	16.8%
FRANCE	2,976	4,739	6,038	3.5%	7.3%	12.9%	1,368	2,419	3,252	1.9%	9.0%	15.9%	4,344	7,159	9,290	2.7%	7.9%	13.9%
GERMANY	373	908	1,329	0.8%	13.6%	21.0%	2,466	4,955	7,558	4.4%	11.9%	23.5%	2,839	5,863	8,887	2.6%	12.1%	23.1%
DENMARK	850	4,478	7,597	4.5%	24.5%	30.2%	153	275	398	0.2%	10.0%	20.2%	1,002	4,753	7,995	2.3%	23.1%	29.7%
CHINA (MAINLAND)	905	1,807	2,426	1.4%	10.4%	15.9%	2,075	3,647	4,878	2.8%	8.9%	15.6%	2,979	5,454	7,304	2.1%	9.4%	15.7%
BELGIUM	2,284	4,765	5,869	3.4%	9.9%	11.0%	358	974	1,348	0.8%	14.2%	17.7%	2,642	5,738	7,217	2.1%	10.6%	12.1%
UNITED KINGDOM	417	1,415	2,121	1.2%	17.7%	22.4%	2,003	3,754	4,877	2.8%	9.3%	14.0%	2,420	5,169	6,998	2.0%	11.2%	16.4%
TAIWAN	137	187	216	0.1%	4.7%	7.6%	1,789	5,912	6,324	3.7%	13.5%	3.4%	1,926	6,098	6,541	1.9%	13.0%	3.6%
INDONESIA	1,224	2,327	3,748	2.2%	11.8%	26.9%	1,054	1,709	2,518	1.5%	9.1%	21.4%	2,278	4,036	6,267	1.8%	10.6%	24.6%
SAUDI ARABIA	672	823	1,208	0.7%	6.0%	21.2%	9,696	950	4,650	2.7%	-7.1%	>99.9%	10,368	1,773	5,858	1.7%	-5.5%	81.8%
NETHERLANDS	373	1,468	2,719	1.6%	22.0%	36.1%	725	1,160	1,458	0.8%	7.2%	12.1%	1,098	2,628	4,177	1.2%	14.3%	26.1%
THAILAND	22	216	130	0.1%	19.7%	-22.6%	1,127	2,395	3,510	2.0%	12.0%	21.0%	1,149	2,612	3,640	1.1%	12.2%	18.0%
ITALY	358	721	1,083	0.6%	11.7%	22.5%	653	1,761	2,317	1.3%	13.5%	14.7%	1,011	2,482	3,400	1.0%	12.9%	17.0%
PHILIPPINES	2,170	1,711	2,005	1.2%	-0.8%	8.2%	442	596	455	0.3%	0.3%	-12.6%	2,612	2,308	2,461	0.7%	-0.6%	3.3%
TURKEY	1,177	2,054	2,237	1.3%	6.6%	4.4%	3	42	167	0.1%	47.9%	98.5%	1,180	2,097	2,405	0.7%	7.4%	7.1%
INDIA	510	488	758	0.4%	4.0%	24.7%	367	868	1,583	0.9%	15.7%	35.0%	877	1,356	2,341	0.7%	10.3%	31.4%
SWITZERLAND	19	63	156	0.1%	23.3%	57.0%	414	1,312	1,818	1.1%	15.9%	17.7%	433	1,375	1,974	0.6%	16.4%	19.8%
UNITED ARAB EMIRAT	40	64	74	0.0%	6.4%	7.1%	761	1,238	1,586	0.9%	7.6%	13.2%	800	1,302	1,659	0.5%	7.6%	12.9%
BRAZIL	264	79	208	0.1%	-2.3%	62.1%	346	1,242	1,159	0.7%	12.8%	-3.4%	610	1,322	1,367	0.4%	8.4%	1.7%
SWEDEN	42	151	151	0.1%	13.7%	-0.2%	556	852	1,209	0.7%	8.1%	19.2%	598	1,003	1,360	0.4%	8.6%	16.4%
BAHRAIN	365	651	1,014	0.6%	10.7%	24.8%	489	223	234	0.1%	-7.1%	2.4%	854	875	1,248	0.4%	3.9%	19.5%
PAKISTAN	882	1,360	963	0.6%	0.9%	-15.9%	108	271	269	0.2%	9.6%	-0.4%	989	1,631	1,232	0.4%	2.2%	-13.1%
IRAN	188	142	202	0.1%	0.7%	19.2%	457	665	780	0.5%	5.5%	8.3%	646	807	982	0.3%	4.3%	10.3%
MEXICO	249	439	692	0.4%	10.8%	25.6%	136	81	207	0.1%	4.3%	59.8%	385	520	899	0.3%	8.8%	31.6%
BULGARIA	337	382	812	0.5%	9.2%	45.8%	21	57	45	0.0%	7.7%	-11.6%	359	439	857	0.3%	9.1%	39.7%
JORDAN	403	642	765	0.4%	6.6%	9.1%	12	66	90	0.1%	21.9%	16.2%	415	708	854	0.2%	7.5%	9.8%
OMAN	294	367	241	0.1%	-2.0%	-19.0%	140	224	584	0.3%	15.3%	61.3%	434	591	825	0.2%	6.6%	18.1%
NEW ZEALAND	62	112	91	0.1%	4.0%	-9.8%	388	533	686	0.4%	5.9%	13.4%	450	645	776	0.2%	5.6%	9.7%
SPAIN	94	166	270	0.2%	11.1%	27.3%	155	328	465	0.3%	11.6%	19.0%	249	494	734	0.2%	11.4%	21.9%
AUSTRIA	21	132	165	0.1%	23.1%	11.8%	116	258	494	0.3%	15.6%	38.4%	136	390	659	0.2%	17.1%	30.0%
BANGLADESH	324	810	545	0.3%	5.3%	-18.0%	18	47	60	0.0%	13.0%	13.1%	341	857	605	0.2%	5.9%	-16.0%
SOVIET UNION	221	127	82	0.0%	-9.5%	-19.7%	128	346	495	0.3%	14.5%	19.7%	350	473	577	0.2%	5.1%	10.5%
SRI LANKA	95	344	407	0.2%	15.7%	8.7%	54	61	133	0.1%	9.5%	47.8%	149	405	540	0.2%	13.8%	15.4%
Total - All Countries	74,137	128,154	170,306	100.0%	8.7%	15.3%	73,118	122,383	172,094	100.0%	8.9%	18.6%	147,255	250,538	342,400	100.0%	8.8%	16.9%

Source: UN Trade Data

Appendix 3
Table 9

Southeast Asia Export Statistics (1991)

	SITC Commodity Grouping	Export Value (Mil. $)	% of Total	1989-1991 Change	Origin Distribution: Thailand (Mil. $)	Thailand Share	Singapore (Mil. $)	Singapore Share	Destination Distribution: SE Asia (Mil. $)	SE Asia Share	U.S. (Mil. $)	U.S. Share
00	LIVE ANIMALS CHIEFLY FOR FOOD	$218	0%	66%	$3	1%	$8	4%	$207	95%	$3	1%
01	MEAT AND MEAT PREPARATIONS	$527	0%	58%	$445	84%	$42	8%	$48	9%	$3	1%
02	DAIRY PRODUCTS AND BIRDS'EGGS	$208	0%	19%	$26	13%	$79	38%	$98	47%	$1	0%
03	FISH,CRUSTACEANS,MOLLUCS,PREPARATIONS THEREOF	$5,898	4%	45%	$2,958	50%	$503	9%	$347	6%	$1,264	21%
04	CEREALS AND CEREAL PREPARATIONS	$631	0%	3%	$273	51%	$148	28%	$272	51%	$23	4%
05	VEGETABLES AND FRUIT	$3,094	2%	24%	$1,619	52%	$195	6%	$337	11%	$451	15%
06	SUGAR,SUGAR PREPARATIONS AND HONEY	$934	1%	-15%	$664	71%	$23	2%	$149	16%	$115	12%
07	COFFEE,TEA,COCOA,SPICES,MANUFACTURES THEREOF	$1,831	1%	-10%	$46	3%	$473	26%	$227	12%	$386	21%
08	FEED.STUFF FOR ANIMALS(NOT INCL.UNMILLED CEREALS)	$278	0%	18%	$184	66%	$36	13%	$46	16%	$35	13%
09	MISCEL.EDIBLE PRODUCTS AND PREPARATIONS	$382	0%	44%	$101	26%	$176	46%	$72	19%	$42	11%
11	BEVERAGES	$212	0%	10%	$12	6%	$154	73%	$57	27%	$9	4%
12	TOBACCO AND TOBACCO MANUFACTURES	$840	1%	78%	$115	14%	$517	62%	$151	18%	$39	5%
21	HIDES,SKINS AND FURSKINS,RAW	$41	0%	-23%	$2	5%	$14	33%	$19	46%	$1	1%
22	OIL SEEDS AND OLEAGINOUS FRUIT	$38	0%	40%	$0	1%	$4	10%	$36	94%	$0	0%
23	CRUDE RUBBER (INCLUDING SYNTHETIC AND RECLAIMED)	$3,825	3%	-18%	$1,001	26%	$646	17%	$574	15%	$738	19%
24	CORK AND WOOD	$2,421	2%	-16%	$58	2%	$243	10%	$530	22%	$75	3%
25	PULP AND WASTE PAPER	$19	0%	-22%	$0	0%	$14	72%	$10	51%	$0	0%
26	TEXTILE FIBRES (EXCEPT WOOL TOPS) AND THEIR WASTES	$281	0%	22%	$101	36%	$68	24%	$90	32%	$13	5%
27	CRUDE FERTILIZERS AND CRUDE MATERIALS (EXCL.COAL)	$208	0%	23%	$103	49%	$33	16%	$65	31%	$1	1%
28	METALLIFEROUS ORES AND METAL SCRAP	$895	1%	-18%	$20	2%	$173	19%	$82	9%	$29	3%
29	CRUDE ANIMAL AND VEGETABLE MATERIALS,N.E.S.	$515	0%	7%	$116	23%	$182	35%	$65	13%	$34	7%
32	COAL,COKE AND BRIQUETTES	$319	0%	207%	$0	0%	$7	2%	$53	17%	$1	0%
33	PETROLEUM,PETROLEUM PRODUCTS AND RELATED MATERIALS	$11,388	7%	14%	$9	0%	$451	4%	$2,135	19%	$832	7%
34	GAS,NATURAL AND MANUFACTURED	$7,216	5%	58%	$165	2%	$93	1%	$83	1%	$113	2%
41	ANIMAL OILS AND FATS	$14	0%	227%	$0	0%	$0	1%	$0	0%	$0	0%
42	FIXED VEGETABLE OILS AND FATS	$2,251	1%	-23%	$6	0%	$180	8%	$315	14%	$256	11%
43	ANIMAL & VEGETABLE OILS AND FATS,PROCESSED & WAXES	$0	0%	-39%	$0	4%	$0	46%	$0	51%	$0	0%
51	ORGANIC CHEMICALS	$1,328	1%	68%	$85	6%	$1,092	82%	$208	16%	$437	33%
52	INORGANIC CHEMICALS	$276	0%	56%	$33	12%	$127	46%	$163	59%	$9	3%
53	DYEING,TANNING AND COLOURING MATERIALS	$344	0%	53%	$53	15%	$224	65%	$150	44%	$8	2%
54	MEDICINAL AND PHARMACEUTICAL PRODUCTS	$330	0%	22%	$38	11%	$225	68%	$97	30%	$36	11%
55	ESSENTIAL OILS & PERFUME MAT.;TOILET-CLEANSING MAT	$628	0%	57%	$82	13%	$234	37%	$294	47%	$51	8%
56	FERTILIZERS,MANUFACTURED	$492	0%	43%	$0	0%	$28	6%	$258	52%	$1	0%
58	ARTIF.RESINS,PLASTIC MAT.,CELLULOSE ESTERS/ETHERS	$1,510	1%	40%	$220	15%	$1,102	73%	$737	49%	$46	3%
59	CHEMICAL MATERIALS AND PRODUCTS,N.E.S.	$982	1%	50%	$112	11%	$502	51%	$306	31%	$79	8%
61	LEATHER,LEATHER MANUF.,N.E.S.AND DRESSED FURSKISG	$447	0%	26%	$270	61%	$40	9%	$34	8%	$93	21%
62	RUBBER MANUFACTURES,N.E.S.	$629	0%	29%	$195	31%	$131	21%	$102	16%	$89	14%
63	CORK AND WOOD MANUFACTURES (EXCL.FURNITURE)	$4,693	3%	28%	$164	3%	$314	7%	$279	6%	$533	11%
64	PAPER,PAPERBOARD,ARTIC.OF PAPER,PAPER-PULP/BOARD	$613	0%	28%	$33	5%	$201	33%	$234	38%	$33	5%
65	TEXTILE YARN,FABRICS,MADE-UPART.,RELATED PRODUCTS	$4,868	3%	55%	$1,164	24%	$1,106	23%	$1,398	29%	$364	7%
66	NON-METALLIC MINERAL MANUFACTURES,N.E.S.	$2,315	2%	33%	$1,217	53%	$384	17%	$436	19%	$381	16%
67	IRON AND STEEL	$1,188	1%	-12%	$172	14%	$507	43%	$586	49%	$52	4%
68	NON-FERROUS METALS	$1,562	1%	-38%	$65	4%	$623	40%	$554	35%	$68	4%
69	MANUFACTURES OF METAL,N.E.S.	$1,567	1%	72%	$367	23%	$718	46%	$587	37%	$165	11%
71	POWER GENERATING MACHINERY AND EQUIPMENT	$1,317	1%	32%	$152	12%	$924	70%	$432	33%	$184	14%
72	MACHINERY SPECIALIZED FOR PARTICULAR INDUSTRIES	$1,397	1%	26%	$75	5%	$1,135	81%	$837	60%	$51	4%
73	METALWORKING MACHINERY	$250	0%	59%	$40	16%	$192	77%	$128	51%	$32	13%
74	GENERAL INDUSTRIAL MACHINERY & EQUIPMENT,AND PARTS	$3,156	2%	39%	$604	19%	$1,844	58%	$1,112	35%	$399	13%

Southeast Asia Export Statistics (1991)

	SITC Commodity Grouping	Export Value (Mil. $)	% of Total	1989-1991 Change	Origin Distribution: Thailand (Mil. $)	Thailand Share	Singapore (Mil. $)	Singapore Share	Destination Distribution: SE Asia (Mil. $)	SE Asia Share	U.S. (Mil. $)	U.S. Share
75	OFFICE MACHINES & AUTOMATIC DATA PROCESSING EQUIP.	$14,137	9%	67%	$1,987	14%	$10,329	73%	$2,186	15%	$6,014	43%
76	TELECOMMUNICATIONS & SOUND RECORDING APPARATUS	$14,840	10%	72%	$1,587	11%	$6,918	47%	$3,531	24%	$4,434	30%
77	ELECTRICAL MACHINERY,APPARATUS & APPLIANCES N.E.S.	$17,533	12%	36%	$2,112	12%	$7,444	42%	$4,746	27%	$5,020	29%
78	ROAD VEHICLES (INCL. AIR CUSHION VEHICLES	$1,194	1%	61%	$304	25%	$578	48%	$334	28%	$100	8%
79	OTHER TRANSPORT EQUIPMENT	$1,024	1%	-24%	$70	7%	$663	65%	$207	20%	$188	18%
81	SANITARY,PLUMBING,HEATING,LIGHTING FIXTURES	$221	0%	76%	$66	30%	$44	20%	$53	24%	$48	22%
82	FURNITURE AND PARTS THEREOF	$1,490	1%	47%	$421	28%	$216	14%	$101	7%	$388	26%
83	TRAVEL GOODS,HANDBAGS,BRIEF-CASES,PURSES,SHEATHS	$441	0%	46%	$272	62%	$31	7%	$34	8%	$156	35%
84	ARTICLES OF APPAREL AND CLOTHING ACCESSORIES	$13,207	9%	50%	$3,767	29%	$1,771	13%	$896	7%	$4,582	35%
85	FOOTWEAR	$2,282	2%	136%	$899	39%	$87	4%	$97	4%	$776	34%
87	PROFESSIONAL,SCIENTIFIC & CONTROLING INSTRUMENTS	$1,253	1%	72%	$119	9%	$808	65%	$278	22%	$288	23%
88	PHOTOGRAPHIC APPARATUS,OPTICAL GOODS,WATCHES	$1,979	1%	89%	$374	19%	$920	47%	$373	19%	$301	15%
89	MISCELLANEOUS MANUFACTURED ARTICLES,N.E.S.	$5,607	4%	29%	$1,829	33%	$1,685	30%	$788	14%	$1,594	28%
95	ARMOURED FIGHTING VEHICLES,ARMS OF WAR & AMMUNIT.	$4	0%	131%	$1	21%	$0	0%	$0	12%	$1	16%
97	GOLD,NON-MONETARY	$379	0%	-7%	$5	1%	$95	25%	$182	48%	$9	2%
98	SPECIAL CATEGORIESSPECIAL CATEGORIES	$2,077	1%	82%	$347	17%	$769	37%	$196	9%	$326	16%
	Total - All Commodities	$151,941	100%	34%	$27,326	18%	$48,476	32%	$29,000	19%	$31,797	21%

Source: UN Trade Data

Appendix 3
Table 11

Southeast Asia to U.S. Export Statistics

Exporting Country	Air Exports (MT)	1991-1992 Growth	Air Percent of Combined Vessel/Air* Value	Air Percent of Combined Vessel/Air* Weight	Average Value ($/KG)
SINGAPORE	35,402	6%	62.2%	3.4%	$174
MALAYSIA	22,708	9%	39.8%	1.2%	$106
THAILAND	22,612	13%	25.6%	1.0%	$68
PHILIPPINES	18,994	9%	32.9%	1.6%	$59
INDONESIA	10,882	27%	8.1%	0.2%	$24
BURMA	151	85%	16.7%	2.0%	$29
BRUNEI	66	-69%	7.0%	0.1%	$28
LAOS	24	84%	64.9%	19.0%	$53
VIETNAM	0		0.0%	0.0%	$0
CAMBODIA	0	NA	0.0%	0.0%	$0
	110,839	11%	40.1%	0.9%	$104

Source: UN Trade Data, U.S. Bureau of Census Foreign Trade Statistics

Southeast Asia to U.S. Export Statistics

	SITC Commodity Grouping	Southeast Asia to U.S. Trade (1991)						World to U.S. Trade (1991)			
		Air Exports (MT)	1991-1992 Growth	Air Percent of Combined Vessel/Air* Value	Air Percent of Combined Vessel/Air* Weight	Average Value* ($/KG)	Pct. of Total Trade	Air Exports (MT)	Air Percent of Combined Vessel/Air* Value	Air Percent of Combined Vessel/Air* Weight	Average Value* ($/KG)
00	LIVE ANIMALS CHIEFLY FOR FOOD	125	-42%	100.0%	100.0%	$37	6%	1,984	99.7%	99.1%	$29
01	MEAT AND MEAT PREPARATIONS	0		0.0%	0.0%	$**,***	0%	3,864	0.9%	0.4%	$6
02	DAIRY PRODUCTS AND BIRDS'EGGS	0	NA	0.0%	0.0%	$**,***	0%	1,404	2.3%	0.9%	$7
03	FISH,CRUSTACEANS,MOLLUCS,PREPARATIONS THEREOF	5,815	-1%	2.5%	1.6%	$5	6%	90,447	10.6%	7.8%	$5
04	CEREALS AND CEREAL PREPARATIONS	1	286%	0.0%	0.0%	$21	0%	1,904	0.6%	0.1%	$2
05	VEGETABLES AND FRUIT	137	54%	0.1%	0.0%	$3	0%	59,203	2.2%	0.9%	$1
06	SUGAR,SUGAR PREPARATIONS AND HONEY	1	218%	0.0%	0.0%	$6	0%	306	0.1%	0.0%	$3
07	COFFEE,TEA,COCOA,SPICES,MANUFACTURES THEREOF	242	-27%	2.6%	0.1%	$38	10%	2,380	0.9%	0.1%	$11
08	FEED.STUFF FOR ANIMALS(NOT INCL.UNMILLED CEREALS)	14	70%	0.0%	0.0%	$0	6%	218	0.3%	0.1%	$2
09	MISCEL.EDIBLE PRODUCTS AND PREPARATIONS	22	-46%	0.7%	0.1%	$13	3%	810	3.2%	0.4%	$12
11	BEVERAGES	1	206%	0.0%	0.0%	$3	0%	3,622	0.6%	0.2%	$4
12	TOBACCO AND TOBACCO MANUFACTURES	40	-23%	1.0%	0.2%	$10	4%	1,104	1.9%	0.4%	$17
21	HIDES,SKINS AND FURSKINS,RAW	8	-53%	13.0%	0.5%	$62	2%	439	46.9%	3.9%	$64
22	OIL SEEDS AND OLEAGINOUS FRUIT	0	NA	0.0%	0.0%	$**,***	0%	196	1.5%	0.4%	$3
23	CRUDE RUBBER (INCLUDING SYNTHETIC AND RECLAIMED)	3	467%	0.0%	0.0%	$7	1%	564	0.4%	0.1%	$6
24	CORK AND WOOD	13	-91%	0.0%	0.0%	$2	1%	2,078	0.4%	0.1%	$1
25	PULP AND WASTE PAPER	0		0.0%	0.0%	$**,***	0%	142	0.0%	0.0%	$1
26	TEXTILE FIBRES (EXCEPT WOOL TOPS) AND THEIR WASTES	0	98%	0.0%	0.0%	$25	0%	573	1.3%	0.2%	$10
27	CRUDE FERTILIZERS AND CRUDE MATERIALS (EXCL.COAL)	10	994%	87.7%	2.3%	$176	0%	4,992	12.3%	0.0%	$18
28	METALLIFEROUS ORES AND METAL SCRAP	205	63%	2.6%	0.0%	$4	15%	1,333	6.6%	0.0%	$133
29	CRUDE ANIMAL AND VEGETABLE MATERIALS,N.E.S.	1,016	1%	39.4%	6.0%	$13	1%	156,839	44.6%	34.2%	$3
32	COAL,COKE AND BRIQUETTES	0		0.0%	0.0%	$**,***	0%	36	0.0%	0.0%	$0
33	PETROLEUM,PETROLEUM PRODUCTS AND RELATED MATERIALS	0	NA	0.0%	0.0%	$**,***	0%	1,170	0.0%	0.0%	$2
34	GAS,NATURAL AND MANUFACTURED	0	NA	0.0%	0.0%	$**,***	0%	3	0.0%	0.0%	$17
35	ELECTRIC CURRENT	0		***.*%	***.*%	$**,***	***%	0	***.*%	***.*%	$**,***
41	ANIMAL OILS AND FATS	0		0.0%	0.0%	$**,***	0%	420	11.5%	2.7%	$5
42	FIXED VEGETABLE OILS AND FATS	0		0.0%	0.0%	$**,***	0%	236	0.2%	0.0%	$4
43	ANIMAL & VEGETABLE OILS AND FATS,PROCESSED & WAXES	0		0.0%	0.0%	$**,***	0%	60	0.7%	0.1%	$6
51	ORGANIC CHEMICALS	377	20%	91.7%	0.7%	$1,070	3%	12,905	31.1%	0.3%	$178
52	INORGANIC CHEMICALS	0	1132%	0.7%	0.0%	$47	0%	7,227	10.1%	0.2%	$30
53	DYEING,TANNING AND COLOURING MATERIALS	2	208%	0.4%	0.0%	$18	0%	5,496	9.0%	2.3%	$19
54	MEDICINAL AND PHARMACEUTICAL PRODUCTS	245	-18%	61.6%	26.5%	$79	2%	14,852	74.3%	18.7%	$144
55	ESSENTIAL OILS & PERFUME MAT.;TOILET-CLEANSING MAT	28	15%	2.3%	0.7%	$14	0%	9,171	24.4%	6.2%	$30
56	FERTILIZERS,MANUFACTURED	0		***.*%	***.*%	$**,***	0%	268	0.0%	0.0%	$1
58	ARTIF.RESINS,PLASTIC MAT.;CELLULOSE ESTERS/ETHERS	102	-4%	1.3%	0.3%	$7	1%	12,547	7.5%	1.4%	$14
59	CHEMICAL MATERIALS AND PRODUCTS,N.E.S.	219	-19%	67.3%	0.8%	$225	1%	18,017	23.2%	3.6%	$20
61	LEATHER,LEATHER MANUF.,N.E.S.AND DRESSED FURSKISG	210	20%	15.6%	2.3%	$40	2%	9,062	42.8%	17.0%	$30
62	RUBBER MANUFACTURES,N.E.S.	256	9%	2.6%	0.6%	$9	4%	6,916	5.3%	0.9%	$18
63	CORK AND WOOD MANUFACTURES (EXCL.FURNITURE)	615	-14%	0.9%	0.1%	$7	19%	3,262	2.4%	0.3%	$9
64	PAPER,PAPERBOARD,ARTIC.OF PAPER,PAPER-PULP/BOARD	240	-2%	3.7%	1.8%	$6	3%	8,688	2.6%	0.3%	$8
65	TEXTILE YARN,FABRICS,MADE-UPART.,RELATED PRODUCTS	675	-5%	5.7%	0.9%	$28	1%	59,430	22.0%	5.8%	$23
66	NON-METALLIC MINERAL MANUFACTURES,N.E.S.	820	-17%	56.6%	1.0%	$245	3%	26,293	58.4%	0.3%	$181
67	IRON AND STEEL	3	42%	0.1%	0.0%	$11	0%	2,978	0.4%	0.0%	$9
68	NON-FERROUS METALS	30	-46%	6.1%	0.3%	$102	1%	5,746	43.7%	0.7%	$327
69	MANUFACTURES OF METAL,N.E.S.	941	-25%	6.6%	1.8%	$10	3%	34,281	14.0%	1.6%	$28
71	POWER GENERATING MACHINERY AND EQUIPMENT	1,051	-37%	54.6%	9.6%	$72	3%	30,286	46.8%	3.2%	$168
72	MACHINERY SPECIALIZED FOR PARTICULAR INDUSTRIES	128	-21%	41.8%	7.7%	$57	0%	30,482	18.6%	3.4%	$57
73	METALWORKING MACHINERY	48	14%	5.1%	1.8%	$30	1%	8,032	14.0%	3.4%	$56

Southeast Asia to U.S. Export Statistics

	SITC Commodity Grouping	Southeast Asia to U.S. Trade (1991)						World to U.S. Trade (1991)			
		Air Exports (MT)	1991-1992 Growth	Air Percent of Combined Vessel/Air* Value	Air Percent of Combined Vessel/Air* Weight	Average Value* ($/KG)	Pct. of Total Trade	Air Exports (MT)	Air Percent of Combined Vessel/Air* Value	Air Percent of Combined Vessel/Air* Weight	Average Value* ($/KG)
74	GENERAL INDUSTRIAL MACHINERY & EQUIPMENT,AND PARTS	1,295	-29%	12.3%	1.6%	$40	2%	68,955	20.3%	5.2%	$33
75	OFFICE MACHINES & AUTOMATIC DATA PROCESSING EQUIP.	22,669	22%	74.3%	32.8%	$188	24%	92,895	49.6%	13.6%	$147
76	TELECOMMUNICATIONS & SOUND RECORDING APPARATUS	7,458	-17%	12.9%	3.6%	$67	17%	43,922	19.5%	5.5%	$88
77	ELECTRICAL MACHINERY,APPARATUS & APPLIANCES N.E.S.	20,548	18%	86.3%	19.8%	$202	16%	125,864	64.6%	10.9%	$135
78	ROAD VEHICLES (INCL. AIR CUSHION VEHICLES	167	114%	7.7%	1.1%	$33	1%	29,502	1.2%	0.4%	$19
79	OTHER TRANSPORT EQUIPMENT	184	-52%	74.7%	23.7%	$202	2%	8,330	55.6%	13.7%	$236
81	SANITARY,PLUMBING,HEATING,LIGHTING FIXTURES	324	-42%	6.3%	3.3%	$7	9%	3,486	5.7%	1.4%	$17
82	FURNITURE AND PARTS THEREOF	265	-13%	0.7%	0.2%	$9	3%	9,120	4.5%	0.8%	$16
83	TRAVEL GOODS,HANDBAGS,BRIEF-CASES,PURSES,SHEATHS	629	20%	5.8%	2.9%	$12	4%	14,727	20.0%	5.7%	$31
84	ARTICLES OF APPAREL AND CLOTHING ACCESSORIES	30,344	18%	18.3%	11.8%	$21	10%	290,222	31.9%	19.5%	$27
85	FOOTWEAR	4,137	-17%	6.0%	4.9%	$11	6%	64,835	13.3%	7.5%	$19
87	PROFESSIONAL,SCIENTIFIC & CONTROLING INSTRUMENTS	1,770	12%	38.6%	13.7%	$53	5%	33,068	61.4%	21.4%	$105
88	PHOTOGRAPHIC APPARATUS,OPTICAL GOODS,WATCHES	1,252	9%	72.2%	43.7%	$162	4%	30,185	54.1%	14.1%	$126
89	MISCELLANEOUS MANUFACTURED ARTICLES,N.E.S.	4,862	11%	24.7%	2.1%	$79	4%	121,315	31.2%	4.4%	$56
95	ARMOURED FIGHTING VEHICLES,ARMS OF WAR & AMMUNIT.	2	231%	24.2%	7.7%	$39	0%	2,083	69.0%	13.8%	$108
97	GOLD,NON-MONETARY	2	0%	74.8%	4.7%	$1,747	1%	299	99.8%	64.5%	$5,039
99	SPECIAL CATEGORIESSPECIAL CATEGORIES	1,287	-3%	64.5%	7.4%	$168	4%	30,107	81.4%	10.9%	$192
		110,839	11%	40.1%	0.9%	$104	7%	1,611,181	26.7%	0.4%	$59

Source: U.S. Bureau of Census Foreign Trade Statistics

1981-91 Thailand Trade Summary by Country/IATA World Area (UN Data)

(Millions of U.S. Dollars)

Country	Export 1981	Export 1989	Export 1991	Export % of 1991 Total	Export Average Annual Growth 1981-91	Export Average Annual Growth 1989-91	Import 1981	Import 1989	Import 1991	Import % of 1991 Total	Import Average Annual Growth 1981-91	Import Average Annual Growth 1989-91	Total 1981	Total 1989	Total 1991	Total % of 1991 Total	Total Average Annual Growth 1981-91	Total Average Annual Growth 1989-91
SINGAPORE	542	1,320	2,264	7.8%	15.4%	30.9%	842	2,368	3,290	9.3%	14.6%	17.9%	1,384	3,689	5,554	8.6%	14.9%	22.7%
MALAYSIA	377	644	698	2.4%	6.4%	4.1%	218	607	1,190	3.4%	18.5%	40.1%	595	1,251	1,888	2.9%	12.2%	22.9%
INDONESIA	129	184	248	0.9%	6.7%	15.8%	27	258	243	0.7%	24.8%	-3.0%	155	442	490	0.8%	12.2%	5.3%
MYANMAR	5	26	59	0.2%	28.3%	51.9%	15	84	187	0.5%	29.1%	49.5%	19	109	247	0.4%	28.9%	50.1%
BRUNEI	13	31	29	0.1%	8.2%	-3.8%	135	187	187	0.5%	3.3%	0.2%	148	218	216	0.3%	3.8%	-0.4%
PHILIPPINES	28	107	107	0.4%	14.2%	0.2%	26	100	98	0.3%	14.1%	-1.3%	55	207	205	0.3%	14.1%	-0.6%
VIETNAM	0	17	23	0.1%	51.6%	16.8%	0	46	116	0.3%	76.8%	59.4%	1	62	139	0.2%	68.7%	49.2%
LAOS	28	66	78	0.3%	10.9%	9.0%	1	50	47	0.1%	50.5%	-3.0%	29	116	125	0.2%	15.9%	4.0%
CAMBODIA	5	0	5	0.0%	-0.5%	>99.9%	0	3	12	0.0%	>99.9%	82.8%	5	4	16	0.0%	12.8%	>99.9%
THAILAND	0	0	0	0.0%	N/A	N/A	0	0	0	0.0%	N/A	N/A	0	0	0	0.0%	N/A	N/A
Southeast Asia	1,127	2,395	3,510	12.1%	12.0%	21.0%	1,264	3,703	5,370	15.1%	15.6%	20.4%	2,391	6,098	8,880	13.8%	14.0%	20.7%
North America	977	4,861	6,646	22.9%	21.1%	16.9%	1,227	2,907	4,229	11.9%	13.2%	20.6%	2,204	7,769	10,875	16.9%	17.3%	18.3%
Caribbean	2	52	46	0.2%	36.2%	-6.5%	2	6	2	0.0%	2.7%	-36.9%	4	58	48	0.1%	28.7%	-9.1%
Central America	4	134	228	0.8%	49.3%	30.3%	18	50	84	0.2%	16.8%	29.9%	22	184	313	0.5%	30.3%	30.2%
Upper South America	0	22	33	0.1%	64.0%	23.9%	4	25	27	0.1%	21.4%	4.1%	4	47	60	0.1%	30.7%	13.7%
Lower South America	23	5	52	0.2%	8.5%	>99.9%	58	321	471	1.3%	23.3%	21.2%	81	325	523	0.8%	20.6%	26.8%
Central/Western Africa	238	270	427	1.5%	6.0%	25.8%	6	82	160	0.4%	38.2%	39.1%	244	353	587	0.9%	9.2%	29.0%
Eastern Africa	37	104	123	0.4%	12.7%	8.9%	2	12	20	0.1%	27.5%	29.1%	39	116	143	0.2%	13.9%	11.2%
Northeastern Africa	2	67	101	0.3%	46.8%	23.1%	2	52	107	0.3%	46.1%	43.5%	5	119	208	0.3%	46.5%	32.4%
Northwestern Africa	75	65	4	0.0%	-25.3%	-75.0%	0	4	24	0.1%	N/A	>99.9%	75	68	28	0.0%	-9.3%	-35.7%
Southern Africa	13	109	156	0.5%	28.2%	19.8%	28	111	168	0.5%	19.6%	22.7%	41	220	324	0.5%	22.9%	21.3%
Western Europe	1,739	4,572	6,778	23.4%	14.6%	21.8%	1,306	3,895	5,940	16.7%	16.4%	23.5%	3,046	8,467	12,718	19.7%	15.4%	22.6%
Eastern/Central Europe	369	310	558	1.9%	4.2%	34.2%	91	313	581	1.6%	20.3%	36.3%	461	623	1,139	1.8%	9.5%	35.2%
Middle East	616	1,165	1,332	4.6%	8.0%	6.9%	1,918	926	1,189	3.3%	-4.7%	13.3%	2,534	2,092	2,521	3.9%	-0.1%	9.8%
South Asia	88	397	313	1.1%	13.6%	-11.2%	74	484	1,086	3.1%	30.9%	49.9%	161	881	1,400	2.2%	24.1%	26.1%
Northeast Asia	1,838	5,670	8,014	27.6%	15.9%	18.9%	3,309	10,728	15,349	43.2%	16.6%	19.6%	5,147	16,398	23,363	36.2%	16.3%	19.4%
Southwest Pacific	92	430	557	1.9%	19.7%	13.6%	225	515	714	2.0%	12.2%	17.7%	317	945	1,271	2.0%	14.9%	16.0%
All Other	7	77	114	0.4%	32.9%	22.0%	0	0	0	0.0%	N/A	N/A	7	77	114	0.2%	32.9%	22.0%
	7,248	20,706	28,993	100.0%	14.9%	18.3%	9,534	24,133	35,522	100.0%	14.1%	21.3%	16,782	44,839	64,515	100.0%	14.4%	20.0%

Source: UN Trade Data

Appendix 3
Table 13

1981-91 Thailand Trade Summary (UN Data) - Top 40 Trade Partners

Country	Export 1981	Export 1989	Export 1991	Export % of 1991 Total	Export Average Annual Growth 1981-91	Export Average Annual Growth 1989-91	Import 1981	Import 1989	Import 1991	Import % of 1991 Total	Import Average Annual Growth 1981-91	Import Average Annual Growth 1989-91	Total 1981	Total 1989	Total 1991	Total % of 1991 Total	Total Average Annual Growth 1981-91	Total Average Annual Growth 1989-91
							(Millions of U.S. Dollars)											
JAPAN	1,036	3,509	5,230	18.0%	17.6%	22.1%	2,412	7,254	10,052	28.3%	15.3%	17.7%	3,448	10,763	15,283	23.7%	16.1%	19.2%
USA	945	4,537	6,245	21.5%	20.8%	17.3%	1,109	2,607	3,935	11.1%	13.5%	22.8%	2,054	7,145	10,180	15.8%	17.4%	19.4%
SINGAPORE	542	1,320	2,264	7.8%	15.4%	30.9%	842	2,368	3,290	9.3%	14.6%	17.9%	1,384	3,689	5,554	8.6%	14.9%	22.7%
GERMANY	417	1,019	1,683	5.8%	15.0%	28.5%	302	1,029	1,764	5.0%	19.3%	31.0%	719	2,048	3,448	5.3%	17.0%	29.8%
HONG KONG	341	812	1,411	4.9%	15.3%	31.8%	223	811	1,148	3.2%	17.8%	19.0%	564	1,623	2,559	4.0%	16.3%	25.6%
TAIWAN	102	327	483	1.7%	16.8%	21.6%	206	1,288	1,790	5.0%	24.1%	17.9%	308	1,614	2,272	3.5%	22.1%	18.6%
SOUTH KOREA	162	352	495	1.7%	11.8%	18.5%	142	807	1,508	4.2%	26.6%	36.7%	304	1,160	2,003	3.1%	20.7%	31.4%
MALAYSIA	377	644	698	2.4%	6.4%	4.1%	218	607	1,190	3.4%	18.5%	40.1%	595	1,251	1,888	2.9%	12.2%	22.9%
UNITED KINGDOM	111	780	1,033	3.6%	25.0%	15.1%	201	671	758	2.1%	14.2%	6.3%	312	1,451	1,791	2.8%	19.1%	11.1%
FRANCE	231	564	885	3.1%	14.4%	25.2%	206	376	516	1.5%	9.6%	17.1%	437	941	1,401	2.2%	12.4%	22.0%
CHINA (MAINLAND)	194	663	373	1.3%	6.8%	-25.0%	321	549	834	2.3%	10.0%	23.3%	514	1,212	1,206	1.9%	8.9%	-0.2%
NETHERLANDS	561	579	827	2.9%	4.0%	19.5%	110	185	277	0.8%	9.7%	22.4%	671	764	1,104	1.7%	5.1%	20.2%
AUSTRALIA	82	377	468	1.6%	19.0%	11.4%	179	457	599	1.7%	12.8%	14.5%	261	833	1,066	1.7%	15.1%	13.1%
ITALY	127	339	561	1.9%	16.0%	28.7%	85	335	484	1.4%	19.0%	20.2%	212	674	1,045	1.6%	17.3%	24.6%
INDIA	23	93	65	0.2%	11.1%	-16.9%	58	319	938	2.6%	32.0%	71.4%	81	413	1,002	1.6%	28.6%	55.9%
BELGIUM	92	279	384	1.3%	15.3%	17.3%	74	355	563	1.6%	22.5%	26.0%	167	633	946	1.5%	19.0%	22.2%
SAUDI ARABIA	188	353	455	1.6%	9.2%	13.6%	1,416	120	413	1.2%	-11.6%	85.5%	1,604	473	869	1.3%	-5.9%	35.5%
SWITZERLAND	81	212	272	0.9%	13.0%	13.4%	70	313	527	1.5%	22.4%	29.8%	151	525	800	1.2%	18.2%	23.4%
CANADA	32	324	400	1.4%	28.9%	11.1%	118	300	295	0.8%	9.6%	-0.9%	149	624	695	1.1%	16.6%	5.5%
UNITED ARAB EMIRAT	69	343	392	1.4%	19.0%	6.9%	122	286	297	0.8%	9.3%	1.8%	191	629	688	1.1%	13.7%	4.6%
POLAND	5	16	457	1.6%	58.5%	>99.9%	12	29	126	0.4%	26.9%	>99.9%	16	45	584	0.9%	43.1%	>99.9%
SPAIN	25	188	395	1.4%	31.7%	45.1%	21	94	130	0.4%	20.0%	17.7%	46	281	525	0.8%	27.5%	36.6%
INDONESIA	129	184	248	0.9%	6.7%	15.8%	27	258	243	0.7%	24.8%	-3.0%	155	442	490	0.8%	12.2%	5.3%
SWEDEN	27	114	161	0.6%	19.4%	18.7%	64	179	276	0.8%	15.7%	24.2%	92	293	437	0.7%	16.9%	22.1%
BRAZIL	22	1	27	0.1%	1.9%	>99.9%	52	245	303	0.9%	19.3%	11.3%	74	246	330	0.5%	16.1%	15.8%
SOVIET UNION	323	275	75	0.3%	-13.6%	-47.8%	15	83	252	0.7%	32.5%	74.1%	338	358	327	0.5%	-0.3%	-4.5%
AUSTRIA	9	79	113	0.4%	28.3%	19.6%	36	44	164	0.5%	16.5%	94.2%	45	122	277	0.4%	19.9%	50.4%
DENMARK	28	92	125	0.4%	16.0%	16.3%	32	59	135	0.4%	15.4%	51.3%	61	151	260	0.4%	15.7%	31.1%
MYANMAR	5	26	59	0.2%	28.3%	51.9%	15	84	187	0.5%	29.1%	49.5%	19	109	247	0.4%	28.9%	50.1%
IRAN	220	173	78	0.3%	-9.8%	-32.9%	12	56	150	0.4%	28.6%	62.8%	232	230	228	0.4%	-0.2%	-0.5%
BRUNEI	13	31	29	0.1%	8.2%	-3.8%	135	187	187	0.5%	3.3%	0.2%	148	218	216	0.3%	3.8%	-0.4%
PHILIPPINES	28	107	107	0.4%	14.2%	0.2%	26	100	98	0.3%	14.1%	-1.3%	55	207	205	0.3%	14.1%	-0.6%
FINLAND	9	66	73	0.3%	23.0%	5.2%	15	45	120	0.3%	22.8%	63.9%	25	111	194	0.3%	22.9%	32.0%
PAKISTAN	23	55	78	0.3%	12.9%	18.4%	12	104	112	0.3%	24.7%	4.2%	36	159	190	0.3%	18.3%	9.3%
OMAN	9	16	23	0.1%	9.6%	19.0%	0	55	161	0.5%	N/A	70.2%	9	72	184	0.3%	34.8%	60.0%
NORWAY	12	35	51	0.2%	15.8%	19.8%	49	100	125	0.4%	9.8%	11.4%	60	136	175	0.3%	11.2%	13.6%
ISRAEL	6	29	56	0.2%	25.1%	39.0%	12	91	115	0.3%	25.4%	12.3%	18	120	171	0.3%	25.3%	19.3%
MEXICO	0	18	96	0.3%	80.4%	>99.9%	11	45	75	0.2%	21.6%	29.5%	11	63	171	0.3%	31.8%	65.1%
NEW ZEALAND	7	34	53	0.2%	22.1%	24.8%	46	55	106	0.3%	8.8%	38.2%	53	90	159	0.2%	11.7%	33.2%
VIETNAM	0	17	23	0.1%	51.6%	16.8%	0	46	116	0.3%	76.8%	59.4%	1	62	139	0.2%	68.7%	49.2%
Total - All Coutnries	7,248	20,706	28,993	100.0%	14.9%	18.3%	9,534	24,133	35,522	100.0%	14.1%	21.3%	16,782	44,839	64,515	100.0%	14.4%	20.0%

Source: UN Trade Data

Appendix 3
Table 14

IMPORTS AND EXPORTS BY MODE 1982-1991

	Sea	% of Total	Land	% of Total	Air	% of Total	Mail	% of Total	Total
					Imports				
82	184,991	91.6%	723	0.4%	15,362	7.6%	808	0.4%	201,884
83	216,598	91.4%	952	0.4%	18,581	7.8%	945	0.4%	237,076
84	217,642	88.8%	933	0.4%	25,544	10.4%	1,007	0.4%	245,126
85	222,909	88.7%	776	0.3%	26,732	10.6%	976	0.4%	251,393
86	197,156	81.7%	1,059	0.4%	42,118	17.5%	922	0.4%	241,255
87	269,983	80.6%	1,686	0.5%	62,091	18.5%	1,094	0.3%	334,854
88	399,031	79.3%	2,815	0.6%	100,124	19.9%	1,423	0.3%	503,393
89	536,395	81.0%	5,120	0.8%	119,274	18.0%	1,815	0.3%	662,604
90	679,211	79.6%	8,239	1.0%	163,459	19.2%	2,070	0.2%	852,979
91	746,263	77.8%	19,445	2.0%	192,071	20.0%	1,618	0.2%	959,397
Avg. Annual Growth									
1982-91	16.8%		44.2%		32.4%		8.0%		18.9%
1986-91	30.5%		79.0%		35.5%		11.9%		31.8%
					Exports				
82	136,731	84.2%	3,578	2.2%	20,086	12.4%	2,036	1.3%	162,431
83	129,102	86.8%	5,388	3.6%	12,737	8.6%	1,444	1.0%	148,671
84	143,115	81.4%	5,748	3.3%	24,816	14.1%	2,213	1.3%	175,892
85	155,439	80.3%	7,099	3.7%	28,572	14.8%	2,394	1.2%	193,504
86	179,608	77.8%	7,561	3.3%	41,828	18.1%	2,005	0.9%	231,002
87	224,217	74.8%	8,198	2.7%	65,104	21.7%	2,165	0.7%	299,684
88	298,596	74.0%	11,606	2.9%	90,634	22.5%	2,620	0.6%	403,456
89	384,450	74.5%	13,890	2.7%	115,435	22.4%	2,072	0.4%	515,847
90	437,278	74.1%	13,858	2.3%	136,637	23.2%	2,021	0.3%	589,794
91	540,491	74.5%	17,268	2.4%	165,728	22.8%	1,960	0.3%	725,447
Avg. Annual Growth									
1982-91	16.5%		19.1%		26.4%		-0.4%		18.1%
1986-91	24.7%		18.0%		31.7%		-0.5%		25.7%
					Imports + Exports				
82	321,722	88.3%	4,301	1.2%	35,448	9.7%	2,844	0.8%	364,315
83	345,700	89.6%	6,340	1.6%	31,318	8.1%	2,389	0.6%	385,747
84	360,757	85.7%	6,681	1.6%	50,360	12.0%	3,220	0.8%	421,018
85	378,348	85.0%	7,875	1.8%	55,304	12.4%	3,370	0.8%	444,897
86	376,764	79.8%	8,620	1.8%	83,946	17.8%	2,927	0.6%	472,257
87	494,200	77.9%	9,884	1.6%	127,195	20.0%	3,259	0.5%	634,538
88	697,627	76.9%	14,421	1.6%	190,758	21.0%	4,043	0.4%	906,849
89	920,845	78.1%	19,010	1.6%	234,709	19.9%	3,887	0.3%	1,178,451
90	1,116,489	77.4%	22,097	1.5%	300,096	20.8%	4,091	0.3%	1,442,773
91	1,286,754	76.4%	36,713	2.2%	357,799	21.2%	3,578	0.2%	1,684,844
Avg. Annual Growth									
1982-91	16.7%		26.9%		29.3%		2.6%		18.5%
1986-91	27.8%		33.6%		33.6%		4.1%		29.0%

IMPORTS AND EXPORTS BY MODE 1982-1991

	Sea	% of Total	Land	% of Total	Air	% of Total	Mail	% of Total	Total
					WEIGHT (Tons)				
					Imports				
82	15,736	99.0%	154	1.0%	8	0.1%	0	0.0%	15,898
83	20,032	99.3%	130	0.6%	19	0.1%	1	0.0%	20,182
84	18,908	99.2%	122	0.6%	27	0.1%	3	0.0%	19,060
85	18,092	99.3%	109	0.6%	26	0.1%	0	0.0%	18,227
86	18,820	99.2%	123	0.6%	35	0.2%	1	0.0%	18,979
87	22,688	99.0%	207	0.9%	23	0.1%	2	0.0%	22,920
88	26,144	98.3%	378	1.4%	60	0.2%	1	0.0%	26,583
89	32,577	97.1%	851	2.5%	132	0.4%	3	0.0%	33,563
90	39,867	95.7%	1,283	3.1%	456	1.1%	53	0.1%	41,659
91	45,402	96.0%	1,572	3.3%	278	0.6%	20	0.0%	47,272
Avg. Annual Growth									
1982-91	12.5%		29.5%		48.3%		NA		12.9%
1986-91	19.3%		66.5%		51.4%		82.1%		20.0%
					Exports				
82	21,110	96.6%	604	2.8%	146	0.7%	0	0.0%	21,860
83	17,101	95.7%	666	3.7%	94	0.5%	0	0.0%	17,861
84	20,266	95.4%	659	3.1%	308	1.5%	6	0.0%	21,239
85	21,737	95.9%	777	3.4%	159	0.7%	5	0.0%	22,678
86	23,368	96.0%	823	3.4%	144	0.6%	0	0.0%	24,335
87	22,506	96.0%	675	2.9%	261	1.1%	0	0.0%	23,442
88	27,204	96.0%	755	2.7%	379	1.3%	1	0.0%	28,339
89	32,009	94.0%	1,120	3.3%	908	2.7%	14	0.0%	34,051
90	29,565	94.8%	991	3.2%	619	2.0%	20	0.1%	31,195
91	30,649	94.0%	1,234	3.8%	719	2.2%	1	0.0%	32,603
Avg. Annual Growth									
1982-91	4.2%		8.3%		19.4%		NA		4.5%
1986-91	5.6%		8.4%		37.9%		NA		6.0%
					Imports + Exports				
82	36,846	97.6%	758	2.0%	154	0.4%	0	0.0%	37,758
83	37,133	97.6%	796	2.1%	113	0.3%	1	0.0%	38,043
84	39,174	97.2%	781	1.9%	335	0.8%	9	0.0%	40,299
85	39,829	97.4%	886	2.2%	185	0.5%	5	0.0%	40,905
86	42,188	97.4%	946	2.2%	179	0.4%	1	0.0%	43,314
87	45,194	97.5%	882	1.9%	284	0.6%	2	0.0%	46,362
88	53,348	97.1%	1,133	2.1%	439	0.8%	2	0.0%	54,922
89	64,586	95.5%	1,971	2.9%	1,040	1.5%	17	0.0%	67,614
90	69,432	95.3%	2,274	3.1%	1,075	1.5%	73	0.1%	72,854
91	76,051	95.2%	2,806	3.5%	997	1.2%	21	0.0%	79,875
Avg. Annual Growth									
1982-91	8.4%		15.7%		23.1%		NA		8.7%
1986-91	12.5%		24.3%		41.0%		83.8%		13.0%

IMPORTS AND EXPORTS BY MODE 1982-1991

	Sea	% of Total	Land	% of Total	Air	% of Total	Mail	% of Total	Total
	UNIT VALUE (000 BAHT/KG)								
	Imports								
82	11.8	92.6%	4.7	37.0%	1,920.3	15121.6%	NA	NA	12.7
83	10.8	92.0%	7.3	62.3%	977.9	8325.2%	945.0	8044.7%	11.7
84	11.5	89.5%	7.6	59.5%	946.1	7356.3%	335.7	2610.0%	12.9
85	12.3	89.3%	7.1	51.6%	1,028.2	7454.5%	NA	NA	13.8
86	10.5	82.4%	8.6	67.7%	1,203.4	9466.7%	922.0	7253.2%	12.7
87	11.9	81.5%	8.1	55.8%	2,699.6	18478.2%	547.0	3744.1%	14.6
88	15.3	80.6%	7.4	39.3%	1,668.7	8812.2%	1,423.0	7514.5%	18.9
89	16.5	83.4%	6.0	30.5%	903.6	4577.0%	605.0	3064.5%	19.7
90	17.0	83.2%	6.4	31.4%	358.5	1750.7%	39.1	190.8%	20.5
91	16.4	81.0%	12.4	60.9%	690.9	3404.3%	80.9	398.6%	20.3
Avg. Annual Growth									
1982-91	3.8%		11.4%		-10.7%		NA		5.3%
1986-91	9.4%		7.5%		-10.5%		-38.5%		9.8%
	Exports								
82	6.5	87.2%	5.9	79.7%	137.6	1851.5%	NA	NA	7.4
83	7.5	90.7%	8.1	97.2%	135.5	1627.9%	NA	NA	8.3
84	7.1	85.3%	8.7	105.3%	80.6	972.9%	368.8	4453.7%	8.3
85	7.2	83.8%	9.1	107.1%	179.7	2106.0%	478.8	5611.4%	8.5
86	7.7	81.0%	9.2	96.8%	290.5	3060.0%	NA	NA	9.5
87	10.0	77.9%	12.1	95.0%	249.4	1951.2%	NA	NA	12.8
88	11.0	77.1%	15.4	108.0%	239.1	1679.7%	2,620.0	18403.0%	14.2
89	12.0	79.3%	12.4	81.9%	127.1	839.2%	148.0	976.9%	15.1
90	14.8	78.2%	14.0	74.0%	220.7	1167.5%	101.1	534.5%	18.9
91	17.6	79.3%	14.0	62.9%	230.5	1035.9%	1,960.0	8808.6%	22.3
Avg. Annual Growth									
1982-91	11.8%		10.0%		5.9%		NA		13.0%
1986-91	18.1%		8.8%		-4.5%		NA		18.6%
	Imports + Exports								
82	8.7	90.5%	5.7	58.8%	230.2	2385.6%	NA	NA	9.6
83	9.3	91.8%	8.0	78.6%	277.2	2733.3%	2,389.0	23560.7%	10.1
84	9.2	88.1%	8.6	81.9%	150.3	1438.9%	357.8	3424.6%	10.4
85	9.5	87.3%	8.9	81.7%	298.9	2748.5%	674.0	6196.9%	10.9
86	8.9	81.9%	9.1	83.6%	469.0	4301.3%	2,927.0	26845.6%	10.9
87	10.9	79.9%	11.2	81.9%	447.9	3272.3%	1,629.5	11905.8%	13.7
88	13.1	79.2%	12.7	77.1%	434.5	2631.7%	2,021.5	12242.9%	16.5
89	14.3	81.8%	9.6	55.3%	225.7	1294.9%	228.6	1311.9%	17.4
90	16.1	81.2%	9.7	49.1%	279.2	1409.6%	56.0	283.0%	19.8
91	16.9	80.2%	13.1	62.0%	358.9	1701.4%	170.4	807.7%	21.1
Avg. Annual Growth									
1982-91	7.6%		9.7%		5.1%		NA		9.1%
1986-91	13.6%		7.5%		-5.2%		-43.4%		14.1%

Source: Kingdom of Thailand, Ministry of Transportation and Communications, Transport Statistics

THAILAND EXPORT TRADE - TOTAL AND AIR (1991)

2-digit Harmonized Schedule Commodity Group	Shipping Value (Mil. US $)			Shipping Weight (000 MT)			Average Value ($) per KG		
	All Modes	Air	Air Pct.	All Modes	Air	Air Pct.	All Modes	Air	Air Pct.
01 LIVE ANIMALS	$2.7	$1.8	67.1%	1	0	44.6%	$3.98	$5.99	150.6%
02 MEAT AND EDIBLE MEAT OFFAL	$416.3	$2.4	0.6%	169	1	0.7%	$2.46	$2.19	88.8%
03 FISH, CRUSTACEANS & AQUATIC INVERTEBRATES	$1,708.8	$34.9	2.0%	469	10	2.1%	$3.64	$3.53	96.9%
04 DAIRY PRODS; BIRDS EGGS; HONEY; ED ANIMAL PR NESOI	$28.3	$2.3	8.2%	22	0	1.7%	$1.27	$6.03	474.0%
05 PRODUCTS OF ANIMAL ORIGIN, NESOI	$21.4	$1.1	5.2%	25	0	0.5%	$0.86	$8.32	972.9%
06 LIVE TREES, PLANTS, BULBS ETC.; CUT FLOWERS ETC.	$33.5	$29.9	89.2%	16	13	84.8%	$2.11	$2.21	105.2%
07 EDIBLE VEGETABLES & CERTAIN ROOTS & TUBERS	$882.8	$22.9	2.6%	6,591	45	0.7%	$0.13	$0.51	380.1%
08 EDIBLE FRUIT & NUTS; CITRUS FRUIT OR MELON PEEL	$63.1	$18.3	29.0%	91	29	32.2%	$0.69	$0.62	89.9%
09 COFFEE, TEA, MATE & SPICES	$41.2	$0.6	1.5%	49	1	1.3%	$0.84	$0.96	114.4%
10 CEREALS	$1,372.0	$12.5	0.9%	5,692	46	0.8%	$0.24	$0.27	113.1%
11 MILLING PRODUCTS; MALT; STARCH; INULIN; WHT GLUTEN	$169.1	$2.2	1.3%	673	9	1.4%	$0.25	$0.24	95.8%
12 OIL SEEDS ETC.; MISC GRAIN, SEED, FRUIT, PLANT ETC	$49.4	$15.1	30.6%	36	4	10.4%	$1.38	$4.07	294.1%
13 LAC; GUMS, RESINS & OTHER VEGETABLE SAP & EXTRACT	$14.6	$0.2	1.1%	10	0	1.3%	$1.43	$1.21	84.4%
14 VEGETABLE PLAITING MATERIALS & PRODUCTS NESOI	$11.0	$0.0	0.4%	18	0	1.7%	$0.59	$0.15	26.0%
15 ANIMAL OR VEGETABLE FATS, OILS ETC. & WAXES	$7.1	$0.0	0.2%	10	0	0.0%	$0.70	$13.18	***.*%
16 EDIBLE PREPARATIONS OF MEAT, FISH, CRUSTACEANS ETC	$1,209.8	$3.4	0.3%	440	1	0.3%	$2.75	$3.08	111.9%
17 SUGARS AND SUGAR CONFECTIONARY	$654.0	$15.8	2.4%	3,958	72	1.8%	$0.17	$0.22	133.7%
18 COCOA AND COCOA PREPARATIONS	$5.4	$0.1	2.4%	2	0	2.0%	$2.62	$3.22	123.0%
19 PREP CEREAL, FLOUR, STARCH OR MILK; BAKERS WARES	$56.3	$0.5	0.9%	52	0	1.0%	$1.08	$0.97	89.2%
20 PREP VEGETABLES, FRUIT, NUTS OR OTHER PLANT PARTS	$693.3	$1.1	0.2%	835	1	0.1%	$0.83	$1.13	136.6%
21 MISCELLANEOUS EDIBLE PREPARATIONS	$97.1	$1.4	1.5%	73	1	0.8%	$1.33	$2.57	192.8%
22 BEVERAGES, SPIRITS AND VINEGAR	$39.8	$0.1	0.2%	72	0	0.5%	$0.55	$0.27	48.9%
23 FOOD INDUSTRY RESIDUES & WASTE; PREP ANIMAL FEED	$191.1	$0.8	0.4%	334	1	0.2%	$0.57	$1.20	210.4%
24 TOBACCO AND MANUFACTURED TOBACCO SUBSTITUTES	$113.2	$0.1	0.1%	44	0	0.2%	$2.59	$0.87	33.5%
25 SALT; SULFUR; EARTH & STONE; LIME & CEMENT PLASTER	$91.9	$0.8	0.9%	6,906	2	0.0%	$0.01	$0.42	***.*%
26 ORES, SLAG AND ASH	$18.6	$0.1	0.3%	69	0	0.0%	$0.27	$2.50	932.8%
27 MINERAL FUEL, OIL ETC.; BITUMIN SUBST; MINERAL WAX	$283.3	$104.1	36.8%	1,335	361	27.1%	$0.21	$0.29	135.8%
28 INORG CHEM; PREC & RARE-EARTH MET & RADIOACT COMPD	$32.4	$0.1	0.3%	62	0	0.1%	$0.52	$1.10	211.9%
29 ORGANIC CHEMICALS	$100.4	$1.3	1.3%	69	0	0.6%	$1.46	$3.21	220.6%
30 PHARMACEUTICAL PRODUCTS	$31.4	$8.6	27.4%	7	0	2.4%	$4.69	$53.06	***.*%
31 FERTILIZERS	$0.1	$0.0	1.4%	0	0	0.0%	$0.21	$*,***.**	********
32 TANNING & DYE EXT ETC; DYE, PAINT, PUTTY ETC; INKS	$53.1	$0.9	1.8%	14	0	0.8%	$3.70	$7.95	215.0%
33 ESSENTIAL OILS ETC; PERFUMERY, COSMETIC ETC PREPS	$65.9	$5.2	7.9%	6	0	5.1%	$10.17	$15.86	155.9%
34 SOAP ETC; WAXES, POLISH ETC; CANDLES; DENTAL PREPS	$29.5	$0.6	2.1%	27	0	0.5%	$1.08	$4.84	446.8%
35 ALBUMINOIDAL SUBST; MODIFIED STARCH; GLUE; ENZYMES	$73.2	$4.4	6.0%	150	1	0.5%	$0.49	$6.10	***.*%
36 EXPLOSIVES; PYROTECHNICS; MATCHES; PYRO ALLOYS ETC	$3.2	$0.1	3.5%	1	0	0.9%	$3.95	$16.12	407.6%
37 PHOTOGRAPHIC OR CINEMATOGRAPHIC GOODS	$3.5	$0.9	27.2%	0	0	5.5%	$11.89	$59.10	497.2%
38 MISCELLANEOUS CHEMICAL PRODUCTS	$28.9	$0.4	1.5%	19	0	0.6%	$1.55	$3.74	242.3%
39 PLASTICS AND ARTICLES THEREOF	$512.3	$20.9	4.1%	342	2	0.6%	$1.50	$9.82	654.4%
40 RUBBER AND ARTICLES THEREOF	$1,261.8	$15.9	1.3%	1,381	6	0.4%	$0.91	$2.59	283.9%
41 RAW HIDES AND SKINS (NO FURSKINS) AND LEATHER	$107.7	$17.1	15.9%	6	1	10.6%	$16.67	$25.09	150.5%
42 LEATHER ART; SADDLERY ETC; HANDBAGS ETC; GUT ART	$432.1	$94.9	22.0%	61	4	6.2%	$7.03	$24.97	355.1%
43 FURSKINS AND ARTIFICIAL FUR; MANUFACTURES THEREOF	$0.3	$0.1	34.9%	0	0	14.3%	$10.53	$25.73	244.3%
44 WOOD AND ARTICLES OF WOOD; WOOD CHARCOAL	$224.2	$5.0	2.2%	168	1	0.8%	$1.34	$3.55	266.0%
45 CORK AND ARTICLES OF CORK	$0.0	$0.0	0.0%	0	0	N/A	$*,***.**	$*,***.**	********
46 MFR OF STRAW, ESPARTO ETC.; BASKETWARE & WICKERWRK	$5.5	$0.2	4.1%	1	0	2.2%	$4.88	$8.97	183.6%
47 PULP OF WOOD ETC; WASTE ETC OF PAPER & PAPERBOARD	$11.5	$0.0	0.0%	27	0	0.0%	$0.42	$*,***.**	********
48 PAPER & PAPERBOARD & ARTICLES (INC PAPR PULP ARTL)	$53.4	$2.4	4.4%	48	0	0.7%	$1.10	$7.44	673.8%
49 PRINTED BOOKS, NEWSPAPERS ETC; MANUSCRIPTS ETC	$18.2	$7.5	41.5%	4	2	40.1%	$4.53	$4.68	103.3%
50 SILK, INCLUDING YARNS AND WOVEN FABRIC THEREOF	$34.6	$14.0	40.4%	1	0	13.7%	$31.20	$92.15	295.4%
51 WOOL & ANIMAL HAIR, INCLUDING YARN & WOVEN FABRIC	$15.5	$0.0	0.2%	4	0	0.0%	$3.75	$29.07	776.0%
52 COTTON, INCLUDING YARN AND WOVEN FABRIC THEREOF	$238.6	$4.0	1.7%	53	1	1.0%	$4.53	$7.64	168.8%

THAILAND EXPORT TRADE - TOTAL AND AIR (1991)

2-digit Harmonized Schedule Commodity Group	Shipping Value (Mil. US $)			Shipping Weight (000 MT)			Average Value ($) per KG		
	All Modes	Air	Air Pct.	All Modes	Air	Air Pct.	All Modes	Air	Air Pct.
53 VEG TEXT FIB NESOI; VEG FIB & PAPER YNS & WOV FAB	$44.7	$0.1	0.2%	73	0	0.1%	$0.62	$1.95	316.0%
54 MANMADE FILAMENTS, INCLUDING YARNS & WOVEN FABRICS	$92.1	$2.5	2.7%	16	0	1.7%	$5.75	$9.06	157.6%
55 MANMADE STAPLE FIBERS, INCL YARNS & WOVEN FABRICS	$547.6	$6.4	1.2%	131	1	0.5%	$4.19	$10.14	241.8%
56 WADDING, FELT ETC; SP YARN; TWINE, ROPES ETC.	$49.9	$0.9	1.9%	19	0	0.6%	$2.59	$7.89	305.3%
57 CARPETS AND OTHER TEXTILE FLOOR COVERINGS	$17.3	$2.8	16.1%	2	0	10.8%	$9.60	$14.27	148.7%
58 SPEC WOV FABRICS; TUFTED FAB; LACE; TAPESTRIES ETC	$37.4	$5.4	14.5%	3	0	6.6%	$11.43	$25.00	218.7%
59 IMPREGNATED ETC TEXT FABRICS; TEX ART FOR INDUSTRY	$8.9	$0.2	2.3%	2	0	0.5%	$3.94	$18.27	463.3%
60 KNITTED OR CROCHETED FABRICS	$4.6	$0.2	3.9%	1	0	2.5%	$8.02	$12.65	157.6%
61 APPAREL ARTICLES AND ACCESSORIES, KNIT OR CROCHET	$1,292.2	$255.6	19.8%	81	14	16.7%	$15.89	$18.84	118.5%
62 APPAREL ARTICLES AND ACCESSORIES, NOT KNIT ETC.	$2,224.6	$422.4	19.0%	140	21	14.8%	$15.94	$20.39	127.9%
63 TEXTILE ART NESOI; NEEDLECRAFT SETS; WORN TEXT ART	$155.7	$15.0	9.6%	52	2	3.2%	$2.99	$8.92	298.4%
64 FOOTWEAR, GAITERS ETC. AND PARTS THEREOF	$933.8	$77.1	8.3%	81	4	5.4%	$11.60	$17.87	154.0%
65 HEADGEAR AND PARTS THEREOF	$23.7	$3.9	16.4%	2	0	11.8%	$15.29	$21.22	138.7%
66 UMBRELLAS, WALKING-STICKS, RIDING-CROPS ETC, PARTS	$19.1	$1.7	8.9%	3	0	8.5%	$7.04	$7.40	105.2%
67 PREP FEATHERS, DOWN ETC; ARTIF FLOWERS; H HAIR ART	$100.9	$14.9	14.7%	9	0	2.9%	$11.76	$59.97	509.9%
68 ART OF STONE, PLASTER, CEMENT, ASBESTOS, MICA ETC.	$19.7	$2.7	13.5%	52	0	0.6%	$0.38	$8.90	***.*%
69 CERAMIC PRODUCTS	$175.3	$4.9	2.8%	209	1	0.7%	$0.84	$3.32	396.8%
70 GLASS AND GLASSWARE	$83.8	$3.5	4.1%	87	0	0.3%	$0.96	$12.62	***.*%
71 NAT ETC PEARLS, PREC ETC STONES, PR MET ETC; COIN	$1,507.7	$1,423.2	94.4%	0	0	69.1%	$6,470.80	$8,839.53	136.6%
72 IRON AND STEEL	$30.0	$0.4	1.4%	38	0	0.4%	$0.80	$3.01	377.2%
73 ARTICLES OF IRON OR STEEL	$282.7	$4.2	1.5%	269	1	0.4%	$1.05	$3.82	363.7%
74 COPPER AND ARTICLES THEREOF	$33.8	$2.2	6.5%	5	0	1.6%	$6.57	$26.26	399.8%
75 NICKEL AND ARTICLES THEREOF	$0.2	$0.0	20.6%	0	0	0.5%	$1.10	$45.59	***.*%
76 ALUMINUM AND ARTICLES THEREOF	$126.3	$2.1	1.7%	24	0	1.0%	$5.27	$8.60	163.4%
78 LEAD AND ARTICLES THEREOF	$0.3	$0.0	5.2%	0	0	0.5%	$1.40	$15.18	***.*%
79 ZINC AND ARTICLES THEREOF	$7.0	$0.1	0.7%	6	0	0.4%	$1.09	$2.11	193.5%
80 TIN AND ARTICLES THEREOF	$46.2	$7.2	15.5%	7	0	1.0%	$6.79	$102.40	***.*%
81 BASE METALS NESOI; CERMETS; ARTICLES THEREOF	$2.1	$0.0	0.8%	1	0	0.0%	$1.58	$*,***.**	********
82 TOOLS, CUTLERY ETC. OF BASE METAL & PARTS THEREOF	$33.5	$4.9	14.7%	4	0	4.4%	$8.30	$27.91	336.2%
83 MISCELLANEOUS ARTICLES OF BASE METAL	$55.7	$2.8	5.1%	26	0	1.0%	$2.18	$11.17	512.7%
84 NUCLEAR REACTORS, BOILERS, MACHINERY ETC.; PARTS	$2,855.5	$1,545.3	54.1%	142	13	9.0%	$20.09	$121.05	602.4%
85 ELECTRIC MACHINERY ETC; SOUND EQUIP; TV EQUIP; PTS	$3,670.3	$1,497.9	40.8%	218	20	9.3%	$16.81	$74.03	440.5%
86 RAILWAY OR TRAMWAY STOCK ETC; TRAFFIC SIGNAL EQUIP	$125.0	$0.1	0.1%	105	0	0.1%	$1.19	$1.31	110.4%
87 VEHICLES, EXCEPT RAILWAY OR TRAMWAY, AND PARTS ETC	$181.0	$8.6	4.8%	35	1	3.2%	$5.16	$7.74	150.1%
88 AIRCRAFT, SPACECRAFT, AND PARTS THEREOF	$3.9	$3.6	90.9%	0	0	56.5%	$171.70	$276.09	160.8%
89 SHIPS, BOATS AND FLOATING STRUCTURES	$64.8	$0.1	0.1%	7	0	0.0%	$9.00	$30.95	343.8%
90 OPTIC, PHOTO ETC, MEDIC OR SURGICAL INSTRMENTS ETC	$198.4	$86.4	43.5%	9	1	15.4%	$22.55	$63.64	282.2%
91 CLOCKS AND WATCHES AND PARTS THEREOF	$297.1	$274.6	92.4%	2	1	40.2%	$159.38	$366.66	230.0%
92 MUSICAL INSTRUMENTS; PARTS AND ACCESSORIES THEREOF	$5.8	$0.5	9.1%	1	0	1.9%	$6.42	$31.02	482.9%
93 ARMS AND AMMUNITION; PARTS AND ACCESSORIES THEREOF	$0.8	$0.7	87.5%	0	0	100.0%	$70.12	$61.37	87.5%
94 FURNITURE; BEDDING ETC; LAMPS NESOI ETC, PREFAB BD	$535.1	$17.2	3.2%	175	2	1.4%	$3.06	$7.02	229.7%
95 TOYS, GAMES & SPORT EQUIPMENT; PARTS & ACCESSORIES	$467.0	$30.7	6.6%	70	3	3.6%	$6.66	$12.27	184.1%
96 MISCELLANEOUS MANUFACTURED ARTICLES	$143.7	$17.0	11.9%	20	1	5.2%	$7.13	$16.16	226.7%
97 WORKS OF ART, COLLECTORS' PIECES AND ANTIQUES	$2.9	$0.4	13.1%	1	0	5.7%	$5.41	$12.48	230.5%
99 SPECIAL IMPORT PROVISIONS, NESOI	$339.9	$273.9	80.6%	30	12	39.7%	$11.19	$22.73	203.2%
GRAND TOTAL - ALL COMMODITIES	$28,460.6	$6,501.7	22.8%	32,603	719	2.2%	$0.87	$9.04	***.*%
1989-91	42%	45%		-4%	-21%				

Source: Kingdom of Thailand, Ministry of Transport and Communications, Transport Statistics

Appendix 3
Table 16
Page 2 of 2

495

THAILAND IMPORT TRADE - TOTAL AND AIR (1991)

2-digit Harmonized Schedule Commodity Group	Shipping Value (Mil. US $)			Shipping Weight (000 MT)			Average Value ($) per KG		
	All Modes	Air	Air Pct.	All Modes	Air	Air Pct.	All Modes	Air	Air Pct.
01 LIVE ANIMALS	$44.2	$26.0	58.8%	8	1	13.3%	$5.65	$24.96	441.4%
02 MEAT AND EDIBLE MEAT OFFAL	$3.8	$0.5	14.2%	1	0	6.7%	$3.25	$6.92	212.9%
03 FISH, CRUSTACEANS & AQUATIC INVERTEBRATES	$1,006.1	$4.3	0.4%	651	2	0.3%	$1.54	$2.15	139.4%
04 DAIRY PRODS; BIRDS EGGS; HONEY; ED ANIMAL PR NESOI	$160.0	$1.3	0.8%	97	0	0.1%	$1.65	$15.50	939.3%
05 PRODUCTS OF ANIMAL ORIGIN, NESOI	$13.6	$3.1	23.1%	1	0	4.1%	$10.41	$58.18	559.1%
06 LIVE TREES, PLANTS, BULBS ETC.; CUT FLOWERS ETC.	$2.0	$1.9	94.2%	0	0	92.5%	$4.32	$4.40	101.9%
07 EDIBLE VEGETABLES & CERTAIN ROOTS & TUBERS	$9.7	$0.2	2.5%	9	0	0.6%	$1.12	$4.76	425.5%
08 EDIBLE FRUIT & NUTS; CITRUS FRUIT OR MELON PEEL	$29.1	$1.0	3.4%	22	0	1.5%	$1.34	$3.00	223.8%
09 COFFEE, TEA, MATE & SPICES	$3.7	$0.0	0.6%	4	0	0.6%	$0.89	$0.89	100.1%
10 CEREALS	$78.1	$0.9	1.2%	466	0	0.1%	$0.17	$3.79	***.*%
11 MILLING PRODUCTS; MALT; STARCH; INULIN; WHT GLUTEN	$56.1	$0.2	0.3%	109	0	0.1%	$0.51	$1.73	337.3%
12 OIL SEEDS ETC.; MISC GRAIN, SEED, FRUIT, PLANT ETC	$52.8	$1.5	2.8%	37	0	0.1%	$1.43	$50.35	***.*%
13 LAC; GUMS, RESINS & OTHER VEGETABLE SAP & EXTRACT	$18.5	$0.3	1.6%	5	0	0.4%	$3.74	$14.19	379.7%
14 VEGETABLE PLAITING MATERIALS & PRODUCTS NESOI	$7.3	$0.0	0.2%	28	0	0.7%	$0.26	$0.07	26.9%
15 ANIMAL OR VEGETABLE FATS, OILS ETC. & WAXES	$35.9	$0.2	0.5%	44	0	0.0%	$0.81	$13.16	***.*%
16 EDIBLE PREPARATIONS OF MEAT, FISH, CRUSTACEANS ETC	$7.2	$0.1	1.3%	13	0	0.1%	$0.56	$13.15	***.*%
17 SUGARS AND SUGAR CONFECTIONARY	$7.1	$0.1	1.0%	9	0	0.1%	$0.78	$9.16	***.*%
18 COCOA AND COCOA PREPARATIONS	$14.6	$0.6	3.9%	7	0	0.6%	$1.98	$12.42	628.2%
19 PREP CEREAL, FLOUR, STARCH OR MILK; BAKERS WARES	$47.9	$0.0	0.1%	19	0	0.0%	$2.51	$8.02	319.1%
20 PREP VEGETABLES, FRUIT, NUTS OR OTHER PLANT PARTS	$5.3	$0.1	1.0%	3	0	0.3%	$1.84	$6.90	375.3%
21 MISCELLANEOUS EDIBLE PREPARATIONS	$35.7	$1.7	4.7%	11	0	1.3%	$3.35	$11.73	349.7%
22 BEVERAGES, SPIRITS AND VINEGAR	$154.8	$0.2	0.2%	23	0	0.1%	$6.72	$8.05	119.9%
23 FOOD INDUSTRY RESIDUES & WASTE; PREP ANIMAL FEED	$244.0	$0.8	0.3%	936	0	0.0%	$0.26	$23.56	***.*%
24 TOBACCO AND MANUFACTURED TOBACCO SUBSTITUTES	$66.2	$0.8	1.1%	8	0	0.3%	$7.81	$31.38	401.9%
25 SALT; SULFUR; EARTH & STONE; LIME & CEMENT PLASTER	$497.7	$8.3	1.7%	6,926	120	1.7%	$0.07	$0.07	96.7%
26 ORES, SLAG AND ASH	$18.1	$0.0	0.0%	87	0	0.0%	$0.21	$*,***.**	********
27 MINERAL FUEL, OIL ETC.; BITUMIN SUBST; MINERAL WAX	$3,474.9	$4.8	0.1%	19,931	23	0.1%	$0.17	$0.21	118.0%
28 INORG CHEM; PREC & RARE-EARTH MET & RADIOACT COMPD	$228.3	$3.1	1.4%	605	1	0.1%	$0.38	$5.64	***.*%
29 ORGANIC CHEMICALS	$1,094.9	$50.0	4.6%	1,156	6	0.5%	$0.95	$9.00	950.0%
30 PHARMACEUTICAL PRODUCTS	$143.8	$78.4	54.6%	6	1	14.9%	$23.12	$84.53	365.6%
31 FERTILIZERS	$405.4	$3.7	0.9%	2,374	20	0.8%	$0.17	$0.18	107.7%
32 TANNING & DYE EXT ETC; DYE, PAINT, PUTTY ETC; INKS	$343.3	$13.4	3.9%	104	1	0.8%	$3.30	$16.08	487.5%
33 ESSENTIAL OILS ETC; PERFUMERY, COSMETIC ETC PREPS	$84.8	$14.1	16.6%	7	1	8.7%	$11.96	$22.79	190.6%
34 SOAP ETC; WAXES, POLISH ETC; CANDLES; DENTAL PREPS	$117.2	$8.9	7.6%	52	1	1.4%	$2.27	$11.96	526.5%
35 ALBUMINOIDAL SUBST; MODIFIED STARCH; GLUE; ENZYMES	$25.1	$4.1	16.4%	6	0	2.7%	$4.55	$27.42	602.8%
36 EXPLOSIVES; PYROTECHNICS; MATCHES; PYRO ALLOYS ETC	$10.4	$0.8	7.8%	3	0	0.4%	$3.77	$67.45	***.*%
37 PHOTOGRAPHIC OR CINEMATOGRAPHIC GOODS	$116.6	$38.2	32.7%	10	1	6.3%	$12.07	$62.24	515.8%
38 MISCELLANEOUS CHEMICAL PRODUCTS	$347.6	$23.5	6.7%	201	1	0.5%	$1.73	$25.66	***.*%
39 PLASTICS AND ARTICLES THEREOF	$1,119.1	$181.5	16.2%	477	17	3.6%	$2.34	$10.45	445.8%
40 RUBBER AND ARTICLES THEREOF	$197.7	$29.7	15.0%	65	1	1.7%	$3.04	$26.56	873.1%
41 RAW HIDES AND SKINS (NO FURSKINS) AND LEATHER	$347.9	$22.1	6.4%	123	3	2.1%	$2.82	$8.43	299.3%
42 LEATHER ART; SADDLERY ETC; HANDBAGS ETC; GUT ART	$12.8	$6.1	47.5%	1	0	14.5%	$14.53	$47.65	327.9%
43 FURSKINS AND ARTIFICIAL FUR; MANUFACTURES THEREOF	$2.8	$1.3	47.3%	0	0	13.4%	$11.54	$40.66	352.3%
44 WOOD AND ARTICLES OF WOOD; WOOD CHARCOAL	$664.4	$1.6	0.2%	2,207	3	0.1%	$0.30	$0.58	194.2%
45 CORK AND ARTICLES OF CORK	$1.3	$0.0	3.7%	0	0	0.7%	$4.42	$24.15	546.4%
46 MFR OF STRAW, ESPARTO ETC., BASKETWARE & WICKERWRK	$0.2	$0.0	3.9%	0	0	0.0%	$7.99	$*,***.**	********
47 PULP OF WOOD ETC; WASTE ETC OF PAPER & PAPERBOARD	$195.4	$0.0	0.0%	542	0	0.0%	$0.36	$0.16	44.9%
48 PAPER & PAPERBOARD & ARTICLES (INC PAPR PULP ARTL)	$383.2	$11.9	3.1%	410	1	0.3%	$0.93	$9.44	***.*%
49 PRINTED BOOKS, NEWSPAPERS ETC; MANUSCRIPTS ETC	$67.1	$39.3	58.6%	5	2	47.5%	$12.78	$15.77	123.4%
50 SILK, INCLUDING YARNS AND WOVEN FABRIC THEREOF	$21.5	$0.1	0.4%	1	0	0.2%	$24.08	$41.43	172.0%
51 WOOL & ANIMAL HAIR, INCLUDING YARN & WOVEN FABRIC	$51.8	$1.8	3.5%	9	0	1.0%	$5.76	$20.99	364.3%
52 COTTON, INCLUDING YARN AND WOVEN FABRIC THEREOF	$842.4	$16.6	2.0%	410	3	0.6%	$2.05	$6.31	307.0%

Appendix 3
Table 17
Page 1 of 2

496

THAILAND IMPORT TRADE - TOTAL AND AIR (1991)

2-digit Harmonized Schedule Commodity Group	Shipping Value (Mil. US $)			Shipping Weight (000 MT)			Average Value ($) per KG		
	All Modes	Air	Air Pct.	All Modes	Air	Air Pct.	All Modes	Air	Air Pct.
53 VEG TEXT FIB NESOI; VEG FIB & PAPER YNS & WOV FAB	$18.3	$0.8	4.5%	11	0	0.3%	$1.64	$27.13	***.*%
54 MANMADE FILAMENTS, INCLUDING YARNS & WOVEN FABRICS	$220.7	$7.7	3.5%	29	1	1.8%	$7.53	$14.49	192.4%
55 MANMADE STAPLE FIBERS, INCL YARNS & WOVEN FABRICS	$257.3	$5.2	2.0%	116	0	0.3%	$2.22	$13.40	604.0%
56 WADDING, FELT ETC; SP YARN; TWINE, ROPES ETC.	$35.4	$2.5	6.9%	5	0	2.9%	$7.17	$17.17	239.4%
57 CARPETS AND OTHER TEXTILE FLOOR COVERINGS	$2.9	$0.3	11.4%	1	0	4.1%	$5.03	$13.79	274.1%
58 SPEC WOV FABRICS; TUFTED FAB; LACE; TAPESTRIES ETC	$37.6	$7.3	19.4%	4	1	16.1%	$9.36	$11.29	120.6%
59 IMPREGNATED ETC TEXT FABRICS; TEX ART FOR INDUSTRY	$134.3	$6.9	5.1%	21	0	2.0%	$6.44	$16.59	257.5%
60 KNITTED OR CROCHETED FABRICS	$124.4	$5.9	4.7%	15	0	2.8%	$8.27	$14.11	170.7%
61 APPAREL ARTICLES AND ACCESSORIES, KNIT OR CROCHET	$6.8	$1.9	27.5%	1	0	12.9%	$13.25	$28.21	213.0%
62 APPAREL ARTICLES AND ACCESSORIES, NOT KNIT ETC.	$9.9	$3.4	34.4%	0	0	13.9%	$21.17	$52.19	246.5%
63 TEXTILE ART NESOI; NEEDLECRAFT SETS; WORN TEXT ART	$9.3	$1.6	17.6%	1	0	7.5%	$8.64	$20.25	234.3%
64 FOOTWEAR, GAITERS ETC. AND PARTS THEREOF	$35.1	$6.0	17.0%	5	0	8.4%	$7.21	$14.63	202.9%
65 HEADGEAR AND PARTS THEREOF	$11.7	$3.1	26.0%	1	0	35.4%	$13.31	$9.79	73.6%
66 UMBRELLAS, WALKING-STICKS, RIDING-CROPS ETC, PARTS	$13.4	$1.9	14.5%	4	0	6.7%	$3.34	$7.25	217.0%
67 PREP FEATHERS, DOWN ETC; ARTIF FLOWERS; H HAIR ART	$0.9	$0.3	31.9%	0	0	2.8%	$8.91	$100.43	***.*%
68 ART OF STONE, PLASTER, CEMENT, ASBESTOS, MICA ETC.	$76.4	$17.7	23.2%	22	0	0.9%	$3.46	$84.65	***.*%
69 CERAMIC PRODUCTS	$42.4	$8.6	20.2%	13	0	2.8%	$3.19	$22.86	716.1%
70 GLASS AND GLASSWARE	$120.9	$18.5	15.3%	55	1	1.0%	$2.20	$35.12	***.*%
71 NAT ETC PEARLS, PREC ETC STONES, PR MET ETC; COIN	$2,100.2	$2,052.1	97.7%	3	1	40.9%	$732.55	$1,747.95	238.6%
72 IRON AND STEEL	$2,930.0	$6.9	0.2%	6,399	3	0.0%	$0.46	$2.17	474.2%
73 ARTICLES OF IRON OR STEEL	$623.2	$89.5	14.4%	292	4	1.3%	$2.13	$23.29	***.*%
74 COPPER AND ARTICLES THEREOF	$350.7	$8.2	2.4%	108	0	0.4%	$3.24	$17.29	533.7%
75 NICKEL AND ARTICLES THEREOF	$10.8	$0.5	4.2%	1	0	1.5%	$11.27	$32.36	287.1%
76 ALUMINUM AND ARTICLES THEREOF	$387.9	$9.6	2.5%	175	0	0.2%	$2.21	$22.95	***.*%
78 LEAD AND ARTICLES THEREOF	$27.3	$0.4	1.5%	42	0	0.0%	$0.65	$28.32	***.*%
79 ZINC AND ARTICLES THEREOF	$19.9	$1.3	6.3%	14	1	5.7%	$1.46	$1.62	110.8%
80 TIN AND ARTICLES THEREOF	$1.3	$0.0	3.7%	0	0	0.4%	$4.88	$47.47	971.9%
81 BASE METALS NESOI; CERMETS; ARTICLES THEREOF	$5.7	$1.3	22.4%	0	0	3.3%	$17.19	$115.28	670.8%
82 TOOLS, CUTLERY ETC. OF BASE METAL & PARTS THEREOF	$177.2	$59.7	33.7%	15	1	4.3%	$11.60	$90.67	781.6%
83 MISCELLANEOUS ARTICLES OF BASE METAL	$110.8	$9.6	8.6%	25	1	2.5%	$4.52	$15.66	346.6%
84 NUCLEAR REACTORS, BOILERS, MACHINERY ETC.; PARTS	$7,315.0	$1,417.6	19.4%	813	16	1.9%	$8.99	$90.71	***.*%
85 ELECTRIC MACHINERY ETC; SOUND EQUIP; TV EQUIP; PTS	$5,298.5	$2,218.0	41.9%	267	21	8.0%	$19.87	$103.86	522.7%
86 RAILWAY OR TRAMWAY STOCK ETC; TRAFFIC SIGNAL EQUIP	$30.1	$0.3	1.1%	8	0	0.4%	$3.64	$9.14	251.4%
87 VEHICLES, EXCEPT RAILWAY OR TRAMWAY, AND PARTS ETC	$2,168.0	$101.0	4.7%	344	6	1.7%	$6.30	$17.79	282.1%
88 AIRCRAFT, SPACECRAFT, AND PARTS THEREOF	$50.8	$29.2	57.6%	0	0	49.8%	$196.06	$226.68	115.6%
89 SHIPS, BOATS AND FLOATING STRUCTURES	$113.4	$0.1	0.1%	25	0	0.0%	$4.59	$37.88	825.5%
90 OPTIC, PHOTO ETC, MEDIC OR SURGICAL INSTRMENTS ETC	$536.6	$240.0	44.7%	15	2	13.6%	$34.88	$114.46	328.2%
91 CLOCKS AND WATCHES AND PARTS THEREOF	$267.7	$246.2	92.0%	2	1	55.1%	$118.21	$197.12	166.8%
92 MUSICAL INSTRUMENTS; PARTS AND ACCESSORIES THEREOF	$16.6	$1.0	6.2%	1	0	1.9%	$16.43	$53.90	328.0%
93 ARMS AND AMMUNITION; PARTS AND ACCESSORIES THEREOF	$19.2	$11.5	59.8%	0	0	21.6%	$56.14	$155.14	276.4%
94 FURNITURE; BEDDING ETC; LAMPS NESOI ETC; PREFAB BD	$49.9	$7.2	14.3%	8	0	2.7%	$6.28	$33.62	535.3%
95 TOYS, GAMES & SPORT EQUIPMENT; PARTS & ACCESSORIES	$53.7	$6.8	12.6%	9	0	4.2%	$5.69	$17.09	300.2%
96 MISCELLANEOUS MANUFACTURED ARTICLES	$64.1	$15.4	24.0%	7	0	5.9%	$9.56	$39.16	409.6%
97 WORKS OF ART, COLLECTORS' PIECES AND ANTIQUES	$0.5	$0.5	90.8%	0	0	31.0%	$17.75	$51.91	292.4%
99 SPECIAL IMPORT PROVISIONS, NESOI	$831.6	$292.6	35.2%	161	5	3.2%	$5.15	$57.08	***.*%
GRAND TOTAL - ALL COMMODITIES	$37,638.2	$7,535.2	20.0%	47,273	279	0.6%	$0.80	$27.05	***.*%
1989-91	46%	62%		41%	111%				

Source: Kingdom of Thailand, Ministry of Transport and Communications, Transport Statistics

Southeast Asian Airport Statistics (1989-92)

Airport	Total Freight & Mail: Total Freight & Mail (Metric Tons) 1989	1990	1991	1992	Avg. Growth Rat 1989-1992	1991-1992	1990 Outbound Share	International: Total Freight & Mail (Metric Tons) 1989	1990	1991	1992	Avg. Growth Rate 1989-1992	1991-1992
Indonesia													
Balikpapan	8,907	9,488	10,987	11,357	8.4%	3.4%	36.3%	274	46	82	46	-44.8%	-43.9%
Biak	NA	3,472	3,123	2,943	NA	-5.8%	58.2%	NA	992	1,297	772	NA	-40.5%
Denpasar - Bali	19,127	19,127	25,684	34,707	22.0%	35.1%	77.7%	6,526	6,966	10,646	18,077	40.4%	69.8%
Jakarta (CKG)	NA	NA	172,278	196,456	NA	14.0%	NA	NA	NA	96,385	111,351	NA	15.5%
Jakarta (HKD)	0	0	2,210	1,904	NA	-13.8%	NA	0	0	5	2	NA	-60.0%
Manado	NA	3,906	4,888	4,194	NA	-14.2%	25.1%	0	0	0	62	NA	NA
Medan	21,248	23,027	22,734	22,487	1.9%	-1.1%	56.0%	8,164	9,602	9,396	9,863	6.5%	5.0%
Surabaya	20,343	22,108	23406	25973	8.5%	11.0%	51.3%	2,269	2,243	2968	5184	31.7%	74.7%
Ujung Pandang	21,333	22,236	21,305	21,700	0.6%	1.9%	45.5%	0	0	0	0	NA	NA
	90,958	103,364	286,615	321,721	NA	12.2%	53.9%	17,233	19,849	120,779	145,357	NA	20.3%
Malaysia													
Kuala Lumpur	135,837	176,200	NA	NA	NA	NA	53.5%	112,118	147,328	NA	NA	NA	NA
Singapore	587,154	632,535	652,922	720,677	7.1%	10.4%	47.4%	587,154	632,535	652,922	720,677	7.1%	10.4%
Thailand													
Bangkok	349,998	405,855	401,670	438,416	7.8%	9.1%	65.3%	341,637	394,296	389,148	422,426	7.3%	8.6%
Phillipines													
Manila	NA	NA	230,189	237,803	NA	3.3%	NA	NA	NA	179,680	193,914	NA	7.9%
Regional Total	1,163,947	1,317,954	1,571,396	1,718,617	13.9%	9.4%	54.2%	1,058,142	1,194,008	1,342,529	1,482,374	11.9%	10.4%
Thailand + Singapore	937,152	1,038,390	1,054,592	1,159,093	7.3%	9.9%	59.7%	928,791	1,026,831	1,042,070	1,143,103	7.2%	9.7%

Source: Airports Council International

Appendix 3
Table 18

INTERNATIONAL AIR CARGO ACTIVITY AT SINGAPORE CHANGI (1990-92)

	IMPORTS				EXPORTS				TOTAL TRADE			
	1990	1991	12 Mths. 3rd Qtr 92	Average Annual Growth	1990	1991	12 Mths. 3rd Qtr 92	Average Annual Growth	1990	1991	12 Mths. 3rd Qtr 92	Average Annual Growth
Malaysia	19,373	21,640	24,509	12.5%	20,396	21,316	20,630	0.6%	39,769	42,956	45,139	6.5%
Philippines	3,730	3,973	3,958	3.0%	6,066	5,502	6,439	3.0%	9,796	9,475	10,397	3.0%
Thailand	24,780	26,952	30,887	11.6%	20,293	19,384	21,637	3.3%	45,073	46,336	52,524	7.9%
Other Southeast Asia	49,803	50,604	57,571	7.5%	31,180	25,027	26,814	-7.3%	80,983	75,631	84,385	2.1%
	97,686	103,169	116,925	9.4%	77,935	71,229	75,520	-1.6%	175,621	174,398	192,445	4.7%
Hong Kong	18,992	18,633	20,553	4.0%	24,181	27,296	26,789	5.3%	43,173	45,929	47,342	4.7%
Japan	44,564	48,170	45,376	0.9%	41,121	48,331	49,900	10.2%	85,685	96,501	95,276	5.4%
Taiwan	22,702	22,210	20,901	-4.0%	8,178	9,567	12,197	22.1%	30,880	31,777	33,098	3.5%
Other Northeast Asia	18,356	19,448	20,755	6.3%	16,830	18,538	18,694	5.4%	35,186	37,986	39,449	5.9%
	104,614	108,461	107,585	1.4%	90,310	103,732	107,580	9.1%	194,924	212,193	215,165	5.1%
India	12,268	10,994	13,148	3.5%	7,550	6,280	6,766	-5.3%	19,818	17,274	19,914	0.2%
Other South Asia	7,131	8,200	8,923	11.9%	6,000	6,275	6,338	2.8%	13,131	14,475	15,261	7.8%
	19,399	19,194	22,071	6.7%	13,550	12,555	13,104	-1.7%	32,949	31,749	35,175	3.3%
West Asia	2,850	1,815	2,510	-6.2%	7,328	6,371	6,826	-3.5%	10,178	8,186	9,336	-4.2%
Australia	32,637	41,698	45,192	17.7%	20,486	21,068	21,551	2.6%	53,123	62,766	66,743	12.1%
New Zealand	2,420	3,435	4,340	33.9%	4,335	4,024	4,351	0.2%	6,755	7,459	8,691	13.4%
Other Oceania	333	393	382	7.1%	1,056	1,041	1,083	1.3%	1,389	1,434	1,465	2.7%
	35,390	45,526	49,914	18.8%	25,877	26,133	26,985	2.1%	61,267	71,659	76,899	12.0%
France	2,847	2,607	3,874	16.7%	2,999	2,481	2,889	-1.9%	5,846	5,088	6,763	7.6%
Germany	4,862	4,936	6,475	15.4%	5,856	5,519	5,700	-1.3%	10,718	10,455	12,175	6.6%
Netherlands	8,544	10,152	9,725	6.7%	10,475	10,763	12,380	8.7%	19,019	20,915	22,105	7.8%
Scandinavia	6,004	6,318	6,087	0.7%	3,843	4,092	4,010	2.1%	9,847	10,410	10,097	1.3%
Switzerland	3,161	4,812	7,893	58.0%	3,014	3,643	6,837	50.6%	6,175	8,455	14,730	54.4%
United Kingdom	10,862	8,165	7,976	-13.5%	12,923	11,611	10,317	-10.6%	23,585	19,776	18,293	-11.9%
Other Europe	13,557	12,294	12,129	-5.4%	22,200	22,617	21,614	-1.3%	35,757	34,911	33,743	-2.9%
	49,637	49,284	54,159	4.5%	61,310	60,726	63,747	2.0%	110,947	110,010	117,906	3.1%
U S A	12,354	12,012	13,603	4.9%	18,323	15,086	17,347	-2.7%	30,677	27,098	30,950	0.4%
Other North America	1,188	1,781	2,159	34.8%	1,474	1,663	1,808	10.8%	2,662	3,444	3,967	22.1%
	13,542	13,793	15,762	7.9%	19,797	16,749	19,155	-1.6%	33,339	30,542	34,917	2.3%
Other Regions	1,036	1,019	1,338	13.6%	3,578	3,453	3,342	-3.4%	4,614	4,472	4,680	0.7%
Total - All Regions	**324,157**	**342,261**	**370,264**	**6.9%**	**299,684**	**300,948**	**316,259**	**2.7%**	**623,841**	**643,209**	**686,523**	**4.9%**
Distribution by World Region												
Southeast Asia	30.1%	30.1%	31.6%		26.0%	23.7%	23.9%		28.2%	27.1%	28.0%	
Northeast Asia	32.3%	31.7%	29.1%		30.1%	34.5%	34.0%		31.2%	33.0%	31.3%	
South Asia	6.0%	5.6%	6.0%		4.5%	4.2%	4.1%		5.3%	4.9%	5.1%	
West Asia	0.9%	0.5%	0.7%		2.4%	2.1%	2.2%		1.6%	1.3%	1.4%	
Oceania	10.9%	13.3%	13.5%		8.6%	8.7%	8.5%		9.8%	11.1%	11.2%	
Europe	15.3%	14.4%	14.6%		20.5%	20.2%	20.2%		17.8%	17.1%	17.2%	
North America	4.2%	4.0%	4.3%		6.6%	5.6%	6.1%		5.3%	4.7%	5.1%	
Other	0.3%	0.3%	0.4%		1.2%	1.1%	1.1%		0.7%	0.7%	0.7%	
	100.0%	100.0%	100.0%		100.0%	100.0%	100.0%		100.0%	100.0%	100.0%	

Source: Civil Aviation Authority of Singapore

1991 Air Freight Flows for Southeast Asia (O&D Data)

Airport/Country/World Area	Thailand			Indonesia			Malaysia			Philippines			Singapore			Vietnam			Southeast Asia - Total		
	Out	In	Total	Out	In	Total	Out	In	Total	Out	In	Total	Out	In	Total	Out	In	Total	Out	In	Total
	(000s of Metric Tons)																				
Southeast Asia	36.0	24.3	60.3	49.4	20.6	70.0	29.5	31.8	61.3	5.1	8.5	13.5	60.3	95.5	155.8	1.6	1.3	3.0	181.9	181.9	363.8
Percent of Total	**17.2%**	**20.4%**	**18.4%**	**69.8%**	**64.6%**	**68.2%**	**35.9%**	**40.7%**	**38.2%**	**9.6%**	**19.6%**	**14.1%**	**24.4%**	**32.5%**	**28.8%**	**100.0%**	**100.0%**	**100.0%**	**27.4%**	**32.1%**	**29.6%**
South Asia	10.7	12.6	23.3	0.0	0.0	0.0	1.7	3.8	5.4	0.2	0.6	0.8	9.7	14.7	24.4	0.0	0.0	0.0	22.3	31.7	54.0
Percent of Total	**5.1%**	**10.6%**	**7.1%**	**0.0%**	**0.0%**	**0.0%**	**2.0%**	**4.8%**	**3.4%**	**0.4%**	**1.5%**	**0.9%**	**3.9%**	**5.0%**	**4.5%**	**0.0%**	**0.0%**	**0.0%**	**3.4%**	**5.6%**	**4.4%**
Northeast Asia	95.1	47.1	142.2	6.5	2.4	8.9	26.9	22.1	49.0	27.0	17.3	44.3	88.4	78.6	167.0	0.0	0.0	0.0	243.9	167.6	411.5
Percent of Total	**45.4%**	**39.6%**	**43.3%**	**9.1%**	**7.7%**	**8.7%**	**32.8%**	**28.3%**	**30.6%**	**51.1%**	**40.2%**	**46.2%**	**35.8%**	**26.8%**	**30.9%**	**0.0%**	**0.0%**	**0.0%**	**36.8%**	**29.5%**	**33.4%**
Southwest Pacific	5.7	4.9	10.6	4.7	1.9	6.6	6.3	8.0	14.3	3.2	2.4	5.6	27.1	46.9	74.0	0.0	0.0	0.0	47.0	64.1	111.1
Percent of Total	**2.7%**	**4.1%**	**3.2%**	**6.7%**	**5.8%**	**6.4%**	**7.7%**	**10.3%**	**8.9%**	**6.0%**	**5.5%**	**5.8%**	**11.0%**	**16.0%**	**13.7%**	**0.0%**	**0.0%**	**0.0%**	**7.1%**	**11.3%**	**9.0%**
North America	1.6	0.9	2.5	0.0	0.0	0.0	0.0	0.0	0.0	7.6	2.5	10.0	8.6	6.4	15.1	0.0	0.0	0.0	17.8	9.8	27.6
Percent of Total	**0.8%**	**0.7%**	**0.8%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**14.4%**	**5.7%**	**10.5%**	**3.5%**	**2.2%**	**2.8%**	**0.0%**	**0.0%**	**0.0%**	**2.7%**	**1.7%**	**2.2%**
Eastern Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.8	2.5	0.0	0.0	0.0	1.7	0.8	2.5
Percent of Total	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.7%**	**0.3%**	**0.5%**	**0.0%**	**0.0%**	**0.0%**	**0.2%**	**0.1%**	**0.2%**
Northeastern Africa	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Percent of Total	**0.0%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Southern Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percent of Total	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Western Europe	57.7	28.8	86.5	8.2	6.7	14.9	15.4	12.1	27.5	7.3	7.1	14.4	48.2	50.2	98.4	0.0	0.0	0.0	137.0	104.8	241.8
Percent of Total	**27.6%**	**24.2%**	**26.3%**	**11.6%**	**21.0%**	**14.6%**	**18.8%**	**15.5%**	**17.2%**	**13.9%**	**16.5%**	**15.1%**	**19.6%**	**17.1%**	**18.2%**	**0.0%**	**0.0%**	**0.0%**	**20.6%**	**18.5%**	**19.6%**
Middle East	2.5	0.4	2.9	1.9	0.2	2.2	2.3	0.4	2.7	2.5	4.7	7.2	2.7	0.8	3.5	0.0	0.0	0.0	12.0	6.6	18.6
Percent of Total	**1.2%**	**0.3%**	**0.9%**	**2.7%**	**0.8%**	**2.1%**	**2.8%**	**0.5%**	**1.7%**	**4.7%**	**11.0%**	**7.5%**	**1.1%**	**0.3%**	**0.6%**	**0.0%**	**0.0%**	**0.0%**	**1.8%**	**1.2%**	**1.5%**
	209.3	119.1	328.4	70.8	31.8	102.6	82.2	78.1	160.3	52.8	43.0	95.9	246.7	294.0	540.7	1.6	1.3	3.0	663.6	567.4	1,230.9

Source: ICAO On-Flight Origin and Destination Statistics

Appendix 3
Table 20

1991 Air Freight Flows for Southeast Asia (Flight Stage Data)

Airport/Country/World Area	Thailand			Indonesia			Malaysia			Philippines			Singapore			All Other			Southeast Asia - Total		
	Out	In	Total	Out	In	Total	Out	In	Total	Out	In	Total	Out	In	Total	Out	In	Total	Out	In	Total
	(000s of Metric Tons)																				
Southeast Asia	68.3	53.1	121.5	35.4	19.3	54.6	41.7	52.4	94.1	13.6	19.2	32.8	97.2	105.4	202.5	1.5	8.2	9.7	257.6	257.6	515.2
% of Total	20.7%	23.6%	21.9%	80.5%	86.7%	82.6%	36.8%	55.2%	45.2%	20.1%	31.4%	25.5%	33.2%	31.6%	32.4%	70.2%	83.6%	81.2%	30.3%	34.5%	32.3%
South Asia	31.6	29.4	61.0	0.0	0.0	0.0	3.3	3.2	6.6	0.6	0.3	0.9	19.6	24.8	44.4	0.6	1.5	2.1	55.8	59.2	115.0
% of Total	9.6%	13.0%	11.0%	0.1%	0.0%	0.1%	2.9%	3.4%	3.2%	0.9%	0.5%	0.7%	6.7%	7.4%	7.1%	27.3%	15.5%	17.6%	6.6%	7.9%	7.2%
Northeast Asia	130.2	78.9	209.2	1.2	1.1	2.3	40.3	19.6	60.0	42.6	34.8	77.3	81.1	92.4	173.5	0.0	0.0	0.1	295.5	226.8	522.3
% of Total	39.5%	35.0%	37.7%	2.7%	5.0%	3.5%	35.6%	20.7%	28.8%	63.1%	56.8%	60.1%	27.7%	27.7%	27.7%	1.7%	0.2%	0.5%	34.8%	30.4%	32.7%
Southwest Pacific	14.7	9.6	24.2	6.0	1.4	7.4	10.7	8.5	19.2	3.8	2.4	6.2	42.1	57.5	99.6	0.0	0.0	0.0	77.3	79.3	156.6
% of Total	4.5%	4.2%	4.4%	13.6%	6.4%	11.2%	9.5%	8.9%	9.2%	5.6%	3.9%	4.8%	14.4%	17.2%	15.9%	0.0%	0.0%	0.0%	9.1%	10.6%	9.8%
North America	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.6	1.8	4.6	2.1	6.7	0.0	0.0	0.0	0.0	0.0	0.0	5.8	2.7	8.5
% of Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	0.6%	0.9%	6.8%	3.5%	5.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.4%	0.5%
Eastern Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.4	1.1	0.0	0.0	0.0	1.3	0.7	2.0	0.0	0.0	0.0	2.1	1.0	3.1
% of Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.4%	0.5%	0.0%	0.0%	0.0%	0.5%	0.2%	0.3%	0.0%	0.0%	0.0%	0.2%	0.1%	0.2%
Northeastern Africa	2.0	1.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.5	0.8	0.0	0.0	0.0	2.3	1.5	3.8
% of Total	0.6%	0.5%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.3%	0.2%	0.2%
Southern Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% of Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Western Europe	52.0	48.6	100.6	0.0	0.0	0.0	4.3	4.7	9.0	0.0	0.0	0.0	28.0	29.5	57.5	0.0	0.0	0.0	84.3	82.9	167.1
% of Total	15.8%	21.6%	18.1%	0.0%	0.0%	0.0%	3.8%	5.0%	4.3%	0.0%	0.0%	0.0%	9.6%	8.9%	9.2%	0.0%	0.0%	0.0%	9.9%	11.1%	10.5%
Eastern/Central Europe	3.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	3.0
% of Total	0.9%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.2%
Middle East	27.5	4.8	32.3	1.4	0.4	1.8	11.0	5.4	16.5	2.4	2.4	4.7	23.0	22.7	45.7	0.0	0.1	0.1	65.3	35.7	101.1
% of Total	8.4%	2.1%	5.8%	3.1%	1.9%	2.7%	9.7%	5.7%	7.9%	3.5%	3.9%	3.7%	7.9%	6.8%	7.3%	0.7%	0.7%	0.7%	7.7%	4.8%	6.3%
	329.4	225.4	554.8	43.9	22.2	66.1	113.3	94.9	208.2	67.3	61.2	128.6	292.7	333.4	626.0	2.2	9.8	12.0	848.8	746.9	1,595.8

Source: ICAO Traffic by Flight Stage Statistics

Appendix 3
Table 21

1991-96 IATA AIR TRAFFIC FORECASTS FOR SOUTHEAST ASIA

	INBOUND									
	Southeast Asia	South Asia	Northeast Asia	North America	Africa	Western Europe	Other Europe	Middle East	Southwest Pacific	Total
	(Metric Tons)									
1991										
Thailand	25,990	17,464	52,597	1,778	42	29,882	180	870	5,090	133,893
Indonesia	20,201	0	6,272	734	0	7,469	0	342	2,854	37,872
Malaysia	29,874	3,886	29,903	3,628	18	13,039	0	471	9,066	89,885
Philippines	3,260	0	29,105	17,130	0	8,488	0	5,072	2,701	65,756
Singapore/All Oth	99,575	13,550	29,323	30	1,340	41,122	20	1,445	49,789	236,194
Total - SE Asia	178,900	34,900	147,200	23,300	1,400	100,000	200	8,200	69,500	563,600
1996										
Thailand	38,973	27,274	82,098	4,091	39	46,639	375	1,414	10,717	211,620
Indonesia	31,935	0	13,173	1,352	0	11,869	0	502	4,968	63,799
Malaysia	38,895	3,886	29,903	5,213	62	75,004	0	2,819	28,376	184,158
Philippines	4,907	0	36,145	26,724	0	14,029	0	8,489	3,791	94,085
Singapore/All Oth	151,590	18,640	63,481	20	1,599	48,259	25	1,176	64,748	349,538
Total - SE Asia	266,300	49,800	224,800	37,400	1,700	195,800	400	14,400	112,600	903,200
1991-96 Annual Growth										
Thailand	8.4%	9.3%	9.3%	18.1%	-1.5%	9.3%	15.8%	10.2%	16.1%	9.6%
Indonesia	9.6%	NA	16.0%	13.0%	NA	9.7%	NA	8.0%	11.7%	11.0%
Malaysia	5.4%	0.0%	0.0%	7.5%	28.1%	41.9%	NA	43.0%	25.6%	15.4%
Philippines	8.5%	NA	4.4%	9.3%	NA	10.6%	NA	10.8%	7.0%	7.4%
Singapore/All Oth	8.8%	6.6%	16.7%	-7.8%	3.6%	3.3%	4.6%	-4.0%	5.4%	8.2%
Total - SE Asia	8.3%	7.4%	8.8%	9.9%	4.0%	14.4%	14.9%	11.9%	10.1%	9.9%
1991 Percent of Total Traffic										
Thailand	19.4%	13.0%	39.3%	1.3%	0.0%	22.3%	0.1%	0.6%	3.8%	100.0%
Indonesia	53.3%	0.0%	16.6%	1.9%	0.0%	19.7%	0.0%	0.9%	7.5%	100.0%
Malaysia	33.2%	4.3%	33.3%	4.0%	0.0%	14.5%	0.0%	0.5%	10.1%	100.0%
Philippines	5.0%	0.0%	44.3%	26.1%	0.0%	12.9%	0.0%	7.7%	4.1%	100.0%
Singapore/All Oth	42.2%	5.7%	12.4%	0.0%	0.6%	17.4%	0.0%	0.6%	21.1%	100.0%
Total - SE Asia	31.7%	6.2%	26.1%	4.1%	0.2%	17.7%	0.0%	1.5%	12.3%	100.0%
1996 Percent of Total Traffic										
Thailand	18.4%	12.9%	38.8%	1.9%	0.0%	22.0%	0.2%	0.7%	5.1%	100.0%
Indonesia	50.1%	0.0%	20.6%	2.1%	0.0%	18.6%	0.0%	0.8%	7.8%	100.0%
Malaysia	21.1%	2.1%	16.2%	2.8%	0.0%	40.7%	0.0%	1.5%	15.4%	100.0%
Philippines	5.2%	0.0%	38.4%	28.4%	0.0%	14.9%	0.0%	9.0%	4.0%	100.0%
Singapore/All Oth	43.4%	5.3%	18.2%	0.0%	0.5%	13.8%	0.0%	0.3%	18.5%	100.0%
Total - SE Asia	29.5%	5.5%	24.9%	4.1%	0.2%	21.7%	0.0%	1.6%	12.5%	100.0%

1991-96 IATA AIR TRAFFIC FORECASTS FOR SOUTHEAST ASIA

	OUTBOUND									
	Southeast Asia	South Asia	Northeast Asia	North America	Africa	Western Europe	Other Europe	Middle East	Southwest Pacific	Total
	(Metric Tons)									
1991										
Thailand	42,012	16,331	95,665	3,928	813	60,019	2,278	7,174	6,044	234,264
Indonesia	49,321	0	14,426	2,095	0	8,049	0	2,240	5,925	82,056
Malaysia	30,424	1,727	34,712	12,521	37	15,768	0	1,309	6,853	103,351
Philippines	1,495	0	35,080	20,264	0	8,739	0	4,040	2,621	72,239
Singapore/All Oth	55,648	8,742	27,517	0	550	43,825	22	4,237	24,657	165,190
Total - SE Asia	178,900	26,800	207,400	38,800	1,400	136,400	2,300	19,000	46,100	657,100
1996										
Thailand	65,936	23,250	163,809	9,679	792	87,675	5,397	12,290	8,428	377,256
Indonesia	80,537	0	36,108	3,193	0	12,979	0	3,115	11,951	147,883
Malaysia	34,166	2,711	85,259	22,498	42	36,006	0	1,493	11,417	193,592
Philippines	1,959	0	46,862	37,376	0	15,419	0	5,515	3,709	110,840
Singapore/All Oth	83,702	10,439	33,062	0	666	79,621	3	6,887	34,495	248,829
Total - SE Asia	266,300	36,400	365,100	72,700	1,500	231,700	5,400	29,300	70,000	1,078,400
1991-96 Annual Growth										
Thailand	9.4%	7.3%	11.4%	19.8%	-0.5%	7.9%	18.8%	11.4%	6.9%	10.0%
Indonesia	10.3%	NA	20.1%	8.8%	NA	10.0%	NA	6.8%	15.1%	12.5%
Malaysia	2.3%	9.4%	19.7%	12.4%	2.6%	18.0%	NA	2.7%	10.7%	13.4%
Philippines	5.6%	NA	6.0%	13.0%	NA	12.0%	NA	6.4%	7.2%	8.9%
Singapore/All Oth	8.5%	3.6%	3.7%	NA	3.9%	12.7%	-32.9%	10.2%	6.9%	8.5%
Total - SE Asia	8.3%	6.3%	12.0%	13.4%	1.4%	11.2%	18.6%	9.0%	8.7%	10.4%
1991 Percent of Total Traffic										
Thailand	17.9%	7.0%	40.8%	1.7%	0.3%	25.6%	1.0%	3.1%	2.6%	100.0%
Indonesia	60.1%	0.0%	17.6%	2.6%	0.0%	9.8%	0.0%	2.7%	7.2%	100.0%
Malaysia	29.4%	1.7%	33.6%	12.1%	0.0%	15.3%	0.0%	1.3%	6.6%	100.0%
Philippines	2.1%	0.0%	48.6%	28.1%	0.0%	12.1%	0.0%	5.6%	3.6%	100.0%
Singapore/All Oth	33.7%	5.3%	16.7%	0.0%	0.3%	26.5%	0.0%	2.6%	14.9%	100.0%
Total - SE Asia	27.2%	4.1%	31.6%	5.9%	0.2%	20.8%	0.4%	2.9%	7.0%	100.0%
1996 Percent of Total Traffic										
Thailand	17.5%	6.2%	43.4%	2.6%	0.2%	23.2%	1.4%	3.3%	2.2%	100.0%
Indonesia	54.5%	0.0%	24.4%	2.2%	0.0%	8.8%	0.0%	2.1%	8.1%	100.0%
Malaysia	17.6%	1.4%	44.0%	11.6%	0.0%	18.6%	0.0%	0.8%	5.9%	100.0%
Philippines	1.8%	0.0%	42.3%	33.7%	0.0%	13.9%	0.0%	5.0%	3.3%	100.0%
Singapore/All Oth	33.6%	4.2%	13.3%	0.0%	0.3%	32.0%	0.0%	2.8%	13.9%	100.0%
Total - SE Asia	24.7%	3.4%	33.9%	6.7%	0.1%	21.5%	0.5%	2.7%	6.5%	100.0%

1991-96 IATA AIR TRAFFIC FORECASTS FOR SOUTHEAST ASIA

	INBOUND + OUTBOUND									
	Southeast Asia	South Asia	Northeast Asia	North America	Africa	Western Europe	Other Europe	Middle East	Southwest Pacific	Total
	(Metric Tons)									
1991										
Thailand	68,002	33,795	148,262	5,706	855	89,901	2,458	8,044	11,134	368,157
Indonesia	69,522	0	20,698	2,829	0	15,518	0	2,582	8,779	119,928
Malaysia	60,298	5,613	64,615	16,149	55	28,807	0	1,780	15,919	193,236
Philippines	4,755	0	64,185	37,394	0	17,227	0	9,112	5,322	137,995
Singapore/All Oth	155,223	22,292	56,840	30	1,890	84,947	42	5,682	74,446	401,384
Total - SE Asia	357,800	61,700	354,600	62,100	2,800	236,400	2,500	27,200	115,600	1,220,700
1996										
Thailand	104,909	50,524	245,907	13,770	831	134,314	5,772	13,704	19,145	588,876
Indonesia	112,472	0	49,281	4,545	0	24,848	0	3,617	16,919	211,682
Malaysia	73,061	6,597	115,162	27,711	104	111,010	0	4,312	39,793	377,750
Philippines	6,866	0	83,007	64,100	0	29,448	0	14,004	7,500	204,925
Singapore/All Oth	235,292	29,079	96,543	20	2,265	127,880	28	8,063	99,243	598,367
Total - SE Asia	532,600	86,200	589,900	110,100	3,200	427,500	5,800	43,700	182,600	1,981,600
1991-96 Annual Growth										
Thailand	9.1%	8.4%	10.6%	19.3%	-0.6%	8.4%	18.6%	11.2%	11.5%	9.8%
Indonesia	10.1%	NA	18.9%	9.9%	NA	9.9%	NA	7.0%	14.0%	12.0%
Malaysia	3.9%	3.3%	12.3%	11.4%	13.6%	31.0%	NA	19.4%	20.1%	14.3%
Philippines	7.6%	NA	5.3%	11.4%	NA	11.3%	NA	9.0%	7.1%	8.2%
Singapore/All Oth	8.7%	5.5%	11.2%	-7.8%	3.7%	8.5%	-7.8%	7.3%	5.9%	8.3%
Total - SE Asia	8.3%	6.9%	10.7%	12.1%	2.7%	12.6%	18.3%	9.9%	9.6%	10.2%
1991 Percent of Total Traffic										
Thailand	18.5%	9.2%	40.3%	1.5%	0.2%	24.4%	0.7%	2.2%	3.0%	100.0%
Indonesia	58.0%	0.0%	17.3%	2.4%	0.0%	12.9%	0.0%	2.2%	7.3%	100.0%
Malaysia	31.2%	2.9%	33.4%	8.4%	0.0%	14.9%	0.0%	0.9%	8.2%	100.0%
Philippines	3.4%	0.0%	46.5%	27.1%	0.0%	12.5%	0.0%	6.6%	3.9%	100.0%
Singapore/All Oth	38.7%	5.6%	14.2%	0.0%	0.5%	21.2%	0.0%	1.4%	18.5%	100.0%
Total - SE Asia	29.3%	5.1%	29.0%	5.1%	0.2%	19.4%	0.2%	2.2%	9.5%	100.0%
1996 Percent of Total Traffic										
Thailand	17.8%	8.6%	41.8%	2.3%	0.1%	22.8%	1.0%	2.3%	3.3%	100.0%
Indonesia	53.1%	0.0%	23.3%	2.1%	0.0%	11.7%	0.0%	1.7%	8.0%	100.0%
Malaysia	19.3%	1.7%	30.5%	7.3%	0.0%	29.4%	0.0%	1.1%	10.5%	100.0%
Philippines	3.4%	0.0%	40.5%	31.3%	0.0%	14.4%	0.0%	6.8%	3.7%	100.0%
Singapore/All Oth	39.3%	4.9%	16.1%	0.0%	0.4%	21.4%	0.0%	1.3%	16.6%	100.0%
Total - SE Asia	26.9%	4.4%	29.8%	5.6%	0.2%	21.6%	0.3%	2.2%	9.2%	100.0%

Baseline Air Cargo Forecasts to 2011

	SE Asia	NE Asia	So. Asia	SW Pacific	Europe	North America*	All Other	Inter-Regional Sub-total	Total
				(000 Metric Tons)					
INBOUND									
1991 Baseline Traffic									
Thailand	26	53	17	5	30	12	1	118	144
Singapore **	103	108	19	46	49	48	3	273	376
Other	53	65	4	15	29	26	5	144	198
SE Asia	182	226	40	66	108	86	9	535	718
Thailand Share	14.3%	23.3%	43.3%	7.7%	27.8%	14.0%	9.8%	22.1%	20.1%
Growth Rates									
1991-96									
Thailand	8.44%	9.31%	9.33%	16.06%	9.36%	18.14%	9.59%	10.7%	10.3%
SE Asia	8.28%	8.84%	7.37%	10.13%	12.67%	9.93%	9.89%	9.9%	9.5%
1996-2005									
Thailand	9.30%	8.30%	9.30%	9.30%	7.40%	7.90%	9.00%	8.2%	8.4%
SE Asia	9.30%	8.30%	9.30%	9.30%	7.40%	7.90%	9.00%	8.2%	8.5%
2005-2020									
Thailand	7.50%	6.50%	7.50%	7.50%	6.50%	7.00%	9.00%	6.8%	6.9%
SE Asia	7.50%	6.50%	7.50%	7.50%	6.50%	7.00%	9.00%	6.9%	7.0%
1996 Forecast Traffic									
Thailand	39	82	27	11	47	28	1	196	235
SE Asia	271	345	58	106	196	138	15	858	1,130
Thailand Share	14.4%	23.8%	47.4%	10.1%	24.0%	20.0%	9.6%	22.9%	20.8%
2005 (Year 5) Forecast									
Thailand	87	168	61	24	89	55	3	400	487
SE Asia	604	707	128	237	373	274	32	1,751	2,356
Thailand Share	14.4%	23.8%	47.4%	10.1%	24.0%	20.0%	9.6%	22.8%	20.7%
2020 (Year 20) Forecast									
Thailand	257	433	180	71	230	151	11	1,075	1,332
SE Asia	1,788	1,618	379	701	959	755	118	4,731	6,519
Thailand Share	14.4%	23.8%	47.4%	10.1%	24.0%	20.0%	9.6%	22.7%	20.4%

605

Baseline Air Cargo Forecasts to 2011

	SE Asia	NE Asia	So. Asia	SW Pacific	Europe	North America*	All Other	Inter-Regional Sub-total	Total
	(000 Metric Tons)								
OUTBOUND									
1991 Baseline Traffic									
Thailand	42	96	16	6	62	26	8	214	256
Singapore **	71	104	13	26	61	39	10	253	324
Other	81	84	2	15	33	59	6	199	280
SE Asia	194	284	31	47	156	124	24	667	861
Thailand Share	21.6%	33.7%	52.6%	12.7%	40.0%	21.0%	32.9%	32.2%	29.8%
Growth Rates									
1991-96									
Thailand	9.43%	11.36%	7.32%	6.88%	8.36%	19.77%	10.00%	11.3%	11.0%
SE Asia	8.28%	11.97%	6.31%	8.71%	8.75%	13.38%	10.42%	11.0%	10.4%
1996-2005									
Thailand	9.30%	8.30%	9.30%	9.30%	7.40%	8.00%	9.00%	8.1%	8.3%
SE Asia	9.30%	8.30%	9.30%	9.30%	7.40%	8.00%	9.00%	8.2%	8.4%
2005-2020									
Thailand	7.50%	6.50%	7.50%	7.50%	6.50%	7.00%	9.00%	6.8%	6.9%
SE Asia	7.50%	6.50%	7.50%	7.50%	6.50%	7.00%	9.00%	6.8%	7.0%
1996 Forecast Traffic									
Thailand	66	164	23	8	93	64	13	365	431
SE Asia	289	500	42	72	237	232	40	1,123	1,412
Thailand Share	22.8%	32.8%	55.1%	11.7%	39.3%	27.6%	32.3%	32.5%	30.5%
2005 (Year 5) Forecast									
Thailand	147	336	52	19	177	128	28	739	886
SE Asia	644	1,024	94	160	451	464	86	2,280	2,924
Thailand Share	22.8%	32.8%	55.1%	11.7%	39.3%	27.6%	32.3%	32.4%	30.3%
2020 (Year 20) Forecast									
Thailand	434	863	153	56	455	353	102	1,982	2,417
SE Asia	1,905	2,634	278	475	1,159	1,281	315	6,142	8,047
Thailand Share	22.8%	32.8%	55.1%	11.7%	39.3%	27.6%	32.3%	32.3%	30.0%

Baseline Air Cargo Forecasts to 2011

	SE Asia	NE Asia	So. Asia	SW Pacific	Europe	North America*	All Other	Inter-Regional Sub-total	Total
	(000 Metric Tons)								
TOTAL									
1991 Baseline Traffic									
Thailand	68	148	34	11	92	38	9	332	400
Singapore **	174	212	32	72	110	87	13	526	700
Other	135	149	6	30	62	85	12	343	478
SE Asia	377	510	71	113	264	210	34	1,202	1,578
Thailand Share	18.1%	29.1%	47.3%	9.8%	35.0%	18.1%	26.5%	27.7%	25.4%
Growth Rates									
1991-96									
Thailand	9.06%	10.65%	8.37%	11.45%	8.69%	19.26%	9.96%	11.1%	10.7%
SE Asia	8.28%	10.63%	6.92%	9.55%	10.42%	12.02%	10.27%	10.5%	10.0%
1996-2005									
Thailand	9.30%	8.30%	9.30%	9.30%	7.40%	7.97%	9.00%	8.2%	8.4%
SE Asia	9.30%	8.30%	9.30%	9.30%	7.40%	7.96%	9.00%	8.2%	8.5%
2005-2020									
Thailand	7.50%	6.50%	7.50%	7.50%	6.50%	7.00%	9.00%	6.8%	6.9%
SE Asia	7.50%	6.50%	7.50%	7.50%	6.50%	7.00%	9.00%	6.8%	7.0%
1996 Forecast Traffic									
Thailand	105	246	51	19	140	92	14	562	667
SE Asia	561	845	100	179	433	370	55	1,981	2,542
Thailand Share	18.7%	29.1%	50.6%	10.7%	32.3%	24.8%	26.1%	28.3%	26.2%
2005 (Year 5) Forecast									
Thailand	234	504	112	43	266	183	31	1,139	1,373
SE Asia	1,248	1,731	222	397	824	738	119	4,032	5,280
Thailand Share	18.7%	29.1%	50.6%	10.7%	32.3%	24.8%	26.1%	28.3%	26.0%
2020 (Year 20) Forecast									
Thailand	691	1,296	333	126	685	504	113	3,058	3,749
SE Asia	3,693	4,452	657	1,176	2,119	2,036	433	10,874	14,566
Thailand Share	18.7%	29.1%	50.6%	10.7%	32.3%	24.8%	26.1%	28.1%	25.7%

Southeast Asia Export Air Weight Estimates (1991)

		Southeast Asia Trade (1991)				Exports to U.S. (1991)						Estimated Air Exports (Adjusted) (000 Metric Tons)					
						Southeast Asia to U.S.				All Countries		Intra-Regional		Inter-Regional		Total	
	SITC Commodity Grouping	Export Value (Mil. $)	Thai-land Share	U.S. Share	1989-1991 Change	Air Weight (MT)	Air Value	Percent of Vessel/Air Total Weight	Average Value* ($/KG)	Air % of V/A Value	Average Value* ($/KG)	Weight	% of Total	Weight	% of Total	Weight	% of Total
00	LIVE ANIMALS CHIEFLY FOR FOOD	$218	1%	1%	56%	125	100%	100%	$37	100%	$29	22.4	11.5%	0.6	0.1%	23.0	2.7%
01	MEAT AND MEAT PREPARATIONS	$527	84%	1%	58%	0	0%	0%	$0	1%	$6	0.0	0.0%	0.1	0.0%	0.2	0.0%
02	DAIRY PRODUCTS AND BIRDS'EGGS	$208	13%	0%	19%	0	0%	0%	$0	2%	$7	0.0	0.0%	0.0	0.0%	0.0	0.0%
03	FISH,CRUSTACEANS,MOLLUCS,PREPARATIONS THEREOF	$5,898	50%	21%	45%	5,815	3%	2%	$5	11%	$5	40.7	21.0%	87.8	13.2%	128.4	15.0%
04	CEREALS AND CEREAL PREPARATIONS	$531	51%	4%	3%	1	0%	0%	$21	1%	$2	0.0	0.0%	0.0	0.0%	0.0	0.0%
05	VEGETABLES AND FRUIT	$3,094	52%	15%	24%	137	0%	0%	$3	2%	$1	0.6	0.3%	5.1	0.8%	5.8	0.7%
06	SUGAR,SUGAR PREPARATIONS AND HONEY	$934	71%	12%	-15%	1	0%	0%	$6	0%	$3	0.0	0.0%	0.0	0.0%	0.0	0.0%
07	COFFEE,TEA,COCOA,SPICES,MANUFACTURES THEREOF	$1,831	3%	21%	-10%	242	3%	0%	$38	1%	$11	0.3	0.2%	1.7	0.2%	2.0	0.2%
08	FEED STUFF FOR ANIMALS(NOT INCL.UNMILLED CEREALS)	$278	66%	13%	18%	14	0%	0%	$0	0%	$2	0.0	0.0%	0.0	0.0%	0.0	0.0%
09	MISCEL.EDIBLE PRODUCTS AND PREPARATIONS	$382	26%	11%	44%	22	1%	0%	$13	3%	$12	0.1	0.1%	0.5	0.1%	0.7	0.1%
11	BEVERAGES	$212	6%	4%	10%	1	0%	0%	$3	1%	$4	0.0	0.0%	0.0	0.0%	0.0	0.0%
12	TOBACCO AND TOBACCO MANUFACTURES	$840	14%	5%	78%	38	1%	0%	$9	0%	$11	2.3	1.2%	8.2	1.2%	10.5	1.2%
21	HIDES,SKINS AND FURSKINS,RAW	$41	5%	1%	-23%	8	13%	1%	$62	47%	$64	0.1	0.0%	0.3	0.0%	0.4	0.0%
22	OIL SEEDS AND OLEAGINOUS FRUIT	$38	1%	0%	40%	0	0%	0%	$0	1%	$3	0.0	0.0%	0.1	0.0%	0.1	0.0%
23	CRUDE RUBBER (INCLUDING SYNTHETIC AND RECLAIMED)	$3,825	26%	19%	-18%	3	0%	0%	$7	0%	$6	0.0	0.0%	0.0	0.0%	0.0	0.0%
24	CORK AND WOOD	$2,421	2%	3%	-16%	9	0%	0%	$2	1%	$1	0.0	0.0%	0.0	0.0%	0.0	0.0%
25	PULP AND WASTE PAPER	$19	0%	0%	-22%	0	***%	***%	$0	1%	$1	0.0	0.0%	0.0	0.0%	0.0	0.0%
26	TEXTILE FIBRES (EXCEPT WOOL TOPS) AND THEIR WASTES	$281	36%	5%	22%	0	0%	0%	$25	1%	$11	0.0	0.0%	0.1	0.0%	0.1	0.0%
27	CRUDE FERTILIZERS AND CRUDE MATERIALS (EXCL COAL)	$208	49%	1%	23%	10	94%	5%	$176	13%	$29	0.5	0.3%	1.4	0.2%	2.0	0.2%
28	METALLIFEROUS ORES AND METAL SCRAP	$895	2%	3%	-18%	205	3%	0%	$4	7%	$133	5.2	2.7%	34.0	5.1%	39.2	4.5%
29	CRUDE ANIMAL AND VEGETABLE MATERIALS,N.E.S.	$515	23%	7%	7%	1,016	39%	6%	$13	45%	$3	3.6	1.9%	18.9	2.8%	22.5	2.6%
32	COAL,COKE AND BRIQUETTES	$319	0%	0%	207%	0	0%	0%	$0	0%	$0	0.0	0.0%	0.0	0.0%	0.0	0.0%
33	PETROLEUM,PETROLEUM PRODUCTS AND RELATED MATERIALS	$11,388	0%	7%	14%	0	0%	0%	$0	0%	$2	0.0	0.0%	0.0	0.0%	0.0	0.0%
34	GAS,NATURAL AND MANUFACTURED	$7,216	2%	2%	58%	0	0%	0%	$0	0%	$17	0.0	0.0%	0.0	0.0%	0.0	0.0%
41	ANIMAL OILS AND FATS	$14	0%	0%	227%	0	***%	***%	$0	19%	$18	0.0	0.0%	0.3	0.0%	0.3	0.0%
42	FIXED VEGETABLE OILS AND FATS	$2,251	0%	11%	-23%	0	0%	0%	$0	0%	$4	0.0	0.0%	0.0	0.0%	0.0	0.0%
43	ANIMAL & VEGETABLE OILS AND FATS,PROCESSED & WAXES	$0	4%	0%	-39%	0	0%	0%	$0	1%	$6	0.0	0.0%	0.0	0.0%	0.0	0.0%
51	ORGANIC CHEMICALS	$1,328	6%	33%	68%	377	92%	1%	$1,070	23%	$132	0.4	0.2%	1.8	0.3%	2.3	0.3%
52	INORGANIC CHEMICALS	$276	12%	3%	56%	0	1%	0%	$47	10%	$30	0.0	0.0%	0.0	0.0%	0.1	0.0%
53	DYEING,TANNING AND COLOURING MATERIALS	$344	15%	2%	53%	2	0%	0%	$18	9%	$19	0.1	0.0%	0.1	0.0%	0.1	0.0%
54	MEDICINAL AND PHARMACEUTICAL PRODUCTS	$330	11%	11%	22%	245	62%	27%	$79	74%	$144	0.3	0.1%	1.4	0.2%	1.7	0.2%
55	ESSENTIAL OILS & PERFUME MAT.,TOILET-CLEANSING MAT	$628	13%	8%	57%	28	2%	1%	$14	25%	$31	0.4	0.2%	0.6	0.1%	1.0	0.1%
56	FERTILIZERS,MANUFACTURED	$492	0%	0%	43%	0	***%	***%	$0	0%	$1	0.0	0.0%	0.0	0.0%	0.0	0.0%
58	ARTIF.RESINS,PLASTIC MAT.,CELLULOSE ESTERS/ETHERS	$1,510	15%	3%	40%	102	1%	0%	$7	7%	$14	2.5	1.3%	2.7	0.4%	5.2	0.6%
59	CHEMICAL MATERIALS AND PRODUCTS,N.E.S.	$982	11%	8%	50%	219	70%	1%	$225	24%	$20	1.3	0.7%	3.1	0.5%	4.4	0.5%
61	LEATHER,LEATHER MANUF.,N.E.S.AND DRESSED FURSKISG	$447	61%	21%	26%	210	16%	2%	$40	43%	$30	0.3	0.2%	3.3	0.5%	3.6	0.4%
62	RUBBER MANUFACTURES,N.E.S.	$629	31%	14%	29%	256	3%	1%	$9	5%	$18	0.5	0.3%	1.8	0.3%	2.3	0.3%
63	CORK AND WOOD MANUFACTURES (EXCL FURNITURE)	$4,693	3%	11%	28%	613	1%	0%	$7	2%	$9	0.1	0.1%	3.5	0.5%	3.6	0.4%
64	PAPER,PAPERBOARD,ARTIC OF PAPER,PAPER-PULP/BOARD	$613	5%	5%	28%	208	10%	6%	$5	2%	$7	3.7	1.9%	5.0	0.7%	8.7	1.0%
65	TEXTILE YARN,FABRICS,MADE-UPART.,RELATED PRODUCTS	$4,868	24%	7%	55%	455	5%	1%	$34	23%	$23	5.2	2.7%	6.5	1.0%	11.7	1.4%
66	NON-METALLIC MINERAL MANUFACTURES,N.E.S.	$2,315	53%	16%	33%	812	57%	1%	$247	59%	$190	1.5	0.8%	3.6	0.5%	5.0	0.6%
67	IRON AND STEEL	$1,188	14%	4%	-12%	3	0%	0%	$11	0%	$9	0.1	0.0%	0.1	0.0%	0.1	0.0%
68	NON-FERROUS METALS	$1,562	4%	4%	-38%	30	6%	0%	$102	44%	$327	1.5	0.8%	1.1	0.2%	2.6	0.3%
69	MANUFACTURES OF METAL,N.E.S.	$1,567	23%	11%	72%	440	6%	1%	$14	11%	$23	3.9	2.0%	6.9	1.0%	10.8	1.3%
71	POWER GENERATING MACHINERY AND EQUIPMENT	$1,317	12%	14%	32%	1,002	54%	9%	$74	47%	$177	2.9	1.5%	7.6	1.1%	10.6	1.2%
72	MACHINERY SPECIALIZED FOR PARTICULAR INDUSTRIES	$1,397	5%	4%	25%	86	37%	6%	$57	13%	$50	3.2	1.7%	1.8	0.3%	5.0	0.6%
73	METALWORKING MACHINERY	$250	16%	13%	59%	48	5%	2%	$30	14%	$56	0.3	0.2%	0.3	0.1%	0.7	0.1%

Southeast Asia Export Air Weight Estimates (1991)

		Southeast Asia Trade (1991)				Exports to U.S. (1991)						Estimated Air Exports (Adjusted) (000 Metric Tons)					
						Southeast Asia to U.S.				All Countries		Intra-Regional		Inter-Regional		Total	
	SITC Commodity Grouping	Export Value (Mil. $)	Thai-land Share	U.S. Share	1989-1991 Change	Air Weight (MT)	Air Percent of Vessel/Air Total Value	Air Percent of Vessel/Air Total Weight	Average Value* ($/KG)	Air % of V/A Value	Average Value* ($/KG)	Weight	% of Total	Weight	% of Total	Weight	% of Total
74	GENERAL INDUSTRIAL MACHINERY & EQUIPMENT,AND PARTS	$3,155	19%	13%	39%	1,269	12%	2%	$40	21%	$33	6.0	3.1%	10.4	1.6%	16.3	1.9%
75	OFFICE MACHINES & AUTOMATIC DATA PROCESSING EQUIP	$14,137	14%	43%	67%	19,620	70%	31%	$165	45%	$125	3.9	2.0%	71.2	10.7%	75.1	8.7%
76	TELECOMMUNICATIONS & SOUND RECORDING APPARATUS	$14,840	11%	30%	72%	7,458	13%	4%	$67	19%	$88	8.7	4.5%	27.6	4.1%	36.2	4.2%
77	ELECTRICAL MACHINERY,APPARATUS & APPLIANCES N.E.S.	$17,533	12%	29%	36%	20,521	86%	20%	$202	64%	$135	43.9	22.6%	100.0	15.0%	143.8	16.7%
78	ROAD VEHICLES (INCL. AIR CUSHION VEHICLES	$1,194	25%	8%	61%	167	8%	1%	$33	1%	$19	0.7	0.4%	1.6	0.2%	2.3	0.3%
79	OTHER TRANSPORT EQUIPMENT	$1,024	7%	18%	-24%	184	75%	24%	$202	56%	$236	0.2	0.1%	0.9	0.1%	1.1	0.1%
81	SANITARY,PLUMBING,HEATING,LIGHTING FIXTURES	$221	30%	22%	75%	324	6%	3%	$7	6%	$17	0.6	0.3%	1.5	0.2%	2.1	0.2%
82	FURNITURE AND PARTS THEREOF	$1,490	28%	26%	47%	265	1%	0%	$9	5%	$16	0.1	0.1%	1.8	0.3%	1.9	0.2%
83	TRAVEL GOODS,HANDBAGS,BRIEF-CASES,PURSES,SHEATHS	$441	62%	35%	46%	629	6%	3%	$12	20%	$31	0.2	0.1%	3.0	0.5%	3.3	0.4%
84	ARTICLES OF APPAREL AND CLOTHING ACCESSORIES	$13,207	29%	35%	50%	30,344	18%	12%	$21	32%	$27	11.1	5.7%	153.2	23.0%	164.3	19.0%
85	FOOTWEAR	$2,282	39%	34%	136%	4,137	6%	5%	$11	13%	$19	0.9	0.5%	21.6	3.2%	22.5	2.6%
87	PROFESSIONAL,SCIENTIFIC & CONTROLING INSTRUMENTS	$1,253	9%	23%	72%	1,770	39%	14%	$53	61%	$105	4.2	2.2%	12.3	1.8%	16.5	1.9%
88	PHOTOGRAPHIC APPARATUS,OPTICAL GOODS,WATCHES	$1,979	19%	15%	89%	1,228	72%	44%	$158	64%	$140	1.8	0.9%	8.9	1.3%	10.7	1.2%
89	MISCELLANEOUS MANUFACTURED ARTICLES,N.E.S	$5,607	33%	28%	29%	4,405	28%	2%	$85	34%	$59	6.1	3.2%	29.1	4.4%	35.2	4.1%
95	ARMOURED FIGHTING VEHICLES,ARMS OF WAR & AMMUNIT.	$4	21%	16%	131%	2	24%	8%	$39	69%	$108	0.0	0.0%	0.0	0.0%	0.0	0.0%
97	GOLD,NON-MONETARY	$379	1%	2%	-7%	2	75%	5%	$1,747	100%	$5,039	0.1	0.0%	0.1	0.0%	0.1	0.0%
99	SPECIAL CATEGORIES	$2,077	17%	16%	82%	1,287	65%	7%	$168	81%	$192	1.4	0.7%	13.4	2.0%	14.8	1.7%
	Total - All Commodities	**$161,941**	**18%**	**21%**	**34%**	**106,395**	**38%**	**1%**	**$98**	**25%**	**$57**	**194.0**	**100.0%**	**667.0**	**100.0%**	**861.0**	**100.0%**

Unadjusted Volumes	**108.0**	**360.3**	**468.2**
Adjustment Factor	**1.7969**	**1.8514**	**1.8388**

* Values for total U.S. imports from all countries are used when no SE Asia-U.S. data is shown

Source: UN Trade Data, U.S. Bureau of Census Foreign Trade Statistics

Appendix 3
Table 24
Page 2 of 2

Thailand Airport Statistics (1986-1991)

	1986	1987	1988	1989	1990	1991	1991 Share	Avg. Growth Rate 1986-1991	Avg. Growth Rate 1990-1991
			(000 MT)						
International									
Bangkok	238.93	287.32	335.50	382.87	436.06	430.59	99.4%	12.5%	-1.3%
Phuket	0.90	1.20	1.60	0.05	0.35	0.96	0.2%	1.3%	174.3%
Hat Yai	1.20	1.40	1.60	0.36	0.46	1.60	0.4%	5.9%	247.8%
	241.03	289.92	338.70	383.28	436.87	433.15	100.0%	12.4%	-0.9%
BKK Share	99.1%	99.1%	99.1%	99.9%	99.8%	99.4%			
Domestic									
Bangkok	4.66	5.67	10.23	10.19	12.96	14.41	47.4%	25.3%	11.2%
Chiang Mai	1.79	2.47	3.72	3.10	5.06	5.96	19.6%	27.2%	17.8%
Chiang Rai	0.17	0.19	0.20	0.16	0.37	0.53	1.7%	25.5%	43.2%
Phitsanulok	0.33	0.31	0.32	0.23	0.28	0.24	0.8%	-6.2%	-14.3%
Other	0.40	0.40	0.43	0.35	0.42	0.69	2.3%	11.5%	62.2%
Northern - Total	2.69	3.37	4.67	3.84	6.13	7.42	24.4%	22.5%	20.9%
Ubon Ratchathani	0.04	0.06	0.06	0.05	0.07	0.09	0.3%	17.6%	28.6%
Khon Kaen	0.12	0.16	0.21	0.20	0.24	0.29	1.0%	19.3%	20.8%
Other	0.06	0.09	0.08	0.06	0.13	0.19	0.6%	25.9%	46.2%
Northeastern - Total	0.22	0.31	0.35	0.31	0.44	0.57	1.9%	21.0%	29.5%
Phuket	0.85	1.42	3.29	3.83	3.60	3.04	10.0%	29.0%	-15.6%
Hat Yai	1.15	1.93	3.61	3.14	3.74	4.00	13.2%	28.3%	7.0%
Surat Thani	0.22	0.29	0.45	0.57	0.75	0.70	2.3%	26.0%	-6.7%
Other	0.21	0.26	0.21	0.26	0.20	0.26	0.8%	4.4%	26.6%
Southern - Total	2.43	3.90	7.56	7.80	8.29	8.00	26.3%	26.9%	-3.6%
DomesticTotal	10.00	13.25	22.81	22.13	27.83	30.39	100.0%	24.9%	9.2%
Grand Total	251.02	303.17	361.51	405.42	464.69	463.54		13.1%	-0.2%
Domestic Share of International									
BKK	2.0%	2.0%	3.0%	2.7%	3.0%	3.3%			
All Airports	4.1%	4.6%	6.7%	5.8%	6.4%	7.0%			

Note: Some adjustments have been made to BKK traffic to correspond to more detailed sources.

Source: Air Transport Statistics (International and Domestic), Transport Statistics, Department of Aviation

International Traffic Summary for Bangkok Airport

	Outbound	% of Total	Inbound	% of Total	Transit	% of Total	Total Cargo	% of Total	Total Handling*	% of Total
Cargo Weight (MT)										
1985	103,511	54.2%	59,725	31.3%	27,804	14.6%	191,040	100.0%	218,844	114.6%
1986	132,812	55.6%	69,339	29.0%	36,774	15.4%	238,925	100.0%	275,699	115.4%
1987	162,110	56.4%	79,721	27.7%	45,487	15.8%	287,318	100.0%	332,805	115.8%
1988	191,762	57.2%	99,712	29.7%	44,024	13.1%	335,498	100.0%	379,522	113.1%
1989	223,630	58.4%	116,663	30.5%	42,579	11.1%	382,872	100.0%	425,451	111.1%
1990	257,966	59.2%	134,891	30.9%	43,198	9.9%	436,055	100.0%	479,253	109.9%
1991	256,245	59.5%	132,903	30.9%	41,439	9.6%	430,587	100.0%	472,026	109.6%
1992	280,628	60.4%	141,798	30.5%	42,482	9.1%	464,908	100.0%	507,390	109.1%
1993	312,762	58.5%	162,843	30.5%	58,999	11.0%	534,604	100.0%	593,603	111.0%
Average Annual Growth (1985-9	13.1%		11.8%		8.7%		12.1%		11.7%	
									* In+Out+2xTransit	
1991 Breakdown by Flight Type										
Passenger										
Scheduled	196,888	76.7%	115,804	87.0%	29,532	71.3%	342,224	79.4%	371,756	78.7%
Non-Scheduled	3,780	1.5%	4,003	3.0%	8,975	21.7%	16,758	3.9%	25,733	5.4%
	200,668	78.2%	119,807	90.0%	38,507	92.9%	358,982	83.3%	397,489	84.1%
Cargo										
Scheduled	47,962	18.7%	12,277	9.2%	950	2.3%	61,189	14.2%	62,139	13.1%
Non-Scheduled	7,983	3.1%	1,006	0.8%	1,982	4.8%	10,971	2.5%	12,953	2.7%
	55,945	21.8%	13,283	10.0%	2,932	7.1%	72,160	16.7%	75,092	15.9%
Scheduled	244,850	95.4%	128,081	96.2%	30,482	73.6%	403,413	93.6%	433,895	91.8%
Non-Scheduled	11,763	4.6%	5,009	3.8%	10,957	26.4%	27,729	6.4%	38,686	8.2%
	256,613	100.0%	133,090	100.0%	41,439	100.0%	431,142	100.0%	472,581	100.0%
1991 Breakdown by Aircraft Type										
Wide-body										
B-747	111,645	43.5%	51,772	38.9%	28,836	69.6%	192,253	44.6%	221,089	46.8%
A-300	65,046	25.3%	43,346	32.6%	2,454	5.9%	110,846	25.7%	113,300	24.0%
A-310	14,238	5.5%	5,186	3.9%	234	0.6%	19,658	4.6%	19,892	4.2%
DC-10	17,764	6.9%	11,231	8.4%	8,651	20.9%	37,646	8.7%	46,297	9.8%
L-1011	12,837	5.0%	5,254	3.9%	65	0.2%	18,156	4.2%	18,221	3.9%
B-767	15,913	6.2%	7,238	5.4%	871	2.1%	24,022	5.6%	24,893	5.3%
	237,443	92.5%	124,027	93.2%	41,111	99.2%	402,581	93.4%	443,692	93.9%
Narrowbody	19,170	7.5%	9,063	6.8%	328	0.8%	28,561	6.6%	28,889	6.1%

Source: Airport Systems Plan

Appendix 3
Table 26

Southeast Asia Export Air Weight Estimates (1991) - Target Commodities

SITC Commodity Grouping	Southeast Asia Trade (1991)				Exports to U.S. (1991)						Estimated Air Exports (Adjusted) (000 Metric Tons)					
					Southeast Asia to U.S.				All Countries		Intra-Regional		Inter-Regional		Total	
	Export Value (Mil. $)	Thai-land Share	U.S. Share	1989-1991 Change	Air Weight (MT)	Air Percent of Vessel/Air Total Value	Air Percent of Vessel/Air Total Weight	Average Value* ($/KG)	Air % of V/A Value	Average Value* ($/KG)	Weight	% of Total	Weight	% of Total	Weight	% of Total
0341 FISH,FRESH(LIVE/DEAD)OR CHILLED,EXCL FILLETS	$371	8%	8%	95%	5,748	99%	99%	$5	94%	$4	40.8	21.0%	88.4	13.3%	129.2	15.1%
2925 SEEDS,FRUIT & SPORES,NES,OF A KIND USED FOR SOWING	$31	83%	26%	92%	104	99%	60%	$79	74%	$76	0.1	0.0%	0.6	0.1%	0.7	0.1%
2926 BULBS,TUBERS & RHIZOMES OF FLOWERING OR OF FOLIAGE	$28	18%	5%	56%	61	100%	100%	$21	21%	$5	0.8	0.4%	1.7	0.3%	2.5	0.3%
516Z OTHER ORGANIC CHEMICALS (NES)	$6	70%	26%	85%	27	95%	51%	$45	22%	$56	0.0	0.0%	0.2	0.0%	0.2	0.0%
611Z LEATHER (NES)	$216	50%	14%	26%	181	25%	11%	$41	45%	$31	0.3	0.2%	2.1	0.3%	2.4	0.3%
641Z PAPER AND PAPERBOARD (NES)	$15	14%	2%	58%	9	72%	25%	$22	7%	$8	0.2	0.1%	0.6	0.1%	0.8	0.1%
6862 TULLE,LACE,EMBROIDERY RIBBONS,& OTHER SMALL WARES (NES)	$354	10%	3%	186%	102	73%	29%	$60	64%	$52	4.2	2.2%	2.2	0.3%	6.4	0.8%
6892 MANUFACTURES OF BASE METAL,N E S (NES)	$39	32%	28%	77%	60	19%	6%	$25	34%	$33	0.1	0.0%	0.3	0.0%	0.4	0.0%
713Z INTERNAL COMBUSTION PISTON ENGINES & PARTS (NES)	$222	11%	6%	31%	38	58%	8%	$272	6%	$30	0.3	0.2%	0.6	0.1%	0.9	0.1%
7182 ROTATING ELECTRIC PLANT AND PARTS (NES)	$629	19%	8%	49%	234	20%	3%	$46	20%	$35	2.0	1.0%	3.0	0.5%	5.0	0.6%
7492 OTHER NON-ELECTRICAL MACH.AMP PARTS	$104	10%	4%	82%	7	25%	9%	$40	41%	$64	0.1	0.1%	0.2	0.0%	0.3	0.0%
7492 NON-ELECTRIC PARTS AND ACCESSORIES OF MACHINES (NES)	$1,001	28%	12%	28%	879	42%	10%	$49	25%	$26	4.6	2.4%	8.9	1.3%	13.5	1.6%
7512 CALCULATING MACHINES,CASH REGISTERS,TICKET & SIM	$4,731	31%	31%	80%	375	28%	8%	$95	18%	$70	0.8	0.4%	1.4	0.2%	2.3	0.3%
752Z AUTOMATIC DATA PROCESSING MACHINES & UNITS THEREOF (NES)	$9,045	6%	49%	63%	19,192	72%	39%	$167	48%	$133	3.0	1.5%	71.1	10.7%	74.0	8.5%
7681 PARTS OF AND ACCESSORIES SUITABLE FOR 751.1-,751.8	$144	11%	34%	126%	52	10%	6%	$29	12%	$31	0.1	0.0%	0.2	0.0%	0.3	0.0%
7641 ELECT.LINE TELEPHONIC & TELEGRAPHIC APPARATUS	$929	27%	54%	127%	1,940	18%	9%	$40	26%	$79	0.8	0.4%	5.8	0.9%	6.7	0.8%
7642 MICROPHONES,LOUDSPEAKERS,AMPLIFIERS	$463	10%	19%	113%	564	21%	5%	$33	14%	$37	2.3	1.2%	3.1	0.5%	5.4	0.6%
764Z TELECOMMUNICATIONS EQUIPMENT AND PARTS (NES)	$6,780	12%	31%	71%	2,477	31%	11%	$126	35%	$115	4.3	2.2%	10.5	1.6%	14.7	1.7%
771Z ELECTRIC POWER MACHINERY AND PARTS THEREOF (NES)	$1,045	8%	13%	94%	1,301	56%	28%	$45	45%	$52	8.3	4.3%	10.8	1.6%	19.1	2.2%
772Z ELECT.APP.SUCH AS SWITCHES,RELAYS,FUSES,PLUGS ETC. (NES)	$1,538	9%	12%	47%	1,702	57%	21%	$59	56%	$71	12.1	6.2%	13.3	2.0%	25.4	3.0%
7792 THERMIONIC,COLD & PHOTO-CATHODE VALVES,TUBES,PARTS (NES	$11,824	10%	33%	29%	14,849	100%	95%	$255	94%	$311	18.2	9.4%	65.2	9.8%	83.4	9.7%
7798 OTHER ELECT.MACHINERY AND EQUIPMENT	$865	13%	19%	53%	822	71%	17%	$178	54%	$95	2.6	1.3%	3.8	0.6%	6.4	0.8%
784Z PARTS & ACCESSORIES OF 722-,781-,782-,783-- (NES)	$366	14%	13%	52%	164	13%	3%	$33	6%	$19	0.7	0.4%	1.6	0.2%	2.3	0.3%
84XZ ARTICLES OF APPAREL AND CLOTHING ACCESSORIES (NES)	$12,310	29%	34%	49%	29,355	19%	15%	$21	32%	$27	11.0	5.7%	152.6	22.9%	163.6	18.9%
871Z OPTICAL INSTRUMENTS AND APPARATUS (NES)	$155	21%	25%	61%	133	58%	40%	$52	52%	$108	0.2	0.1%	0.8	0.1%	1.0	0.1%
872Z MEDICAL INSTRUMENTS AND APPLIANCES (NES)	$393	12%	32%	92%	426	11%	5%	$33	49%	$73	0.2	0.1%	2.3	0.3%	2.5	0.3%
874Z MEASURING,CHECKING,ANALYSING INSTRUMENTS (NES)	$706	5%	17%	65%	1,212	68%	35%	$59	67%	$119	3.8	1.9%	9.5	1.4%	13.3	1.5%
8811 PHOTOGRAPHIC,CAMERAS,PARTS & ACCESSORIES	$487	11%	25%	164%	781	66%	53%	$95	47%	$109	0.9	0.4%	4.9	0.7%	5.8	0.7%
8841 LENSES,PRISMS,MIRRORS,OTHER OPTICAL ELEMENTS	$105	20%	21%	99%	175	66%	42%	$96	69%	$122	0.2	0.1%	1.1	0.2%	1.3	0.2%
8842 SPECTACLES AND SPECTACLE FRAMES	$45	9%	10%	72%	18	25%	15%	$34	79%	$137	0.2	0.1%	0.2	0.0%	0.3	0.0%
8862 WATCHES AND CLOCKS (NES)	$919	31%	14%	90%	247	79%	33%	$407	76%	$199	0.5	0.3%	2.8	0.4%	3.2	0.4%
8947 OTHER SPORTING GOODS AND FAIRGROUND AMUSEMENTS	$267	44%	32%	172%	679	18%	5%	$44	13%	$26	0.2	0.1%	1.8	0.3%	2.1	0.2%
8982 MUSICAL INSTRUMENTS,PARTS AND ACCESSORIES (NES)	$458	14%	6%	69%	247	43%	19%	$34	22%	$38	2.2	1.2%	6.0	0.9%	8.2	1.0%
8999 ORTHOPAEDIC APPLIANCES,SURGICAL BELTS AND THE LIKE	$20	5%	7%	82%	11	100%	100%	$191	93%	$141	0.0	0.0%	0.2	0.0%	0.2	0.0%
Total - Target Commodities	**$56,612**	**17%**	**32%**	**55%**	**84,174**	**60%**	**21%**	**$105**	**42%**	**$63**	**126.3**	**65.1%**	**477.8**	**71.6%**	**604.0**	**70.1%**
Total - All Commodities	**$149,481**	**18%**	**21%**	**34%**	**105,105**	**38%**	**1%**	**$97**	**23%**	**$63**	**194.0**	**100.0%**	**667.0**	**100.0%**	**861.0**	**100.0%**

Selection Criteria: Air Weight >= 100 MT | 1989-91 Growth>= 25% | Thailand Share of Export Value>= 5% | Share of U.S. Import Weight>= 2% | Avg. Value per KG >= $20 ex. 0100-0999

Appendix 3
Table 27

Southeast Asia Export Air Weight Estimates (Forecast to 2020) - Target Commodities

SITC Commodity Grouping	1991 Weight	1991 % of Total	2005 (Year 5) Weight	2005 (Year 5) % of Total	2005 (Year 5) Average Annual Growth	2020 (Year 20) Weight	2020 (Year 20) % of Total	2020 (Year 20) Average Annual Growth
0341 FISH,FRESH(LIVE/DEAD)OR CHILLED,EXCL FILLETS	129.2	15.1%	490.7	16.8%	10.0%	1,556.6	19.4%	8.0%
2925 SEEDS,FRUIT & SPORES,NES OF A KIND USED FOR SOWING	0.7	0.1%	2.8	0.1%	10.0%	8.8	0.1%	8.0%
2926 BULBS,TUBERS & RHIZOMES OF FLOWERING OR OF FOLIAGE	2.5	0.3%	9.3	0.3%	10.0%	29.6	0.4%	8.0%
516Z OTHER ORGANIC CHEMICALS (NES)	0.2	0.0%	0.3	0.0%	2.4%	0.4	0.0%	2.4%
611Z LEATHER (NES)	2.4	0.3%	9.2	0.3%	10.0%	29.1	0.4%	8.0%
641Z PAPER AND PAPERBOARD (NES)	0.8	0.1%	3.2	0.1%	10.0%	10.2	0.1%	8.0%
656Z TULLE,LACE,EMBROIDERY,RIBBONS,& OTHER SMALL WARES (NES)	6.4	0.8%	24.4	0.9%	10.0%	77.4	1.0%	8.0%
699Z MANUFACTURES OF BASE METAL,N.E.S. (NES)	0.4	0.0%	1.5	0.1%	10.0%	4.9	0.1%	8.0%
713Z INTERNAL COMBUSTION PISTON ENGINES & PARTS (NES)	0.9	0.1%	1.8	0.1%	5.2%	3.8	0.0%	5.2%
716Z ROTATING ELECTRIC PLANT AND PARTS (NES)	5.0	0.6%	19.0	0.7%	10.0%	60.3	0.8%	8.0%
7452 OTHER NON-ELECTRICAL MACH.AMP PARTS	0.3	0.0%	1.2	0.0%	10.0%	3.8	0.0%	8.0%
749Z NON-ELECTRIC PARTS AND ACCESSORIES OF MACHINES (NES)	13.5	1.6%	51.4	1.8%	10.0%	163.0	2.0%	8.0%
7512 CALCULATING MACHINES,CASH REGISTERS,TICKET & SIM	2.3	0.3%	8.6	0.3%	10.0%	27.3	0.3%	8.0%
752Z AUTOMATIC DATA PROCESSING MACHINES & UNITS THEREOF (NES)	74.0	8.5%	281.2	9.5%	10.0%	892.0	11.0%	8.0%
7591 PARTS OF AND ACCESSORIES SUITABLE FOR 751.1-,751.8	0.3	0.0%	1.1	0.0%	10.0%	3.4	0.0%	8.0%
7641 ELECT LINE TELEPHONIC & TELEGRAPHIC APPARATUS	6.7	0.8%	25.4	0.9%	10.0%	80.6	1.0%	8.0%
7642 MICROPHONES,LOUDSPEAKERS,AMPLIFIERS	5.4	0.6%	20.7	0.7%	10.0%	65.6	0.8%	8.0%
764Z TELECOMMUNICATIONS EQUIPMENT AND PARTS (NES)	14.7	1.7%	56.0	1.9%	10.0%	177.7	2.2%	8.0%
771Z ELECTRIC POWER MACHINERY AND PARTS THEREOF (NES)	19.1	2.2%	72.7	2.5%	10.0%	230.6	2.9%	8.0%
772Z ELECT APP SUCH AS SWITCHES,RELAYS,FUSES,PLUGS ETC (NES)	25.4	3.0%	37.1	1.3%	2.8%	55.8	0.7%	2.8%
776Z THERMIONIC,COLD & PHOTO-CATHODE VALVES,TUBES,PARTS (NES)	83.4	9.7%	316.5	10.8%	10.0%	1,004.1	12.5%	8.0%
778Z OTHER ELECT MACHINERY AND EQUIPMENT	6.4	0.8%	24.3	0.8%	10.0%	77.2	1.0%	8.0%
784Z PARTS & ACCESSORIES OF 722-,781-,782-,783- (NES)	2.3	0.3%	6.4	0.2%	7.5%	19.0	0.2%	7.5%
84XZ ARTICLES OF APPAREL AND CLOTHING ACCESSORIES (NES)	163.6	18.9%	621.1	21.1%	10.0%	1,970.4	24.3%	8.0%
871Z OPTICAL INSTRUMENTS AND APPARATUS (NES)	1.0	0.1%	3.8	0.1%	10.0%	11.9	0.1%	8.0%
872Z MEDICAL INSTRUMENTS AND APPLIANCES (NES)	2.5	0.3%	9.5	0.3%	10.0%	30.2	0.4%	8.0%
874Z MEASURING,CHECKING,ANALYSING INSTRUMENTS (NES)	13.3	1.5%	50.4	1.7%	10.0%	160.0	2.0%	8.0%
8611 PHOTOGRAPHIC,CAMERAS,PARTS & ACCESSORIES	5.8	0.7%	21.9	0.7%	10.0%	69.6	0.9%	8.0%
8641 LENSES,PRISMS,MIRRORS,OTHER OPTICAL ELEMENTS	1.3	0.2%	4.2	0.1%	8.6%	13.5	0.2%	8.0%
8642 SPECTACLES AND SPECTACLE FRAMES	0.3	0.0%	1.3	0.0%	10.0%	4.1	0.1%	8.0%
865Z WATCHES AND CLOCKS (NES)	3.2	0.4%	12.3	0.4%	10.0%	39.1	0.5%	8.0%
8947 OTHER SPORTING GOODS AND FAIRGROUND AMUSEMENTS	2.1	0.2%	7.9	0.3%	10.0%	25.0	0.3%	8.0%
898Z MUSICAL INSTRUMENTS,PARTS AND ACCESSORIES (NES)	8.2	1.0%	31.2	1.1%	10.0%	99.0	1.2%	8.0%
8998 ORTHOPAEDIC APPLIANCES,SURGICAL BELTS AND THE LIKE	0.2	0.0%	0.8	0.0%	10.0%	2.4	0.0%	8.0%
Total - Target Commodities	**604.0**	**70.1%**	**2,229.3**	**76.2%**	**9.8%**	**7,006.4**	**87.8%**	**7.9%**
Total - All Commodities	**861.8**	**100.0%**	**2,924.8**	**100.0%**	**9.1%**	**8,847.8**	**100.0%**	**7.9%**

Southeast Asia Export Air Weight Estimates (Forecast to 2020) - Target Industries

SIC	Industry Grouping	Regional Export Weight (000 MT) 1991 (Base)	2000 (Year 0)	2005 (Year 5)	2020 (Year 20)	GTP Projected Production Year 5 (000 MT)	Year 5 % of Yr. 0-5 Growth	Year 20 (000 MT)	Year 20 % of Yr. 5-20 Growth	Cargo Productivity (MT per Employee) Base	Year 5	Year 20	GTP Employment (Thousands) Year 5	Year 20	Empl. per Plant	GTP Plants Year 5	Year 20
013	FIELD CROPS, EXCEPT CASH GRAINS	0.4	1.0	1.6	5.0	0.0	1.0%	0.0	1.0%	0.6	1.7	4.0	0.0	0.0	72	0	0
018	HORTICULTURAL SPECIALTIES AND VEG PRODUCTS, NSPF	2.7	6.4	10.3	32.7	0.0	1.0%	0.3	1.0%	0.6	1.7	4.0	0.0	0.1	72	0	1
091	FISH, FRESH, CHILLED, OR FROZEN, AND OTHER MARINE	127.5	300.6	484.1	1,535.8	1.8	1.0%	12.4	1.0%	0.6	1.7	4.0	1.1	3.1	72	15	43
	AGRICULTURE, FORESTRY, AND FISHING - Subtotal	130.6	308.0	496.0	1,573.5	1.9	1.0%	12.7	1.0%				1.1	3.2		15	44
225	KNIT FABRICS AND HOSIERY OF TEXTILE MATERIALS	9.8	23.1	37.1	117.8	0.1	1.0%	0.9	1.0%	0.6	1.7	4.0	0.1	0.2	72	1	3
231	MEN'S OR BOYS' SUITS AND COATS, EXCEPT RAINCOATS	1.4	3.4	5.4	17.2	0.0	1.0%	0.1	1.0%	0.1	0.2	0.3	0.1	0.5	178	1	3
232	M & B SHRTS, TRSRS, NGHTWR, UNDRWR & NECKWR, ETC	48.2	113.6	183.0	580.5	0.7	1.0%	4.7	1.0%	0.2	0.3	0.6	2.1	7.9	136	15	58
233	WGI DRESSES, BLS, CTS, SUITS & SHRTS, EX KT SHIRTS	88.6	208.8	336.3	1,066.8	1.3	1.0%	8.6	1.0%	0.3	0.6	1.1	2.1	8.1	39	54	207
234	WOMEN'S, GIRLS', & INFANTS' UNDER GARMENTS & NTWR	7.4	17.5	28.2	89.5	0.1	1.0%	0.7	1.0%	0.1	0.2	0.3	0.7	2.6	127	5	20
236	OUTERWEAR, NSPF, OF TEXTILE MATERIALS	0.4	1.0	1.5	4.9	0.0	1.0%	0.0	1.0%	0.1	0.1	0.2	0.0	0.2	77	1	2
238	WEARING APPAREL AND ACCESSORIES, NSPF	4.7	11.2	18.0	57.2	0.1	1.0%	0.5	1.0%	0.6	1.0	1.7	0.1	0.3	72	1	4
239	FABRICATED TEXTILE ARTICLES, NSPF	5.4	12.6	20.3	64.5	0.1	1.0%	0.5	1.0%	0.6	1.0	1.7	0.1	0.3	72	1	4
267	CONVERTED PPR & PAPERBRD PROD EXC CONTNRS & BOXES	0.8	2.0	3.2	10.1	0.0	1.0%	0.1	1.0%	0.3	0.2	0.1	0.1	0.7	107	1	7
	MANUFACTURING - NON-DURABLE - Subtotal	167.0	393.5	633.6	2,009.4	2.4	1.0%	16.2	1.0%				5.4	20.8		80	308
311	TANNED AND FINISHED LEATHERS	2.4	5.6	9.0	28.5	0.0	0.5%	1.0	5.0%	0.6	1.8	5.0	0.0	0.2	72	0	3
326	CERAMIC SANITARY & INDUS WR, CHINA WR & REL PRODS	0.3	0.7	1.1	3.6	0.0	0.5%	0.1	5.0%	0.6	1.7	4.0	0.0	0.0	72	0	0
340	METAL FORGINGS AND STAMPINGS	0.3	0.6	0.9	2.6	0.0	0.5%	0.1	5.0%	0.6	1.1	2.1	0.0	0.0	72	0	1
349	FABRICATED METAL PRODUCTS, NSPF	2.1	4.9	7.9	25.1	0.0	0.5%	0.9	5.0%	0.9	1.7	3.4	0.0	0.3	75	0	3
354	METALWORKING MACHINERY AND EQUIP, AND PARTS, NSPF	1.1	2.6	4.2	13.3	0.0	0.5%	0.5	5.0%	0.1	0.2	0.3	0.0	1.4	23	2	60
356	GENERAL INDUST MACH & EQUIP, NSPF AND PARTS, NSPF	11.0	25.9	41.8	132.5	0.1	0.5%	4.6	5.0%	0.4	0.7	1.2	0.1	4.0	111	1	36
357	OFFICE, COMPUTING & ACCOUNTING MACH & PARTS, NSPF	68.0	160.4	258.3	819.3	0.5	0.5%	28.5	5.0%	1.1	1.8	3.0	0.3	9.7	160	2	61
361	ELECTRIC DISTRIBUTION EQUIPMENT	1.5	3.1	4.7	13.9	0.0	0.5%	0.5	5.0%	0.1	0.5	1.3	0.0	0.4	120	0	3
362	ELECTRICAL INDUSTRIAL APPARATUS, AND PARTS, NSPF	19.0	40.2	62.1	186.5	0.1	0.5%	6.3	5.0%	0.4	1.8	5.1	0.1	1.2	179	0	7
364	ELECTRIC LIGHTING AND WIRING EQUIPMENT	10.1	12.9	14.8	22.3	0.0	0.5%	0.4	5.0%	0.6	2.7	7.4	0.0	0.1	72	0	1
365	RADIO AND TV RECEIVING EQUIPMENT	13.7	32.2	51.9	164.6	0.1	0.5%	5.7	5.0%	0.6	2.7	7.4	0.0	0.8	72	1	11
366	COMMUNICATION EQUIPMENT, NSPF, AND PARTS, NSPF	16.6	39.1	63.0	199.9	0.1	0.5%	7.0	5.0%	0.2	0.9	2.6	0.1	2.7	179	1	15
367	ELECTRONIC COMPONENTS AND ACCESSORIES, NSPF	115.4	260.9	414.0	1,288.1	0.8	0.5%	44.5	5.0%	2.0	9.3	25.6	0.1	1.7	107	1	16
369	ELECTRCL MACH, EQUIP & SUPPLIES, NSPF & PARTS NSPF	1.0	2.3	3.6	11.5	0.0	0.5%	0.4	5.0%	0.6	2.7	7.4	0.0	0.1	72	0	1
371	MOTOR VEHICLES, AND PARTS, NSPF	2.7	4.9	6.8	19.2	0.0	0.5%	0.6	5.0%	1.0	3.9	10.8	0.0	0.1	124	0	0
381	ENGN, LAB, SCIENT & RES INSTR & ASSOC EQP PTS NSPF	1.1	2.6	4.2	13.2	0.0	0.5%	0.5	5.0%	0.6	2.7	7.4	0.0	0.1	72	0	1
382	MECH MEASNG & CONTRLLG INSTR & AUTOMTC TEMP CONTRL	13.6	32.0	51.5	163.3	0.1	0.5%	5.7	5.0%	0.5	2.2	6.1	0.0	0.9	80	1	12
384	SURG, MED & DENTAL INSTRMTS & SUPPLIES & PTS NSPF	2.6	6.2	10.0	31.9	0.0	0.5%	1.1	5.0%	0.4	2.1	5.8	0.0	0.2	73	0	3
385	OPTHALMIC GOODS, AND PARTS, NSPF	1.3	2.9	4.4	14.0	0.0	0.5%	0.5	5.0%	0.6	2.7	7.4	0.0	0.1	72	0	1
386	PHOTOGRAPHIC EQUIPMENT AND SUPPLIES	5.9	14.0	22.5	71.5	0.0	0.5%	2.5	5.0%	0.4	1.9	5.3	0.0	0.5	70	0	7
387	WATCHES, CLOCKS, CLOCKWORK OPER DEVICES & PTS NSPF	3.2	7.4	12.0	38.1	0.0	0.5%	1.3	5.0%	0.6	2.7	7.4	0.0	0.2	72	0	2
394	TOYS AND AMUSEMENT, SPORTING, AND ATHLETIC GOODS	2.2	5.1	8.2	26.0	0.0	0.5%	0.9	5.0%	0.2	1.0	2.8	0.0	0.3	40	0	8
	MANUFACTURING - DURABLE - Subtotal	295.6	667.7	1,058.9	3,294.5	2.0	0.5%	113.5	5.0%				0.9	24.7		9	252
	Total - Target Industries	**593.2**	**1,369.2**	**2,188.5**	**6,877.4**	**6.2**		**142.4**		**0.8**	**0.8**	**2.9**	**7.4**	**48.7**		**104**	**604**

Note: Totals exclude commodities with no industrial breakdown in U.S. data. Industries with total projected traffic less than 2,000 MT in 2020 are not included as target industries, but are in regional totals

Appendix 3
Table 29

Southeast Asia Export Air Weight Estimates (1991)

SITC Commodity Grouping	Southeast Asia Trade (1991)				Exports to U.S. (1991)						Estimated Air Exports (Adjusted) (000 Metric Tons)					
					Southeast Asia to U.S.				All Countries		Intra-Regional		Inter-Regional		Total	
	Export Value (Mil. $)	Thai-land Share	U.S. Share	1989-1991 Change	Air Weight (MT)	Air Percent of Vessel/Air Total Value	Air Percent of Vessel/Air Total Weight	Average Value* ($/KG)	Air % of V/A Value	Average Value* ($/KG)	Weight	% of Total	Weight	% of Total	Weight	% of Total
0011 ANIMALS OF THE BOVINE SPECIES,INCL BUFFALOES,LIVE	$1	8%	0%	-49%	0	0%	0%	$0	100%	$7	0.1	0.1%	0.0	0.0%	0.1	0.0%
0013 SWINE, LIVE	$99	0%	0%	37%	0	0%	0%	$0	100%	$9	19.5	10.1%	0.0	0.0%	19.5	2.3%
0014 POULTRY, LIVE (I.E., FOWLS, DUCKS, GEESE, ETC.)	$104	2%	0%	90%	0	100%	100%	$74	100%	$15	2.5	1.3%	0.0	0.0%	2.5	0.3%
001Z LIVE ANIMALS CHIEFLY FOR FOOD (NES)	$13	3%	23%	34%	124	100%	100%	$37	100%	$33	0.1	0.0%	0.6	0.1%	0.6	0.1%
00 LIVE ANIMALS CHIEFLY FOR FOOD	**$218**	**1%**	**1%**	**56%**	**125**	**100%**	**100%**	**$37**	**100%**	**$29**	**22.4**	**11.5%**	**0.6**	**0.1%**	**23.0**	**2.7%**
012Z MEAT & EDIBLE OFFALS,SALTED,IN BRINE,DRIED/SMOKED (NES)	$2	1%	0%	37%	0	0%	0%	$0	31%	$9	0.0	0.0%	0.1	0.0%	0.2	0.0%
01 MEAT AND MEAT PREPARATIONS	**$527**	**84%**	**1%**	**58%**	**0**	**0%**	**0%**	**$0**	**1%**	**$6**	**0.0**	**0.0%**	**0.1**	**0.0%**	**0.2**	**0.0%**
02 DAIRY PRODUCTS AND BIRDS'EGGS	**$208**	**13%**	**0%**	**19%**	**0**	**0%**	**0%**	**$0**	**2%**	**$7**	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.0**	**0.0%**
0341 FISH,FRESH(LIVE/DEAD)OR CHILLED,EXCL FILLETS	$371	8%	8%	95%	5,748	99%	99%	$5	94%	*$4	40.5	20.9%	86.6	13.0%	127.1	14.8%
0342 FISH,FROZEN (EXCLUDIND FILLETS)	$460	48%	4%	56%	22	1%	0%	$5	1%	*$4	0.1	0.1%	0.9	0.1%	1.0	0.1%
0344 FISH,FRESH (LIVE OR DEAD),CHILLED OR FROZEN (NES)	$5	8%	7%	36%	29	13%	4%	$9	57%	*$5	0.0	0.0%	0.1	0.0%	0.1	0.0%
03 FISH,CRUSTACEANS,MOLLUCS,PREPARATIONS THEREOF	**$5,898**	**50%**	**21%**	**45%**	**5,816**	**3%**	**2%**	**$5**	**11%**	**$5**	**40.7**	**21.0%**	**87.8**	**13.2%**	**128.4**	**15.0%**
04 CEREALS AND CEREAL PREPARATIONS	**$531**	**51%**	**4%**	**3%**	**1**	**0%**	**0%**	**$21**	**1%**	**$2**	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.0**	**0.0%**
0546 OTHER FRESH OR CHILLED VEGETABLES	$987	81%	1%	0%	8	26%	5%	$4	53%	*$2	0.1	0.1%	1.5	0.2%	1.6	0.2%
0572 FRUIT & NUTS(NOT INCLUD OIL NUTS),FRESH OR DRIED (NES)	$684	7%	1%	18%	122	1%	0%	$2	1%	*$1	0.5	0.2%	3.6	0.5%	4.1	0.5%
05 VEGETABLES AND FRUIT	**$3,094**	**52%**	**15%**	**24%**	**137**	**0%**	**0%**	**$3**	**2%**	**$1**	**0.6**	**0.3%**	**5.1**	**0.8%**	**5.8**	**0.7%**
06 SUGAR,SUGAR PREPARATIONS AND HONEY	**$934**	**71%**	**12%**	**-16%**	**1**	**0%**	**0%**	**$6**	**0%**	**$3**	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.0**	**0.0%**
075Z SPICES (NES)	$360	4%	23%	-24%	239	11%	1%	$38	7%	$16	0.3	0.1%	1.6	0.2%	1.9	0.2%
07 COFFEE,TEA,COCOA,SPICES,MANUFACTURES THEREOF	**$1,831**	**3%**	**21%**	**-10%**	**242**	**3%**	**0%**	**$38**	**1%**	**$11**	**0.3**	**0.2%**	**1.7**	**0.2%**	**2.0**	**0.2%**
08 FEED.STUFF FOR ANIMALS(NOT INCL UNMILLED CEREALS)	**$278**	**66%**	**13%**	**18%**	**14**	**0%**	**0%**	**$0**	**0%**	**$2**	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.0**	**0.0%**
091Z MARGARINE AND SHORTENING (NES)	$85	0%	0%	13%	0	0%	0%	$0	1%	$4	0.0	0.0%	0.3	0.0%	0.4	0.0%
099Z EDIBLE PRODUCTS AND PREPARATIONS N.E.S. (NES)	$297	34%	14%	57%	22	1%	0%	$13	3%	$12	0.1	0.0%	0.2	0.0%	0.3	0.0%
09 MISCEL.EDIBLE PRODUCTS AND PREPARATIONS	**$382**	**26%**	**11%**	**44%**	**22**	**1%**	**0%**	**$13**	**3%**	**$12**	**0.1**	**0.1%**	**0.5**	**0.1%**	**0.7**	**0.1%**
11 BEVERAGES	**$212**	**6%**	**4%**	**10%**	**1**	**0%**	**0%**	**$3**	**1%**	**$4**	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.0**	**0.0%**
1222 CIGARETTES	$603	0%	1%	73%	31	13%	13%	$7	7%	$12	2.3	1.2%	8.1	1.2%	10.4	1.2%
12 TOBACCO AND TOBACCO MANUFACTURES	$840	14%	5%	78%	38	1%	0%	$9	0%	$11	2.3	1.2%	8.2	1.2%	10.5	1.2%

515

Southeast Asia Export Air Weight Estimates (1991)

SITC Commodity Grouping	Southeast Asia Trade (1991)				Exports to U.S. (1991)						Estimated Air Exports (Adjusted) (000 Metric Tons)					
					Southeast Asia to U.S.				All Countries		Intra-Regional		Inter-Regional		Total	
	Export Value (Mil. $)	Thai-land Share	U.S. Share	1989-1991 Change	Air Weight (MT)	Air Percent of Vessel/Air Total Value	Air Percent of Vessel/Air Total Weight	Average Value* ($/KG)	Air % of V/A Value	Average Value* ($/KG)	Weight	% of Total	Weight	% of Total	Weight	% of Total
211Z HIDES AND SKINS (EXCEPT FURSKINS), RAW (NES)	$21	6%	2%	-36%	5	85%	19%	$105	32%	$22	0.1	0.0%	0.3	0.0%	0.3	0.0%
21 HIDES,SKINS AND FURSKINS,RAW	**$41**	**5%**	**1%**	**-23%**	**8**	**13%**	**1%**	**$62**	**47%**	**$64**	**0.1**	**0.0%**	**0.3**	**0.0%**	**0.4**	**0.0%**
22 OIL SEEDS AND OLEAGINOUS FRUIT	**$38**	**1%**	**0%**	**40%**	**0**	**0%**	**0%**	**$0**	**1%**	**$3**	**0.0**	**0.0%**	**0.1**	**0.0%**	**0.1**	**0.0%**
23 CRUDE RUBBER (INCLUDING SYNTHETIC AND RECLAIMED)	**$3,826**	**26%**	**19%**	**-18%**	**3**	**0%**	**0%**	**$7**	**0%**	**$6**	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.0**	**0.0%**
24 CORK AND WOOD	**$2,421**	**2%**	**3%**	**-16%**	**9**	**0%**	**0%**	**$2**	**1%**	**$1**	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.0**	**0.0%**
25 PULP AND WASTE PAPER	**$19**	**0%**	**0%**	**-22%**	**0**	*****%**	*****%**	**$0**	**1%**	**$1**	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.0**	**0.0%**
26 TEXTILE FIBRES (EXCEPT WOOL TOPS) AND THEIR WASTES	**$281**	**36%**	**6%**	**22%**	**0**	**0%**	**0%**	**$25**	**1%**	**$11**	**0.0**	**0.0%**	**0.1**	**0.0%**	**0.1**	**0.0%**
2786 QUARTZ,MICA,FELSPAR,FLUORSPAR,CRYOLITE & CHIOLITE	$16	85%	0%	10%	3	28%	32%	$5	2%	*$5	0.4	0.2%	1.3	0.2%	1.7	0.2%
278Z OTHER CRUDE MINERALS (NES)	$21	19%	3%	53%	6	97%	4%	$266	1%	*$3	0.1	0.0%	0.1	0.0%	0.1	0.0%
27 CRUDE FERTILIZERS AND CRUDE MATERIALS (EXCL.COAL)	**$208**	**49%**	**1%**	**23%**	**10**	**94%**	**5%**	**$176**	**13%**	**$29**	**0.5**	**0.3%**	**1.4**	**0.2%**	**2.0**	**0.2%**
2682 OTHER NON-FERROUS BASE METAL WASTE AND SCRAP,N E S	$175	0%	1%	-4%	203	34%	21%	$3	3%	*$2	5.2	2.7%	33.9	5.1%	39.1	4.5%
28 METALLIFEROUS ORES AND METAL SCRAP	**$895**	**2%**	**3%**	**-18%**	**205**	**3%**	**0%**	**$4**	**7%**	**$133**	**5.2**	**2.7%**	**34.0**	**5.1%**	**39.2**	**4.5%**
2911 BONES,HORNS,IVORY,HOOVES,CLAWS,CORAL,SHELLS ETC	$47	23%	5%	-14%	93	10%	6%	$3	67%	$39	0.0	0.0%	2.8	0.4%	2.8	0.3%
2925 SEEDS,FRUIT & SPORES,NES,OF A KIND USED FOR SOWING	$31	83%	26%	92%	104	99%	60%	$79	74%	$76	0.1	0.0%	0.6	0.1%	0.7	0.1%
2926 BULBS,TUBERS & RHIZOMES OF FLOWERING OR OF FOLIAGE	$28	18%	5%	56%	61	100%	100%	$21	21%	*$5	0.8	0.4%	1.6	0.2%	2.4	0.3%
2927 CUT FLOWERS AND FOLIAGE	$68	43%	6%	41%	751	65%	47%	$5	94%	*$2	2.7	1.4%	13.6	2.0%	16.3	1.9%
292Z CRUDE VEGETABLE MATERIALS, N E S (NES)	$177	11%	7%	8%	6	1%	0%	$11	16%	$45	0.0	0.0%	0.1	0.0%	0.2	0.0%
29 CRUDE ANIMAL AND VEGETABLE MATERIALS,N.E.S.	**$516**	**23%**	**7%**	**7%**	**1,016**	**39%**	**6%**	**$13**	**46%**	**$3**	**3.6**	**1.9%**	**18.9**	**2.8%**	**22.5**	**2.6%**
32 COAL,COKE AND BRIQUETTES	**$319**	**0%**	**0%**	**207%**	**0**	**0%**	**0%**	**$0**	**0%**	**$0**	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.0**	**0.0%**
33 PETROLEUM,PETROLEUM PRODUCTS AND RELATED MATERIALS	**$11,388**	**0%**	**7%**	**14%**	**0**	**0%**	**0%**	**$0**	**0%**	**$2**	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.0**	**0.0%**
34 GAS,NATURAL AND MANUFACTURED	**$7,216**	**2%**	**2%**	**68%**	**0**	**0%**	**0%**	**$0**	**0%**	**$17**	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.0**	**0.0%**
4111 FATS AND OILS OF FISH AND MARINE MAMMALS	$14	0%	0%	227%	0	0%	0%	$0	19%	$18	0.0	0.0%	0.3	0.0%	0.3	0.0%
41 ANIMAL OILS AND FATS	**$14**	**0%**	**0%**	**227%**	**0**	*****%**	*****%**	**$0**	**19%**	**$18**	**0.0**	**0.0%**	**0.3**	**0.0%**	**0.3**	**0.0%**
42 FIXED VEGETABLE OILS AND FATS	**$2,251**	**0%**	**11%**	**-23%**	**0**	**0%**	**0%**	**$0**	**0%**	**$4**	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.0**	**0.0%**

Southeast Asia Export Air Weight Estimates (1991)

SITC Commodity Grouping	Southeast Asia Trade (1991)				Exports to U.S. (1991)						Estimated Air Exports (Adjusted) (000 Metric Tons)					
					Southeast Asia to U.S.				All Countries		Intra-Regional		Inter-Regional		Total	
	Export Value (Mil. $)	Thai-land Share	U.S. Share	1989-1991 Change	Air Weight (MT)	Air Value	Percent of Vessel/Air Total Weight	Average Value* ($/KG)	Air % of V/A Value	Average Value* ($/KG)	Weight	% of Total	Weight	% of Total	Weight	% of Total
43 ANIMAL & VEGETABLE OILS AND FATS,PROCESSED & WAXES	**$0**	**4%**	**0%**	**-39%**	**0**	**0%**	**0%**	**$0**	**1%**	**$6**	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.0**	**0.0%**
511Z HYDROCARBONS NES,& THEIR HALOGEN & ETC DERIVATIVES (NES)	$122	1%	0%	2%	0	100%	100%	$85	2%	$26	0.3	0.1%	0.5	0.1%	0.8	0.1%
515Z ORGANO-INORGANIC AND HETEROCYCLIC COMPOUNDS (NES)	$752	1%	54%	79%	344	100%	68%	$1,167	60%	$329	0.1	0.0%	1.1	0.2%	1.2	0.1%
516Z OTHER ORGANIC CHEMICALS (NES)	$6	70%	26%	85%	27	95%	51%	$45	22%	$56	0.0	0.0%	0.2	0.0%	0.2	0.0%
51 ORGANIC CHEMICALS	**$1,328**	**6%**	**33%**	**68%**	**377**	**92%**	**1%**	**$1,070**	**23%**	**$132**	**0.4**	**0.2%**	**1.8**	**0.3%**	**2.3**	**0.3%**
52 INORGANIC CHEMICALS	**$276**	**12%**	**3%**	**56%**	**0**	**1%**	**0%**	**$47**	**10%**	**$30**	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.1**	**0.0%**
533Z DYEING,TANNING AND COLOURING MATERIALS (NES)	$344	15%	2%	53%	2	0%	0%	$18	9%	$19	0.1	0.0%	0.1	0.0%	0.1	0.0%
53 DYEING,TANNING AND COLOURING MATERIALS	**$344**	**15%**	**2%**	**53%**	**2**	**0%**	**0%**	**$18**	**9%**	**$19**	**0.1**	**0.0%**	**0.1**	**0.0%**	**0.1**	**0.0%**
5411 PROVITAMINS & VITAMINS,NARURAL/REPROD BY SYNTHESIS	$5	12%	0%	27%	5	55%	52%	$39	13%	$93	0.1	0.0%	0.0	0.0%	0.1	0.0%
5413 ANTIBIOTICS N.E.S.,NOT INCL. IN 541.7	$74	4%	23%	27%	172	64%	64%	$92	80%	$207	0.1	0.0%	0.9	0.1%	0.9	0.1%
5414 VEGETAB.ALKALOIDS,NATURAL/REPRODUCED BY SYNTHESIS	$12	6%	25%	17%	60	95%	95%	$55	41%	$213	0.0	0.0%	0.3	0.1%	0.4	0.0%
541Z MEDICINAL AND PHARMACEUTICAL PRODUCTS (NES)	$31	29%	6%	20%	7	7%	3%	$10	46%	$50	0.1	0.0%	0.1	0.0%	0.2	0.0%
54 MEDICINAL AND PHARMACEUTICAL PRODUCTS	**$330**	**11%**	**11%**	**22%**	**245**	**62%**	**27%**	**$79**	**74%**	**$144**	**0.3**	**0.1%**	**1.4**	**0.2%**	**1.7**	**0.2%**
553Z PERFUMERY,COSMETICS AND TOILET PREPARATIONS (NES)	$279	19%	14%	69%	20	5%	1%	$14	24%	$27	0.1	0.1%	0.2	0.0%	0.3	0.0%
5542 ORGANIC SURFACE-ACTIVE AGENTS,N.E.S.	$197	7%	1%	21%	6	4%	2%	$3	4%	*$8	0.3	0.1%	0.4	0.1%	0.7	0.1%
55 ESSENTIAL OILS & PERFUME MAT.;TOILET-CLEANSING MAT	**$628**	**13%**	**8%**	**57%**	**28**	**2%**	**1%**	**$14**	**25%**	**$31**	**0.4**	**0.2%**	**0.6**	**0.1%**	**1.0**	**0.1%**
56 FERTILIZERS,MANUFACTURED	**$492**	**0%**	**0%**	**43%**	**0**	*****%**	*****%**	**$0**	**0%**	**$1**	**0.0**	**0.0%**	**0.0**	**0.0%**	**0.0**	**0.0%**
58XZ ARTIF.RESINS,PLASTIC MAT.,CELLULOSE ESTERS/ETHERS (NES)	$1,510	15%	3%	40%	102	1%	0%	$7	7%	$14	2.5	1.3%	2.7	0.4%	5.2	0.6%
58 ARTIF.RESINS,PLASTIC MAT.,CELLULOSE ESTERS/ETHERS	**$1,510**	**15%**	**3%**	**40%**	**102**	**1%**	**0%**	**$7**	**7%**	**$14**	**2.5**	**1.3%**	**2.7**	**0.4%**	**5.2**	**0.6%**
5922 ALBUMINOIDAL SUBSTANCES,GLUES	$100	70%	4%	67%	12	1%	0%	$6	4%	$15	0.1	0.0%	0.3	0.1%	0.4	0.0%
599Z MISCELLANEOUS CHEMICAL PRODUCTS,N.E.S. (NES)	$762	4%	10%	47%	207	76%	1%	$237	36%	$20	1.2	0.6%	2.8	0.4%	4.0	0.5%
59 CHEMICAL MATERIALS AND PRODUCTS,N.E.S.	**$982**	**11%**	**8%**	**50%**	**219**	**70%**	**1%**	**$225**	**24%**	**$20**	**1.3**	**0.7%**	**3.1**	**0.5%**	**4.4**	**0.5%**
611Z LEATHER (NES)	$216	50%	14%	26%	181	25%	11%	$41	45%	$31	0.3	0.2%	2.1	0.3%	2.4	0.3%
612Z MANUFACTURES OF LEATHER/OF COMPOSITION LEATHER NES (NE	$202	81%	32%	36%	29	4%	0%	$29	30%	$28	0.0	0.0%	0.2	0.0%	0.2	0.0%
613Z FURSKINS,TANNED/DRESSED,PIECES/CUTTINGS OF FURSKIN (NES)	$28	0%	0%	-20%	0	0%	0%	$0	60%	$29	0.0	0.0%	1.1	0.2%	1.1	0.1%
61 LEATHER,LEATHER MANUF.,N.E.S.AND DRESSED FURSKISG	**$447**	**61%**	**21%**	**26%**	**210**	**16%**	**2%**	**$40**	**43%**	**$30**	**0.3**	**0.2%**	**3.3**	**0.5%**	**3.6**	**0.4%**
621Z MATERIALS OF RUBBER(E.G.,PASTES,PLATES,SHEETS,ETC) (NES)	$185	14%	16%	30%	11	0%	0%	$6	9%	$17	0.0	0.0%	0.1	0.0%	0.1	0.0%
625Z RUBBER TYRES,TYRE CASES,ETC FOR WHEELS (NES)	$278	38%	10%	20%	8	0%	0%	$5	0%	*$6	0.0	0.0%	0.1	0.0%	0.1	0.0%
629Z ARTICLES OF RUBBER,N.E.S. (NES)	$165	36%	19%	46%	237	6%	1%	$9	19%	$20	0.5	0.2%	1.6	0.2%	2.1	0.2%
62 RUBBER MANUFACTURES,N.E.S.	**$629**	**31%**	**14%**	**29%**	**266**	**3%**	**1%**	**$9**	**6%**	**$18**	**0.6**	**0.3%**	**1.8**	**0.3%**	**2.3**	**0.3%**

Southeast Asia Export Air Weight Estimates (1991)

SITC Commodity Grouping	Southeast Asia Trade (1991)				Exports to U.S. (1991)						Estimated Air Exports (Adjusted) (000 Metric Tons)					
					Southeast Asia to U.S.				All Countries		Intra-Regional		Inter-Regional		Total	
	Export Value (Mil. $)	Thai-land Share	U.S. Share	1989-1991 Change	Air Weight (MT)	Air Percent of Vessel/Air Total Value	Air Percent of Vessel/Air Total Weight	Average Value* ($/KG)	Air % of V/A Value	Average Value* ($/KG)	Weight	% of Total	Weight	% of Total	Weight	% of Total
6363 BUILDERS' CARPENTRY AND JOINERY	$406	4%	7%	82%	9	0%	0%	$13	2%	*$8	0.0	0.0%	0.2	0.0%	0.2	0.0%
6362 WOOD MANUFACTURES,N.E.S. (NES)	$340	38%	32%	35%	604	4%	1%	$7	4%	*$9	0.1	0.0%	3.2	0.5%	3.3	0.4%
63 CORK AND WOOD MANUFACTURES (EXCL.FURNITURE)	**$4,693**	**3%**	**11%**	**28%**	**613**	**1%**	**0%**	**$7**	**2%**	**$9**	**0.1**	**0.1%**	**3.5**	**0.5%**	**3.6**	**0.4%**
6415 PAPER AND PAPERBOARD,IN ROLLS OR SHEETS,N E S	$221	3%	0%	-1%	1	39%	8%	$21	2%	*$4	0.6	0.3%	1.1	0.2%	1.7	0.2%
6416 BUILDING BOARD OF WOOD PULP OR OF VEGETABLE FIBRE	$20	16%	2%	37%	2	13%	14%	$2	2%	*$2	0.1	0.0%	0.1	0.0%	0.2	0.0%
6417 PAPER & PAPERBOARD,CORRUGATED,CREPED,CRINKLED ETC	$15	0%	0%	9%	6	15%	12%	$5	3%	*$6	0.5	0.2%	0.4	0.1%	0.9	0.1%
641Z PAPER AND PAPERBOARD (NES)	$15	14%	2%	58%	9	72%	25%	$22	7%	*$8	0.2	0.1%	0.6	0.1%	0.8	0.1%
6421 BOXES,BAGS & OTH PACKING CONTAINERS,OF PAPER/PAPBD	$69	8%	5%	82%	118	15%	10%	$4	11%	*$8	2.1	1.1%	2.1	0.3%	4.2	0.5%
6424 PAPER AND PAPERBOARD,CUT TO SIZE OR SHAPE,N E S	$164	8%	17%	70%	70	5%	5%	$4	9%	*$9	0.2	0.1%	0.6	0.1%	0.8	0.1%
64 PAPER,PAPERBOARD,ARTIC.OF PAPER,PAPER-PULP/BOARD	**$613**	**5%**	**5%**	**28%**	**208**	**10%**	**6%**	**$5**	**2%**	**$7**	**3.7**	**1.9%**	**5.0**	**0.7%**	**8.7**	**1.0%**
651Z TEXTILE YARN (NES)	$851	32%	6%	45%	14	0%	0%	$5	10%	$17	0.1	0.0%	0.3	0.1%	0.4	0.0%
6531 FABRICS,WOVEN OF CONTINUOUS SYNTH.TEXTIL.MATERIALS	$1,544	21%	4%	63%	30	3%	1%	$15	19%	$20	0.3	0.2%	1.0	0.1%	1.3	0.2%
653Z FABRICS,WOVEN,OF MAN-MADE FIBRES (NES)	$242	43%	12%	149%	109	2%	1%	$11	29%	$20	0.1	0.1%	0.6	0.1%	0.7	0.1%
6542 TEXTIL FABRICS,WOVEN,OTH.THAN COTTON/MAN-MADE FIBR (NES)	$70	29%	8%	-2%	60	96%	27%	$84	64%	$78	0.2	0.1%	1.2	0.2%	1.4	0.2%
6562 TULLE,LACE,EMBROIDERY,RIBBONS,& OTHER SMALL WARES (NES)	$354	10%	3%	186%	102	73%	29%	$60	64%	$52	4.2	2.2%	2.1	0.3%	6.4	0.7%
6584 BED LINEN,TABLE LINEN,TOILET & KITCHEN LINEN ETC	$249	33%	12%	52%	31	2%	1%	$12	7%	$15	0.1	0.0%	0.4	0.1%	0.5	0.1%
6582 MADE-UP ARTICLES,WHOLLY/CHIEFLY OF TEXT.MATERIALS (NES)	$95	34%	27%	63%	84	6%	2%	$20	11%	*$4	0.1	0.0%	0.4	0.1%	0.5	0.1%
6583 CARPETS,CARPETING AND RUGS,KNOTTED	$111	17%	8%	26%	6	56%	40%	$37	31%	$37	0.0	0.0%	0.1	0.0%	0.1	0.0%
65 TEXTILE YARN,FABRICS,MADE-UPART.,RELATED PRODUCTS	**$4,868**	**24%**	**7%**	**55%**	**455**	**5%**	**1%**	**$34**	**23%**	**$23**	**5.2**	**2.7%**	**6.5**	**1.0%**	**11.7**	**1.4%**
6623 REFRACTORY BRICKS & OTHER REFRACT.CONSTRUCT MATER.	$14	38%	0%	43%	0	0%	0%	$0	2%	$3	0.1	0.1%	0.1	0.0%	0.2	0.0%
6699 MANUFACTURES OF MINERAL MATERIALS,N E S	$100	28%	6%	113%	50	28%	11%	$10	26%	$24	0.8	0.4%	0.7	0.1%	1.4	0.2%
665Z GLASSWARE (NES)	$444	19%	5%	58%	35	13%	0%	$34	23%	$30	0.4	0.2%	0.9	0.1%	1.3	0.2%
666Z POTTERY (NES)	$234	38%	50%	49%	456	4%	1%	$10	5%	$14	0.1	0.1%	1.5	0.2%	1.6	0.2%
6672 DIAMONDS,UNWORK.CUT/OTHERWISE WORK.NOT MOUNTED/SET	$587	68%	9%	108%	7	100%	100%	$2,259	100%	$3,207	0.0	0.0%	0.1	0.0%	0.2	0.0%
6674 SYNTHETIC/RECONSTRUCTED PRECIOUS/SEMI-PREC STONES	$684	82%	24%	17%	24	100%	91%	$723	98%	$614	0.0	0.0%	0.2	0.0%	0.2	0.0%
66 NON-METALLIC MINERAL MANUFACTURES,N.E.S.	**$2,315**	**53%**	**16%**	**33%**	**812**	**57%**	**1%**	**$247**	**59%**	**$190**	**1.5**	**0.8%**	**3.6**	**0.5%**	**5.0**	**0.6%**
67XZ IRON AND STEEL (NES)	$1,188	14%	4%	-12%	3	0%	0%	$11	0%	*$9	0.1	0.0%	0.1	0.0%	0.1	0.0%
67 IRON AND STEEL	**$1,188**	**14%**	**4%**	**-12%**	**3**	**0%**	**0%**	**$11**	**0%**	**$9**	**0.1**	**0.0%**	**0.1**	**0.0%**	**0.1**	**0.0%**
6811 SILVER,UNWROUGHT,UNWORKED OR SEMI-MANUFACTURED	$25	0%	12%	-47%	22	100%	100%	$131	98%	$111	0.2	0.1%	0.2	0.0%	0.3	0.0%
6822 COPPER (NES)	$545	2%	1%	-23%	7	2%	1%	$13	3%	$12	0.6	0.3%	0.6	0.1%	1.3	0.1%
6832 NICKEL AND NICKEL ALLOYS,WORKED	$11	0%	0%	-7%	0	100%	100%	$23	7%	$30	0.5	0.3%	0.2	0.0%	0.8	0.1%
6842 LEAD AND LEAD ALLOYS,WORKED	$22	0%	0%	442%	0	8%	5%	$8	19%	*$4	0.2	0.1%	0.0	0.0%	0.2	0.0%
68 NON-FERROUS METALS	**$1,562**	**4%**	**4%**	**-38%**	**30**	**6%**	**0%**	**$102**	**44%**	**$327**	**1.6**	**0.8%**	**1.1**	**0.2%**	**2.6**	**0.3%**
691Z STRUCTURES & PARTS OF STRUC.;IRON,STEEL,ALUMINIUM (NES)	$296	33%	2%	92%	50	9%	11%	$4	6%	$13	1.6	0.8%	3.5	0.5%	5.1	0.6%
692Z METAL CONTAINERS FOR STORAGE AND TRANSPORT (NES)	$149	26%	4%	44%	2	2%	1%	$8	7%	$12	0.1	0.0%	0.1	0.0%	0.1	0.0%
694Z NAILS,SCREWS,NUTS,BOLTS ETC OF IRON,STEEL,COPPER (NES)	$145	17%	10%	49%	48	4%	0%	$12	7%	$27	0.3	0.1%	0.6	0.1%	0.9	0.1%
6964 INTERCHANGEABLE TOOLS FOR HAND & MACHINE TOOLS	$113	12%	10%	59%	13	23%	4%	$15	13%	$27	0.1	0.1%	0.1	0.0%	0.2	0.0%
6974 ART COMMONLY USED FOR DOM PURPOSES,POT SCOURERS	$146	27%	32%	115%	84	1%	1%	$8	3%	$13	0.1	0.1%	0.4	0.1%	0.5	0.1%

Southeast Asia Export Air Weight Estimates (1991)

SITC Commodity Grouping	Southeast Asia Trade (1991)				Exports to U.S. (1991)						Estimated Air Exports (Adjusted) (000 Metric Tons)					
					Southeast Asia to U.S.				All Countries		Intra-Regional		Inter-Regional		Total	
	Export Value (Mil. $)	Thailand Share	U.S. Share	1989-1991 Change	Air Weight (MT)	Air Percent of Vessel/Air Total Value	Air Percent of Vessel/Air Total Weight	Average Value* ($/KG)	Air % of V/A Value	Average Value* ($/KG)	Weight	% of Total	Weight	% of Total	Weight	% of Total
6691 LOCKSMITHS WARES,SAFES,STRONG ROOMS OF BASE METAL	$113	19%	17%	51%	43	3%	1%	$14	7%	$13	0.1	0.1%	0.4	0.1%	0.5	0.1%
6698 MISCELLANEOUS ARTICLES OF BASE METAL	$67	25%	3%	64%	4	3%	1%	$13	16%	$22	0.1	0.1%	0.1	0.0%	0.3	0.0%
6697 ARTICLES OF IRON OR STEEL, N.E.S.	$161	24%	6%	81%	67	19%	3%	$18	12%	$25	1.1	0.6%	0.9	0.1%	2.0	0.2%
6696 ART ,NES OF COPPER,NICKEL,ALUMINUM,LEAD,ZINC,TIN	$125	25%	15%	86%	59	15%	5%	$20	26%	$34	0.3	0.2%	0.4	0.1%	0.7	0.1%
6692 MANUFACTURES OF BASE METAL,N.E.S. (NES)	$39	32%	28%	77%	60	19%	6%	$25	34%	$33	0.1	0.0%	0.3	0.0%	0.4	0.0%
69 MANUFACTURES OF METAL,N.E.S.	**$1,567**	**23%**	**11%**	**72%**	**440**	**6%**	**1%**	**$14**	**11%**	**$23**	**3.9**	**2.0%**	**6.9**	**1.0%**	**10.8**	**1.3%**
713Z INTERNAL COMBUSTION PISTON ENGINES & PARTS (NES)	$222	11%	6%	31%	38	58%	8%	$272	6%	$30	0.3	0.2%	0.6	0.1%	0.9	0.1%
714Z ENGINES & MOTORS,NON-ELECTRIC (NES)	$379	0%	28%	13%	729	96%	98%	$73	96%	$391	0.6	0.3%	4.1	0.6%	4.8	0.6%
716Z ROTATING ELECTRIC PLANT AND PARTS (NES)	$629	19%	8%	49%	234	20%	3%	$46	20%	$35	2.0	1.0%	3.0	0.4%	4.9	0.6%
71 POWER GENERATING MACHINERY AND EQUIPMENT	**$1,317**	**12%**	**14%**	**32%**	**1,002**	**64%**	**9%**	**$74**	**47%**	**$177**	**2.9**	**1.6%**	**7.6**	**1.1%**	**10.6**	**1.2%**
723Z CIVIL ENGINEERING & CONTRACTORS PLANT AND PARTS (NES)	$468	1%	3%	45%	9	14%	4%	$23	6%	$23	0.3	0.2%	0.3	0.0%	0.6	0.1%
7246 MACH.FOR PREPARING,TANNING OR WORKING HIDES	$10	8%	0%	303%	0	0%	0%	$0	30%	$13	0.3	0.2%	0.1	0.0%	0.4	0.1%
727Z FOOD PROCESSING MACHINES AND PARTS (NES)	$55	13%	1%	30%	2	16%	2%	$46	27%	$42	0.2	0.1%	0.1	0.0%	0.3	0.0%
7281 MACH.TOOLS FOR SPECIALIZED PARTICULAR INDUSTRIES	$61	3%	0%	64%	1	73%	15%	$53	13%	$52	0.4	0.2%	0.1	0.0%	0.5	0.1%
7283 MACH.FOR SORTING,SCREENING,SEPARATING,WASHING ORES	$48	3%	3%	-47%	28	61%	5%	$59	16%	$37	0.6	0.3%	0.3	0.1%	0.9	0.1%
7284 MACH.& APPLIANCES FOR SPEZIALIZED PARTICULAR IND.	$570	7%	3%	18%	42	44%	17%	$64	21%	$86	1.4	0.7%	0.9	0.1%	2.3	0.3%
72 MACHINERY SPECIALIZED FOR PARTICULAR INDUSTRIES	**$1,397**	**5%**	**4%**	**25%**	**86**	**37%**	**6%**	**$57**	**13%**	**$50**	**3.2**	**1.7%**	**1.8**	**0.3%**	**5.0**	**0.6%**
73XZ METALWORKING MACHINERY (NES)	$250	16%	13%	59%	48	5%	2%	$30	14%	$56	0.3	0.2%	0.3	0.1%	0.7	0.1%
73 METALWORKING MACHINERY	**$250**	**16%**	**13%**	**59%**	**48**	**5%**	**2%**	**$30**	**14%**	**$56**	**0.3**	**0.2%**	**0.3**	**0.1%**	**0.7**	**0.1%**
7413 IND.& LAB.FURNACES AND OVENS AND PARTS	$86	7%	6%	139%	3	12%	1%	$60	37%	$56	0.1	0.0%	0.0	0.0%	0.1	0.0%
741Z HEATING & COOLING EQUIPMENT AND PARTS (NES)	$79	9%	1%	125%	132	3%	1%	$22	16%	$34	0.1	0.1%	0.1	0.0%	0.2	0.0%
742Z PUMPS FOR LIQUIDS,LIQ.ELEVATORS AND PARTS (NES)	$88	10%	8%	-41%	62	19%	7%	$21	26%	$34	0.8	0.4%	0.6	0.1%	1.4	0.2%
743Z PUMPS & COMPRESSORS,FANS & BLOWERS,CENTRIFUGES (NES)	$529	12%	27%	27%	179	2%	0%	$18	13%	$39	0.2	0.1%	0.7	0.1%	0.9	0.1%
7492 OTHER NON-ELECTRICAL MACH.AMP PARTS	$104	10%	4%	82%	7	25%	9%	$40	41%	$64	0.1	0.1%	0.2	0.0%	0.3	0.0%
749Z NON-ELECTRIC PARTS AND ACCESSORIES OF MACHINES (NES)	$1,001	28%	12%	28%	879	42%	10%	$49	25%	$26	4.6	2.4%	8.7	1.3%	13.3	1.6%
74 GENERAL INDUSTRIAL MACHINERY & EQUIPMENT,AND PARTS	**$3,156**	**19%**	**13%**	**39%**	**1,269**	**12%**	**2%**	**$40**	**21%**	**$33**	**6.0**	**3.1%**	**10.4**	**1.6%**	**16.3**	**1.9%**
7512 CALCULATING MACHINES,CASH REGISTERS,TICKET & SIM	$4,731	31%	31%	80%	375	28%	8%	$95	18%	$70	0.8	0.4%	1.4	0.2%	2.2	0.3%
752Z AUTOMATIC DATA PROCESSING MACHINES & UNITS THEREOF (NES)	$9,045	6%	49%	63%	19,192	72%	39%	$167	48%	$133	3.0	1.5%	69.6	10.4%	72.6	8.4%
7591 PARTS OF AND ACCESSORIES SUITABLE FOR 751.1-,751.6	$144	11%	34%	126%	52	10%	6%	$29	12%	$31	0.1	0.0%	0.2	0.0%	0.3	0.0%
75 OFFICE MACHINES & AUTOMATIC DATA PROCESSING EQUIP.	**$14,137**	**14%**	**43%**	**67%**	**19,620**	**70%**	**31%**	**$165**	**45%**	**$125**	**3.9**	**2.0%**	**71.2**	**10.7%**	**75.1**	**8.7%**
761Z TELEVISION RECEIVERS (NES)	$2,954	16%	15%	99%	91	0%	0%	$21	4%	$32	0.3	0.1%	0.8	0.1%	1.1	0.1%
762Z RADIO-BROADCAST RECEIVERS (NES)	$3,711	1%	34%	46%	1,607	7%	2%	$47	7%	$46	1.1	0.5%	7.6	1.1%	8.7	1.0%
7641 ELECT.LINE TELEPHONIC & TELEGRAPHIC APPARATUS	$929	27%	54%	127%	1,940	18%	9%	$40	20%	$79	0.8	0.4%	5.7	0.9%	6.6	0.8%
7642 MICROPHONES,LOUDSPEAKERS,AMPLIFIERS	$463	10%	19%	113%	564	21%	5%	$33	14%	$37	2.3	1.2%	3.1	0.5%	5.4	0.6%
764Z TELECOMMUNICATIONS EQUIPMENT AND PARTS (NES)	$6,780	12%	31%	71%	2,477	31%	11%	$126	35%	$115	4.2	2.2%	10.3	1.5%	14.5	1.7%
76 TELECOMMUNICATIONS & SOUND RECORDING APPARATUS	**$14,840**	**11%**	**30%**	**72%**	**7,468**	**13%**	**4%**	**$67**	**19%**	**$88**	**8.7**	**4.5%**	**27.6**	**4.1%**	**36.2**	**4.2%**

Southeast Asia Export Air Weight Estimates (1991)

SITC Commodity Grouping	Southeast Asia Trade (1991) Export Value (Mil. $)	Thai-land Share	U.S. Share	1989-1991 Change	Exports to U.S. (1991) Southeast Asia to U.S. Air Weight (MT)	Air Percent of Vessel/Air Total Value	Air Percent of Vessel/Air Total Weight	Average Value* ($/KG)	All Countries Air % of V/A Value	All Countries Average Value* ($/KG)	Estimated Air Exports (Adjusted) (000 Metric Tons) Intra-Regional Weight	Intra-Regional % of Total	Inter-Regional Weight	Inter-Regional % of Total	Total Weight	Total % of Total
771Z ELECTRIC POWER MACHINERY AND PARTS THEREOF (NES)	$1,045	8%	13%	94%	1,301	56%	28%	$45	45%	$52	8.2	4.3%	10.6	1.6%	18.9	2.2%
772Z ELECT.APP SUCH AS SWITCHES,RELAYS,FUSES,PLUGS ETC (NES)	$1,538	9%	12%	47%	1,702	57%	21%	$59	56%	$71	12.0	6.2%	13.0	1.9%	25.0	2.9%
7731 INSULATED,ELECT WIRE,CABLE,BARS,STRIP AND THE LIKE	$790	24%	30%	67%	1,291	11%	5%	$19	25%	$30	2.4	1.2%	5.5	0.8%	8.0	0.9%
7738 ELECTRO-THERMIC APPLIANCES,N.E.S.	$513	36%	39%	31%	111	1%	0%	$10	3%	$12	0.1	0.0%	0.5	0.1%	0.5	0.1%
776Z THERMIONIC,COLD & PHOTO-CATHODE VALVES,TUBES,PARTS (NES)	$11,824	10%	33%	29%	14,849	100%	95%	$255	94%	$311	18.1	9.3%	63.8	9.6%	81.9	9.5%
7781 BATTERIES AND ACCUMULATORS AND PARTS	$331	10%	11%	21%	121	16%	2%	$36	26%	$44	0.3	0.1%	1.8	0.3%	2.1	0.2%
7782 ELECT.FILAMENT LAMPS AND DISCHARGE LAMPS	$93	31%	18%	74%	55	24%	2%	$72	23%	$71	0.1	0.0%	0.5	0.1%	0.6	0.1%
7783 ELECTR.EQUIP.FOR INTERNAL COMBUSTION ENGINES,PARTS	$114	21%	28%	90%	38	9%	2%	$29	8%	$17	0.1	0.0%	0.2	0.0%	0.2	0.0%
7788 OTHER ELECT MACHINERY AND EQUIPMENT	$865	13%	19%	53%	822	71%	17%	$178	54%	$95	2.6	1.3%	3.7	0.6%	6.3	0.7%
77 ELECTRICAL MACHINERY,APPARATUS & APPLIANCES N.E.S.	**$17,633**	**12%**	**29%**	**36%**	**20,621**	**86%**	**20%**	**$202**	**64%**	**$136**	**43.9**	**22.6%**	**100.0**	**16.0%**	**143.8**	**16.7%**
784Z PARTS & ACCESSORIES OF 722--,781--,782--,783-- (NES)	$366	14%	13%	52%	164	13%	3%	$33	6%	$19	0.7	0.4%	1.6	0.2%	2.3	0.3%
78 ROAD VEHICLES (INCL. AIR CUSHION VEHICLES	**$1,194**	**25%**	**8%**	**61%**	**167**	**8%**	**1%**	**$33**	**1%**	**$19**	**0.7**	**0.4%**	**1.6**	**0.2%**	**2.3**	**0.3%**
792Z AIRCRAFT & ASSOCIATED EQUIPMENT AND PARTS (NES)	$424	1%	30%	-42%	184	88%	56%	$202	60%	$251	0.2	0.1%	0.9	0.1%	1.1	0.1%
79 OTHER TRANSPORT EQUIPMENT	**$1,024**	**7%**	**18%**	**-24%**	**184**	**75%**	**24%**	**$202**	**56%**	**$236**	**0.2**	**0.1%**	**0.9**	**0.1%**	**1.1**	**0.1%**
8124 LIGHTING FIXTURES AND FITTINGS AND PARTS	$140	22%	28%	91%	316	8%	6%	$7	6%	$17	0.6	0.3%	1.5	0.2%	2.1	0.2%
81 SANITARY,PLUMBING,HEATING,LIGHTING FIXTURES	**$221**	**30%**	**22%**	**75%**	**324**	**6%**	**3%**	**$7**	**6%**	**$17**	**0.6**	**0.3%**	**1.5**	**0.2%**	**2.1**	**0.2%**
821Z FURNITURE AND PARTS THEREOF (NES)	$1,490	28%	26%	47%	265	1%	0%	$9	5%	$16	0.1	0.1%	1.8	0.3%	1.9	0.2%
82 FURNITURE AND PARTS THEREOF	**$1,490**	**28%**	**26%**	**47%**	**265**	**1%**	**0%**	**$9**	**5%**	**$16**	**0.1**	**0.1%**	**1.8**	**0.3%**	**1.9**	**0.2%**
831Z TRAVEL GOODS,HANDBAGS,BRIEF-CASES,PURSES,SHEATHS (NES)	$441	62%	35%	46%	629	6%	3%	$12	20%	$31	0.2	0.1%	3.0	0.5%	3.3	0.4%
83 TRAVEL GOODS,HANDBAGS,BRIEF-CASES,PURSES,SHEATHS	**$441**	**62%**	**35%**	**46%**	**629**	**6%**	**3%**	**$12**	**20%**	**$31**	**0.2**	**0.1%**	**3.0**	**0.5%**	**3.3**	**0.4%**
842Z ART.OF APPAREL & CLOTHING ACCESSORIES,NO TEXTILE (NES)	$897	20%	47%	57%	989	9%	2%	$28	31%	$40	0.1	0.1%	3.8	0.6%	3.9	0.5%
843Z ARTICLES OF APPAREL AND CLOTHING ACCESSORIES (NES)	$12,310	29%	34%	49%	29,355	19%	15%	$21	32%	$27	10.9	5.6%	149.5	22.4%	160.4	18.5%
84 ARTICLES OF APPAREL AND CLOTHING ACCESSORIES	**$13,207**	**29%**	**35%**	**50%**	**30,344**	**18%**	**12%**	**$21**	**32%**	**$27**	**11.1**	**5.7%**	**153.2**	**23.0%**	**164.3**	**19.0%**
851Z FOOTWEAR (NES)	$2,282	39%	34%	136%	4,137	6%	5%	$11	13%	$19	0.9	0.5%	21.6	3.2%	22.5	2.6%
85 FOOTWEAR	**$2,282**	**39%**	**34%**	**136%**	**4,137**	**6%**	**5%**	**$11**	**13%**	**$19**	**0.9**	**0.5%**	**21.6**	**3.2%**	**22.5**	**2.6%**
871Z OPTICAL INSTRUMENTS AND APPARATUS (NES)	$155	21%	25%	61%	133	58%	40%	$52	52%	$108	0.2	0.1%	0.8	0.1%	1.0	0.1%
872Z MEDICAL INSTRUMENTS AND APPLIANCES (NES)	$393	12%	32%	92%	426	11%	5%	$33	49%	$73	0.2	0.1%	2.2	0.3%	2.5	0.3%
874Z MEASURING,CHECKING,ANALYSING INSTRUMENTS (NES)	$706	5%	17%	65%	1,212	68%	35%	$59	67%	$119	3.7	1.9%	9.3	1.4%	13.1	1.5%
87 PROFESSIONAL,SCIENTIFIC & CONTROLING INSTRUMENTS	**$1,253**	**9%**	**23%**	**72%**	**1,770**	**39%**	**14%**	**$53**	**61%**	**$105**	**4.2**	**2.2%**	**12.3**	**1.8%**	**16.6**	**1.9%**
8611 PHOTOGRAPHIC,CAMERAS,PARTS & ACCESSORIES	$487	11%	25%	164%	781	66%	53%	$95	47%	$109	0.9	0.4%	4.8	0.7%	5.7	0.7%
8641 LENSES,PRISMS,MIRRORS,OTHER OPTICAL ELEMENTS	$105	20%	21%	99%	175	66%	42%	$96	69%	$122	0.2	0.1%	1.1	0.2%	1.3	0.2%
8642 SPECTACLES AND SPECTACLE FRAMES	$45	9%	10%	72%	18	25%	15%	$34	79%	$137	0.2	0.1%	0.2	0.0%	0.3	0.0%

Southeast Asia Export Air Weight Estimates (1991)

SITC Commodity Grouping	Southeast Asia Trade (1991)				Exports to U.S. (1991)						Estimated Air Exports (Adjusted) (000 Metric Tons)					
					Southeast Asia to U.S.				All Countries		Intra-Regional		Inter-Regional		Total	
	Export Value (Mil. $)	Thai-land Share	U.S. Share	1989-1991 Change	Air Weight (MT)	Air Percent of Vessel/Air Total Value	Air Percent of Vessel/Air Total Weight	Average Value* ($/KG)	Air % of V/A Value	Average Value* ($/KG)	Weight	% of Total	Weight	% of Total	Weight	% of Total
8861 WATCHES AND CLOCKS (NES)	$919	31%	14%	90%	247	79%	33%	$407	76%	$199	0.5	0.3%	2.7	0.4%	3.2	0.4%
88 PHOTOGRAPHIC APPARATUS,OPTICAL GOODS,WATCHES	$1,979	19%	16%	89%	1,228	72%	44%	$168	64%	$140	1.8	0.9%	8.9	1.3%	10.7	1.2%
8821 BOOKS,PAMPHLETS,MAPS AND GLOBES,PRINTED	$307	2%	24%	63%	337	3%	2%	$8	19%	$15	0.5	0.3%	1.8	0.3%	2.3	0.3%
8822 NEWSPAPERS JOURNALS,PERIODICALS	$21	13%	3%	6%	6	14%	12%	$6	60%	*$5	0.1	0.1%	0.2	0.0%	0.4	0.0%
8828 PRINTED MATTER,N.E.S.	$105	9%	14%	95%	146	15%	11%	$9	35%	$15	0.3	0.2%	1.6	0.2%	1.9	0.2%
8881 ART.FOR THE CONVEYANCE OR PACKING OF GOODS	$463	33%	7%	50%	146	9%	2%	$13	14%	$15	0.9	0.5%	2.8	0.4%	3.7	0.4%
8882 ARTICLES OF MATERIALS DESCRIBED IN DIVISION 58 (NES)	$591	23%	20%	71%	356	5%	1%	$14	9%	$19	1.1	0.6%	2.1	0.3%	3.2	0.4%
8842 CHILDREN S TOYS,INDOOR GAMES,ETC.	$1,305	35%	52%	46%	784	2%	2%	$9	3%	$13	0.1	0.1%	2.7	0.4%	2.8	0.3%
8847 OTHER SPORTING GOODS AND FAIRGROUND AMUSEMENTS	$267	44%	32%	172%	679	18%	5%	$44	13%	$26	0.2	0.1%	1.8	0.3%	2.0	0.2%
8865 OFFICE AND STATIONERY SUPPLIES,N.E.S. (NES)	$247	14%	25%	51%	57	2%	0%	$17	21%	$40	0.1	0.1%	0.3	0.0%	0.4	0.0%
8897 JEWELLERY,GOLDSMITHS AND OTHER ART OF PRECIOUS M. (NES)	$1,052	55%	25%	-19%	995	98%	61%	$302	94%	$192	0.1	0.0%	6.3	0.9%	6.3	0.7%
8898 MUSICAL INSTRUMENTS,PARTS AND ACCESSORIES (NES)	$458	14%	6%	69%	247	43%	19%	$34	22%	$38	2.2	1.1%	5.9	0.9%	8.1	0.9%
8891 ART.& MANUF.OF CARVING OR MOULDING MATERIALS	$29	12%	29%	-16%	39	11%	2%	$20	38%	$26	0.0	0.0%	0.2	0.0%	0.3	0.0%
8899 ORTHOPAEDIC APPLIANCES,SURGICAL BELTS AND THE LIKE	$20	5%	7%	82%	11	100%	100%	$191	93%	$141	0.0	0.0%	0.2	0.0%	0.2	0.0%
8897 BASKETWORK,WICKERWORK ETC. OF PLAITING MATERIALS	$200	14%	41%	11%	121	3%	1%	$15	9%	$11	0.0	0.0%	0.5	0.1%	0.5	0.1%
8898 SMALL-WARES AND TOILET ART.,FEATHER DUSTERS ETC	$301	34%	20%	49%	241	23%	17%	$14	41%	$15	0.3	0.2%	1.9	0.3%	2.2	0.3%
8899 OTHER MISCELLANEOUS MANUFACTURED ARTICLES (NES)	$161	75%	43%	-24%	223	9%	2%	$35	10%	$35	0.0	0.0%	0.7	0.1%	0.7	0.1%
89 MISCELLANEOUS MANUFACTURED ARTICLES,N.E.S.	$5,607	33%	28%	29%	4,405	28%	2%	$85	34%	$59	6.1	3.2%	29.1	4.4%	35.2	4.1%
95 ARMOURED FIGHTING VEHICLES,ARMS OF WAR & AMMUNIT.	$4	21%	16%	131%	2	24%	8%	$39	69%	$108	0.0	0.0%	0.0	0.0%	0.0	0.0%
971Z GOLD,NON-MONETARY (NES)	$379	1%	2%	-7%	2	75%	5%	$1,747	100%	$5,039	0.1	0.0%	0.1	0.0%	0.1	0.0%
97 GOLD,NON-MONETARY	$379	1%	2%	-7%	2	75%	5%	$1,747	100%	$5,039	0.1	0.0%	0.1	0.0%	0.1	0.0%
9999 NON-IDENTIFIED PRODUCTS	$2,077	17%	16%	82%	1,287	65%	7%	$168	81%	$192	1.4	0.7%	13.4	2.0%	14.8	1.7%
99 SPECIAL CATEGORIES	$2,077	17%	16%	82%	1,287	65%	7%	$168	81%	$192	1.4	0.7%	13.4	2.0%	14.8	1.7%
Total - All Commodities	$151,941	18%	21%	34%	106,395	38%	1%	$98	25%	$57	194.0	100.0%	667.0	100.0%	861.0	100.0%

Unadjusted Volumes	108.0	360.3	468.2
Adjustment Factor	1.80	1.85	1.84

Note: Values for total U.S. imports from all countries are used when no SE Asia-U.S. data is shown.
Commodity detail is shown only if estimated total weight exceeds 100 MT; totals include all commodities.

Source: UN Trade Data, U.S. Bureau of Census Foreign Trade Statistics

Appendix 4

THAILAND GLOBAL TRANSPARK FEASIBILITY STUDY
INITIAL SITE DEVELOPMENT COST COMPARISON

Item - Description	New Faclility ($U.S. x 1,000)	U-Taphao ($U.S. x 1,000)	Nam Phong ($U.S. x 1,000)	New Korat ($U.S. x 1,000)
1. LAND ACQUISITION	VARIES	0	0	0
2. SITE PREP. & MASTER DRAINAGE *	20,000	5,000	15,000	20,000
3. INITIAL AIRFIELD				
A. Runway Pavement	30,000	0	0	30,000
B. Runway Lighting	3,000	1,500	3,000	3,000
C. Taxiway Pavement	15,000	15,000	0	15,000
D. Taxiway Lighting	1,000	1,000	1,000	1,000
E. Navaids	7,500	5,000	7,500	7,500
4. ELECTRICAL VAULT	3,000	1,000	3,000	3,000
5. CONTROL TOWER	10,000	5,000	10,000	10,000
6. ARFF FACILITY	5,000	5,000	5,000	5,000
7. CARGO COMPLEX W/ AIRCRAFT APRON	25,000	20,000	25,000	25,000
8. AIRCRAFT FUELING FACILITY	15,000	10,000	15,000	15,000
9. PRIMARY ACCESS ROAD	5,000	3,000	5,000	5,000
10. ON-SITE UTILITIES				
A. Power Substation	5,000	3,500	5,000	5,000
B. Water Plant and Distribution	7,500	5,000	7,500	7,500
C. Sewer Plant and Collection	5,000	5,000	5,000	5,000
D. Natural Gas	2,000	2,000	2,000	2,000
E. Telecommunications	5,000	4,000	5,000	5,000
F. Satellite Communication System	5,000	5,000	5,000	5,000
11. SECURITY SYSTEMS AND FENCE	1,500	1,500	1,500	1,500
12. INTERNAL SERVICE ROADWAYS *	2,500	2,500	2,500	2,500
13. OFFSITE ROADWAYS *	15,000	0	15,000	15,000
14. OFFSITE UTILITIES *	25,000	0	25,000	25,000
15. RAILROAD SERVICE *	15,000	10,000	15,000	15,000
EXPECTED CONSTRUCTION COST: (U.S. $)	**228,000**	**110,000**	**178,000**	**228,000**
(MILLIONS THAI BAHT)	**5,700**	**2,765**	**4,450**	**5,700**

* Allowance only - Specific improvements have not been identified.

THAILAND GLOBAL TRANSPARK FEASIBILITY STUDY
CUMULATIVE DEVELOPMENT REQUIREMENTS

Item - Description	Initial Development Stage	Intermediate Development Stage	Ultimate Development Stage
1. LAND ACQUISITION			
Airfield Site (rai)	3,500	3,500	6,500
Aircraft Maintenance Base (rai)	75 (3 bays)	110 (5 bays)	165 (8 bays)
Industrial Development (rai)	3,000	5,000	10,000
Rights-of-Way & Other Property (rai)	175	250	335
Total Property (rai)	6,750	8,860	17,000
2. SITE PREPARATION & MASTER DRAINAGE			
Includes demucking, backfill of swamp areas, preparation of airfield and industrial fill areas, excavation of drainage canal system and minor box culvert or bridge crossings for roads and airfield pavements.	*	*	*
3. INITIAL AIRFIELD			
A. Runway Pavement	1 - 3350m X 45m w/ 7.5m Shoulders	1 - 3350m X 45m w/ 7.5m Shoulders	2 - 3350m X 45m w/ 7.5m Shoulders
B. Runway Lighting	HIRL, Centerline & Touchdown	HIRL, Centerline & Touchdown	HIRL, Centerline & Touchdown
C. Taxiway Pavement	1 - 3350m X 23m Parallel	2 - 3350m X 23m Parallel	4 - 3350m X 23m Parallel
D. Taxiway Lighting	MITL & Centerline	MITL & Centerline	MITL & Centerline
E. Navaids			
- CAT III ILS	1	2	4
- ALS	1	2	4
- TACAN	1	1	1
- DVOR / DME	1	1	1
- NDB	1	1	1
- VASI / PAPI	2	2	4
- Approach Radar	1	1	1
- Weather Radar	1	1	1
4. ELECTRICAL VAULT Includes building, auxiliary generator, terminals, switch gear, and regulator	1	1	2
5. CONTROL TOWER w/ Airport Surveillance Radar	1	1	1
6. AIRPORT RESCUE & AND FIRE FIGHTING FACILITY (ARFF) w/ 2 Fire Trucks, 2 Quick Response Vehicles & Support Equipment	1	1	2
7. CARGO COMPLEX W/ AIRCRAFT APRON			
A. Cargo Processing Building (sq. meters)	10,000	20,000	35,000
B. Aircraft Apron (sq. meters)	50,000	100,000	160,000

THAILAND GLOBAL TRANSPARK FEASIBILITY STUDY
CUMULATIVE DEVELOPMENT REQUIREMENTS

Item - Description	Initial Development Stage	Intermediate Development Stage	Ultimate Development Stage
8. AIRCRAFT FUELING FACILITY Includes storage tanks and 2 fuel trucks	1	1	2
9. PRIMARY ACCESS ROAD Includes 4 Lane	*	*	*
10. ON-SITE UTILITIES			
A. Power			
- Power Substation (kva)	80,000	160,000	360,000
- Power Distribution Lines (meters)	5,000	8,000	17,000
B. Water			
- Water Treatment Plant (cu. m / day)	7,000	21,000	41,000
- Water Storage Tank(s) (cu. meters)	20,000	20,000	40,000
- Water Distribution Mains (meters)	5,000	8,000	17,000
C. Sewer			
- Sewage Treatment Plant (cu. meters)	6,000	15,000	29,000
- Sewage Collection System (meters)	5,000	8,000	17,000
D. Telecommunications (lines)	3,000	5,000	10,000
E. Satellite Communication System	1	1	2
11. SECURITY SYSTEMS AND FENCE (meters) Includes 2m perimeter fencing with gates	9,500	9,500	14,000
12. INTERNAL SERVICE ROADWAYS (km) Includes 2 lane internal circulation road	1	2	4
13. OFFSITE ROADWAYS Includes upgrade of adjacent facilities	*	*	*
14. OFFSITE UTILITIES Includes transmission lines from substation	*	*	*
15. RAILROAD SERVICE Includes rail spur to site and onsite siding(s)	*	*	*

* This work element will vary dependent on the site selected and the specific site master plan that is developed. A budget "allowance" should be considered.