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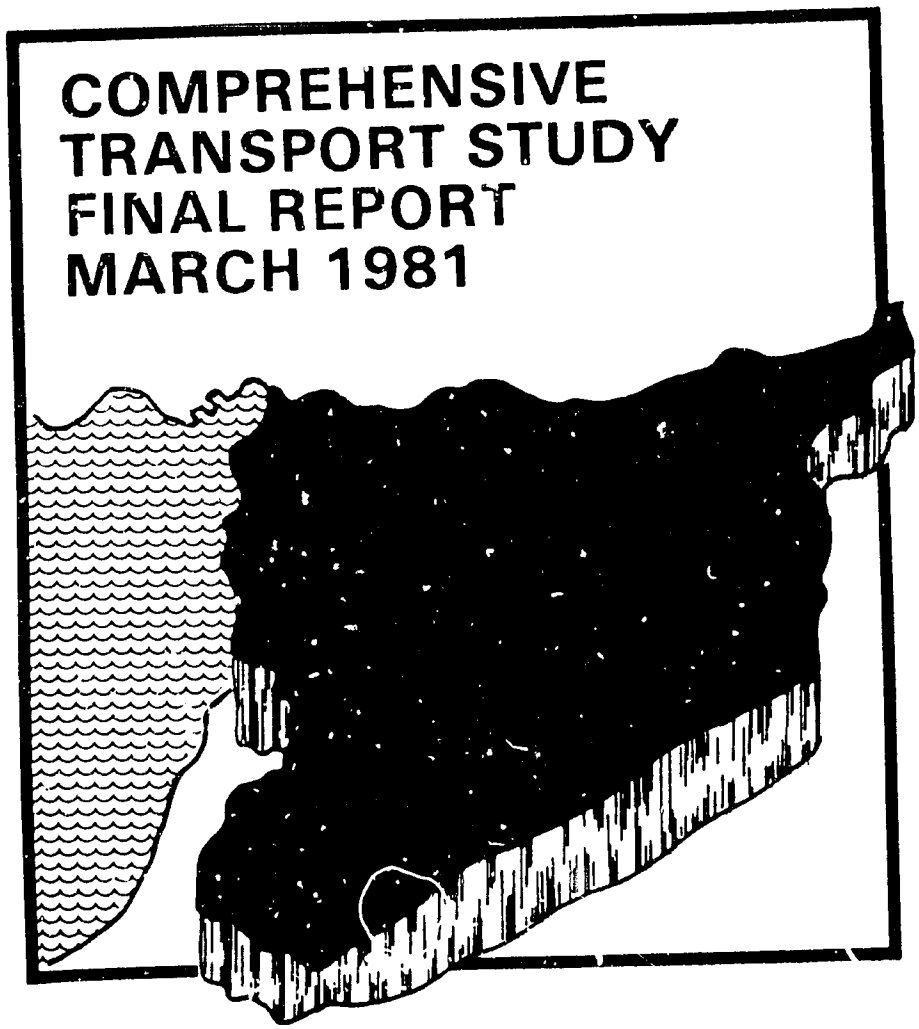

VOLUME III

RAILWAYS

LOUIS BERGER INTERNATIONAL, INC.

in association with

TIPPETTS-ABBETT-McCARTHY-STRATTON

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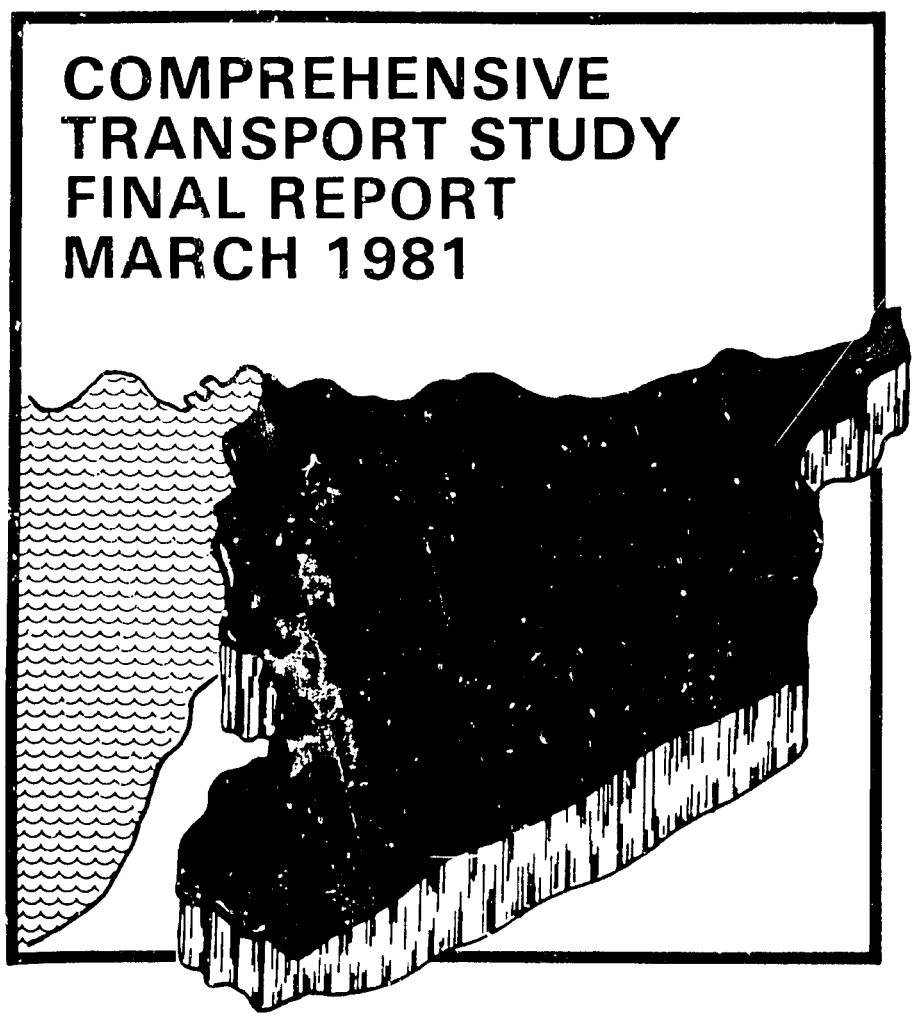

VOLUME III

RAILWAYS

LOUIS BERGER INTERNATIONAL, INC.

in association with

TIPPETTS ABBETT McCARTHY STRATTON

This volume is one of seven produced as the Final Report for the Syrian Comprehensive Transport Study. The complete set of volumes is as follows:

Volume I	–	Executive Summary
Volume II	–	Transport Demand
Volume III	–	Railways
Volume IV	–	Roads and Road Transport
Volume V	–	Ports and Shipping
Volume VI	–	Other Modes and Related Industries (Aviation, Pipelines, and Construction and Storage Industries)
Volume VII	–	Transport Sector Plans

VOLUME III

RAILWAYS

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A

PART A

CHEMIN DE FER SYRIEN

CHAPTER A-1

CONCLUSIONS AND RECOMMENDATIONS

Chapter A-1

CONCLUSIONS AND RECOMMENDATIONS

A-1.1 INTRODUCTION

Volume III is concerned with railways. A discussion of the projection of national transport demand from which the railway traffic forecasts have been derived is contained in Volume II. The inter-modal analysis and modelling of the transport system are presented in Volume VII.

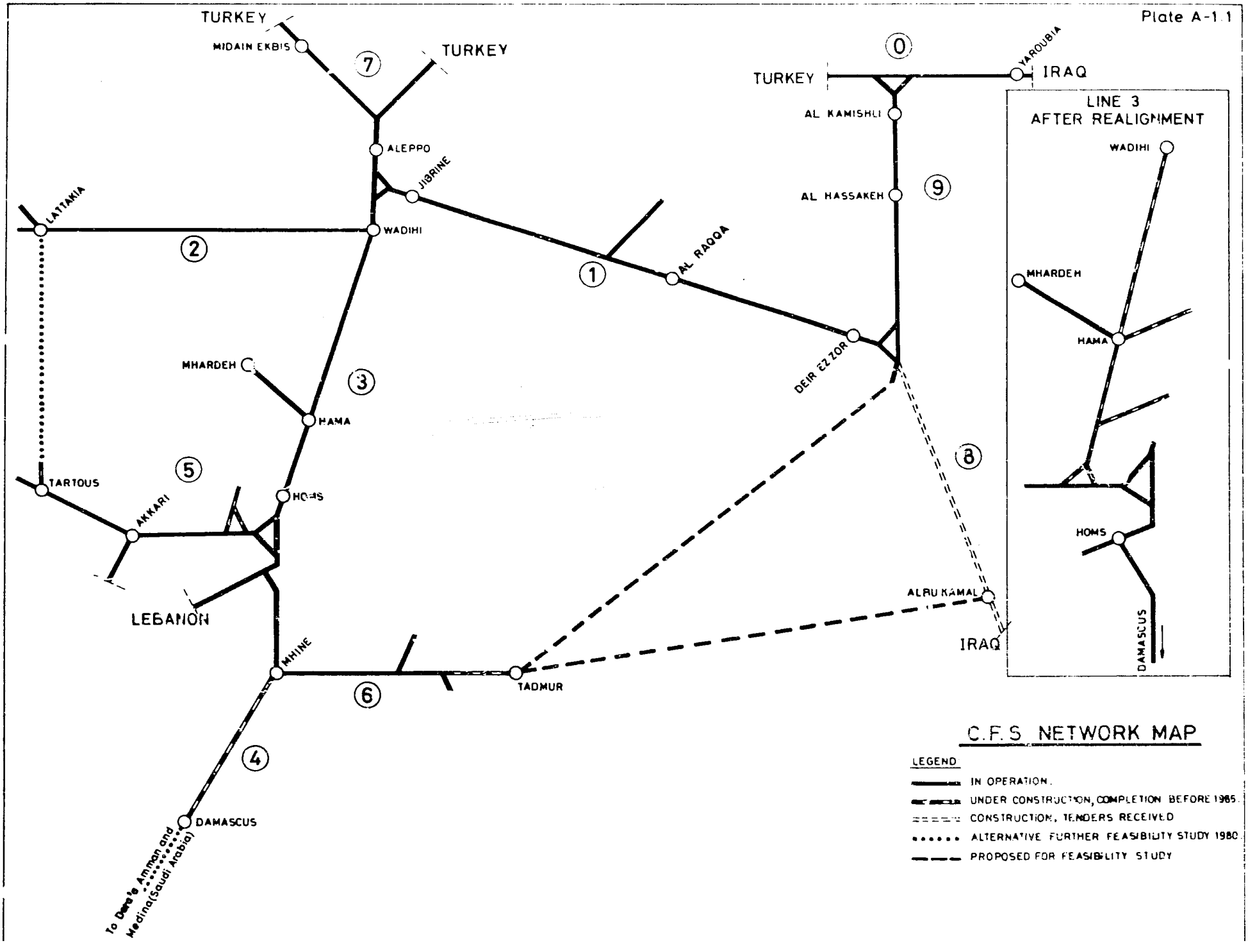
In this volume, Part A deals with the standard gauge (1,435 mm) railway system, and Part B with the narrow gauge (1,050 mm) network. The conclusions and recommendations of Part A are given in this chapter. The subsequent seven chapters are concerned with the railway organization, system, operations and maintenance, traffic, costing and tariffs, finance, and plans and policy.

A line drawing of the Chemin de Fer Syrien (CFS) system is shown in Plate A-1.1. A scale map of the standard and narrow gauge systems is available in the Consultants' files. On Plate A-1.1 are shown the numbers assigned to sections of line by the Consultants.

A-1.2 GENERAL

Syria is potentially an ideal country for railway operations. A large proportion of the population and development is concentrated on a single north-south and a single east-west axis. The distances between major cities are generally those for which rail is most competitive on inter-city passenger services. The country is well placed astride international freight transit routes, and these are, for the most part, common to the main domestic demand axes. The two major ports are conveniently served by rail. Finally, major railway expansion is underway in Iraq and planned in Jordan, Saudi Arabia, and Kuwait, which will produce an integrated network in the Middle East for which the railways of Syria provide the natural Arab gateway to Europe.

A major railway construction program is in progress. This moment of massive change is not an ideal time to draw conclusions from current or past performance. The Consultants' approach is therefore to present an overview of the current situation, to determine the scope for increased traffic that is being created by the development program, and to point out areas for improvement so that the railway will be able to exploit fully its future capacity.


TURKEY
MIDAIN EKBIS
7
TURKEY
ALEPPO
JIBRINE
LATTAKIA
WADIHI
2
1
AL RAQQA
MHARDEH
3
HAMA
5
TARTOUS
AKKARI
HOMS
LEBANON
MHINE
6
TADMUR
4
DAMASCUS
To Dera'a Amman and Medina(Saudi Arabia)
0
TURKEY
YAROUBIA
IRAQ
AL KAMISHLI
AL HASSAKEH
9
DEIR EZ ZOR
8
ALBU KAMAL
IRAQ
LINE 3
AFTER REALIGNMENT
WADIHI
MHARDEH
HAMA
HOMS
DAMASCUS
C.F.S NETWORK MAP
LEGEND
IN OPERATION.
UNDER CONSTRUCTION, COMPLETION BEFORE 1985.
CONSTRUCTION, TENDERS RECEIVED
ALTERNATIVE FURTHER FEASIBILITY STUDY 1980
PROPOSED FOR FEASIBILITY STUDY

A-1.3 MAJOR FINDINGS

The major findings of the study on the railway are as follows.

1. Line construction and reconstruction now in progress or planned will dramatically increase railway traffic potential. Traffic on a 1,900 kilometer route network, which represents the existing system plus the Mhine-Damascus and Deir Ez Zor-Albu Kamal lines in 1985, and on a 2,100 kilometer system including Tartous-Lattakia and a standard gauge Hijaz line to Jordan by 2000, is projected below.

	Actual 1979	1985 (million)	2000
Passengers	1.32	7.4	24.1-24.6
Passengers Kms	370	1,950	4,900-5,000
Freight Tons	1.91	6.2	16.5
Freight Ton Kms	449	2,090	6,190
Train Kms Passenger	1.29	4.65	9.5
Train Kms Freight	1.50	5.15	10.9

2. There is significant potential for better utilization of present rolling stock. Not withstanding this, a considerable amount of equipment, in addition to that on order, will be required to carry the projected 1985 traffic. With full utilization of existing and ordered stock, this could be limited to an additional 50 main-line locomotives, 300 coaches, 600 freight wagons, and 20 shunting locomotives. For 1986 to 2000 the additional stock required to handle the maximum expected traffic and to replace life-expired equipment is estimated at 134 main-line locomotives, 543 coaches, 6,940 wagons, and 45 shunting locomotives.

3. Capacity problems will be experienced during the 1990s if the projected traffic materializes on the Damascus-Homs line. Double-tracking will be required in the mid-1990s.

4. The railway will be unable to cope with the increased traffic without an immediate major program of technical assistance and training.

5. A strengthened management team is required to improve overall control and operating discipline, marketing, and maintenance of track and rolling stock for the future system.

6. Coordination of operations and planning between the railway and the Ports of Lattakia and Tartous needs to be enhanced.

7. The basic railway network is expected to be complete by 1985, with a consequent sharp reduction investment in the 6th Five-Year Plan from the current peak levels.

8. Passenger tariffs are, in many cases, well below the marginal costs calculated for the operating efficiencies assumed attainable by 1985 and bear no relation to existing operating costs.

A-1.4 RECOMMENDATIONS

The Consultants' recommendations are presented below in the order in which they appear in the report. A reference to the report section is provided in parentheses in each case. It is not appropriate to classify the recommendations into major and minor categories or to rank them in order of importance because they are concerned with so many aspects of the organization. The recommendations are:

- that the director-general be authorized to increase the Chemin de Fer Syrien (CFS) establishment by up to 5 percent in any year while an establishment application is awaiting Government approval (A-2.3)

- that general manager positions for finance and law, administration and personnel, movements, planning and marketing, and engineering be created (A-2.4)

- that director positions be established for port liaison, reclamation, rules and safety, marketing, and training (A-2.4)

- that a port liaison office be set up (A-2.4)

- that an advisory board of directors be appointed consisting of the director-general and representatives of key ministries, the ports, and major customers (A-2.4)

- that divisional managers be appointed for Aleppo, Deir Ez Zor, Al Kamishli, Lattakia, Homs, Tartous, and (at a later date) Damascus (A-2.4)

- that track charts be prepared and made widely available to CFS officers and supervisors (A-3.2)

- that new standards for construction and maintenance be prepared appropriate to current technology (A-3.2)

- that the stations at Bir Ghadir and Ard Ez Zor on the Homs-Damascus line be provided at the outset, and the station at Kawkab on the new Homs-Aleppo line be provided soon after 1985 (A-2.5)

- that the station at Rmeli on the Mhine-Tadmur line be considered for early construction (A-3.5)

- that an expanded train planning section be assigned to prepare advance timetables and rolling stock diagrams for new lines (A-3.5)

- that rules, regulations, and standards for operations and maintenance be drafted, adopted, and enforced (A-4.1)

- that proper training programs be adopted for supervisors and maintenance staff (A-4.1)

- that adequate supplies of spare parts and repair materials be maintained (A-4.1)

- that an additional track be provided at the north end of Aleppo yard (A-4.3)

- that consideration be given to increased stabling facilities for passenger rolling stock at Aleppo (A-4.3)

- that mandatory annual rule examinations for operating employees be instituted (A-4.3)

- that vigilance protection systems be reactivated on all locomotives (A-4.3)

- that drivers be instructed to observe their trains at frequent intervals (A-4.3)

- that the deficiencies in new line construction be remedied, which requires proper compaction of fill sections during construction, an increase in roadbed width, subbase material extending the entire width of the roadbed, the provision of ballast wing walls at bridge ends, longer culverts for the provision of adequate headwalls, and a redistribution of ballast on curves to supply the outside of the curve with adequate ballast (A-4.4)

- that the track between Ansari and Wadihi be surfaced and aligned (A-4.4)

- that the curves between Aleppo and Katma be checked for alignment (A-4.4)

- that a pilot project be initiated for the control of drifting sand/silt between Al Jazireh and Abou Fahs, Line 9 (A-2.8)

- that consideration be given to a complete reballast, surfacing, and alignment of the Al Kamishli-Ya'roubia line (A-4.4)

- that continuous welded rail be utilized for future construction (A-4.4)

- that mechanized equipment be purchased for drainage maintenance (A-4.4)

- that fences be constructed to enclose railway right-of-way in towns and villages (A-4.4)

- that on-track/off-track automobiles be repaired (A-4.4)

- that qualified supervisors be appointed to maintain the General Electric (GE) locomotives (A-4.5)

- that present cleaning procedures be improved or that an automatic washing plant be constructed at Jibrine to clean locomotives before entry into the shops (A-4.5)

- that coach cleaning and maintenance be improved (A-4.5)

- that greater emphasis be placed on environmental design of facilities (A-4.4)

- that a scrapping and clean-up program be instituted (A-4.5)

- that a four-channel radio system be considered for the whole network (A-4.6)

- that Centralized Traffic Control (CTC) be installed from Aleppo to Damascus and Tartous (A-4.6)

- that the signalling supply contract ratified in May 1980 be modified to cover installation of CTC from Aleppo to Damascus and Tartous (A-4.6)

- that tariff policy be adjusted to encourage maximum efficient use of railway infrastructure (A-6.5)

- that the older passenger tariffs still in operation be sharply increased (A-6.5)

- that a management information section be formed to prepare up-to-date quarterly financial and traffic statements (A-7.1)

- that an annual analysis of costs and revenues be made by service and commodity (A-7.1)

- that responsibility for the preparation and monitoring of expenditure budgets be given to individual directors (A-7.1)

- that the annual accounts for years 1976 to 1979 be produced as soon as possible (A-7.5)

- that a depreciation account be prepared based on appropriate asset lives (A-7.5)

- that the target dates for the bringing into operation of a line and the traffic forecasts and technical assumptions underlying its justification be incorporated into future five-year plans (A-8.4)

- that rolling stock acquisitions be authorized only on the basis of outline future stock diagrams and working timetables (A-8.4)

- that the order out to tender for 80 locomotives of 3,000 horsepower be phased with delivery of 50 units in 1982/83 and the remaining 30 in 1986/87 (A-8.4)

- that consideration be given to different types of locomotives for passenger and for freight service (A-8.4)

- that coaches and freight wagons be ordered for delivery before 1985 (A-8.4)

A-1.5 TECHNICAL ASSISTANCE PROGRAM

The traffic volume projected by the Consultants for CFS in 1985 is of a level consistent with the major investment being undertaken in new railway facilities. It will not be achieved, nor will the postulated operating efficiencies, without a major change in the training and general attitude of many railway employees. Highly disciplined operation will be required by 1985. It is unreasonable to expect CFS management to carry through the necessary staff recruitment and training programs or the introduction of new operating techniques without outside assistance. It is the view of the Consultants that a comprehensive program of technical assistance must be provided as soon as

possible. It is essential that such a program be undertaken in large part by a consulting subsidiary of one of the world's major railways and that a railway operating to European UIC standards be associated with the program. The assistance should be of a wide range and last for a minimum period of two years. Also, senior CFS personnel should be encouraged to spend time abroad assimilating the experience of other railways.

The Consultants' recommended staffing schedule for the technical assistance program is shown in Plate A-1.2. The tasks and qualifications for each advisor are given in Appendix A-1.1. Such a program, involving 30 man-years of foreign consultants' time in Syria, is estimated to cost SP 12 to 15 million (at 1980 prices) including local expenses. This is equivalent to the capital cost of only four main-line locomotives. Such an investment in human resources is basic to the successful operation of the future railway system. The return in terms of improved techniques and increased efficiency should pay for the expenditure over a short period.

PROPOSED STAFFING SCHEDULE
RAILWAY TECHNICAL ASSISTANCE PROGRAM

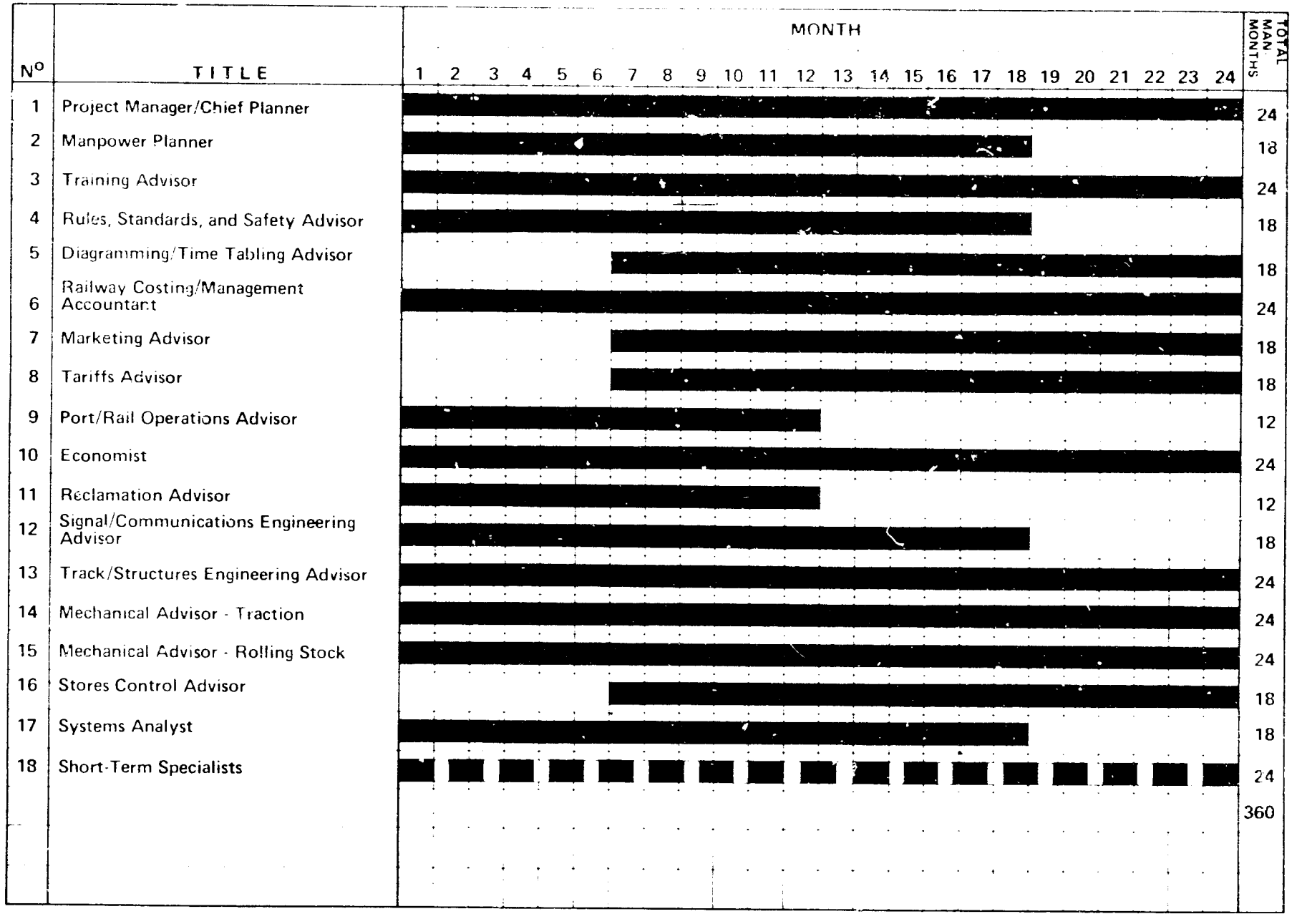


Plate A-1.2

APPENDIX A-1.1

TECHNICAL ASSISTANCE PROGRAM
STAFF TASKS AND QUALIFICATIONS

APPENDIX A-1.1

Technical Assistance Program Staff Tasks and Qualifications

1. PROJECT MANAGER/CHIEF PLANNER

Specific Tasks and Outputs

Assist and advise the Director General in all aspects of the technical assistance program, including:

- directing and coordinating the technical assistance program

- coordinating with the State Planning Commission, the Ministry of Transport, and other Government agencies as necessary on the work of this team

- providing the Director General with continuous information on the progress of the program and problems encountered and the proposed solutions

- reviewing the railway component of the 5th Five-Year Plan and other proposed railway developments

- developing a detailed medium term planning strategy to 1990 for railway services and a broad outline strategy to 2000

Qualifications of Advisor

General

Have a well documented background in management of training programs with a broad knowledge of railway systems.

Experience

Have served a minimum of 15 years as supervisor and manager of training schools in the field of railways.

2. MANPOWER PLANNER

Specific Tasks and Outputs

Assist and advise the CFS General Manager of Administration and personnel as follows:

- prepare a staff analysis and classification system appropriate for manpower planning purposes

- determine by comparison with equivalent external positions the appropriate salary scale for each employment class

- estimate manpower requirements by class annually to 1985 and for 1990 consistent with the planned system expansion and the projected volume of operation

- identify deficiencies and over-staffing in the establishment proposal submitted to the Government by the CFS

- identify potential areas for recruitment

- assist the training advisor in setting up a program for training employees in manpower planning techniques

- assist in setting up a manpower planning unit for the CFS

Qualifications of Advisor

General

Have a technical background in industrial engineering, or equivalent, and a thorough understanding of railways, including maintenance, operations, and engineering.

Experience

Have served a minimum of 15 years with railway companies as a technical employee and supervisor in the field of personnel and manpower planning.

3. TRAINING ADVISOR

Specific Tasks and Outputs

Assist and advise the Directorate of Training, as follows:

- investigate and inventory existing planned training facilities and programs

- determine the requirements for training in detail to 1985 and in outline to 1990 consistent with the forecast manpower requirement

- identify deficiencies in existing and planned facilities and programs, and recommend action required to correct them

- identify foreign and non-CFS domestic training requirements

- help prepare specific training programs for each identified training need

- assist in the conduct of the training programs and in evaluation of the effectiveness of each program

- help develop a long-range training program including staffing, facilities, and a preliminary budget

Qualifications of Advisor

General

Have a thorough knowledge of railway operation, maintenance, and engineering. Be familiar with the general educational background required by the employees of the various departments.

Experience

Have a background in the teaching and management of technical training programs, especially in the field of railway and rail transit networks. Have a minimum of five years of experience as a manager of a technical training school.

4. RULES, STANDARDS, AND SAFETY ADVISOR

Specific Tasks and Outputs

Assist and advise the CFS General Manager of Movements in the preparation and implementation of a program of rules, regulations, and safety standards, including:

- the coordination of the program with all General Managers and concerned Directors

- the establishment of a close working relationship with the other advisors of the technical assistance program

- the publication of rules, regulations, and safety standards addressing all facets of railway operation and maintenance

- the establishment of a training program to insure that all employees have a thorough working knowledge of the rules, regulations, and safety standards

Qualifications of Advisor

General

Have a technical background in industrial engineering with a knowledge of the rules, regulations, and safety standards in force on major railway networks. Be an effective communicator and have the ability to work with railway maintenance engineering and operating staff.

Experience

Have served a minimum of 15 years with major railway companies in a management position, preferably in safety and training.

5. DIAGRAMMING/TIMETABLING ADVISOR

Specific Tasks and Outputs

Assist and advise the CFS General Manager of Movements in the preparation of working timetables, motive power, and rolling stock diagrams as follows:

- prepare and draft working timetables for the Damascus-Aleppo line consistent with the forecast initial traffic levels

- prepare rolling stock and motive power diagrams for the Damascus-Aleppo line service

- review working timetables and rolling stock diagrams for all lines now in service

- assist the training advisor in establishing a program for training necessary employees in diagramming and timetabling techniques

- assist in setting up a diagramming and timetable section

Qualifications of Advisor

General

Have a good working knowledge of railway transportation, which will include a thorough knowledge of types and classes of diesel and electric locomotives and rolling stock. Be familiar with UIC standards.

Experience

Have served a minimum of 15 years with major railway companies as a traffic supervisor with a minimum of 5 years having been dedicated to the preparation of working timetables and rolling stock diagrams.

6. RAILWAY COSTING/MANAGEMENT ACCOUNTANT

Specific Tasks and Outputs

Assist and advise the Director of Finance and the Director of Marketing in cost accounting procedures as follows:

- prepare and assist in the implementation of a classification system for expenditures and receipts for accounting purposes

- determine to the extent that data permits the direct cost incurred by major commodity groups, transit traffic, and major passenger service

- study and advise on the appropriate share that individual traffic should bear of indirect costs

- provide training in management accounting and traffic cost techniques

- assist in establishing a traffic costing section

- advise the management information section on the content of its financial report

Qualifications of Advisor

General

Have been employed with railway companies and be knowledgeable in all aspects of cost accounting.

Experience

Have served a minimum of 10 years with major railway companies in the field of cost accounting and served a minimum of three years as a supervisor responsible for cost accounting procedures and the compilation of reports and data required for management decisions.

7. MARKETING ADVISOR

Specific Tasks and Outputs

Assist and advise the Director of Marketing in the following areas:

- determine to the extent that data permits the potential freight traffic that would be economically attractive for railway transport

- coordinate with the State Planning Commission, Ministry of Transport, and other Government agencies, as necessary, to seek to direct Government freight to the railway system when it cam be most economically transported by rail

- prepare from available Government data and other sources a list of shippers that should be contacted to develop rail transport

- study and make recommendations on how railway services could be improved to attract potential shippers and serve existing customers better

- study rail door-to-door service and make recommendations as to its potential in Syria

Qualifications of Advisor

General

Have thorough knowledge of railway marketing for both passenger and freight services, including containerized cargo and industrial rail warehousing complexes.

Experience

Have served at least 20 years with a major railway in its traffic department, with a minimum of 5 years as an officer with responsibilities of supervising and promoting marketing development.

8. TARIFF ADVISOR

Specific Tasks and Outputs

Assist and advise the General Manager of Planning and Marketing in the following areas:

- formulation of proposals for freight rates and passenger fares

- publication and distribution of tariffs or rate schedules

- preparation of testimony on rates before rate regulating bodies

- classification of freight through joint bureaus and committees

- planning of freight and passenger schedules in conjunction with movement officers

Qualifications of Advisor

General

Have a thorough knowledge of railway operations, transport, and traffic; have had special training in transport and the

establishment of tariff rate schedules; and have a working knowledge of UIC tariffs including transit rates.

Experience

Have served with major railroads for 20 years in their operations, transport, and traffic departments. Have had a minimum of 5 years working with the establishment of railway tariffs.

9. PORT/RAIL OPERATIONS ADVISOR

Specific Tasks and Outputs

Assist and advise the CFS Director General in the preparation and implementation of an overall program for port/rail operations, including:

- the efficient operation of a port/rail transport system

- rail transport of commodities which are rail oriented and are economically transported by rail

- the coordination between the CFS Director of Port Liaison, General Manager of Planning and Marketing, representatives of CFS Division Managers, and Director General of Ports

- the evaluation of rail facilities in the ports

- the proposing of recommendations as to modifications, expansions, and changes in operating procedures to facilitate expedient and economical port rail service

Qualifications of Advisor

General

Have a well documented background in rail/port operations. Have been employed by a major railway or port authority to manage rail traffic at a port facility.

Experience

Have served a minimum of 20 years with major railway companies as a trainmaster or terminal superintendent with a minimum of 5 years managing rail traffic at a port facility.

10. ECONOMIST

Specific Tasks and Outputs

Assist and advise the Director of Planning and Statistics in the following endeavors:

- conduct economic studies of the existing system

- conduct economic studies for the planning of future railway expansion

- provide inputs for decision making as to alternative courses of action in railway planning

- analyze existing transport statistics to establish historical trends and to use as data base for forecast of future trends

- prepare economic and financial data on motive power and rolling stock costs

- analyze railway policy and effect on national economy

- prepare the economic section of railway feasibility studies

- assist training advisor in setting up a training course in above functions

Qualifications of Advisor

General

Have a sound background in railway transport economics and have demonstrated capability for analytical and planning type work. Be able to work effectively as a member of a technical assistance program.

Experience

Have a minimum of 5 years experience in the field of transport economics and planning and experience in research and evaluation, preferably in railway transport.

11. RECLAMATION ADVISOR

Specific Tasks and Outputs

Assist and advise the CFS General Manager of Movements in the preparation and implementation of a program for the reclamation of obsolete and surplus equipment, materials, and parts, including:

- the preparation of a list of surplus and obsolete equipment, materials, and parts that should be disposed of

- the preparation of a paper indicating trackage, warehouse area, and real estate that could be more profitably utilized through a reclamation program

- the coordination of the program with all concerned departments

- the coordination with the General Manager of Finance and Law relative to sale of reclaimed materials

- the establishment of an on-going department for future reclamation

Qualifications of Advisor

General

Have a documented background in railway store keeping with experience in the classification and sale of reclaimed railway materials.

Experience

Have served a minimum of 15 years with major railway companies in various storekeeping positions. Be familiar with track, structures, traction, and rolling stock commodities and inventories. Have held a responsible supervisory position in the classification and reclamation of obsolete and surplus commodities, equipment, and materials.

12. SIGNAL/COMMUNICATIONS ENGINEER ADVISOR

Specific Tasks and Outputs

Assist and advise the CFS General Manager of Engineering in the preparation and implementation of the following signal/communications program:

- rules, regulations, and standards
- preventive maintenance
- organization
- employee training
- reclamation of surplus equipment and materials
- warehousing and logistics support

- design and specification for future signal and communication systems.

Qualifications of Advisor

General

Have a well documented background in the design, installation, and maintenance of modern railway signal and communication systems.

Experience

Have served a minimum of 25 years with major railway or signal companies in the design, installation, and maintenance of modern signal and communication systems. Have held responsible positions in design, installation, and maintenance, serving a minimum of 5 years as a senior signal maintenance engineer or superintendent of signal installation.

13. TRACK/STRUCTURES ENGINEERING ADVISOR

Specific Tasks and Outputs

Assist and advise the CFS General Manager of Engineering in the preparation and implementation of the following track and structure programs:

- rules, regulations, and standards

- mechanized track and structure maintenance

- preventive maintenance for off-track and on-track equipment

- research and construction relative to alleviation of drifting sand/silt hazards

- employee training

- reclamation of surplus track equipment and materials

- warehousing and logistics support

Qualifications of Advisor

General

Have a well documented background in the civil engineering aspects of railway design, construction, and maintenance. Be familiar with UIC standards.

Experience

Have served a minimum of 25 years with major railway and railway construction companies, preferably in both maintenance and construction. Have a thorough knowledge of railway construction and maintenance in arid regions. Have served as line supervisor and line officer including a minimum of 5 years in overall charge of construction projects and maintenance projects, attaining the position of project manager, project superintendent, or senior engineer.

14. MECHANICAL ADVISOR/TRACTION

Specific Tasks and Outputs

Assist and advise the CFS General Manager of Engineering in the preparation and implementation of the following diesel electric and mechanical locomotive programs:

- rules and regulations relative to locomotive operations
- preventive maintenance including scheduled overhaul
- employee training
- reclamation of surplus materials and equipment
- warehousing and logistics support

Qualifications of Advisor

General

Have a thorough knowledge of diesel electric and mechanical locomotives, locomotive-serving facilities and repair shops, in addition to training in modern maintenance and logistics support programs. Be familiar with UIC standards.

Experience

Have served a minimum of 15 years with major railway companies as a technician, line supervisor, including a minimum of 5 years as a mechanical traction superintendent and/or master motive power mechanic.

15. MECHANICAL ADVISOR/ROLLING STOCK

Specific Tasks and Outputs

Assist and advise the CFS General Manager of Engineering in the preparation and implementation of the following passenger coach, generator/baggage car, and freight vehicle programs:

- rules, regulations and standards pertinent to their use, loading, and movement in trains,

- long-range preventive maintenance

- running repairs

- major repairs

- employee training

- reclamation of surplus equipment and materials

- warehousing and logistics support

Qualifications of Advisor

General

Have a thorough knowledge of railway rolling stock, service and repair facilities, modern maintenance procedures, and logistics support programs. Be familiar with UIC standards.

Experience

Have served a minimum of 15 years with major railway companies, having served as a technician, line supervisor, with a minimum of 5 years as a chief mechanical officer and/or a shop superintendent of rolling stock.

16. STORES CONTROL ADVISOR

Specific Tasks and Outputs

Assist and advise the CFS General Manager of Finance and Law in the preparation and implementation of logistical programs, including:

- rules, regulations, and standards

- procurement of spare parts, materials, and equipment

- warehousing and distribution

- logistics facility maintenance

- reclamation of obsolete and surplus materials, spare parts, and equipment

Qualifications of Advisor

General

Have a well documented background in modern railway logistical support, with experience in purchasing, warehousing, and distributing track materials, motive power and rolling stock parts, signalling and communication components, and general construction supplies. Be familiar with UIC standards.

Experience

Have served a minimum of 25 years with major railway companies in the position of stock clerk, shipping clerk, and purchasing agent. A minimum of 5 years of experience shall have been spent in the position of a senior purchasing agent and/or senior general store keeper.

CHAPTER A-2

ORGANIZATION

Chapter A-2

ORGANIZATION

A-2.1 GENERAL

An effective organization structure is particularly important for railways, which are complex and difficult to manage. They are highly vertically integrated, performing all their own maintenance and providing their own track and structures. Inherently dispersed geographically, they must nevertheless operate in a very disciplined fashion. Their output is of a multi-product type with each component sharing many facilities in common with the others. Conflicts between departments are inevitable because their objectives necessarily conflict. Optimizing the performance of any one department will produce a sub-optimal position for the whole system. The tradeoffs between departments required for the most efficient operation of the network are learned only through long experience. Finally, insuring that the potential for movement that has been created is actualized in terms of traffic is frequently overlooked as a management task.

The railways in Syria are no different from those in other countries in having these management problems. They are different from most in being given a virtually new system with which to operate. This is both an opportunity and a responsibility. If the new railway is used effectively, it will be a great asset in the nations's transport system. Failure will be a correspondingly great waste of precious investment resources.

A-2.2 LEGISLATIVE POSITION

The General Organization for Establishment of Railways, which is referred to throughout the report by its UIC designation - CFS - has its headquarters at Baghdad Station, Aleppo. The current establishment and organization of CFS is set out in Legislative Decree No. 153 of 31 December 1964, as modified by Decree 18 of 15 February 1974 and Decree 1612 of 4 August 1977. Decree 153 lays down the responsibility of the director-general and lists those decisions requiring prior cabinet or ministerial approval. Decree 18 is the umbrella law for all general organizations, companies, and establishments. In the case of CFS, it amends Decree 153 in particular in specifying that the board of directors should be internal to the organization rather than external, as previously required. Decree 1612 sets up a General Company for Railways Construction with responsibility for the construction, execution, and furnishing of all CFS new lines. The Construction Company is connected to CFS,

being responsible to the director-general, but in most respects it acts as an independent body. Its headquarters are in Aleppo. The decree limits its capital to SP 100 million.

The management of CFS has little freedom of action in major policy matters in terms of legislative provision. Its authorized establishment and annual budgets are subject to legislation. Wages and salaries are set by the Government and tariffs cannot be altered without Presidential approval. Contracts of more than SP 25,000 require Government ratification. The board of directors and the director-general do have considerable freedom, however, in formulating policy and programs for its implementation and in day-to-day operations of the railway. Government intervention has been more in the nature of delaying approval for proposals than of detailed control or supervision. Such delay can be important, however; for instance, an appli a-tion for a much increased establishment for CFS has been awaiting Government action for a considerable period.

A-2.3 ESTABLISHMENT

In Table A-2.1 the CFS staff, including those employed in the Construction Company, are shown by category and by level of educational achievement. From end-1970 to end-1974 staff numbers increased by 22 percent, and from end-1974 to end-1978 by 42 percent to reach a total of 7,139. Of these, 2,900 were employed in the Construction Company. The large majority of staff are classified as general workers. The proportion of professional and technical staff has, however, increased considerably, from 4.5 percent of the total in 1970 to 9.7 percent in 1978. The level of educational attainment shows that a high, although falling proportion of staff has not reached the primary certificate level. In 1970, 76 percent were so classified falling to 63 percent in 1978. The proportion of graduates, or holders of the secondary certificate, increased from 10 percent to 14 percent over the same period.

True railway staff numbers, excluding the Construction Company, are shown by directorate in Table A-2.2. In July 1979, out of a total of 4,005 staff, 35 percent were in traction and rolling stock, 30 percent in movements, and 28 percent in fixed facilities. A total of 526 staff or 13 percent were classified as temporary workers, the remainder being permanent staff. A large increase in establishment, representing near doubling of staff, has been proposed to the Government by CFS. The suggested new totals by directorate are given in Table A-2.2. This staff of 8,642 employees for 1,900 kilometers of railway give a ratio of 4.5 employees per route kilometer. With the expansion of services and network underway, there must clearly be a substantial

Table A-2.1

STAFF BY CATEGORY AND EDUCATIONAL ATTAINMENT

	Staff at Year-End					
	1970	1974	1975	1976	1977	1978
Staff Category						
Administrative	381	444	724	725	800	700
Professional and Technical	186	258	289	579	524	690
General Workers	3,232	3,958	4,005	4,026	4,840	5,446
Others	310	355	369	370	252	303
Total	4,109	5,015	5,387	5,700	6,416	7,139
Educational Achievement						
Doctorate/Higher Degree	40	42	39	45	45	50
University Graduate	130	153	129	166	170	180
Secondary Certificate	250	627	692	777	793	805
Primary/Intermediate Certificate	575	614	1,153	1,025	1,286	1,587
Literate	2,213	2,466	2,424	2,500	2,622	3,012
Illiterate	901	1,113	950	1,187	1,500	1,505
Total	4,109	5,015	5,387	5,700	6,416	7,139
Staff of General Company for Railways Construction (included in above)	1,904	2,196	2,280	2,400	2,840	2,900

Source: CFS Planning and Statistics.

Table A-2.2

STAFF BY DIRECTORATE

Directorate	Permanent Staff	Temporary Staff	Total 31 July 1979	Proposed Establishment
Traction and Rolling Stock	1,354	41	1,395	2,160
Movements	987	216	1,203	2,934
Fixed Facilities	862	269	1,131	1,989
Finance	218	-	218	371
Medical Services	12	-	12	22
Director-General	46	-	46	96[1]
Total	3,479	526	4,005	7,572[2]

Source: CFS Planning and Statistics.

Note: General Company for Railways Construction staff excluded.

1 Director-General, Administrative and Legal, Commercial and International Relations.

2 Excluded from table:

Public Garage	192
Public Relations	287
Engineering Institute	44
Studies	89
Planning	35
Signalling and Telecomms.	423

increase in staff during the 1980 to 1985 period. This increase can be kept to a minimum by placing emphasis on an adequate training program that would increase overall management, maintenance, and operating efficiencies and reduce the need for excessive staffing. The present requirement for a decree to be issued before such an increase can be made is very restrictive. A rapidly expanding organization needs flexibility in setting its own staffing levels and the filling of key positions may be much delayed before an overall change in staffing is approved. To overcome this restriction, the director-general should be given authority to increase the establishment by up to, say, 5 percent in any year as long as an application is awaiting Government authorization. This would insure that at least the most important positions could be filled ahead of the issuance of a decree.

In Table A-2.3 the number of staff in each salary range is shown. The rates are base levels excluding allowances and overtime payments. In March 1979, 55 percent of all staff received monthly wages of under SP 445 and 8.4 percent earned over SP 705. In December 1974 the corresponding proportions were 71 percent and 5 percent.

A-2.4 MANAGEMENT STRUCTURE

The present management structure is shown in Plate A-2.1. A key to the position numbers is given in Table A-2.4. The board of directors consists of the director-general and the directors of finance, movements, traction and planning, the technical director, and a labor representative. The board meets at least monthly. The assistant director-general does not sit on the board, although all directors report through him to the director-general.

A change in management structure is recommended for the much larger and more complex system of the future, even though any such change might be disruptive and even counterproductive initially. The major shortcomings of the current structure are:

- overloading of the assistant director-general position
- no marketing department
- no forum for liaison with major customers
- no divisional structure
- poor provision for rules and safety

The revised structure proposed by the Consultants is illustrated in Plate A-2.2, with the key to position numbers in Table A-2.4. The position of assistant director-general, which will soon fall vacant on retirement of the incumbent, is abolished as such, although during absences of the director-general one of the general managers (GMs) would be nominated to

act temporarily in the position. A new tier of five GMs is created, each of whom would be a member of the board of directors. The GM positions are finance and law, administration and personnel, movements, planning and marketing, and engineering. The GMs and the director-general would form a management committee to run the railway. Position descriptions outlining the suggested responsibilities of the GMs are contained in Appendix A-2.2 of the Final Phase I Report. Existing director positions would be little changed except that reporting would be to a GM rather than to the assistant director-general. The administrative responsibilities of the present director of administration and legal affairs would be transferred to the new GM administration, which would also be in control of central offices, apart from the office of the director-general. The director of movements position might well be split into two, with directors of passenger and of freight services. The rules and safety functions of the technical director would be transferred to the new director of rules and safety. The technical director would then be free to concentrate on technical studies, including evaluation of the productivity in use of equipment, and on operations research and work study, areas that will become increasingly important.

Five new directors are proposed to cover port liaison, reclamation, rules and safety, marketing, and training. Position descriptions for these and for new assistant directors of transport economics, sales, market research, safety, and rules are contained in Appendix A-2.1 of the Final Phase I Report. The Consultants view the early creation of these positions and the GM positions to be essential to strengthen the management team to meet the coming challenge of an expanded system.

The Ports of Lattakia and Tartous are already important traffic generators for the railway and their importance is expected to increase considerably in the next few years. In order for rail operations to be carried out efficiently in the port areas and for rail to compete for and capture as much port traffic as it can carry economically, a new emphasis on the ports is proposed. Four separate recommendations are made to this effect:

- The directors-general of the Ports of Lattakia and Tartous should sit on the new advisory board of directors (discussed below).

- A port liaison office that reports to the director-general of the CFS should be set up.

- The GM planning and marketing personnel should pay special attention to the development of port traffic.

Table A-2.3

STAFF SALARIES

Salary Range (SP per month)	Staff Category at Year-end				
	1974	1975	1976	1977	1979[1]
310 - 345	2,184	2,149	1,179	802	-
345 - 390	979	634	1,148	828	2,362
390 - 445	415	920	894	1,235	1,564
445 - 555	864	455	1,324	1,140	1,374
555 - 705	321	764	692	1,768	1,223
705 - 975	202	400	398	428	320
975 - 1,280	40	62	51	131	214
1,280 - 1,610	10	13	14	66	41
1,610 and over	-	-	-	18	27
Total	5,015	5,387	5,700	6,416	7,125

Source: CFS Planning and Statistics.

Note: Salaries are base levels excluding overtime and allowances.

[1] As of 31 March.

CHEMIN DE FER SYRIEN

TABLE OF ORGANIZATION

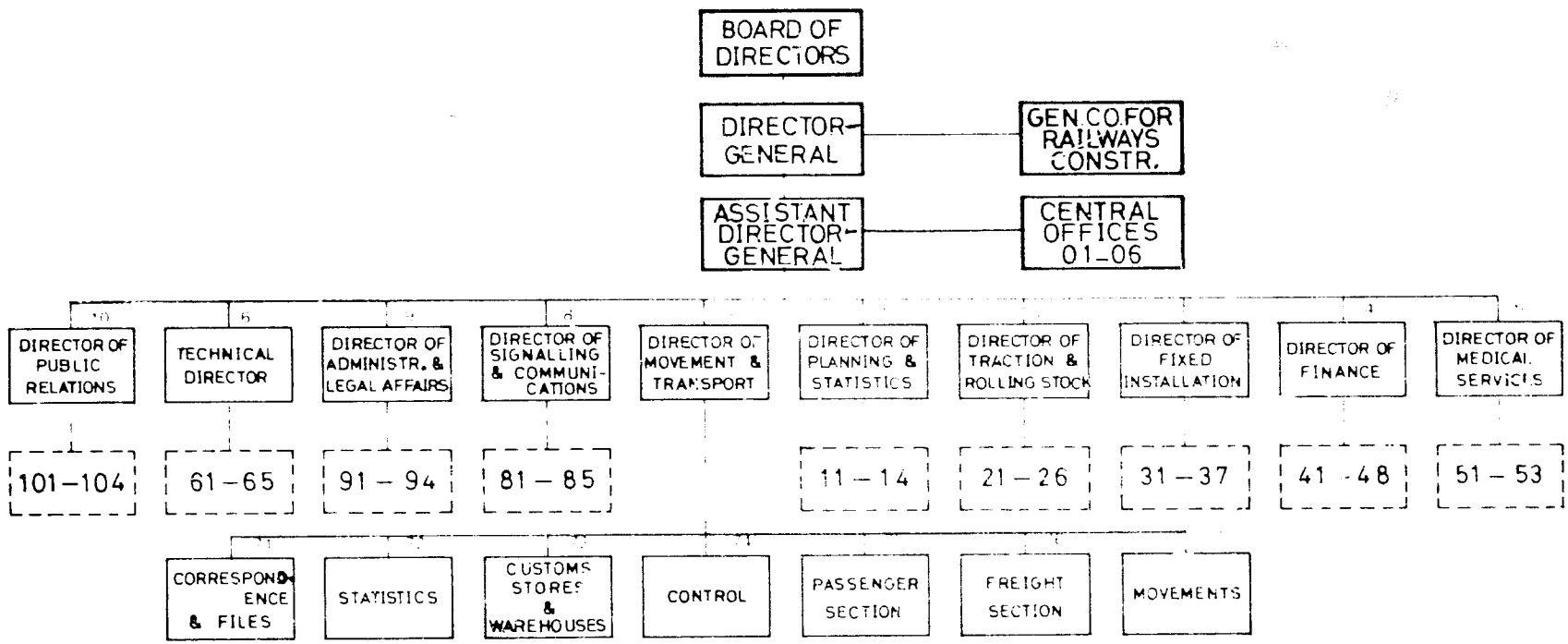


Plate A-2.1

Table A-2.4

KEY TO ORGANIZATION TABLE-CFS

01	Office of the Director-General
02	Consultants
03	Public Relations and International Agreements
04	Training School
05	Correspondence and Files
06	Central Garage
1	Director of Planning and Statistics
2	Director of Traction and Rolling Stock
3	Director of Fixed Installations
4	Director of Finance
5	Director of Medical Services
6	Technical Director
7	Director of Movements and Transport
8	Director of Signalling and Communications
9	Director of Administration and Legal Affairs
10	Director of Public Relations
11	Correspondence and Files
12	Training
13	Statistics
14	Planning
21	Correspondence and Files
22	Traction
23	Technical
24	Wagons and Coaches Inspection
25	Secondary Locomotive Sheds
26	Primary Locomotive Sheds
31	Correspondence and Files
32	District and Mechanics Workshop
33	Railway Installations
34	Buildings
35	Mechanics
36	Agricultural
37	Materials
41	Expenditures
42	Wages and Social Insurance
43	Expenditure Control
44	Contracts and Purchases
45	Correspondence and Files
46	Funds
47	Incomes

Table A-2.4 (Continued)

48	Stores
51	Correspondence and Files
52	Pharmacy
53	Doctors
61	Project Studies
62	Equipment and Structure Studies
63	Regulations and Instructions
64	Locomotive Safety
65	Correspondence and Files
71	Correspondence and Files
72	Statistics
73	Customs Stores and Warehouses
74	Control
75	Passenger Section
76	Freight Section
77	Movements
81	Technical
82	Communications
83	Signalling
84	Electrical
85	Correspondence and Files
91	Legals
92	Personnel
93	Expropriation
94	Correspondence and Files
101	Security
102	World Food Office
103	Publicity
104	Correspondence and Files

Source: CFS Planning and Statistics.

PROPOSED ORGANIZATION STRUCTURE CFS

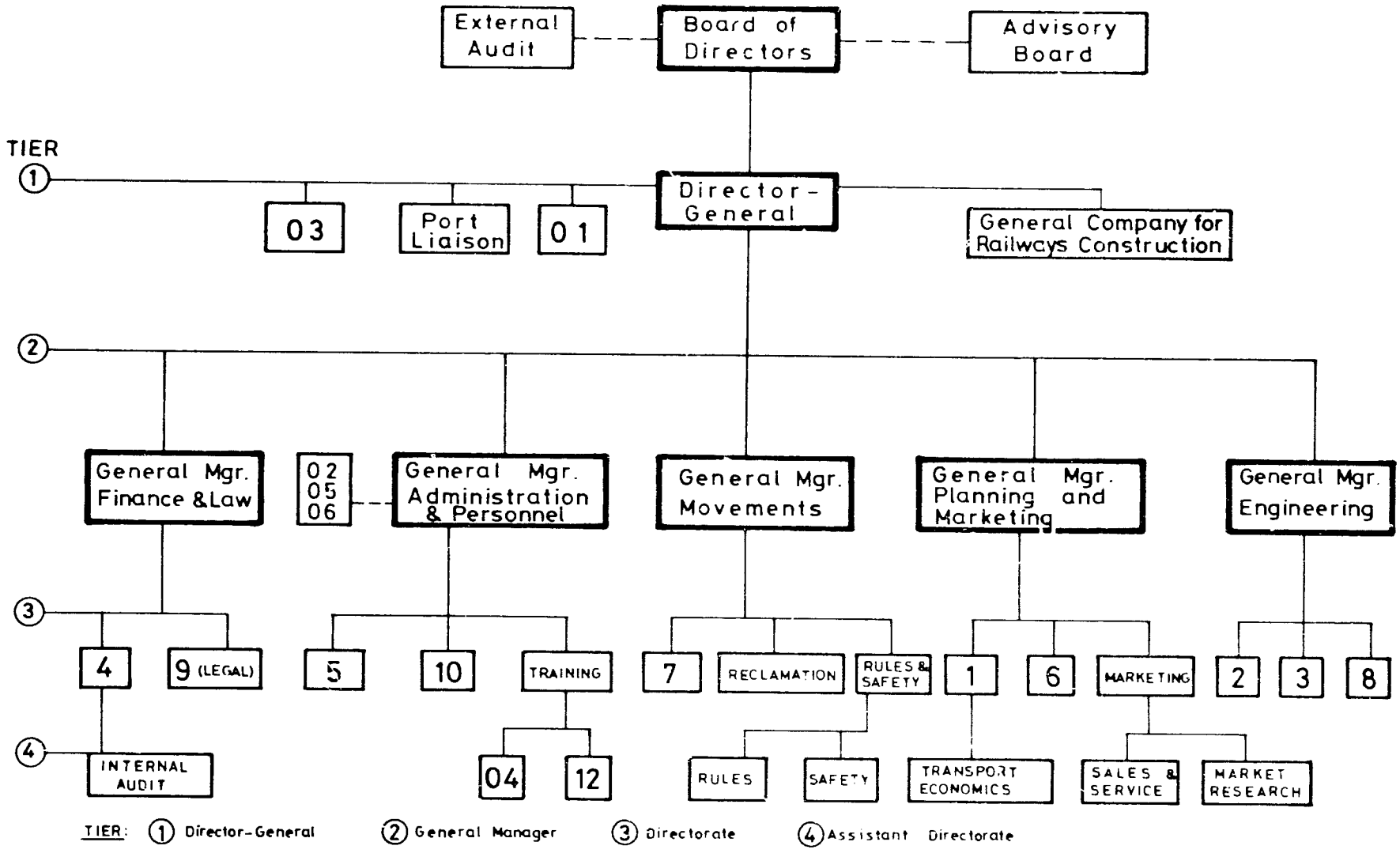


Plate A-2.2

- Divisional managers should be appointed at Lattakia and Tartous and have particular responsibility for port traffic operations.

The director of the Port Liaison Office would maintain on a day-to-day basis high level contact with port and shipping officials and major port users and would coordinate the port-related activities of the movements and planning and marketing departments. With the key traffic position of the ports and the inter-departmental nature of the Port Liaison Office's responsibilities its director should report to the director-general rather than to any one of the GMs.

The director of reclamation would be responsible for organizing the sale and removal from the system of all materials and rolling stock surplus to requirements. The magnitude of this task at the present time is such that a temporary appointment at the director level is warranted to undertake it (see Section A-4.5). After the scrap backlog has been cleared and procedures for surplus disposal have been set up, the responsibility could be handled at a lower level.

The director of rules and safety would have twin responsibilities. In association with line officers he would insure that appropriate rule books were prepared, and he would be responsible for enforcing their observance. The urgent requirement for these tasks is discussed in Sections A-4.1 and A-4.3. Aiding him in these tasks would be assistant directors of rules and of safety.

The director of marketing position is a key one. Little attention has so far been given to exploiting the traffic potential of the new lines. Current construction will add considerably to this potential. The director of marketing would be responsible under the GM planning and marketing for market assessment, traffic development, sales, and advertising. Close liaison is required with other directors and with major customers to ensure that rail's quality of service and tariff structure are competitive and that the service pattern is tailored to attract the traffic most suitable for the railway. Assistant directors of market research and development and of sales and service would assist the marketing director in these tasks.

The director of training would have three basic responsibilities. He would promote the establishment of a modern training school, insure that the CFS meets major objectives through appropriate training programs directed at improved personnel performance and productivity, and maintain close liaison with department supervisors to identify training programs vital to the overall operation of the railway system. He would report directly to the General Manager of Administration and Personnel and work closely with the Railway Technical Assistance Program, discussed in Section A-2.5.

The final major new headquarters appointment recommended is that of assistant director of transport economics reporting to the director of planning and statistics. The primary role of this position is to set up a management information system, the output of which would be the quarterly traffic and operating performance reports recommended in Section A-7.1. The transport economist would in addition carry on special cost studies and review capital expenditure proposals to determine investment priorities and rates of return on capital.

At present there is no forum for top-level contact between major customers of the railway, Government departments, and the board of directors. The Consultants view this as an important weakness in the organization. Prior to Decree 18, the board of directors was external and such a forum existed, although not with the membership now proposed. To overcome this problem, it is recommended that an advisory board of directors be appointed. It would be consulted and informed of major policy decisions by the director-general and be provided with the quarterly performance reports prepared by the assistant director of transport economics. It is recommended that the advisory board meet quarterly. The proposed composition of the board is:

Director-General CFS
Director-General Port of Lattakia
Director-General Port of Tartous
Senior Representative State Planning Commission
Senior Representative Ministry of Transport
Senior Representatives from the petroleum, phosphate, cement, iron and steel, and cereals organizations
A CFS labor representative

As the rail system expands the need for decentralized control and management will increase. At present, although there are regional divisions within departments, these are not coordinated at the local level. It is now appropriate to institute a second tier of management by dividing the whole system into divisions and appointing divisional managers who will be responsible for day-to-day operations of all departments in their areas. Divisional managers would be of assistant director status. The divisions proposed are Aleppo, Deir Ez Zor, Al Kamishli, Lattakia, Homs, Tartous, and eventually Damascus.

The organization table of the General Company for Railways Construction is shown in Plate A-2.3, and a key to the position numbers is given in Table A-2.5. The southern projects, which at present constitute the bulk of the work, are administered from an office in Homs. For financial control purposes and monitoring of the physical progress of projects the CFS director of planning and statistics acts as intermediary between the

GENERAL COMPANY FOR RAILWAYS CONSTRUCTION

TABLE OF ORGANIZATION

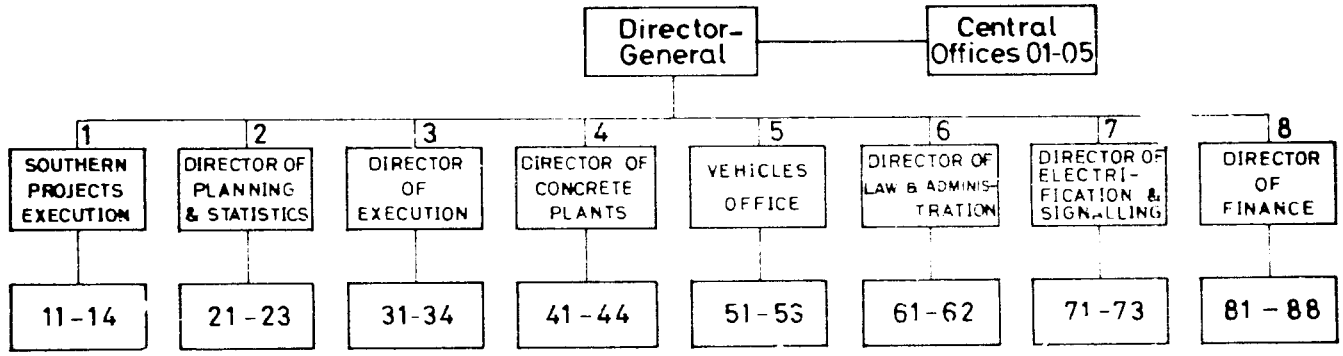


Plate A-2.3

Table A-2.5

KEY TO ORGANIZATION TABLE

GENERAL COMPANY FOR RAILWAYS CONSTRUCTION

01	Secretary
02	Administrative Committee
03	Technical Office
04	Correspondence and Files
05	Security
1	Southern Projects Execution
2	Director of Planning and Statistics
3	Director of Execution
4	Director of Cement Products and Cross Ties Plants
5	Vehicles Office
6	Director of Law and Administration
7	Director of Electrification and Signalling
8	Director of Finance
11	Correspondence and Files
12	Vehicle Repair Workshops
13	Directorate for Superstructure
14	Directorate of Execution-Southern
21	Statistics
22	Planning
23	Correspondence and Files
31	Correspondence and Files
32	Supervision and Control
33	Industrial Structures
34	Tracklaying and Ballast
41	Correspondence and Files
42	Laboratory
43	Technical Center
44	Production Center
51	Correspondence and Files
52	Central Garage
53	Vehicle Repair Workshop-Jibrine
61	Legal
62	Personnel
71	Correspondence and Files
72	Signalling and Communications
73	Electrical Office
81	Correspondence and Files
82	Finance
83	Control
84	Stores
85	Salaries and Social Insurance
86	Expenditures
87	Contracts and Purchases
88	Funding and Computations

Source: CFS-General Company for Railways Construction.

Construction Company and the Ministry of Transport and other Government departments. The budget of the Company is set by CFS after Government approval. The company acts purely as the construction arm of the railway, although with greater freedom of action, particularly in salary structure and recruitment, than the railway itself. This has caused problems for the railway, with staff requesting transfers to the company. This situation emphasizes the low level of top railway salaries rather than overpaying by the company.

A-2.5 TRAINING

The technical assistance program proposed in Section A-1.5 will focus primarily on the top levels of management. It will identify in some detail training requirements for middle and lower level staff, but cannot by itself satisfy them. The development of training facilities and programs is complementary to the assistance program.

Over the next few years, as the railway is extended to new areas of the country and more intensive operations are introduced, the training function will be a key management area. Responsibility for it should be centralized under the control of a new director of training, as discussed in Section A-2.4. To benefit from the technical assistance program such an appointment should be made as early as possible. Each advisor's function would then include liaison with the director of training on the establishment and content of permanent training programs.

The position of director must be created in such a way that:

- a well-qualified and motivated director is attracted

- the director can work as a peer with the other department heads with whom he must continually coordinate

- the director has the responsibility and authority to carry out a training mandate in accord with an approved plan that he and the technical assistance advisors, and in particular the training advisor, have prepared

- an adequate budget is allocated for the training facilities

Present and proposed courses given in rules, regulations, safety, and other areas should be coordinated initially with the appropriate technical assistance programs advisor and the training advisor. Once the content of the courses has been developed and a pilot course run and evaluated, all further

courses should be given directly by the training department, with appropriate support from the rules and safety department. This leaves the latter with more time to carry out its inspection and monitoring functions.

The courses to be developed during the period of the technical assistance program should be based primarily on the criteria of increased operating efficiency and overall equipment and manpower productivity. They should be designed to measure the contribution of training to productivity by changing the behavior of the trainee in such a way that his increase in productivity can be measured. For example, if the average on-line delays to passenger and freight trains caused by breakdowns associated with lack of preventive maintenance could be reduced by 20 percent through adequate technical training, it is a positive and measurable benefit. This approach allows training to be evaluated on a cost/benefit basis (i.e., the saved passenger or freight train hours converted to costs/train hour). At present there is a lack of adequate training facilities to carry out any integrated training program. The training advisor on the proposed technical assistance team should assist the director of training in planning for required facilities in addition to developing a budget for their operation. It is essential that proper classrooms, mock-ups, special equipment, and adequate training aids be available.

CHAPTER A-3

SYSTEM

Chapter A-3

SYSTEM

A-3.1 NETWORK DESCRIPTION

The CFS network in commercial service in January 1980 totalled 1,375 route kilometers, comprising 482 kilometers of line constructed during the years from 1904 to 1940 and 893 kilometers that had been opened since 1967. New construction totalling 184 kilometers was in the final stages of completion. When added to the present system, this will give an operating network of 1,559 kilometers. An additional 139 kilometers now under construction is scheduled for completion prior to 1985, and a further 194 kilometers is planned for commencement and completion by 1985.

The present network, as well as future planned construction and lines proposed for feasibility studies, has been divided by the Consultants into 10 lines designated 0 through 9. This basically splits the network into lines with specific track and/or geographical characteristics. The route kilometers by line are summarized in Table A-3.1. Maps of the CFS system showing all stations and station-to-station distances and the Consultants' line numbers were presented in Appendix A-3.1 of the Final Phase I Report. The lines are described below.

Line 1 Jibrine-Deir Ez Zor (Passenger Station)

This line was completed in 1969. It is 323 kilometers in length, with one branch line of 10.4 kilometers serving the city of Al Thawra and the Al Tabkah Dam Project. The line traverses much of the area that will be irrigated under the Euphrates Dam Project.

Line 2 Jibrine-Lattakia Port

Completed in 1975, Line 2 is a continuation westward of Line 1, passing through the coastal mountain range to serve the Port of Lattakia. It is 207 kilometers in length, with one branch line of two kilometers that serves the passenger station in Lattakia.

Line 3 Lebanese Border-Wadihi

This line, completed south of Homs in 1927, links Rayak - the junction in Lebanon with the narrow gauge Beirut to Damascus line - with Aleppo. It has a length of 228 kilometers, with one branch line of 21 kilometers opened in 1979 that serves the electric power station at Mhardeh.

Table A-3.1

ROUTE-KILOMETERS BY LINE

	Operational Railway	In Last Stages of Construction	Under Construction To Be Completed Before 1985	Expected Completion By 1985
Line 0	81.076			
Line 1	334.218			
Line 2	209.425			
Line 3	248.894			
Line 4		63.630	138.945	
Line 5	109.521			
Line 6		120.435		50.565
Line 7	173.870			
Line 8				143.000
Line 9	217.400			
	1,374.404	184.065	138.945	193.565
Line 3 (After Reconstruction)			59.863	125.461

Feasibility Studies Completed

Line 5	Tartous - Lattakia	80.00 (Approx.)
Line o	Tadmur - Deir Ez Zor	195.00 (Approx.)

Proposed Feasibility Study

Line 6 (Alternative)	Tadmur - Albu Kamal	250.00 (Approx.)

Source: CFS - Fixed Installations - Technical Project Studies.
Line Number Designation - LBII

This line serves one of the higher-density population areas and some of the most fertile and productive farmland. Industry on this line is greater than on any other in the network.

Line 3 After Realignment 1985 (Homs) Snessel - Wadihi

Line 3 is being completely reconstructed to a new alignment, with completion scheduled prior to 1985. The new alignment will reduce the length of the existing line by approximately 7 kilometers, for a total length of 176 kilometers. The 21 kilometer branch line that was constructed to Mhardeh will be connected to the Hama yard at its new location upon completion. There will be an additional industrial spur track from the new line to the steel plant north of Hama.

Line 4 Homs II-Damascus (Passenger Station)

Construction is underway on this line and a large percentage of the subgrade and drainage structure work has been completed. The 64 kilometers between Homs II and Mhine is basically completed. The total length of this line will be 203 kilometers.

Line 5 Homs II-Tartous Port

The construction of this line has been carried out in two phases. The first phase was the construction of 41 kilometers of railway from Akkari to the Port of Tartous in 1967. The second phase was almost completed in 1979 and it was to be in operation in early 1980. A 5-kilometer branch line from Akkari to the Lebanese border will continue to link Tripoli, Tartous, and Homs. The length of the entire line will be 104 kilometers when completed. The new alignment places the entire Homs to Tartous line within Syria.

Line 6 Mhine-Tadmur

Construction of this line is underway, and the section from Mhine to Sharkieh is nearing completion. When completed, the line will have a length of 161 kilometers with two branch lines serving the phosphate mines at Khneifiss and Sharkieh, measuring 7 kilometers and 2.7 kilometers, respectively.

Line 7 Turkish Border-Ansari-Mousselmieh-Turkish Border

The two lines north of Aleppo were constructed from 1903 to 1907 to link Adana with Aleppo and Aleppo with Al Kamishli. With the completion of the new line from Aleppo-Jibrine to Al Kamishli, consideration is being given to abandoning the branch line from Mousselmieh to the Turkish border. The total length of Line 7 from Ansari to the two Turkish border stations is 174 kilometers.

Line 8 Deir Ez Zor-Albu Kamal

This 143-kilometer line was put out for tender as a turn-key project in early 1979, and approximately 30 tenders were received from contractors worldwide. The tenders were unexpectedly high and a final design study may be performed as the next step.

Line 9 Deir Ez Zor (Freight Station)-Al Kamishli

Line 9 is a 217-kilometer continuation of Line 1 to the north, passing through very arid terrain to Al Kamishli. Its construction was completed in 1975.

Line 0 Turkish Border-Al Kamishli-Iraqi Border

The railway from the Turkish border to Al Kamishli was completed prior to World War I and was the eastern end of the rail link from Aleppo to Al Kamishli. The rail link from Al Kamishli to the Iraqi border was not completed until 1940. This line is 81 kilometers in length.

A-3.2 TRACK AND STRUCTURES INVENTORY AND STANDARDS

The compilation by the Consultants of a track and structures inventory was time consuming. The data required from profiles, station plans, and other blueprints had to be drawn from four separate railway departments: Fixed Structures, Technical, Signalling and Communications, and Construction. It would have simplified the inventory task if track charts had been available. Track charts are used on modern railways throughout the world. They contain pertinent information on track, structures, and operation (curve, profile, rail, bridge, tunnel, signal, speed, and other data required for the efficient operation and maintenance of a railway system). Such charts are necessary as a ready source of information on inspection trips over the system.

A free flow of information and technical data between departments is of paramount importance in operating an efficient railway system.

To prepare the inventory, the Consultants utilized track characteristics sheets on which all track and structures inventory data were listed progressively from station to station. To prepare the inventory data for computer use, each station was assigned a node number, and a coding sheet was prepared assigning numbers to various track and structures characteristics. A Track Structures Inventory Summary Sheet was prepared for each line (0 through 9) to summarize the data listed on the station-to-station track characteristics sheets. The summary sheet for

each line, a map of the line, and a sample of the station-to-station inventory sheet, were provided in Appendix A-3.1 of the Final Phase I Report. The complete set of station-to-station inventory sheets is available in the Consultants' files.

In addition to the track and structures inventory, a visual inspection was carried out over the whole of the operating railway. A number of lines under construction were also inspected.

The past 15 years of major railway construction, using modern track and structures technology, has made existing standards obsolete. The Department of Fixed Facilities is planning to draw up new standards, including rules and regulations for construction and maintenance.

A-3.3 ROLLING STOCK INVENTORY AND STANDARDS

The designs and standards adopted for rolling stock have been conditioned by two factors: all stock is imported, and as a major conveyor of transit traffic, stock has to be compatible with that of neighboring countries and with through-working European equipment. CFS locomotives do not work outside Syria under normal circumstances, and there is no through running of Iraqi or Turkish locomotives. Both Iraqi and Turkish coaches, however, run into Aleppo, and CFS coaches are expected to operate to Baghdad commencing in 1980. There is a considerable interchange of freight wagons with neighboring countries, and all transit traffic is carried on foreign wagons from as far afield as northern Europe. All modern CFS stock has therefore been constructed to be compatible with UIC standards, and with the exception of 30 GE diesel locomotives, all the rolling stock has been built in Europe. A wide range of suppliers has been used; they were chosen after open bidding for each group of equipment. Items have been supplied by nine countries.

With the rapid expansion of the network that has taken place and that is still in progress, most of the rolling stock is modern and in generally good physical condition. Steam locomotives ceased operations in 1976 and the fleet is now all diesel. The complete inventory of stock in service, or on order, as of 1 January 1980 is given in Table A-3.2. CFS has received bids for the proposed acquisition of 80 locomotives of 3,000 hp and 20 of 1,000 hp, but the purchase of these has not yet received Government approval. The need for these locomotives is discussed in Chapter A-8.

Although new lines have been constructed to a 25-ton axle load standard, in practice, CFS limits loading to 20 tons. The weights of all units are given in Table A-3.2 with the carrying capacities of freight wagons.

Table A-3.2

CFS ROLLING STOCK INVENTORY, 1 JANUARY 1980

1. Locomotives

HP/ Class	No. of Units	Delivered	Tare Weight (tons)	Length (meters)	Max. Speed (kph)	Constructed
650	10	1968	60.[illegible]	12.4	60	France CEM
1200	1[illegible]	1973	107.0	17.0	100	U.S.S.R.
2800	30	1974	116.0	17.4	100	U.S.S.R.
1800[1]	15	1976	83.5	15.4	114	U.S. GE
1800[1]	15	1976	83.5	15.4	138	U.S. GE
	81					

2. Coaches

Class	No. of Units	Delivered	Seats 1st	Seats 2nd	Seats Berths	Tare Weight (tons)	Length (meters)	Constructed
ABm	15	1971	12	64	-	38	24.5	G.D.R.
Bm	10	1971	-	80	-	38	24.5	G.D.R.
ACm	10	1977	48	or	32	42	24.5	Romania Air Cond.
Am	5	1977	54	-	-	42	24.5	" "
Bm	10	1977	-	80	-	42	24.5	" "
BRm[2]	10	1977	-	40[2]	-	42	24.5	" "
Bhm	50	1979	-	96+4	-	39	24.5	Poland
	110							

Table A-3.2 (Continued)

CFS ROLLING STOCK INVENTORY, 1 JANUARY 1980

3. Diesel Railcars

Class	No. of Units	Delivered	Seats 1st	Seats 2nd	Tare Weight (tons)	Length (meters)	HP	Max. Speed (kph)	Constructed
zzA	1	1934	11	58	28	18.1	270	90	France-Dietrich
zzB	2	1934	11	66	29	19.5	270	90	France-Dietrich
T	7	1967	11	58	52	26.2	640	100	Austria-SGP
	10								

4. Freight Vehicles

Class	No. of Units	Type	Delivered	Tare/Net Tons	Stock Nos.	Constructed
Kwf	80	Van	1955/7	$12/20^3$	110601-640,110761-800	Germany-Austria
Kw	120	Van	1955/7	$11/20^3$	110641-760	Germany-Austria
Taes	180	Van Sliding Roof	1975	22/58	31 97 585 1 00 1 -180	France
Ealos	98	Open Van	1973	20/60	31 97 591 2001 -100	Poland
Rw^f	100	Flat	1973	21/58	153701-800	U.S.S.R.
Rps	100	Flat	1975	$24/56_3$	31 97 391 4001 -100	Romania
Kbs	50	Flat	1975	$14/26^3$	21 97 334 8 001 -050	Romania
Os	50	Flat	1975	$15/25^3$	21 97 370 5 001 -050	Romania
Res	100	Flat	1977/8	23/56	31 97 393 6 001 -100	Poland
Remms	150	Flat	1977/8	21/56	31 97 394 8 001 -150	Poland

Table A-3.2 (Continued)

CFS ROLLING STOCK INVENTORY, 1 JANUARY 1980

4. Freight Vehicles (Contd.)

Class	No. of Units	Type	Delivered	Tare/Net Tons	Stock Nos.		Constructed
R	64	Flat for Rails	1967	22/63	153501-564		U.S.S.R.
Ud	89	Ballast	1967	23/60	155101-189		U.S.S.R.
Fads	160	Phosphate	1975	27/53	2197 69 0 001	-160	Poland
Uad	7	Rock	1975	27/53	154435-445		U.S.S.R.
Uadgs	250	Cereals	1975	20/59	31 97 931 0 001	-250	France
Uaces	17	Cement	1970/8	25/55	31 97 932 1 501	-517	Poland
Sw[f]	10	Tanks Water Petroleum Products	1960	21/39	120 601 - 610		Czechoslovakia
Sw	38	Tanks Water Petroleum Products	1960	21/39	120 611 - 650		Czechoslovakia
Uahs	70	Tanks White Petroleum Products	1973/6	22/58	31 97 725 3 201	-270	Poland
Uahs	80	Tanks Black Petroleum Products	1973/6	23/57	31 97 728 6 001	-080	Poland
Rw[f]	70	Flat	1979	21/58	153601-670		U.S.S.R.
Ud	70	Ballast	1979	23/57	155201-270		U.S.S.R.
	1,953						

Table A-3.2 (Continued)

CFS ROLLING STOCK INVENTORY, 1 JANUARY 1980

5. Other Rolling Stock - Unilok Rail/Road Vehicles

No. of Units	Delivered	Tare Weight (tons)	Length (meters)	HP	Max. Speed (kph)	Constructed
6	1976	4	3.8	61	34	G.F.R.

Generating/Baggage Cars

No. of Units	Class	Delivered	Tare Weight (tons)	Length (meters)	Constructed
10	DPEm	1977	47	24.5	Romania
4	DPVm	1977	45	24.5	Romania
10	DPEm	1979	45	24.5	Poland
24					

6. Rolling Stock on Order

No. of Units	Type	Delivery	Tare/Net Tons	Constructed
300	Van (Open)	1981-82	22/58	G.D.R.
600	Van (Covered)	1979-80	14/26	G.D.R.
200	Flats	1981	12.5/27.5	G.D.R.
300	Vans (Sliding Cover)	1982	23/57	G.D.R.
120	Tanks Petroleum Products	1980-81	22/58	Poland
20	Tanks Water	1980-81	22/58	Poland
30	Cement	1980	25/55	Poland
20	Side Tip	1980	-	Poland
1,590				

Table A-3.2 (Continued)

CFS ROLLING STOCK INVENTORY, 1 JANUARY 1980

7. Rolling Stock Out to Tender

No. of Units	Type
80	Diesel Electric Locomotive 3,000 HP
20	Diesel Electric Locomotive 1,000 HP
60	Bulk Sulphur Wagon
160	

Source: CFS, Traction and Rolling Stock.

1 Four damaged.

2 Restaurant/buffet cars.

3 Two axles.

A-3.4 SIGNALLING AND TELECOMMUNICATIONS INVENTORY AND STANDARDS

The railway system that was constructed prior to 1940 - Lines 0, 3, and 7 - totalling 475 route kilometers, is operated as a manual block system where the block is established by train order or by special instructions where conditions require.

The 1967 to 1975 construction of 756 route kilometers of railway from Lattakia to Al Kamishli, Lines 1, 2, and 9, was designed to use a manual block signal system. The use of each block is governed by block signals controlled manually or by hand signals in the absence of fixed signals, or block limit signals, or any combination thereof, upon information by telephone. The construction of this manual block signal system has not been completed, although the section from Jibrine to Al Raqqa has recently been put into operation. The system is operated on a station-to-station basis by the station operators. (Future signal systems will be automatic block systems.) The efficiency of such a system is low, especially when compared to an automatic block signal system.

The telecommunications system on the Lattakia to Al Kamishli line is basically the same system as used on the old lines, except that it has been upgraded with new equipment.

The Consultants were unable to obtain specifications or a general scheme of operation for the signal and communications system that will be installed on the lines now under construction. The contract for this system was ratified by the Syrian Government in May 1980, and includes Lines 4, 5, 6, and the realignment of Line 3, which are scheduled for completion before 1985. The general description of the new signal and communication system, based on discussion with the technical officers concerned, suggests that the system will be more sophisticated than the system now being installed on Lines 1, 2, and 9. This traffic control system would not be operated from a central control point but rather from miniature control panels at each station and under supervision of dispatchers located at Aleppo, Homs II, and Damascus. Necessary signal and communications circuits would be provided by cable.

The new freight yard at Jibrine was constructed to operate under a Traffic Control System (TCS), where train movements will be authorized by block signals and 46 electric-powered switches will be interphased with the block signals. A portion of the Lattakia freight yard will also be operated under TCS.

The accelerated railway construction program, linked with the introduction of three new rail signal systems, has not permitted the Signalling Department to draft detailed standards. Work generally is being accomplished with direct reference to blueprints as furnished by the manufacturer of the equipment.

A-3.5 SYSTEM AND LINE CAPACITY

A review of engineering design data by the Consultants raises the question of whether line capacity parameters are having any impact on final design criteria for new line construction. In particular, before construction of Line 5, Homs II to Tartous, the maximum curvature radius was 400 meters, but the 38-kilometer section of this line from Kizlakher to Akkari was constructed with a maximum grade of 2 percent and a minimum curvature radius of 300 meters. This section is further restricted since 15 kilometers, or 40 percent, is composed of curves.

The Consultants also note that the design standards of the lines constructed since 1966 may be excessive, since they allow for speeds much higher than present average operating speeds. For example, permissible passenger train design speed from Aleppo to Lattakia is 110-140 kilometers per hour, but scheduled operating time is about three hours, with average speeds of 59-68 kilometers per hour.

The Consultants have applied an average scheduled speed for each line that they feel is attainable in determining line capacity. For estimating purposes, those lines to be completed before 1985 have been assigned average speeds consistent with operating lines of similar characteristics. The assumed speeds are given in Table A-3.3.

After reviewing various line capacity formulas, the Consultants judge the following to be the most applicable to single-track sections:

$$\text{Capacity } C = \frac{1,440}{T+T_1} \times K$$

Where: C = the maximum number of trains that can be run in 24 hours in both directions

T = the longest running time of a train between two crossing stations (in minutes)

T_1 = the time for setting and cancelling routes (in minutes)

K = the efficiency factor, which depends on operating efficiency and utilization

The formula for double-track lines is:

$$\text{Capacity } C = 2 \frac{1,440}{T+T_1+T_2} \times K$$

Table A-3.3

ASSUMED OPERATING SPEEDS

Line No.	Average Freight Train Speed (kms/hr)	Average Passenger Train Speed (kms/hr)
1	70	100
2	60	90
3	25	25
3[1]	70	100
4	70	100
4[2]	70	100
5	55	90
6	70	100
7	30	40
8	70	100
9	70	100
0	40	50

Source: Consultants' estimates.

[1] Line 3 after reconstruction.

[2] Line 4 between Homs II and Mhine.

Where: T = the scheduled time between trains

T_1 = the time for setting and cancelling the route

T_2 = the longest track occupation and time between any consecutive interlocking station yards

The expression $T+T1+T2$ indicates the maximum headway between two trains moving in one direction. T (in the single-track formula) and T2 (in the double-track formula) vary with the train load and the tractive effort of the motive power. The parameter T1 in both formulas varies with the type of signalling and interlocking equipment and the suitability of the station layouts.

The factor K depends on:

- the frequency of trains running at the lowest speed compared with faster trains

- the mix of fast express and slow goods trains and the need to overtake and delay the crossing of trains

- the availability of terminal capacity

- the availability of motive power

- the time required for track maintenance and renewal

For estimating purposes, individual lines have been treated as if the proposed signalling systems for those lines were in operation.

The parameters used in the analysis and the resultant capacities by line in number of trains per day (total for both directions added together) are shown in Table A-3.4.

In Table A-3.5 the line capacities are compared with the forecast number of trains expected to be in operation in 1985. The derivation of this forecast is described in Section A-8.2. The comparison shows that on two important sections of line, Damascus-Mhine and Homs-Aleppo, traffic in 1985 will be close to comfortable operating capacity unless planned future passing stations are open. In the case of Damascus-Mhine, the stations at Bir Ghadir and Ard Ez Zor should be provided from the outset. Bir Ghadir is the first station south of the junction at Mhine and, as such, is particularly important. On the Homs-Aleppo line, the station at Kawkab breaks a section that would otherwise be 27.3 kilometers long, and this should be opened soon after 1985. The station of Rmeli on the Mhine-Tadmur line should also be considered for early construction, otherwise

Table A-3. 4

TRAIN CAPACITY BY LINE

Line No.	T (minutes)	T_1 (minutes)	K	C-Estimated Capacity Trains/Day
1	15	6	60	41
2	25	6	60	28
3	38	15	50	14
3[1] & 4	23	6	65	32
3[2] & 4	14	6	65	46
4[1]	35	6	65	23
4[2]	20	6	65	36
4[3]	17	6	65	40
5	24	6	65	31
6[1]	35	6	65	23
6[2]	19	6	65	37
7	54	15	50	10
8	16	6	65	42
9	24	6	60	31
0	42	15	50	13

Source: Consultants' estimates.

[1] Future stations omitted.

[2] Future stations included.

[3] Line 4 between Homs II and Mhine.

[4] Line 3 after reconstruction.

Table A-3.5

LINE CAPACITY AND DEMAND IN 1985

Line No.	Capacity Trains/Day	1985 Forecast Passenger Trains	Freight Trains	Spare Paths
1	41	8/12[1]	8/14[1]	25/15[1]
2	28	6	8	14
3A	32	14	14[2]	4
3B	46	14	14	18
4A	23	14	10	nil
4B	36	14	10	12
4[3]	40	14	16	10
5	31	6	10	15
6A	23	0	6	17
6B	37	0	6	31
7	10	2	4	4
8	42	4	6	32
9	31	4/6[4]	2	25/23[4]
0	13	4	2	7

Source: Consultants' estimates.

Note: A/B = Future stations omitted/included.

1 Aleppo-Al Raqqa.

2 Hama to Homs has 16, but the capacity restriction is north of Hama.

3 Homs II to Mhine section.

4 Deir Ez Zor-Al Hassakeh.

there is a 25.9-kilometer section into Mhine junction that reduces operating flexibility approaching the most intensively used stretch of the entire network, Mhine-Homs II, which is forecast to be carrying 32 trains per day by 1985. Apart from the early construction of the proposed future stations, no other action appears to be required before 1985 to increase line capacity. Table A-3.5 shows all other lines to have a reasonable margin of spare paths. The capacity situation over the 1985 to 2000 period is discussed in Section A-8.4.

The Consultants' comparison of capacity with demand is only a first approximation; until a notional timetable is constructed that allows for the actual operating constraints (such as permanent way possessions and restrictions on the times at which it is practical to run passenger trains), the real capacity situation will not be clear. The Consultants recommend that the train planning section in the Movements Department be expanded rapidly to cover both advance timetable preparation for new lines and the determination of rolling stock diagrams to provide for the planned services. The only accurate method of calculating future rolling stock requirements is by matching diagrams to a draft service timetable. The two operations are complementary; an efficient timetable is one that provides good daily kilometerage for each train set and locomotive.

A-3.6 NEW LINE CONSTRUCTION

Construction is being carried out on three separate lines on the expanding railway network; Line 6, Mhine-Sharkieh; and Line 3, Homs II-Wadihi (realignment).

Construction Methods

Construction under normal conditions is carried out by clearing a four- or five-meter strip along the route alignment, allowing wheeled vehicles access so that construction can proceed on the bridges and structures prior to the subgrade construction.

The main-line roadbed width is designed for a ballast depth of 35 centimeters, with ballast side slopes of 1:1.5 and supporting subgrade shoulders that extend 63 centimeters beyond the base of the ballast section, for a total roadbed width of 6.10 meters. Subgrade side slopes on fill sections are 1:1.5, except on special construction, and the side slopes in cut areas vary with the angle of repose of the particular soil. The side slopes in deep cuts are further stabilized by use of offsets; terraces, retaining walls, and drainage details are given careful attention in cut areas.

Subgrade materials are placed in layers and compacted during construction to minimize future settlement and consolidation,

but this aspect of construction requires attention since subgrade settlement of fill areas is excessive.

The main-line standard for rail since 1966 has been 50 kilometers per meter in lengths of 25 meters. The cross tie standard since 1966 has been prestressed concrete, except for the cross ties used in turnouts, which are wood.

The laying of the rail and cross ties on the roadbed is accomplished by constructing 25-meter sections of track at an assembly yard. These track sections are transported on flat cars to the construction site, where the sections are laid end-to-end on the roadbed with a specially constructed railcar crane. The 25-meter sections are bolted together with rail joint bars.

Specially constructed railway ballast cars are used to spread ballast evenly over the newly layed sections of track. Automated Plasser track machines are utilized to raise the track to a desired elevation, align the track, and tamp and vibrate the ballast under the cross ties in sequential order.

Ballast regulators equipped with track brooms are used to distribute the ballast evenly along the track after the tamping and aligning has been completed. In addition, this machine establishes proper ballast shoulders and side slopes for the ballast section.

A ballast compactor is used last to compact the shoulder and slope sections of the ballast. Improvements with regard to utilization of ballast regulators are necessary. Curves invariably have excessive ballast on the inside and insufficient ballast on the outside.

The General Company for Railways Construction is basically well organized, including the concrete tie manufacturing plants, track assembly yards, ballast crushing plants, and site construction areas. Construction schedules are realistic and construction goals are generally being met.

Since the major new construction of railways, which began in the 1st Five-Year Plan early in the 1960s, and the inception of the General Company for Railways Construction in 1977, railway construction has been dependent on a long-term technical assistance program. This program involves a large number of engineers and technicians from the USSR. The long duration of this technical assistance program should have established a cadre of Syrian engineers, technicians, and administrators capable of handling all aspects of railway construction in the future. However, this does not seem to be the case: the Consultants

were advised that the future design and construction of the Deir Ez Zor-Albu Kamal railway would, in all probability, be accomplished by using engineers and technicians from the USSR.

The Consultants recommend that the CFS take the necessary steps to have the General Company for Railways Construction do their own track and structure design as well as the field engineering and construction. A proposed new technical assistance program should be initiated and based on the explicit requirement that counterpart Syrian design, field, and construction engineers and managers to be trained as an integral part of the program. Counterparts should be assigned on a one-to-one basis to work fulltime with the technical assistance experts. The overall goal of the program should be to develop a basic cadre of Syrian talent capable of handling all aspects of railway construction, including design, field engineering, and management. Upon completion of the program, this cadre should be given the responsibility for the training of other key personnel in the company, including new professionals and technicians, in their special areas.

CHAPTER A-4

OPERATIONS AND MAINTENANCE

Chapter A-4

OPERATIONS AND MAINTENANCE

A-4.1 GENERAL

The extensive construction and modernization of the CFS network during the past 15 years has confronted management with a series of problems not normally associated with operating a railway. The introduction of new technology and equipment into a rapidly expanding railway system requires organizational changes, which management must initiate, as well as the adoption of new rules, regulations, and standards applicable to both operating and maintenance procedures. Further, systematic planning and timely implementation of training programs for supervisors, equipment operators, and maintenance technicians are essential to achieve reasonable operating efficiency. To assure the timely acquisition of spare parts and commodities that are essential to planning and scheduling of maintenance programs, a responsive logistics support program is required. In addition, management must continually monitor the human resource aspect of the railway system and keep morale at a high level.

The Consultants have spent over 20 man-weeks at the CFS headquarters in Aleppo and have performed a physical examination of virtually the entire system. Discussions have been held with not only the senior staff members, but with line supervisors, foremen, and employees from most departments. This on-the-job examination of the system has revealed the following weaknesses:

1. Rules, regulations, and standards required for both the operation and the maintenance of the modernized system have not been adopted and, in some cases, have not yet been drafted.

2. Training programs have been confined to the employees of only a small sector of the entire system.

3. The lack of spare parts and basic repair materials has not only led to expensive equipment lying idle, but has forced repairmen to cannibalize idle equipment.

4. The most disturbing aspect noted by the Consultants is the low morale of many of the officers, supervisors, technicians, and laborers. Their primary concerns are their low salaries compared to other sectors of the economy; the lack of adequate training to perform their jobs; and the lack of spare parts to make repairs in a proper and expeditious manner.

This low morale problem is evidenced by high absenteeism, a slowdown in work performance, and the stopping of work long before the end of the tour of duty. Further evidence is provided by the generally untidy conditions of the yards, shops, and offices, and the dirty condition of the tools and equipment.

Within the next five years, with the completion of major new lines, CFS will require an additional large, well-trained staff of technicians. This staff must be trained in every aspect of railway operations and maintenance. It will be asked to maintain a modern railway network on a 24-hour-a-day basis, a system providing intensive passenger and freight services requiring an operating and maintenance discipline not essential for existing services. To meet this challenge, a large-scale training program is essential, and this must be initiated at the earliest possible date.

Rules, regulations, and standards pertaining to operations and maintenance must be drafted and adopted as soon as possible and they need to be included in the training curriculum.

The problem of logistics support, evidenced in the lack of spare parts, is already critical in some areas of maintenance. Once the enti e system is put into operation, with full utilization of equipment, lack of adequate logistics support will lead to service problems of a high order. Attention needs to be focussed on inventory control and the timely ordering of key spare parts.

A-4.2 TIMETABLING AND TRAIN PERFORMANCE

Train paths are plotted on a paper graph and the final schedules are derived from it. The current graphs were prepared in 1978. The graph between Aleppo and Tartous includes paths for inspection, oil refinery, general freight, port, and mixed trains. The graph between Lattakia and Al Kamishli includes excursion, inspection, transit, fast freight, slow freight, diesel railcar, petroleum, express passenger (air conditioned), and ordinary passenger trains. The information from the train graphs is used to prepare working timetables that are used by dispatchers, locomotive drivers, and stationmasters.

About one-third of the graphed trains were being operated in 1979. The passenger timetable for the Lattakia-Aleppo and Aleppo-Al Kamishli lines is shown in Table A-5.4. Two daily passenger trains run between Lattakia and Aleppo and Aleppo and Al Kamishli. A diesel railcar operates between Aleppo and Al Tabkah. On Saturdays and Tuesdays an air-conditioned train operates from Baghdad to Aleppo, returning on Sundays and

Wednesdays. Mixed trains are run daily between Midan Ikbis-Aleppo, Aleppo-Homs, and Al Kamishli-Ya'roubia.

Freight trains are run as and when required on the most convenient train graph path available. At present two or three freight trains are operated daily between Midan Ikbis-Aleppo, Aleppo-Homs, and Aleppo-Al Kamishli. An oil train is run daily between Aleppo and Lattakia. On Sundays extra ballast trains are operated from Aleppo to Homs. A work train runs daily between Aleppo and Jibrine for railway employees, handling freight when required.

The operating performance of passenger trains is from good to fair. It is not unusual, however, for a train to be more than one hour late. Most of the train delays result from:

- waiting for other trains at passing stations
- locomotive problems
- reduced speed orders on the track
- delays in loading and unloading passengers at stations

It would be helpful, particularly at night, if stations had more prominent station signs and train arrivals were announced in advance over the public address system. The stations could also be announced in each car by the train attendants.

Customs and immigration officials use an excessive amount of time at Ya'roubia in processing the passengers.

Because the freight trains are not presently run according to published schedules, it was impossible to ascertain their performance. It was observed that, on occasion, the pay (salary) coach was run on the rear of freight trains. This requires stopping at most stations for lengthy periods of time, which delays other trains. A diesel railcar or automobile would be better suited for this purpose. Since the train density is now very low, it may not seem important to take advantage of every minute; however, in a few years the railway will be operating a more intensive service. When this happens, precision operations will be required. It is not too early to initiate training for "on-time operations." On the Aleppo-Damascus route the railway will be in competition with an established bus and taxi operation and a high quality of service will be essential if traffic is to be diverted from road to rail.

The yard crew (shunting locomotive) assignments are as follows:[1]

Lattakia	-	2 of 16 hours (Port) 1 of 24 hours (Station)

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[1] Source: CFS - Movements and Transport.

Aleppo	-	1 of 24 hours (Depot) 1 of 16 hours (Station)
Jibrine	-	1 of 16 hours
Deir Ez Zor	-	1 of 24 hours
Al Hassakeh	-	1 of 24 hours
Al Kamishli	-	1 of 24 hours
Homs	-	1 of 24 hours (No. 1 Station) 1 of 24 hours (No. 2 Station)
Tartous	-	1 of 24 hours (Port) 1 of 24 hours (Station)

In total, the 35 yard crew assignments require a minimum of 13 shunting locomotives plus locomotives set aside for maintenance purposes.

A-4.3 OPERATING PROCEDURES, RULES, AND SECURITY

The operating procedures and rules are conceived, promulgated, and revised by the Directorate of Movements with the help of other departments, where necessary. As of July 1979, the directorate had 1,203 employees. It is responsible for the compilation of transport statistics, the management of customs and transport warehouses, the control and dispatching of trains, planning, the movement of trains, the operation of stations, and the distribution and utilization of passenger and freight rolling stock.

At present there are 93 stations on the system. When the new lines to Damascus, Tadmur, and Deir Ez Zor are completed, the number will rise to 123.

Station tracks throughout the system are generally 600 meters in length. Hence, the length of most trains is limited to 600 meters. Trains are dispatched from station to station under a positive block system. Only one train is permitted between stations at any one time. Trains are moved from the departing stations after the stationmaster has received clearance from the stationmaster at the receiving station. The stationmaster then issues a clearance card to the locomotive driver, who signs the clearance card and retains a copy. Trains operating on timetable schedules must not depart from the station before the published departure time. At each station there is a points operator equipped with appropriate signalling flags and lanterns to communicate with the locomotive driver. The stationmaster has a similar signalling device. The stationmasters

communicate with each other and with the train dispatchers in Allepo by telephone. They also issue reduced speed orders and other written instructions to the train drivers. Maintenance staff and others who need to use the railway between stations receive clearance to do so in the same manner as for trains.

The line between Lattakia and Al Kamishli has electric signals at each station. These signals are controlled remotely by the stationmaster from a control console in the station. The only signals operating at this time are at stations between Jibrine and Al Raqqa. Signals at all stations from Lattakia to Al Kamishli should be in operation in 1980.

The major stations, such as Lattakia, Ansari, Jibrine, Al Raqqa, Deir Ez Zor, Al Hassakeh, Al Kamishli, Ya'roubia, Homs, and Tartous, are well-designed and should be able to handle traffic growth for many years to come. In studying the plans of the major stations, the following problems were noted:

Aleppo - There is now a bottleneck area at the north end of Aleppo yard where the tracks lead into the locomotive and wagon shops. The future plans do not appear to correct this situation. Another track or through route is needed to provide a main track, shunting lead, and a through track. This would permit the movements of locomotives, trains, and shunting at the same time with a minimum of delay. The Aleppo station and yard area may also be insufficient to cope with an intensive passenger service because it does not provide enough storage area for coaching stock.

Jibrine - A large investment over many years has been made in the construction of the marshalling yard at Jibrine. For the most part, the yard is well-designed, but there is no plan for (1) weigh-in-motion scales on the hump, (2) retardation of wagons going down the hump, (3) power switches for the hump end of the classification yard, and (4) use of radio communications to control the yard operation. All of the equipment required is readily available abroad and consideration should be given to acquiring it.

The present manual of operating rules and procedures was revised in 1968 and 1973. The manual is now being revised in order to accommodate new signalling and operating techniques. All departments are involved in this effort, and the new edition of the manual should be complete in late 1980.

Most railways require a mandatory rule examination on an annual basis for all employees who are governed by the operating rules and who have to implement them. The adoption of such a practice is strongly urged. There is a provision in the rules that trains not exceed 25 kilometers per hour through turnouts, 40 kilometers per hour over facing points, and 70 kilometers

per hour over trailing points on straight movements. However, trains were observed operating at 65 kilometers per hour over turnouts at the triangle tracks at both Ansari and Deir Ez Zor. The need for reducing speed over facing points to 40 kilometers per hour is questioned. The speed through turnouts should not exceed 25 kilometers per hour.

The vigilance protection systems on the 2,800 hp and 1,800 hp class locomotives are deactivated. This is dangerous, and these systems should be reactivated immediately.

The most serious violation of the rules observed was the failure of some locomotive drivers and assistant drivers to observe their trains. In one case the driver did not look back during an entire trip. Older drivers were constantly looking back at their trains, but the younger drivers need to be impressed with the importance of constantly observing their train. The many derailments that have run on occasion for 8 to 10 kilometers should have been detected much sooner.

A-4.4 TRACK MAINTENANCE

The Directorate of Fixed Structures is responsible for maintenance of tracks, bridges, tunnels, drainage structures, and buildings. It also maintains its own on-track and off-track equipment. The track maintenance section of Fixed Structures is organized along lines similar to European and U.S. railways prior to 1950. At present the department is maintaining 1,375 kilometers of main tracks and 256 kilometers of station and yard tracks with 1,000 main-line, station, and yard switches. The track maintenance section has branches with headquarters at Aleppo, Jibrine, Lattakia, Homs, Deir Ez Zor, and Al Kamishli. There are 25 divisions, 70 brigades, and 146 guards. Each guard patrols 10 kilometers of track on foot.

There is sufficient mechanized equipment for five surfacing and lining gangs, each equipped with a tamper-liner, ballast regulator, and compactor. There are no records available as to monthly kilometer production of these mechanized gangs, but from the kilometers of track that require surfacing and aligning, production is low. This low production can be attributed to the shortage of spare parts, lack of qualified operators, and high absenteeism.

Field inspection trips were conducted by the Consultants over the CFS network. Comments are as follows.

Line 1

The inspection of Line 1 revealed six problem areas in design or construction that the Consultants believe will substantially

increase maintenance costs over the years. Data are not available to support the conclusion and the recommended changes in economic terms. Rather, they are the Consultants' engineering judgement, based in part on the high standards of construction and maintenance that are essential for the present designs. The Consultants question whether the CFS will achieve and sustain these standards in the foreseeable future.

The following problem areas were found on all lines constructed since 1965, including lines now under construction.

- As pointed out in Section A-3.6, settlement and/or soil consolidation of the subgrade fill sections is greater than would be expected if proper compaction had been used during construction.

- The roadbed, particularly on fill sections, is not of adequate width because an additional depth of ballast must be added to compensate for settlement. The slope ratio of the shoulder ballast takes a slope greater than 1.5:1 under operating conditions, and in many instances, normal erosion and sloughing cause full sections of the subgrade to take a slope ratio of slightly less than 1.5:1.

The lack of an adequate roadbed width is most obvious on the higher fill sections that have been subject to excessive settlement and at locations where large culverts have been installed in the fill sections without adequate headwalls. The Consultants are recommending that future roadbed width be increased during construction to 7.5 meters for fills from 0 to 1 meter high, 8 meters for fills from 1 to 5 meters high, and 8.5 meters for fill over 5 meters high. The Consultants further recommended that 15 centimeters of graded pervious subbase material be placed on the roadbed prior to the placement of ballast. This would eliminate the need for a sub-ballast. The subbase material would cover the entire roadbed, be compacted in place, and serve two purposes: (a) provide a 15 centimeter minimum leveling course prior to placing the ballast and (b) allow proper roadbed drainage with an absolute minimum of roadbed erosion and subgrade scouring and sloughing.

- Bridges are constructed without ballast wing walls from the ends of the structure to the roadbed to hold the ballast. The lack of such wing walls, combined with the narrow width of the roadbed, has created an expensive maintenance problem. This design weakness is most obvious, and the Department of Fixed Structures is endeavoring to minimize the condition by putting concrete ties, steel ties, and other debris on the subgrade and slopes at the end of such structures to hold the ballast in the track.

- The lack of adequate headwalls on culverts that are of a minimum length has also created problems of maintaining sufficient roadbed width over the culvert. Culverts must be of a maximum length, otherwise adequate headwalls must be installed to maintain a proper roadbed width.

- The majority of all curves have an excessive amount of ballast on the inside of the curve and the outside has been left skeletonized. This is poor practice and will cause the track to kick out during periods of extremely hot weather. This condition can be corrected by having the ballast regulator operator take the necessary steps to see that the proper portion of ballast is going to the outside (high side) of the curve during the dress-up operation. Further, excess ballast has been left between the rails and covers the concrete cross ties at many locations. This ballast should be removed with the ballast regulator and placed on the shoulders. Such excess ballast has a tendency to work between the rail and fastener, damaging the pads, and/or working between the fastener and concrete cross tie, damaging the pad as well as loosening the fastener from the cross tie. If track circuits are utilized for signalling, which is the case in modern signalling systems, excessive ballast between the rails can shunt the track circuits during wet seasons of the year.

Line 2

The inadequacies in design and construction are not so pronounced on this line as on Line 1, but they do exist. The track between Ansari and Wadihi is extremely rough and should be surfaced and aligned as soon as possible. The track between Wadihi and Lattakia is in fair-to-good condition. There are a number of locations where the fills still show signs of settlement and should be surfaced and aligned. In summary, Line 2 is well engineered, except for the problems mentioned. It is remarkable that only one major landslide has occurred (Kilometer Post 163) and, from all appearances, this seems to have been contained.

Line 3

This line, which was constructed in 1904, is being maintained safely with as much maintenance being deferred as possible. It will be replaced with a new line between Homs and Wadihi in the next five years. The speed limit is 40 kilometers per hour, which is proper considering the age of the rail and cross ties and general condition of the track structure.

Line 4

This line has been spot inspected where accessible by automobile. It is presently under construction and is virtually complete to Bir Ghadir, 20 kilometers south of Mhine. Construction work on the structures is underway on most of the remaining section to Damascus.

This line is being constructed to the same standards as Lines 1 and 2, except that the rail fastener is revised and the siding and yard tracks are laid with 50 kilogram per meter rail. This line has the same design and construction inadequacies as Lines 1 and 2. They are not as pronounced on this new line, however, which has not been subjected to several years of erosion and sloughing of the subgrade, nor has it been subjected to operation of any magnitude.

Line 5

The line from Homs II to Akkari is scheduled for completion in early 1980 and has been constrcuted to the same track standards as Line 4. The line from Akkari to Tartous was completed in 1967 and the track standards were the same as for Lines 1 and 2.

The construction of the line between Kizlakher and Akkari deviates from standards formerly used in mountainous terrain in that maximum grades of 20:1,000 were allowed and the minimum curvature radius was decreased to 300 meters.

The design and construction inadequacies, as pointed out on Line 1, exist on Line 5 as well. The settlement of the subgrade on some sections of the latter construction are the most severe found on any of the lines.

Line 6

This line has been constructed to the same track standards as Line 4. The limited inspection made on this line also substantiates the weakness in design and construction as noted for Line 1.

Line 7

The line was completed between 1903 and 1907 and most of the original track is still in service. Considering its age, it is in remarkably good condition. The design axle loading for this line is 17 tons, compared to 25 tons for the new lines. The curves between Aleppo and Katma should be checked for alignment because they appear to have shifted over the years. The

northern one-half of the line has been much better maintained than the southern.

Line 9

The construction of this line through drifting sand and silt territory without preventive measures taken to protect the track structure, to a reasonable degree, is certainly a design failure. Every design effort should have been made to keep the track structure higher than the surrounding area. Where cut sections were unavoidable, they should have been kept as shallow as possible and made excessively wide. Some corrective work is now being undertaken by Fixed Structures in widening the cut sections.

Line 0

Line 0 is maintained to handle the current tonnage, but requires ditching throughout its entire length to improve drainage. If transit tonnage continues to develop from Turkey to Iraq over this line, as well as passenger traffic from Baghdad to Aleppo, then maintenance funds should be made available to completely reballast, surface, and align the track. This would be the first major work on the line since it was constructed.

General Observations

The inspection tour conducted by the Consultants over the CFS network prompted the following general recommendations:

- Continuous welded rail should be utilized in future construction of the Syrian railway system. Rail joints consume as much as 45 percent of track maintenance labor; a savings is accomplished by their elimination. A rail joint assembly costs approximately the same as a welded joint, and a welded joint lasts the life of the rail; rail joint assemblies are normally renewed once or twice during the life of the rail. Railways worldwide report labor savings of 30 percent on continuous rail installations. The Consultants recommend the use of continuous welded rail on new construction, utilizing the electric flash welding process.

- A hydraulically operated backhoe with on-track/off-track hi-rail accessories should be purchased for the Fixed Installations Directorate to assist with drainage ditch maintenance and a hydraulically operated spreader/ditcher should be purchased to clean cut areas and assist with drainage maintenance. This spreader/ditcher can be further used with side dump

construction wagons to widen roadbed fill sections and to place riprap. In addition, it can be used extensively to remove sand/silt from the tracks.

- Fences should be constructed to enclose the railway right-of-way through towns and villages to protect the railway equipment and personnel as well as the public at large.

- Detailed inspection of the railway is difficult because of a lack of reliable rail transport. The Consultants recommend that the six off-track/on-track hi-rail automobiles purchased by the CFS for inspection work be repaired and made available to the Fixed Structures. Investigation indicated that the purchase of minor items with minimum repair effort would allow these units to be utilized for the purpose for which they were purchased.

- Greater emphasis is required relative to environmental design of railway facilities, such as work shops, locomotive fueling areas, and cleaning stations. Fluid wastes from such facilities should not enter storm sewers, sanitary sewers, or run-off ditches whereby they could enter streams or rivers without adequate treatment. The fluid wastes from such facilities should be carried in separate underground waste sewer lines to ponding areas where the petroleum products can be removed and the fluid properly treated before entering streams or rivers. The Consultants recommend that a review be made of all railway facilities to see if environmental criteria are being met.

On Lines 1 and 9 in the vicinity of Deir Ez Zor, the railway has to deal with this problem. The Fixed Installations Directorate should experiment with green belts, dikes, and sand fences, which are all used with fair to good results in many parts of the world. Until a solution can be found to alleviate this condition a combination of jets and blowers should be used in conjunction with ballast regulators equipped with track brooms to keep the track safe for the passage of trains.

In general, the bridges, tunnels, drainage structures, and buildings on the system are in good condition. The level crossings are also in good conditon.

There are plans to decentralize the workshops section of the Structures Directorate and assign the various skills to the six geographic divisions. This should reduce travel time and increase output.

In summary, the entire track network has been and is being maintained relatively well. As noted, the Fixed Installations Directorate inherits a number of design and construction problems when it takes over new constructed lines. These problems

should be corrected for safe and efficient future operations. The Directorate of Fixed Installations has a well-organized infrastructure. Its officers are well educated, experienced in both railway construction and maintenance, and familiar with the entire system; they are in close contact with their field engineers, supervisors, and foremen. With proper assistance from management in the areas of training programs, logistic support, and an incentive wage program, the directorate can become a major contributor to the efficient operation of the system.

A-4.5 MAINTENANCE OF ROLLING STOCK

The Directorate of Traction and Rolling Stock is the largest department of the railway. As of 31 July 1979, there were 1,354 permanent and 41 temporary staff. It is responsible for the maintenance of coaches, wagons, railcars, and locomotives; the daily and periodic inspections and repairs to damaged equipment; and the overhaul of equipment to the manufacturers' recommended specifications. The control section of the directorate monitors locomotive speed tapes, investigates accidents and locomotive failures, and is responsible for the rules and regulations for the operation of the locomotives. The technical section is responsible for maintaining a proper inventory of spare parts and tools for all rolling stock. It is the responsibility of this section to insure that the prescribed methods of performing rolling stock maintenance are followed. The current rolling stock fleet being maintained is inventoried in Table A-3.4.

Frequent inspections of the locomotive and wagon shops at Aleppo and at Jibrine were made by the Consultants over a two-month period. The locomotive shops were visited on 30 occasions to determine the number of locomotives available for traffic but not in use; i.e., the spare capacity in the fleet. The figures, given in Table A-4.1, show from 30 to 47 percent of the main-line fleet available for use but with no trains to pull.

Two of the LDE 1800 locomotives were involved in accidents more than two years ago, one with a military tank and the other with another locomotive. Both units incurred cracked engine frames. The engines had to be removed from the units to be repaired, but these repairs were never made and these two nearly new and expensive locomotives are being cannibalized. Two complete spare engines were in stock, and if these had been used to replace the damaged engines, the locomotives could have been returned to operating service in a few weeks. A third LDE 1800 locomotive, after being involved in a minor accident, remained idle for six months before repairs were made.

Table A-4.1

LOCOMOTIVES AVAILABLE FOR SERVICE BUT UNUSED

Type of Locomotive	Maximum Number	Percent of Total	Minimum Number	Percent of Total
LDE 2800	15	50	11	36
LDE 1800	13	43	7	23
LDE 1200	5	45	3	27
LDE 650	3	30	1	10

Source: Consultants' estimates.

Table A-4.2

ANNUAL LOCOMOTIVE KILOMETERS, LDE 2800 CLASS

(000)

Locomotive No.-LDE	Cumulative Kms 1 Jan. 79	Cumulative Kms 1 July 79	Kms Operated (annual rate)	Locomotive No.-LDE	Cumulative Kms 1 Jan. 79	Cumulative Kms 1 July 79	Kms Operated (annual rate)
201	203.5	203.5	0.0	216	124.6	147.3	45.4
202	204.4	217.9	27.0	217	133.8	163.3	59.0
203	224.6	253.8	58.4	218	133.7	164.7	62.0
204	173.7	193.5	39.6	219	132.7	160.3	55.2
205	227.8	275.8	96.0	220	115.8	150.3	69.0
206	213.8	242.2	56.8	221	118.0	162.3	88.6
207	195.3	215.1	39.6	222	102.7	141.5	77.6
208	204.5	224.9	40.8	223	131.1	153.3	44.4
209	198.9	236.7	75.6	224	131.3	168.5	74.4
210	139.3	179.2	79.8	225	109.1	152.9	87.6
211	100.3	146.8	93.0	226	117.6	165.4	95.6
212	112.4	144.3	63.8	227	90.7	128.7	76.0
213	107.9	125.5	35.2	228	60.8	107.6	93.6
214	128.0	158.4	60.8	229	112.4	164.9	105.0
215	119.2	152.3	66.2	230	135.0	152.5	35.0
				Total	-	-	1,901.0
				Average per Locomotive	-	-	63.4

LDE 1800 Class (GE)

Total kilometers run January 1979	88.5
Total kilometers run February 1979	102.8
Average per annum per locomotive	38.3

Source: CFS, Traction and Rolling Stock.

Prior to the delivery of the 30 GE LDE 1800 locomotives, a small number of Syrian technicians were trained in the U.S. to supervise the maintenance, overhaul, and repair of the units. These trained technicians have been transferred to other positions, and for the past three months, no qualified supervisors have been in charge of the GE locomotives. Recently, a unit developed a crack in a piston and was allowed to continue in service until the piston failed, damaging the engine to the point that repairs to it will be costly, if not prohibitive, to carry out. This unit is presently at Jibrine, where it is being equipped with one of the two spare engines.

The last inspection made by the Consultants indicates that the GE locomotives are not at present being maintained properly, and continued failures in service can be expected. It was also found that there is a shortage of miscellaneous small parts for the units and that the repair crews are endeavoring to make some of the precision parts themselves to keep the units in service. This is not only very costly in terms of man-hours, but if particular parts are not made to precise tolerances and from proper metals, further failures can be expected.

In addition to the locomotives in the Aleppo shop area, one LDE 2800 is normally being dismantled at the Jibrine shop for periodic inspection, and between one and three LDE 2800s are in Jibrine. The LDE 2800 class is receiving better preventative maintenance than other classes of locomotives. The Consultants were informed that CFS is retaining representatives of the manufacturers of these locomotives to supervise their operation, maintenance, and overhaul.

The present utilization of main-line locomotives is low. This is evident from the number of units idle at any one time at Aleppo and Jibrine, as noted in Table A-4.1. The average annual rate of kilometers run by each of the LDE 2800s, based on their performance in the first half of 1979, is given in Table A-4.2. For the LDE 2800 class, the average was 63,400 kilometers, and for the LDE 1800 class only 38,300 kilometers. Since there is no time-consuming local freight or commuter traffic to be hauled, an average annual utilization of over 100,000 kilometers should be possible after the lines now under construction are brought into use. This is well in excess of current performance and emphasizes the point that the existing fleet has considerable spare capacity.

Locomotive shops are presently being constructed in Tartous, Lattakia, Homs II, Deir Ez Zor, and Al Kamishli. The shops at Aleppo are to be reconstructed and used for inspection, service, and light maintenance of passenger coaches and locomotives in passenger service, as well as for inspection and service of shunting locomotives used in Aleppo. The Jibrine shops will be utilized to inspect, service, and maintain

freight locomotives and wagons, in addition to handling major overhauls and heavy repairs on passenger and shunting locomotives. There is potentially considerable excess shop capacity planned, and this will become evident in the future. The servicing, inspection, major overhaul, and heavy repairs should be centralized at Jibrine and Aleppo. The outlying shops should be utilized only to make emergency repairs to enable equipment to be moved safely to the central shops for major repairs.

The present cleaning of locomotives and coaches (inside and out) is inadequate. Cleaning procedures should be greatly improved and consideration should be given to constructing an automatic washing plant at Jibrine to clean the exterior of locomotives, including the trucks and undercarriage, before they are permitted to enter any shops for inspection, service, or overhaul. Such facilities cannot be kept clean unless the locomotives are clean. Clean workshops and clean equipment not only increase the work efficiency of the technicians, but also raise morale. The Consultants favor an automatic washing plant because they doubt that manual cleaning procedures will be effectively carried out on a continuing basis.

All coaches should be thoroughly cleaned manually or put through an automatic washer at the end of each trip and prior to being set out for interior cleaning. Overall maintenance of the coaches is poor. Broken and cracked windows are not being replaced. The seats, door latches, small tables, lights, toilets, and many other small items are being neglected and could become unmanageable if not rectified soon. The expansion of coaching service facilities at Aleppo will help to solve this problem, but improved supervision and availability of parts are vital.

There are many retired cars and steam locomotives in store all over the system. The Aleppo shops and back-track areas have an accumulation of old steam locomotive parts, wagon parts, machines, equipment, wrecked equipment, and scrap of every description. In fact, many new parts are stored outside because the shops and storage sheds are full of old parts that should be scrapped with the old equipment. The establishment of at least a temporary department, to carry out a scrapping and clean-up program, is vital to overall efficiency. Once the clean-up program has been completed, the new and usable parts could be stored properly out of the weather and in an orderly manner, which is certainly not now being done.

The inspection of wagons indicates that a considerable number of new units are being set aside on back tracks and at Jibrine because of minor damage and running repairs. This backlog of repairs will affect the entire operation of the system if not kept in check.

The Directorate of Traction and Rolling Stock has capable staff officers, most with adequate experience. The older first-line supervisors are well-trained and dedicated employees, but they are confronted with a major morale problem requiring management action. The most urgent need is to assign a qualified supervisor to the section who will be responsible for the inspection, service, and maintenance of the LDE 1800 class. If this is not done, further costly failures of these units are inevitable.

The volume of rolling stock maintenance and repair work will continue to increase rapidly as new lines are brought into service. Table A-5.3 shows that diesel locomotive kilometers increased by 53 percent from 1976 to 1979 and coach kilometers almost tripled in the same period. Existing stock is still relatively new and underutilized. As the age of existing stock and the size and utilization of the fleet increases, it will require more maintenance, but less time out of service will be available for this. High quality and efficient work by the department will become increasingly important if operating efficiency is not to be affected. Management is faced with a considerable task of training and supervision under difficult external conditions to insure this occurs. A major investment has been and is being made in the rolling stock fleet, however, and failure to maintain and utilize it adequately would be a major waste of scarce investment resources.

A-4.6 SIGNALLING AND COMMUNICATIONS

The Directorate of Signalling and Communications is responsible for the maintenance of communications, signals, and electrical service. The telecommunications system in use is basically a circuit line wire system carried on wood and concrete poles. Stations are connected with each other and to the central office at Aleppo. Normally the system gives fair service, but during inclement weather, it is unreliable, especially considering that the movement of trains depends solely upon it. The use of aboveground and underground cable is being given consideration for future construction. The Consultants recommend that a modern communications system, with radio transmission capability, be considered for the entire railway network. Railway officials and department heads, almost without exception, expressed a desire to the Consultants for radio communications to improve railway operations. A four-channel radio system would be appropriate, with separate channels for road trains and track maintenance gangs and two channels for yard shunting operations. All radios and base stations would have four-channel capability. The base radios should have sufficient wattage to communicate with each other, and each station should be able to communicate with the trains and track maintenance gangs in their area. The system would help ensure that planned operating efficiencies are achieved.

No signal system was installed on the old CFS network. Train movement was handled by timetable or train orders transmitted to the stations by telephone from a central dispatching office. A manual block signal system is presently being installed from Lattakia to Al Kamishli, and recently the section between Jibrine and Al Raqqa was put into service. This system does not utilize track circuits. It is a single block system between each station with a distant and home signal, in addition to station signals, which are controlled by each station attendant. Movement of the trains depends on telephone communications between the stations with a dispatcher monitoring the operation from a central office.

In Section A-3.4 the Consultants indicated that they were unable to obtain specification or a general scheme relative to the operation of the signalling and communication system that will be installed on the new lines now under construction, i.e., Line 3A, 4, 5, and 6. Therefore the Consultants have had to rely upon information gathered from a number of sources in an endeavor to determine the basic aspects and general operating scheme of the proposed system.

From the information gathered it seems evident that the proposed system can be classified as a modified traffic control system, utilizing track circuits, block signalling, and power operated switches for the main line turnouts. The Consultants have further been informed that this traffic control system will be controlled not from a central location but from control panels at each station and under the constant monitoring of dispatches located at Aleppo, Homs II, and Damascus. The latest information received would suggest that the communication system will include coded carrier controls, allowing telephone and other circuits to be superimposed on the same line circuit that controls the signalling and power switch instructions. If the above description of the system is correct, such a signalling and communication system would be far superior to the system presently being installed on Lines 1, 2, and 9.

The Consultants are in full accord with the upgrading of the specifications for the proposed signalling and communications system, but would recommend that the system be further upgraded to operate as a Central Traffic Control (CTC) system. This would include coded track circuits and control of the system from two CTC machines, one at Aleppo and the other at Damascus. (See also Section A-8.4 below.)

The ideal future communications system would be a national microwave system sponsored as a Government project to improve communications throughout Syria, with the CFS being furnished adequate channels for railway operations. It is realized that such a system cannot be recommended or justified under the scope of this transport study, nor could a microwave system be

justified at this point in time for the sole use of the railway, although it must be realized that a modern, reliable communications system is most essential to a railway transport system. For example, the Railway Port Liaison Group must have fast reliable communications with both ports, and the railway marketing group must be able to communicate readily with customers and potential customers throughout Syria. Only through a good communication system can the railway be expected to grow and gain their respective share of the available transports.

Future planning should include the installation of a CTC system on Lines 1, 2, and 9, in addition to future and existing lines where investment proves economical.

The Consultants have been advised that a contract was ratified in May 1980 with an East German company for the provision of signalling and communications on Lines 3A, 4, 5, and 6 and that the installation completion schedule is as follows:

Line Section	Months from Contract Start
Homs - Mhine	18
Mhine - Phosphate Mines	20
Homs - Tel Kalach	24
Tel Kalach - Tartous	28
Homs - Hama	31
Hama - Vodehi	34
Mhine - Damascus	41
One year's maintenance assistance	53

CHAPTER A-5

TRAFFIC

Chapter A-5

TRAFFIC

A-5.1 INTRODUCTION

The railway network in the Middle East is undergoing major expansion and reconstruction, with planned developments in Iraq, Kuwait, and Saudi Arabia complementing those in Syria. By 1985 CFS will have a traffic-carrying potential, both physically and in terms of the places served, of a larger order of magnitude from that of the present system. The new and improved lines coming into use will not only generate substantial self-contained traffic, but they will also produce a synergetic effect on the potential of the existing routes. The analysis of past and present traffic is in consequence of little relevance in estimating future carryings. Up to now, relatively little effort has been made by the railway to attract traffic, with management and physical resources having been concentrated more on construction of the system than on operations or marketing.

The traffic potential for 1985 and 2000 for all modes has been identified by the Consultants in Volume II, Transport Demand. The share of this traffic that should be carried by rail is dependent on complex factors that can be forecast only with a wide margin of error given the scope of the planned development of the railway system. There is quite simply no current experience in Syria of intensive freight or passenger train operations of the type that will be required to service, for instance, the Damascus-Aleppo corridor. The level of operating efficiency in its widest sense, including marketing of the services, is the key factor that will determine future traffic levels. Current poor performance could be improved substantially. The Consultants' recommendations in this volume will, when implemented, assist with this improvement.

The nature of the railway traffic analysis in this report is different from that in most national transport studies, where a trend analysis of past performance on a static or declining network is often appropriate. In the case of CFS, it is necessary to emphasize the nature of the change in traffic potential and to determine the required responses to that potential. In the remainder of this chapter, the present traffic and performance is put in the perspective of the railway system of the future.

A-5.2 SYSTEM EXPANSION

Section A-3.1 summarizes the present and planned network in physical terms. A more detailed physical description is

contained in Chapter A-3.1 and Appendix A-3.1 of the Final Phase I Report. In this section, the effect of system development on traffic potential is considered.

The expansion of the network is illustrated in Table A-5.1. The opening dates of existing lines and the expected completion dates of lines under construction or out to tender are given. Total route kilometers in service are listed for 1946, 1967, and 1979, with the length expected to be open in 1985. Line sections are defined as being between nodal points as per the Consultants' coding system explained in Chapter A-3 of the Final Phase I Report.

In 1946 the standard gauge route kilometerage totalled 557. Independent Syria inherited a railway network ill-suited to its geography, with Iraq reachable from Aleppo after 1945 only via a long stretch of line through Turkish territory, and Damascus only through Lebanon via a change to narrow gauge line at Rayak. The only rail route to the Mediterranean was over Lebanese territory to the Port of Tripoli. The first priority of the CFS was the development of a Syrian-territory route to Iraq and service to Syrian ports. The length of the network in 1967 was 919 route kilometers, and at the end of 1979 it was 1,375 kilometers. Of this, 818 route kilometers, or 60 percent of the total, had been opened since 1967.

The present system, although much improved compared to that inherited in 1956, is still deficient. Damascus is not now served from the north by railway due to the problems in Lebanon. The lightly constructed French lines south of Aleppo are incompatible with the new lines: axle load on these is 17 tons, compared to 25 tons; rail is 37 kilograms per meter or less, compared to 50 kilograms per meter; and poor track and alignment seriously reduce operating speeds. A third major problem with the present system is that the Akkari to Homs line passes through short sections of Lebanese territory. These deficiencies should all be eliminated over the next five years. It is planned that 525 kilometers of the new route be open by 1985 and 250 kilometers of the existing route be completely rebuilt. The network in 1985 is expected to total 1,900 route kilometers, no less than 1,594 kilometers or 84 percent of which will have been opened or rebuilt since 1967. About 40 percent of the route network will be less than five years old in 1985.

The railway system in 1985, with all the projects in operation, will be substantially better placed to meet the transport needs of the country than the present network. The route kilometerage opened since 1967 will be almost doubled. Damascus will be connected to the standard gauge network. The railway will be far more attractive for transit traffic to Iraq. Both major ports will be part of an integrated network constructed to a high standard.

Table A-5.1

DEVELOPMENT OF NETWORK

Line	End Node Nos.	Opening Date	Route Kms
Turkish Border (Midan Ikbis)-Aleppo	45- 52	Pre-1946	118.1
Mousselmieh-Turkish Border (Jopanbey)	51- 54	1946	48.4
Aleppo-Homs I	52- 71	1946	201.9
Homs I-Lebanese Border (Akkari)	71- 97	1946	69.0
Homs North Leg Wye-Lebanese Border (Al Qussein)	150- 85	1946	38.2
Turkish Border (Nusaybin)-Iraqi Border (Ya'roubia)	39- 44	1946	81.1
Akkari-Tartous	93- 96	1967	42.0
Ansari (Aleppo)-Al Raqqa	55- 18/ 11- 14	1967	210.1
Wadihi (Aleppo)-Jisr Al Shughour	56- 62	1967	109.9
Al Raqqa-Al Hassakeh	18- 34/153- 28	1968-76[1]	270.5
Jisr Al Shughour-Lattakia	62- 69/ 68- 70	1975	80.3
Al Hassakeh-Al Kamishli	34-157	1978[2]	81.1
Third Legs of Wyes	160-159/156-158/ 149-151/155-154		3.0
Hama-Mhardeh	75-135	1979	21.0
Homs I-Akkari	71- 93	1980[3]	63.7

Table A-5.1 (Continued)

DEVELOPMENT OF NETWORK

Line	End Node Nos.	Opening Date	Route Kms
Tartous-Cement Plant	95-161	1981	8.6
Homs North Leg Wye-Mhine-Tadmur	150-121/114-115/ 117-118	1980-84[4]	236.6
Mhine-Damascus	101-109	1983-84	138.9
Homs (New Line Junction)-Wadihi (Aleppo)	152-56/122-136	1983-84[3]	185.8
Deir Ez Zor-Iraqi Border (Albu Kamal)	155-148	1984[5]	142.7

Date	Total Route Kms	Post-1966 Kms
Pre-1946	556.7	0.0
1967	918.7	362.0
1979	1,374.6	817.9
1985	1,899.6	1,594.2

Sources: CFS, Various directorates and LBII compilation.

1 Opened in stages.

2 For passenger, earlier for freight services.

3 Complete reconstruction, partial realignment.

4 Homs-Khneifiss/Sharkieh 186 kilometers in 1980.

5 Under tender.

Table A-5.2

TRAIN-KILOMETERS
(000)

	1976	1977	1978	1979[1]
Diesel Locomotives				
Passenger	551	723	1,015	1,292
Ordinary Freight	1,240	1,581	1,184	1,495
Rail Construction	277	143	223	174
Others	20	22	14	
Total	2,086	2,469	2,435	2,961
Diesel Railcars				
Passenger	71	88	269	244
Others	16	22	17	70
Total	87	110	286	314
Steam Locomotives[2]				
Passenger	9	-	-	-
Ordinary Freight	189	-	-	-
Others	1	-	-	-
Total	200	-	-	-
All				
Passenger	631	811	1,284	1,536
Ordinary Freight	1,429	1,581	1,184	1,495
Rail Construction, etc.	313	187	254	244
Grand Total	2,373	2,579	2,721	3,275

Source: CFS - Movements and Transport.

1 Actual January-September results x 1.333.

2 Ceased operating April 1976.

Table A-5.3

ROLLING STOCK KILOMETERS
(000)

	1976	1977	1979	1979[1]
Diesel Locomotives				
Train-Kms (Table A-5.2)	2,086	2,469	2,435	2,961
Double Heading	90	97	184	272
Light Running	51	73	77	99
Marshalling	345	424	510	600
Total	2,573	3,062	3,207	3,932
Steam Locomotives[2]				
Train-Kms (Table A-5.2)	200	-	-	-
Double Heading	6	-	-	-
Light Running	7	-	-	-
Marshalling	14	-	-	-
Total	227	-	-	-
Coaches	3,118	4,965	7,668	9,112
Railcars	87	110	286	314
Wagons				
Loaded	19,039	19,697	11,832	15,146
Empty	14,064	16,172	12,001	14,178
Total	33,103	35,869	23,833	29,324

Source: CFS - Movements and Transport.

1 Actual January-September results x 1.333.

2 Ceased operating April 1976.

Although the 1985 prospect is promising, present performance is less so. The full potential of completed investments is not being realized. There are special factors, however, and recent traffic levels have been affected by the following:

- The Syria-Iraq border was closed from 17 November 1977 to 23 October 1978. This halted the transit flow from Turkey to Iraq via Syria, as well as Syria-Iraq local traffic, seriously reducing freight carryings for the closure period and well into 1979.

- The Homs-Akkari line was closed for reconstruction from August to November 1979. This halted service to Tartous, a major freight traffic generator.

- Reconstruction of the Homs-Aleppo line is discouraging passenger traffic. Only a minimal service will be maintained until completion.

A-5.3 VOLUME OF OPERATIONS

The volume of train kilometers by type of service and by mode of traction is given in Table A-5.2. Based on the results for the first nine months of 1979, a total of 3.3 million train kilometers was performed in the year, 90 percent of which were locomotive-hauled with the remaining 10 percent operated by diesel railcars. The addition of new passenger services to Al Kamishli and Baghdad (Iraq), and the reopening of transit freight traffic, were mainly responsible for a 20 percent growth in train kilometers between 1978 and 1979. In 1976 and 1977 ordinary freight train kilometers were about double those of passenger trains. In 1978 and 1979 passenger train kilometers slightly exceeded freight, having grown by 143 percent between 1976 and 1979. Railway construction and other train kilometers accounted for 7 percent of operations in 1979, compared to 13 percent in 1976.

The volume of rolling stock kilometers is given in Table A-5.3. Steam locomotives ceased operations in April 1976. In 1979, again based on the performance for the first nine months, 3.9 million locomotive kilometers were run, an average of 51,000 for each of the 77 serviceable locomotives. Marshalling operations accounted for 15 percent of kilometers. Trains were double headed for 1 train kilometer in 11 in 1979, compared with 1 in 23 in 1976.

Coach kilometers amounted to 9.1 million in 1979, almost three times the 1976 volume. On average a train consisted of 7.1 coaches in 1979, compared with 5.7 in 1976 and 7.6 in 1978.

Railcar kilometers totalled 0.3 million, with railcars always operating as single units. A total of 29.3 million wagon kilometers was performed in 1979, with 52 percent loaded and 48 percent running empty. In 1976, 58 percent loaded operation was achieved. Although wagon kilometers recovered 23 percent from 1978 to 1979, they were still only 82 percent of the volume reached in 1977 before the Iraq border closure. The average number of wagons per train in 1979 was 17.6, compared with 20.8 in the peak year 1977.

Gross kilometers performed are given in Table A-5.4. A total of 1.4 billion was operated in 1979, an increase of 27 percent over 1978. Between 1976 and 1978 there was little change in the overall level, but a significant switch in shares between services occurred. In 1979 ordinary freight services accounted for 62 percent of gross ton kilometers, passenger services for 31 percent, and railway construction and other trains for the remaining 7 percent. In 1977 the freight share was as high as 74 percent.

A-5.4 PASSENGER TRAFFIC

The most important passenger services, which carry about 80 percent of all passengers, are operated on the Lattakia-Aleppo and Aleppo-Al Kamishli lines. The timetable for these trains is given in Table A-5.5. In addition to the services shown in the table, two return trips weekly have been operated between Aleppo and Baghdad since April 1979. Virtually all traffic between Aleppo and Lattakia is end to end, with Jisr Al Shughour the only intermediate station of any significance.

Between Aleppo and Al Kamishli, the trains have fairly long intermediate stops at Al Raqqa, Deir Ez Zor, and Al Hassakeh, and average speeds are 71 to 73 kilometers per hour. For the rail car services speeds average 80 kilometers per hour.

Passenger trains run north from Aleppo to Midan Ikbis, with a twice-weekly through-service to Istanbul and to Al Ra'i. A summer service operates to Kafr Jinni near the Turkish border. A slow daily mixed freight and passenger train is run between Aleppo and Homs. The only other passenger service operating in January 1980 was between Al Kamishli and Ya'roubia.

Monthly carryings between pairs of stations in 1978 and 1979 are given in Tables A-5.6 and A-5.7. The significant increase in journey length in 1979 was due to a full year's operation to Al Kamishli, compared with only one month of service in 1978. Traffic is concentrated on a few stations. In 1979 the top four origin-destination pairs - Aleppo to Lattakia, Al Kamishli, Hassakeh, and Deir Ez Zor - accounted for 59 percent of journeys and 77 percent of all passenger kilometers. Aleppo is the dominant station, being either origin or destination for 82 percent of all journeys in 1979.

Table A-5.4

GROSS TON-KILOMETERS
(million)

	1976[2]	1977	1978	1979[1]
Diesel Hauled				
Passenger	135	220	362	442
Freight	755	852	613	889
Railway Construction	156	77	133	79
Others	4	2	1	-
Total	1,050	1,151	1,109	1,410
Diesel Railcars	5	6	18	15

Source: CFS - Movements and Transport.

1 Actual January-September results x 1.333.

2 Excludes steam haulings, which ceased operating in April 1976.

Table A-5.5

PASSENGER TIMETABLE

Station	Km	Eastbound Trains Nos.			Westbound Trains Nos.		
		51	131[1]	133[2]	130[2]	132[1]	50
Lattakia	-	07:10	16:00	18:48	09:15	10:31	18:33
Aleppo	200.0	10:32	18:57	21:48	06:15	07:26	15:15
Average Speed (kph)	-	59	68	67	67	65	61
		151	571	153	150	570	152
Aleppo	-	06:00	07:35	15:00	13:33	17:18	23:32
Euphrates Dam	157.2	-	09:33	-	-	15:18	-
Al Raqqa	203.7	08:32/ 08:40	-	17:33/ 17:45	10:49/ 11:00	-	20:52/ 20:59
Deir Ez Zor	339.6	10:26/ 10:35	-	19:26/ 19:40	08:57/ 09:07	-	18:59/ 19:11
Al Hassakeh	477.4	12:21 12:35	-	21:30 21:40	07:02/ 07:06	-	17:00/ 17:14
Al Kamishli	558.5	13:46	-	22:52	05:50	-	15:49
Average Speed (kph)	-	72	80	71	73	79	73

Source: CFS, Movements and Transport.

1 October to March.

2 April to September.

Table A-5.6

PASSENGER TRAFFIC, 1978

(000 persons)

Route	Distance (kms)	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Aleppo-Al Raqqa	204	7.7	7.0	6.0	5.1	4.2	5.0	6.2	5.7	7.6	5.1	4.8	4.5	68.9
Aleppo-Deir Ez Zor	340	23.7	18.3	19.5	20.0	17.7	19.2	15.6	15.1	14.3	13.3	13.4	12.6	202.7
Aleppo-Al Hassakeh	477	20.3	22.4	17.3	20.0	18.6	20.5	28.2	29.9	33.1	24.3	21.1	17.2	272.9
Aleppo-Al Kamishli	558	-	-	-	-	-	-	-	-	-	-	-	17.4	17.4
Al Raqqa-Al Hassakeh	274	1.8	2.4	2.0	2.0	2.1	2.1	3.3	3.7	4.3	2.3	2.5	2.0	30.5
Al Raqqa-Deir Ez Zor	136	3.0	2.2	1.9	2.6	1.8	2.7	1.6	1.6	1.5	1.5	1.4	1.4	23.2
Deir Ez Zor-Al Hassakeh	138	4.2	3.9	3.6	3.5	3.4	5.5	4.6	6.0	4.7	4.3	4.0	3.7	51.4
Aleppo-Lattakia	200	6.6	7.8	16.8	20.0	20.8	25.5	33.8	24.0	32.2	15.4	13.6	13.6	230.1
Aleppo-Jisr Al Shughour	124	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.2
Lattakia-Jisr Al Shughour	76	0.0	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	1.2

Table A-5.6 (Continued)

PASSENGER TRAFFIC, 1978

(000 persons)

Route	Distance (kms)	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Aleppo-Midan Ikbis	117	3.1	4.1	3.5	3.6	3.7	4.0	5.5	4.6	5.2	4.2	5.3	3.0	49.8
Aleppo-Al Ra'i	60	4.5	4.5	3.1	3.0	2.9	2.5	3.0	2.9	3.2	3.4	5.5	6.6	45.1
Ya'roubia-Al Kamishli	80	11.5	12.8	7.6	7.5	7.3	7.0	8.6	8.0	5.5	6.0	7.4	8.3	97.5
Aleppo-Homs	203	13.0	13.9	13.6	12.2	8.0	7.5	8.5	7.9	7.7	6.1	7.1	6.9	112.4
Aleppo-Kafr Jinni	58	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	43.7
Aleppo-Tartous	304	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	17.8
Total	-	99.5	99.5	95.1	99.7	90.7	101.8	119.1	109.6	119.5	86.1	86.3	97.4	1,265.8

Total Passenger Kilometers (million) 334.8

Average Journey Length (kms) 264.5

Source: CFS, Movements and Transport.

Note: NA = Not available, excluded from monthly totals.

Table A-5.7

PASSENGER TRAFFIC, 1979

(000 persons)

Route	Distance (kms)	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Aleppo-Al Raqqa	204	7.7	5.4	5.8	5.4	5.0	4.9	4.7	4.5	4.5	3.1	3.5	3.0	57.5
Aleppo-Deir Ez Zor	340	16.3	15.5	14.4	12.5	11.5	12.0	10.9	12.0	12.5	9.2	9.7	9.5	146.0
Aleppo-Al Hassakeh	477	18.0	12.6	12.8	13.1	13.9	14.5	16.1	18.1	18.5	14.8	15.8	13.1	181.3
Aleppo-Al Kamishli	558	19.2	16.3	16.8	15.3	14.0	19.3	20.6	18.8	23.8	18.2	17.8	15.2	215.3
Al Raqqa-Al Kamishli	355	1.2	1.9	1.6	1.6	1.7	2.3	2.1	1.9	1.6	1.5	1.5	1.2	20.1
Al Raqqa-Al Hassakeh	274	1.4	1.1	1.0	1.1	1.3	1.4	1.6	1.5	1.6	1.1	1.2	1.0	15.3
Al Raqqa-Deir Ez Zor	136	2.1	1.8	2.4	1.9	1.6	1.6	1.3	1.3	1.1	1.1	1.1	1.7	19.0
Deir Ez Zor-Al Kamishli	219	1.7	2.2	2.0	1.8	1.5	1.5	1.9	1.9	2.4	1.7	1.6	1.8	22.0
Deir Ez Zor-Al Hassakeh	138	3.2	3.4	3.0	2.5	2.4	2.6	2.7	3.0	2.8	2.9	3.0	2.6	34.1
Al Hassakeh-Al Kamishli	31	0.2	0.6	0.4	0.4	0.5	0.3	0.7	0.6	0.5	0.7	0.3	0.8	6.0

Table A-5.7 (Continued)

PASSENGER TRAFFIC, 1979

(000 persons)

Route	Distance (kms)	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Aleppo-Lattakia	200	18.7	14.5	19.9	17.4	17.4	23.9	26.9	37.1	15.5	12.8	13.4	13.8	231.3
Aleppo-Jisr Al Shughour	124	0.3	0.1	0.2	0.1	0.1	0.2	0.2	0.3	0.2	0.1	0.2	0.3	2.3
Lattakia-Jisr Al Shughour	76	0.7	0.2	0.2	0.2	0.2	0.4	0.3	0.5	0.8	0.3	0.3	0.4	4.5
Aleppo-Midan Ikbis	117	3.8	2.9	3.5	3.5	3.8	4.1	4.3	4.8	3.9	3.6	3.8	3.6	45.6
Aleppo-Al Ra'i	60	8.0	6.8	6.6	6.2	6.4	5.8	6.2	7.1	7.0	6.4	6.9	6.7	80.1
Ya'roubia-Al Kamishli	80	11.1	12.0	10.5	8.9	7.9	8.1	9.2	8.0	8.2	8.2	9.6	10.7	112.4
Aleppo-Homs	203	6.3	5.6	5.5	6.0	5.4	6.0	7.1	6.7	5.6	6.6	5.2	4.9	70.9
Aleppo-Kafr Jinni	58	-	-	-	-	0.6	11.1	10.9	3.7	-	-	-	-	26.3
Aleppo-Baghdad	628[1]	-	-	-	1.8	2.8	3.6	4.9	3.8	4.3	2.6	2.6	3.1	29.5
Total	-	119.9	102.9	106.3	99.6	97.8	123.6	132.6	135.3	114.7	94.9	97.5	93.4	1,319.6

Total Passenger Kilometers (million) 392

Average Journey Length (kms) 297

Source: CFS, Movements and Transport.

[1] In Syria, total distance 1,059 kilometers.

There is little consistent seasonal variation in passenger flows, as the monthly figures in Tables A-5.6 and A-5.7 illustrate. Only the Aleppo-Lattakia route has a marked summer peak.

With new lines entering service and other lines having service withdrawn or disrupted by reconstruction work, the traffic growth rate by origin-destination is difficult to establish. For Aleppo to Lattakia and to Al Raqqa, little change in traffic occurred between 1978 and 1979. Traffic to Deir Ez Zor and Al Hassakeh declined sharply, but this was a result of the opening of services to Al Kamishli. Until December 1978, passengers transferred to road transport for Al Kamishli at Deir Ez Zor or Al Hassakeh. The service to Baghdad opened in April 1979 has proved highly successful with most trains fully booked. The frequency of this service is expected to be doubled in 1980. The most significant growth from 1978 to 1979 occurred on the Aleppo to Al Ra'i service with traffic nearly doubling. Aleppo to Homs carryings fell by 36 percent, affected by the poor service being provided during reconstruction of the line.

In 1976 the average load per coach was 46 passengers, in 1977 it was 49, and in both 1978 and 1979 it was 43 passengers, representing load factors of between 60 and 70 percent.

A-5.5 FREIGHT TRAFFIC

Freight traffic divides naturally into three components: ordinary domestic freight, transit traffic plus imports and exports overland, and the transport of railway construction materials. The 1974 to 1979 period saw a major change in the traffic structure. In 1974 domestic freight accounted for 17 percent of tonnage, but by 1979 its share had risen to 65 percent. The share of transit traffic and imports and the exports declined from 36 percent to 12 percent over the period, and railway construction materials' share fell from 47 percent to 23 percent. Although the composition of carryings changed considerably, the overall volume was quite stable from 1974 to 1979, with traffic growing by only 11 percent in terms of tonnage.

Commodity tonnage carryings from 1974 to 1979 are given in Table A-5.8. Petroleum products was the largest commodity group in 1979, with carryings of 0.48 million tons, over four times the 1974 volume. Cement, iron and steel, and cereals amounted to 0.50 million tons, four times the combined volume in 1974. These four bulk commodities accounted for 79 percent of the 1979 ordinary domestic freight tonnage, with no other commodity carried in large volume.

Table A-5.8

FREIGHT TRAFFIC
(000 tons)

Commodity Group	1974	1975	1976	1977	1978	1979
Petroleum Products	116	115	124	241	252	479
Cement	67	75	44	82	81	125
Iron and Steel	56	116	136	175	103	158
Cereals	5	6	217	101	166	214
Foodstuffs	10	23	67	42	61	46
Cotton and Textiles	9	20	27	19	10	16
Timber	23	1	14	8	6	16
Live Animals	5	6	10	80	9	34
Miscellaneous	23	26	158	61	131	147
Subtotal	295	388	796	808	818	1,235
Transit	447	541		383	20[2]	156
Imports and Exports[1]	175	137	546	221	113	82
Subtotal	916	1,066	1,343	1,412	951	1,473
Railway Construction Materials	798	684	418	293	523	436
Total	1,713	1,751	1,760	1,704	1,474	1,909

Source: CFS - Movements and Transport.

1 Overland only, excludes port traffic.

2 Syria-Iraq border was closed between 17 November 1977 and 23 October 1978.

Transit traffic is composed predominantly of freight from Europe and Turkey to Iraq. Until completion of the Aleppo to Al Kamishli line, this was carried over the 81-kilometer section from Nusaybin to Ya'roubia. Traffic originating in Turkey still uses this route, but some of the European traffic travels via Midan Ikbis-Aleppo-Ya'roubia, a haul of 749 kilometers over CFS. Transit traffic was completely halted between November 1977 and October 1978 as a result of the closure of the Syria-Iraq border and has yet to recover its pre-closure volume. In 1979 tonnage was about 30 percent of that in the peak year 1975. Transit traffic to Lebanon has virtually ceased due to the internal situation in that country. No transit traffic by rail is yet handled through the ports. The commodity composition of transit traffic in 1977, the last year before service interruption, is given in Table A-5.9. The combined tonnage shown between Europe and Turkey and Iraq of 0.41 million compares with 0.38 million in Table A-5.8. The discrepancy results because the former derives from accounting statistics and the latter from operating, and there is a timing difference between the coverage of the two series. Nearly all transit traffic flows eastbound. For the European traffic, 43 percent used Midan Ikbis-Ya'roubia and 57 percent used Nusaybin-Ya'roubia in 1977. Almost half of the total traffic of 0.17 million tons consisted of machinery and iron and steel. Between Turkey and Iraq about half the 0.23 million tons was grain and vegetables.

Imports and exports overland (traffic through Lattakia or Tartous is classified as domestic) declined considerably in 1978 and again in 1979. This fall occurred for a number of reasons: the Iraq border closure, which increased competition from the ports, poor transit service by Turkish railways, and tariff increases relative to road freight. The commodity composition of the European portion of imports and exports for 1977 is given in Table A-5.9. Imports from Turkey consist mainly of live animals. In 1979 total import and export traffic overland was 0.07 million tons.

The Consultants experienced some difficulty in preparing a consistent set of freight traffic statistics. Ton kilometer data is not available by commodity, and the tonnage data, particularly for railway construction materials, are not always available. Construction materials traffic may be included partially under the miscellaneous category of ordinary freight or, particularly for 1977, may have been excluded altogether. These materials consist of stone, sand, ballast, and rail, and carryings have fluctuated considerably as expansion of the network has progressed. Further large movements of construction materials are likely for the construction and reconstruction projects now underway or planned, but once these are completed, traffic should be limited to relatively small movements of ballast.

In Table A-5.10 monthly carryings in tons and ton kilometers are shown for 1976 to 1978, together with the average length of haul. Ordinary domestic freight is shown separately from transit and imports and exports. Railway construction materials traffic is excluded throughout. For 1976, the statistics are consistent with those in Table A-5.8, but for 1977, total tonnage is 1.45 million compared with 1.41 million in the earlier table. The difference of 40,000 tons in the ordinary domestic freight component could not be accounted for. For 1978, monthly tonnage figures, excluding railway construction materials, were not available, and only annual tonnage is shown. Traffic fluctuations from month to month are unusually large. In 1976 the peak month in terms of ton kilometers was 285 percent of the lowest month's traffic. In 1977 the ratio was 211 percent, and in 1978 it was 360 percent, although the latter was increased by the resumption of operations to Iraq in October 1978. Although monthly variations are large, no seasonal pattern is evidenced in the statistics.

The average haul of domestic freight fell sharply from 1976 to 1977. In 1978 there was a partial recovery to an average distance of 233 kilometers, with total ton kilometers of 191 million. Transit and overland import and export traffic is mostly short haul, Nusaybin to Ya'roubia or Midan Ikbis to Aleppo. In terms of ton kilometers, its share of the total (excluding construction materials) is also relatively small, 17 percent in 1976, rising to 29 percent in 1977, but then falling to only 9 percent in 1978 with the Iraq border closure. The average haul of this traffic has been rising, however, with more use of the much longer CFS route via Midan Ikbis-Ya'roubia. In 1977 the average distance was 119 kilometers, 21 percent higher than in 1976. Total ton kilometers, excluding construction materials, in 1978 amounted to 210 million, 32 percent below 1976 volume of 309 million. In 1979 some transit traffic was regained, and there was a 51 percent rise in ordinary domestic freight tonnage. Ordinary domestic freight ton kilometers totalled 341 million, with 34 million for transit and imports and exports traffic, to give a total of 375 million, 79 percent above that of 1978. The overall average length of haul was 255 kilometers.

The complete origin-destination pattern of domestic freight traffic by commodity, for the half-year from July to December 1978, was shown in Appendix A-5.1 of the Final Phase I Report. Traffic in the matrix totalled 406,900 tons, almost exactly half the annual carryings for 1978 given in Table A-5.8. There are 116 point-to-point commodity flows, with a minimum volume for inclusion of 50 tons over the six months. All the traffic was handled by 13 stations. The top ten flows listed in Table A-5.11 accounted for 63 percent of all the tonnage.

Table A-5.9

INTERNATIONAL TRAFFIC BY COMMODITY, 1977
(000 tons)

Commodity	Europe to/ from Iraq	Turkey to/ from Iraq	Europe to/ from Syria
Grain and Vegetables	-	112.9	-
Cement	-	26.3	-
Motor Vehicles and Spares	16.3	21.7	-
Mechanical and Electrical Machinery	49.9	7.7	27.9
Iron and Steel	33.7	9.4	7.7
Fibers, Yarns and Textiles	19.3	4.8	7.4
Chemicals and Pharmaceuticals	3.1	1.8	1.2
Railway Rolling Stock	11.5	-	-
Manufactured Foodstuffs	4.1	2.7	-
Timber and Wood Products	-	3.7	1.5
Aluminum Products	2.0	-	-
Asphalt, etc.	-	5.3	-
Paper and Cardboard	-	2.7	1.2
Other Commodities	34.1	34.4	14.4
Total	173.8[1]	233.3[2]	61.3

Source: CFS - Movements and Transport.

Note: Overland traffic only, traffic through Lattakia and Tartous is excluded.

1 Of which Nusaybin-Ya'roubia 98.5 and Midan Ikbis-Ya'roubia 75.4.

2 Virtually all Nusaybin-Ya'roubia.

Table A-5.10

FREIGHT TRAFFIC, 1976 TO 1978

	Tons (000)			Ton Kms (million)			Average Haul (kms)		
Month	A	B	Total	A	B	Total	A	B	Total
1976									
Jan.	46.8	61.4	108.2	13.4	5.7	19.1	286	93	177
Feb.	60.9	28.1	89.0	12.9	4.1	17.0	212	146	191
Mar.	67.3	35.7	103.0	13.1	4.9	18.0	195	137	175
Apr.	37.4	67.0	104.4	11.4	6.1	17.5	305	91	168
May	43.3	42.5	85.8	11.7	3.8	15.5	270	89	181
Jun.	73.4	36.8	110.2	21.2	3.2	24.4	289	87	221
Jul.	95.1	41.3	136.4	37.7	3.7	41.4	396	90	304
Aug.	68.4	39.8	108.2	23.1	3.6	26.7	338	90	247
Sep.	52.3	38.2	90.5	19.7	3.6	23.3	377	94	257
Oct.	70.4	44.2	114.6	23.1	4.2	27.3	328	95	238
Nov.	101.5	53.5	155.0	39.0	5.2	44.2	384	97	285
Dec.	79.8	57.7	137.5	29.0	5.4	34.4	363	94	250
Total	796.4	546.3	1,342.7	255.3	53.5	308.8	321	98	230
1977									
Jan.	71.2	70.3	141.5	14.7	6.6	21.3	206	94	151
Feb.	68.2	58.3	126.0	16.1	5.4	21.5	236	93	170
Mar.	79.5	51.0	130.5	19.8	5.1	24.9	249	100	191
Apr.	53.6	72.1	125.7	13.1	6.7	19.8	244	93	158
May	77.5	72.8	150.3	16.9	11.7	28.6	218	161	190
Jun.	63.0	43.1	106.1	13.5	7.8	21.3	214	181	201
Jul.	66.5	53.5	120.0	12.6	9.9	22.5	189	185	188
Aug.	78.7	36.9	115.6	13.6	3.7	17.3	173	100	150
Sep.	82.5	33.7	116.2	16.4	3.9	20.3	199	116	175
Oct.	99.3	55.3	154.6	17.4	5.5	22.9	175	99	148
Nov.	43.4	38.5	81.9	9.5	4.0	13.5	219	104	165
Dec.	65.5	14.7	80.2	11.2	1.8	14.0	171	122	175
Total	848.8	600.2	1,449.0	174.9	71.3	246.2	206	119	170

Table A-5.10 (Continued)

FREIGHT TRAFFIC, 1976 to 1978

	Tons (000)			Ton Kms (million)			Average Haul (kms)		
Month	A	B	Total	A	B	Total	A	B	Total
1978									
Jan.	-	-	-	10.3	1.6	11.9	-	-	-
Feb.	-	-	-	9.8	1.0	10.8	-	-	-
Mar.	-	-	-	9.5	0.8	10.3	-	-	-
Apr.	-	-	-	11.6	1.1	12.7	-	-	-
May	-	-	-	20.6	0.8	21.4	-	-	-
Jun.	-	-	-	19.0	0.6	19.6	-	-	-
Jul.	-	-	-	19.7	2.1	21.8	-	-	-
Aug.	-	-	-	10.0	1.9	11.9	-	-	-
Sept.	-	-	-	8.9	2.3	11.2	-	-	-
Oct.	-	-	-	12.2	2.3	14.5	-	-	-
Nov.	-	-	-	24.8	2.1	26.9	-	-	-
Dec.	-	-	-	34.2	2.9	37.1	-	-	-
Total	818	133	951	190.6	19.5	210.1	233	147	221

Source: CFS - Movements and Transport.

Notes: Railway construction materials are excluded.

A = Ordinary domestic freight.

B = Transit and imports and exports overland.

Table A-5.11

COMMODITY FLOWS, JULY TO DECEMBER 1978

Origin	Destination	Commodity	Volume (000 tons)
Homs	Aleppo	Petroleum Products	75.6
Tartous	Hama	Billets, etc.	51.2
Lattakia	Aleppo	Petroleum Products	24.0
Al Raqqa	Aleppo	Wheat	21.6
Al Kamishli	Aleppo	Wheat	17.6
Aleppo	Al Raqqa	Cement	17.6
Al Hassakeh	Aleppo	Wheat	14.3
Homs	Tartous	Petroleum Products	13.9
Deir Ez Zor	Al Kamishli	Sand	11.6
Aleppo	Deir Ez Zor	Cement	10.0
		Total	257.4

Source: CFS - Movements and Transport.

The freight traffic plans for 1979 and 1980, prepared by the CFS director of movements were reproduced in Appendices A-5.2 and A-5.3 of the Final Phase I Report. The plans are summarized in Table A-5.12, which shows that 1979 carryings, although well up on 1978, fell short of forecast tonnage by 29 percent. The worst performance was recorded for transit traffic, with traffic about 40 percent of that planned. Fulfillment of the 1980 plan will depend in particular on phosphate carryings. The first rail movements were scheduled for July 1980 and 0.8 million tons were forecast during the remaining six months of the year. A large growth in petroleum products traffic over 1979 is also expected, with carryings up by 73 percent at 0.83 million tons. For transit traffic the 1980 plan is more modest than the 1979 plan, with a total of 0.25 million tons still representing a 60 percent increase over actual 1979 performance. Total ordinary domestic freight traffic in 1980 is forecast to be 2.75 million tons, 123 percent above that of 1979. No change in railway construction materials traffic is expected, and the grand total of 3.53 million tons of freight represents an 85 percent growth from 1979. The overall average haul projected for 1980 is 261 kilometers. With the exception of cereals (485 kilometers) and railway construction materials (131 kilometers), all commodity groups have average hauls from 200 to 300 kilometers. A total of 921 million net ton kilometers is projected for 1980, involving 2.11 billion gross ton kilometers, an average of 2.3 gross tons per net ton.

In Table A-5.13 monthly carryings in 1979 are shown in tons and ton kilometers, together with the average length of haul. Domestic freight, international freight, and railway construction materials traffic are shown separately. For the tonnage statistics, international traffic is split into transit and imports and exports carryings. The effect of the closure of the Homs-Tartous line for reconstruction, from August to November, is apparent on domestic traffic.

Table A-5.12

FREIGHT TRAFFIC PLANS, 1979 AND 1980
(000 tons)

Commodity Group	1979 Plan	1979 Actual	1980 Plan (tons)	1980 Plan Ton Kms (million)	1980 Average Haul (kms)
Petroleum Products	620	479	830	225	271
Steel Products	130	158	205	41	200
Cement	195	125	155	44	284
Cereals	360	214	330	160	485
Phosphate	0	0	800	188	235
Other Domestic	410	259	425	121	285
Total Ordinary Domestic	1,715	1,235	2,745	779	284
Transit	400	156	250	54	216
Imports and Exports	110	82	110	32	291
Total Ordinary and International	2,225	1,473	3,105	865	279
Rail Construction Materials	450	436	420	55	131
Total	2,675	1,909	3,525	921	261

Source: CFS - Movements and Transport.

Table A-5.13

CFS FREIGHT TRAFFIC, 1979

Category	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
(000 tons)													
Domestic	96.6	120.1	128.7	120.3	115.3	108.8	109.5	73.5	86.6	86.2	70.1	119.8	1,235.5
Transit	12.2	5.0	11.3	13.3	14.0	14.2	12.1	16.9	12.3	14.6	16.5	13.3	155.7
Imports and Exports	10.1	8.8	5.4	4.1	3.3	3.2	4.8	6.6	4.9	9.6	11.9	9.1	81.8
Subtotal	118.9	133.9	145.5	137.7	132.6	126.2	126.4	97.0	103.8	110.4	98.5	142.2	1,473.0
Rail Construction Materials	30.7	12.6	29.1	46.6	49.4	51.2	51.1	41.0	19.0	31.7	30.1	43.3	435.8
Total	149.6	146.5	174.6	184.3	182.0	177.4	177.5	138.0	122.8	142.1	128.6	185.5	1,908.8
(million ton kms)													
Domestic	30.24	29.35	35.08	43.26	26.62	26.30	27.36	18.37	21.07	24.14	20.79	38.71	341.29
International	3.05	2.12	3.91	2.23	2.41	2.06	2.29	3.31	2.36	3.21	3.92	2.91	33.78
Rail Construction Materials	3.09	1.75	3.33	4.85	5.76	7.02	8.89	9.77	4.99	7.12	6.60	10.67	73.84
Total	36.38	33.22	42.32	50.34	34.79	35.38	38.54	31.45	28.42	34.47	31.31	52.29	448.91
Average Haul (kms)													
Domestic	313	244	273	360	231	242	250	250	243	280	297	323	276
International	137	154	233	128	139	119	135	141	137	132	138	129	142
Rail Construction Materials	101	139	114	104	117	137	174	238	262	224	219	246	169
Total	243	250	242	273	191	200	217	228	231	242	244	281	235

Source: CFS, Movements and Transport.

Note: Tartous closed for line construction Akkari-Homs August to November.

CHAPTER A-6

TRAFFIC COSTING AND TARIFFS

Chapter A-6

TRAFFIC COSTING AND TARIFFS

A-6.1 GENERAL

Users of a service should pay the costs of providing it, and providers of a service should attempt to recover their costs from the users. This rule has as much validity in the transport field as in any other sector of the economy, which is to say that it should at least form the starting point for a cost and tariff analysis. In the case of railways, attempting to translate the rule (modified to suit individual circumstances) into practice has throughout the world proven extremely difficult and it has usually been frustrated in practice. The reasons for this fall into four categories:

- identification of costs
- inefficiency in railway operations
- imperfections in the transport market
- Government action

By their nature, railway operations involve a large element of joint costs, the allocation of which to individual services provides methodological problems of a high order. In the case of CFS, this difficulty is compounded by the poor accounting data available and by the significant element of transit traffic carried. Railways, although potentially a highly efficient mode of transport, often fall well short of their theoretical efficiency. This is the present situation on CFS, as Chapter A-4 has indicated. Imperfections in the transport market result from many sources. Road users, particularly heavy trucks, may not be paying their full share of road maintenance costs, for instance. In Syria diesel fuel is sold at only 36 percent of its economic opportunity cost, and because railways are more fuel efficient than trucks, this represents a proportionately greater subsidy to road transport. Government action takes many forms, ranging from restrictions on tariff freedom to limitations on staff salaries and the total number of staff. Basically, all the factors that complicate the cost-tariff equation resolve into two problems: the identification of existing and future costs and the relation that tariffs should bear to them.

A-6.2 TRAFFIC COSTING

Books on railway costing date from 1847. A vast amount of theoretical and practical work has been carried out, with doctoral theses on areas as narrow as the allocation of track costs to individual services. The conclusions have been, in general, disappointing. Circumstances vary so widely and are

changing so rapidly and the costs required for a particular decision are usually applicable so specifically to the decision that at the micro-level of analysis costs are more trouble to determine than they are worth. Detailed cost allocation is usually less important than analysis of cost change over time. The latter, together with up-to-date costs by broad category and a macro-level indication of cost causation, is sufficient for most management decisions.

The major cost distinctions are between capital and operating expenditures, direct and indirect costs (or variable and fixed costs), short-run and long-run costs, and marginal and average costs. Each of these costs can be divided between services or between lines. Unfortunately, none of the distinctions are clear cut. For instance, questions such as whether track-relaying is a capital or an operating cost, or part operating and part capital, are matters of judgement and accountancy practice, and the answer varies from country to country and even within the same country over time. In the case of CFS, the practice on capital expenditure is to include some items that might properly be charged to operating account; in particular, this applies to equipment and spare parts. This practice will no longer be possible as the major new construction projects are completed.

There are two approaches to the identification of costs. Total costs can be allocated (a top-down analysis) or costs for particular services can be constructed (a bottom-up system). The problem with either for CFS is the lack of basic data. Only operating expenditure budgets are available from 1976 onwards, and the cost classification used, the Unified Government Accounting System for General Organizations, is appropriate for traffic costing purposes. Expenditures are broken down by item (staff costs, fuel and oil, spares, and equipment) rather than by department or by traffic.

In connection with their feasibility studies of the Deir Ez Zor-Albu Kamal, Tadmur-Deir Ez Zor, and Lattakia-Tartous lines made in 1976, the Indian Railways consultants--RITES--performed a cost analysis. Because of poor CFS statistics, they used data derived from Indian Railways for the major cost items. In early 1979, CFS prepared their own cost study, but due to the continued lack of internal data, use was made of the 1976 RITES figures unchanged for many of the costs. These RITES values are at 1975 price levels and unrepresentative of the 1980 situation.

To determine order-of-magnitude current operating costs, the Consultants have allocated the operating budgets for 1977, 1979, and 1980 for four types of operation: ordinary freight, railway construction, locomotive-hauled passenger, and railcar services. Weighted train kilometers have been used for the

allocation, with weights based on the Consultants' operating experience. The weighting factors are derived in Table A-6.1. Year 1978 was not calculated because of the disruption to traffic in that year caused by the closure of the Iraqi border. The train kilometer figures used for 1980 are the Consultants' estimates; the volume of ordinary freight traffic is particularly uncertain. In Table A-5.12 the increase forecast by the CFS freight traffic plan is shown with ordinary tonnage and ton kilometerage projected to more than double the actual 1979 levels. A much more modest increase is used in the cost analysis, with ordinary freight net ton kilometers assumed to rise by 60 percent and freight train kilometers by 34 percent. This implies a 20 percent increase in average load per train, which should be easily achievable given the projected growth in petroleum products traffic and the commencement of bulk phosphate movements in 1980. The operating cost budgets are taken from Table A-7.4, with fees to European railways and Turkey, Syria, Lebanon, and Iraq (TSLI) Railways for wagon usage excluded, these being essentially capital costs. For 1980 the adjusted budget, including the February 1980 salary increases, has been allocated.

The results of the allocation, as given in Table A-6.1, show quite large changes between years in the shares of costs between services, following from the different growth patterns of train kilometers. The ordinary freight allocation varies from 54 percent (1979) to 67 percent (1977), and that of locomotive-hauled passenger services from 24 percent (1977) to 37 percent (1979). The sharp rise in the operating budget, particularly between 1979 and 1980, produces a 70 percent increase in the total allocated cost for ordinary freight services, and a 160 percent increase for locomotive-hauled passenger trains. The inflation in costs per train kilometer is, however, far more modest. From 1977 to 1979 the growth in train kilometers exceeded that of operating costs, and the overall cost per train kilometer fell from 22.9 piasters to 22.2 piasters, although because of the weighting factors used, the costs for individual services show rises of about 4 percent over the period. In 1979 the operating cost per ordinary freight train kilometer was 25.4 piasters, and for locomotive-hauled passenger trains it was 20.4 piasters. In 1980 costs per train kilometer rise significantly on the basis of the assumed traffic growth. For ordinary freight the 1980 cost is 33 piasters, and for locomotive-hauled passenger, 26.4 piasters per train kilometer - 30 percent above 1979 levels. The average train kilometer cost for all services in 1980 is 29.3 piasters. These large cost increases must be seen in the perspective of the substantial salary raises given in February 1980 (see Section A-7.3).

Table A-6.1

ALLOCATION OF OPERATING COSTS

Service	Trains Kms (000) 1977	1979[1]	1980[2]	Weighting Factor	Cost Share (%) 1977	1979	1980
Ordinary Freight	1,581	1,495	2,000	1.0	66.8	53.6	59.1
Railway Construction	143	160	160	1.3	7.9	7.5	6.2
Passenger Locomotive Hauled	723	1,292	1,400	0.8	24.5	37.1	33.2
Passenger Railcar	88	244	250	0.2	0.8	1.8	1.5
Total	2,535	3,191	3,810	-	100.0	100.0	100.0

Service	Allocated Operating Cost (million SP) 1977	1979	1980[3]	Allocated Cost per Train-Km (SP) 1977	1979	1980
Ordinary Freight	38.7	37.9	65.9	24.5	25.4	33.0
Railway Construction	4.6	5.3	6.9	32.2	33.1	43.1
Passenger Locomotive Hauled	14.2	26.3	37.9	19.6	20.4	26.4
Passenger Railcar	0.5	1.3	1.7	5.7	5.3	6.8
Total	58.0	70.8	111.5	22.9	22.2	29.3

Source: Consultants' estimates.

1 Actual January-September kilometers x 1.333.

2 Consultants' estimates.

3 Adjusted budget allowing for February 1980 salary increases.

In Table A-6.2 allocated costs are shown converted into unit costs per passenger and per net ton kilometer. To determine passenger kilometers by railcar, statistics for which are not available, an average load per railcar equal to that per coach for the whole system has been used. Average net load per freight train improved substantially between 1977 and 1979, and a further rise is projected for 1980. Thus, although costs per train kilometer rose over the period, there was a 36 percent decline in per ton kilometer cost from 1977 to 1979 and only a 9 percent increase is forecast for 1980. For passenger services there was a decline in the average number of passengers per train between 1977 and 1980, accentuating the increase in costs per train kilometer to give increases per passenger kilometer of 16 percent from 1977 to 1979, and 28 percent from 1979 to 1980 for locomotive-hauled trains; for railcars the rate of increase was less. In 1980 the projected cost per net ton kilometer is 11 piasters (10.1 in 1979), and for locomotive-hauled passenger services, it is 8.6 piasters per passenger kilometer (6.7 in 1979). Costs per traffic unit (the sum of passenger and net ton kilometers) rise from 8.3 piasters in 1979 to 10 in 1980, but are still below the 1977 figure of 10.7 piasters.

The preceding operating cost analysis provides order-of-magnitude average costs and an indication of cost trends. It is clearly dependent on the accuracy of the operating budget and traffic figures and on the subjective weighting factors used. The latter undoubtedly change from year to year in practice as the pattern of train services and train sizes alters. It is also to be sufficient to maintain services in the long run. Materials and supplies expenditure may well be understated, with some of it being treated under capital account. Maintenance of the very new physical plant, both track and structures and rolling stock, is at a lower than average level, and a large increase in establishment is pending Government approval. Thus, the calculated cost levels are on the low side in the long run, given the present level of operating efficiency. The latter is low, however, and the new lines and services to be introduced by 1985 give management exceptional scope to raise rolling stock utilization, train sizes, loads, and manpower and materials productivity in every way. In real terms (discounting inflation), unit operating costs should show further sharp falls by 1985, continuing the 1977 to 1980 trend. A prediction of either the long-term true level of average operating costs in real terms, or the extent to which management will succeed in achieving--through attracting and efficiently carrying traffic--the potential productivity gains that could be realized, is too speculative to be worthwhile given the lack of current cost data and the magnitude of the network and traffic changes that will take place by 1985. Nevertheless, for inter-modal comparisons and as a basis for later refinement, something more than allocated operating costs is

Table A-6.2

UNIT OPERATING COSTS

Service	Passenger Kms/Net Ton-Kms (million)			Allocated Cost per Passenger Km/Net Ton-Km (piasters)		
	1977	1979	1980[1]	1977	1979	1980
Ordinary Freight	246.0	375.0	600.0	15.7	10.1	11.0
Railway Construction	50.0	74.0	75.0	9.2	7 2	9.2
Passenger Locomotive Hauled	244.0	395.0	430.0	5.8	6.7	8.6
Passenger Railcar	4.3	10.5	10.8	11.6	12.4	15.7
Traffic Units[2]	544.0	854.0	1,116.0	10.7	8.3	10.0

Note: Totals may not add up due to rounding.

1 Consultants' estimates.

2 Passenger-kilometers plus net ton-kilometers.

required. The bottom-up approach to costs that follows is based on an assumed 1985 network of 1,900 route kilometers, with traffic of 3.6 million passenger train kilometers and 6.3 million freight train kilometers. The method adopted is similar to that of 1979 CFS and 1976 RITES analyses. As noted, the basic data from which current costs have been derived is weak and often out of date.

Movement, nonmovement, and rolling stock costs, in economic and financial terms, have been calculated by component for a freight and for a passenger train kilometer. The railway pays no taxes, and the major difference between financial and economic costs lies in the heavily subsidized price of diesel fuel. The Consultants calculate the economic price to be 70 piasters per liter, but both the railway and road transport operators paid 25 piasters in 1979. In addition to deriving both financial and economic costs, the effect of the 1980 salary increases on costs has been determined. For rolling stock, a rate of return on investment of 12 percent has been assumed, as used throughout the Comprehensive Transport Study.

The detailed cost analysis for freight and passenger trains was presented in Tables A-6.3 and A-6.4 of the Final Phase I Report. The results for the 1985 system per train kilometer and per ton and passenger kilometer are:

Component	Economic (Financial) Costs per Train Km, 1985 (Syrian pounds)							
	Freight				Passenger			
	1979 Prices		1980 Prices		1979 Prices		1980 Prices	
Movement	(6.9)	9.0	(9.8)	11.9	(6.6)	8.4	(9.3)	11.1
Nonmovement		9.8		14.2		7.4		10.5
Rolling Stock Depreciation		3.8		4.3		2.7		3.0
Rolling Stock 12% Return		11.7		13.4		6.7		7.6
Total Cost	(32.2)	34.3	(41.7)	43.8	(23.4)	25.2	(30.4)	32.2
Cost in Piasters per Net Ton/ Passenger Km	(8.1)	8.6	(10.4)	10.9	(5.9)	6.3	(7.6)	8.0

Costs for specific movements and lengths of haul can be derived in a similar manner by varying assumptions on train size, rolling stock utilization, and traffic per route kilometer, although considerable refinement of the basic input data is clearly necessary before any such analyses can be considered very realistic. Network construction costs have been excluded from the calculation as being sunk costs, but for any new project evaluation, these would have to be added in.

The costs can be compared with those of the allocated operating costs approach by adding the financial movement to the non-movement costs. The average costs at 1980 prices for the 1985 traffic are, as to be expected, lower than those for projected 1980 traffic given in Tables A-6.1 and A-6.2. Operating costs per net ton kilometer are 45 percent lower (6 piasters compared with 11), and per passenger kilometer are 43 percent lower (4.9 piasters against 8.6). Applying the 1979 prices to 1985 traffic produces greater declines than these in cost compared with the 1979 actual allocated operating costs, because operating efficiency is assumed to have improved between 1979 and 1980 in the allocation analysis.

A comparison of the results of the cost analysis with actual tariffs is made in Section A-6.5, which also discusses the division of the costs into direct and indirect components and the derivation of marginal costs from them.

A-6.3 FREIGHT TARIFFS

Three sets of tariffs are applied for freight traffic, two for transit and import and export traffic, and one for domestic freight. For international traffic with origin or destination outside of Turkey, Syria, Lebanon, and Iraq, the BPO (Bulgarie Proche Orient) tariff applies. This is an internationally agreed upon tariff set in Swiss francs. There are six commodity classes with a range of the top class 1 rate being approximately 2.4 times the lowest class 6 rate. The tariff is applied per ton with a discount allowed for higher wagon loads. For international traffic with both origin and destination in Turkey, Syria, Lebanon, or Iraq, the TSLI tariff applies. This is also set in Swiss francs but with considerably lower rates than the BPO tariff. The principle is similar, although there are seven commodity classes with a much wider range averaging 3.6 times between classes 1 and 7. The class 1 rate is itself 20 to 25 percent below the BPO equivalent, and thus for commodities in the high class numbers, the discount is considerable.

The BPO and TSLI freight tariffs are presented in Table A-6.3 for the major transit corridors of Midan Ikbis-Deir Ez Zor-Ya'roubia, Nusaybin-Ya'roubia, and Lattakia-Ya'roubia. In terms

Table A-6.3

TRANSIT FREIGHT TARIFFS
(SF per ton)

BPO (Bulgarie Proche Orient)

Commodity Class	Midan Ikbis - Deir Ez Zor (749 kms)				Nusaybin - Ya'roubia (82 kms)			
	5[1]	10	15	20	5	10	15	20
1	133.5	126.5	121.	114.5	37.5	37.0	36.5	35.0
2	117.5	112.5	108.0	102.0	35.0	34.5	33.5	32.0
3	103.5	96.5	92.0	86.0	32.0	30.0	29.0	27.0
4	88.5	83.0	77.5	72.5	27.0	25.5	23.5	22.0
5	73.0	67.5	62.5	57.0	21.0	19.5	18.0	16.0
6	57.0	53.0	49.0	45.5	16.0	15.0	14.5	13.5

TSLI (Turkey, Syria, Lebanon, Iraq)

Commodity Class	Nusaybin - Ya'roubia (82 kms)			Lattakia - Ya'roubia (825 kms)		
	5[1]	10	15	5	10	15
1	30.0	27.5	25.0	127.0	117.5	108.5
2	25.0	22.5	20.0	107.5	99.0	91.0
3	20.0	17.5	15.0	88.0	80.5	73.5
4	15.0	14.5	11.5	73.5	67.0	62.0
5	11.5	11.0	10.0	60.5	56.5	52.0
6	10.0	9.0	8.0	49.0	45.0	41.5
7	8.0	7.5	6.5	37.0	34.5	31.5

Source: Published transit tariffs.

Note: SF = Swiss Francs.

[1] Wagon load in tons.

of rates per ton kilometer, the short Nusaybin-Ya'roubia transit route tariffs are 2.6 to 2.8 times higher than for the longer routes (see Table A-6.6).

Although the BPO and TSLI tariffs have not been altered for some years, the appreciation of the Swiss franc against all other currencies has meant that their equivalent in Syrian pounds has risen considerably. In Table A-6.4 the conversion rates of the Swiss franc into Syrian pounds used by CFS are shown. Between January 1975 and November 1978 the rate more than doubled, and although it thereafter fell back somewhat, in July 1979 it was still 76 percent above the January 1975 level. This appreciation of what, by domestic tariff standards, was already a high rate has led to a proposal for a 40 percent reduction in both the BPO and the TSLI tariffs. This was to be discussed by the railways concerned at a meeting in Turkey in January 1980.

The domestic freight tariff consists of seven commodity classes with a range of 3.3 times between the class 1 and class 7 rates. Rates are set per ton with a distance taper so that the per ton kilometer rate for a 300-kilometer haul is two-thirds of the rate for 100 kilometers, and for 900 kilometers, 55 percent of the 100-kilometer rate. The tariff per ton and ton kilometer is given in Table A-6.5 for specimen distances. The domestic tariff is compared with the BPO and TSLI rates in Table A-6.6, using the conversion factor of SP 2.65 per Swiss franc that applied in July 1979. For the Nusaybin-Ya'roubia distance of 82 kilometers, the BPO rate is roughly five times the domestic tariff, and the TSLI rate is between three and four times as high. For Midan Ikbis-Ya'roubia (749 kilometers), the BPO rate is about 3.5 times the domestic, and for Lattakia-Ya'roubia (825 kilometers), over which all traffic is considered to be TSLI, the ratio is about three to one.

The combination of a much higher tariff rate, a shorter average length of haul, and generally higher rating of commodities (lower commodity class numbers) for transit than for domestic traffic produced in 1979 an average rate per ton kilometer for transit traffic of 70 piasters, more than 10 times the average domestic receipt of 6.4 piasters (see Table A-7.2).

In Table A-6.7 the rate classes assigned to major commodities are shown. The classes, according to Internal Freight Tariff No. 8, which applied from 15 June 1976, are given with the proposed changes to the class structure to apply from 1 February 1980. The latter are major, with a 50 percent increase in petroleum products rates implied by the uprating from class 6 to class 4, and a 75 percent rise for billets and iron and steel scrap (class 6 to class 3). These changes, which distort the tariff structure (where bulkier or easier to handle products enjoy lower rates), are temporary revenue-raising

Table A-6.4

SWISS FRANC CONVERSION RATES FOR INTERNATIONAL TRAFFIC

Date	Syrian Pounds per Swiss Franc	Date	Syrian Pounds per Swiss Franc
15 Jan. 1975	1.50	1 Jun. 1978	2.25
26 Apr. 1976	1.60	1 Jul. 1978	2.50
1 Jul. 1976	1.75	21 Jul. 1978	2.65
18 Oct. 1977	1.90	26 Aug. 1978	3.00
7 Dec. 1977	2.00	1 Nov. 1978	3.25
21 Dec. 1977	2.15	22 Nov. 1978	2.80
17 Feb. 1978	2.35	1 Jun. 1979	2.55
5 Mar. 1978	2.50	11 Jul. 1979	2.65

Source: Published conversion rates.

Table A-6.5

DOMESTIC FREIGHT TARIFF

Commodity Class	Rate-SP per Ton					Rate-Piasters per Ton-Km				
	100[1]	300	500	700	900	100	300	500	700	900
1	20	40	60	80	97.50	20.0	13.3	12.0	11.4	10.8
2	17	34	50	68	82.85	17.0	11.3	10.0	9.7	9.2
3	14	28	42	56	68.30	14.0	9.3	8.4	8.0	7.6
4	12	24	36	48	58.50	12.0	8.0	7.2	6.9	6.5
5	10	20	30	40	48.75	10.0	6.6	6.0	5.7	5.4
6	8	16	24	32	39.00	8.0	5.3	4.8	4.6	4.3
7	6	12	18	24	29.75	6.0	4.0	3.6	3.4	3.3

Source: Published freight tariffs.

[1] Distance in kilometers.

Table A-6.6

COMPARISON OF TRANSIT AND DOMESTIC TARIFFS
(piasters per ton-km)

Commodity Class	Nusaybin-Ya'roubia			Midan Ikbis-Deir Ez Zor		Lattakia-Ya'roubia	
	BPO	TSLI	Domestic Equivalent	BPO	Domestic Equivalent	TSLI	Domestic Equivalent
1	113.1	80.8	22.6	40.5	11.4	34.9	11.2
2	103.4	64.6	19.1	36.1	9.7	29.2	9.5
3	87.3	48.5	15.8	30.4	8.0	23.6	7.8
4	71.1	37.2	13.5	25.7	6.8	19.9	6.7
5	51.7	32.3	11.3	20.2	5.7	16.7	5.6
6	43.6	25.9	9.0	16.1	4.6	13.3	4.5
7	-	21.0	6.8	-	3.4	10.1	3.4

Source: Tables A-6.5 and A-6.7.

Notes: Rates shown are for a wagon load of 20 tons.

Table A-6.7

DOMESTIC COMMODITY CLASSIFICATION

Commodity	Tariff Class 15 June 1976	Tariff Class 1 February 1980
Crude, Fuel and Gas Oils	6	4
Petrol (Benzin)	4	3
Crude Phosphate	7	uc
Billets, Iron and Steel Scrap	6	3
Pipes, Sheets, and Bars	4	uc
Sawn Timber	5	uc
Logs	6	uc
Cement	5	uc
Fertilizers	5	uc
Chemical Products	4	uc
Machinery, Vehicles and Spares	3	uc
Raw Cotton	4	uc
Ginned Cotton	5	uc
Barley and Wheat	6	uc
Other Cereals and Cereal Products	5	uc
Sugar, Flour, Tea, Coffee, and Mineral Water	5	uc
Canned Food, Bread, and Biscuits	4	uc
Vegetables	4	uc
Live Animals	7	4

Source: Published classification.

Note: UC = Unchanged.

actions pending an uprating of all scales. The latter requires Government approval, whereas reclassification does not.

Under Freight Tariff No. 8, all the major freight traffic is rated from classes 4 to 7 and, in terms of revenue-raising power, the highest-rated classes 1 and 2 are unimportant. Rates do not include either loading or unloading by CFS, and there is a minimum charge for a consignment based on 50 percent of the rated tonnage capacity of the wagon; thus, a 5-ton load in a 20-ton-capacity wagon would be double rated. Loaded containers travel at class 2 rates, irrespective of commodity, and empty containers travel free. This is a considerable over-rating, discouraging container traffic, and a change to a class 5 rate is expected to be made in 1980. Privately owned wagons receive a 15 percent discount on normal tariffs. Live animals are rated on the basis of one square meter of floor equal to one ton, charging for the whole floor space of the wagon irrespective of the number of animals loaded. Small consignments and parcels travel at class 1 or class 2 rates. Railway construction materials are carried at a 15 percent discount on commercial rates. The minimum distance charged for is 40 kilometers.

Although the rationale behind the domestic tariff structure is sound, a number of changes and refinements are recommended. In general, rates are now much too low, and a substantial overall uplift would be required to bring the tariff-cost relationship back to its June 1976 level, particularly after the substantial salary increases awarded from 1 February 1980. Rail costs include a large fixed element and a large element for rolling stock provision, as shown in Section A-6.2. This is far less the case for road transport; turnaround times for trucks are usually much shorter than for rail wagons and the fixed element of rail track costs is absent in road costs. Thus the rail cost curve shows a high starting point per ton kilometer for short hauls but a sharp taper as length of haul rises. Road costs start from a much lower point but taper less. The cost curves generally intersect at distances of 100 to 500 kilometers depending on the commodities and volumes concerned, with rail cheaper for the longer hauls and road for the shorter. Rate structures should reflect these cost characteristics. For the railway tariff, this means that the starting point to cover the fixed cost and rolling stock provision element of cost should be raised considerably, but with a low incremental charge per kilometer in addition. With the present tariff structure, this can be accomplished by setting the minimum chargeable distance much higher than the current 40 kilometers, in the range of 100-160 kilometers, and by raising the scale rates per ton proportionately more for lower than for higher distances when the tariff is next changed.

With a considerable imbalance in traffic on most routes, consideration should be given to discounts for traffic in the minority traffic direction, wherever there is spare wagon capacity.

Containers are an area of significant traffic potential and a special tariff policy should be formulated for them. Most of the traffic will be international, and special attention will need to be given to collection and delivery charges from the possible inland container terminals at Damascus and Aleppo. The charging experience of other railway companies, such as Freightliners in London or Intercontainer in Basle, should be sought before a new tariff is set.

For regular and large volume traffic, special tariff arrangements should apply, with considerable variation on the to-be-revised published scales. The extent of such variation is an area the new Planning and Marketing Department should investigate at the earliest opportunity, based on the relative rolling stock utilization and general operating costs of particular traffics.

A-6.4 PASSENGER TARIFFS

The passenger tariff is formulated on a line basis, with considerable variation between lines in rates per passenger kilometer, reflecting the dates at which the tariffs were effected. The current tariff was first applied at various times between 1969 and 1979 as new lines and services were introduced. There are two classes, first and second, with first class 50 to 70 percent higher than second. On Aleppo-Baghdad (Iraq) services, first and second class sleepers are operated with a tourist class for ordinary coaches. Children under five travel free, and those aged five to nine pay half the adult fare. In 1978, 11 percent of passenger journeys and 12 percent of passenger kilometers were first class. Soldiers and students receive a 20 to 30 percent discount on adult fares. For most services, this discount is only available on second class (tourist class only for Aleppo-Baghdad). Per kilometer rates on each line generally taper slightly with increasing distance, although the tariff is not a strict distance tariff, rates between major stations being set in round pounds. The tariffs for single journeys from Aleppo to major destinations, with the dates at which they were introduced, are given in Table A-6.8. In Table A-6.9 the special tariff that applies on the 7 April 1979 (the date of its inauguration) service to Iraq is shown.

The per kilometer rate from Aleppo to Lattakia is about 75 percent higher than for the equivalent distance from Aleppo to Al Raqqa. The former rate was introduced in 1978 and the

latter in 1974. On the 7 April 1979 train, the tourist class rate to Al Raqqa is nearly triple the 1974 rate for other trains. Present rates are all exceptionally low by international standards, and passenger travel by all modes is in effect being heavily subsidized by the Government through an uneconomically low price for fuel oil and provision of free capital for rolling stock and new lines. In Section 3.3 of Volume VII the Consultants have recommended that railway passenger tariffs be sharply tapered to discourage short trips and that rail and road tariffs be increased to cover marginal costs by the year 2000. Within these constraints rates should be more or less harmonized between lines, taking into account relative road distances. With a considerably higher base rate, incentive day return and weekend return rates can be introduced where seating capacity is available at substantial discounts on equivalent single fares. The half-price concession for children should be extended to at least age 14, in line with general international practice. When the Damascus to Aleppo line is complete the possibility of operating first-class-only premimum business services should be considered, with a standard comparable to the 7 April 1979 trains.

A-6.5 COSTS AND TARIFFS COMPARED

Virtually all the railway systems in Europe incur large losses, as do Japanese Railways and the inter-city passenger service on U.S. railroads. The losses are borne by the governments because they accept that the existence of a basic railway network conveys unquantifiable but significant benefits to society of a strategic, social, and political nature. In the case of Syria, decisions have been made to develop a network of 1,900 route kilometers to be in operation in 1985. This will be a basic integrated network containing only short stretches that could be closed without affecting the integrity of the whole. It will be a system mostly of modern construction to international standards. There can be little question that it is intended to be maintained in use beyond 2000 as a national asset, irrespective of whether the railway can break even in financial or economic terms. Tariff policy should thus aim at full economic utilization of the capacity provided.

A tariff based on long-run marginal costs will maximize the volume of economically profitable use of the infrastructure. It will also maximize non-loss-making revenue in the price-elastic segments of the market (i.e., where a change in price produces a more-than-proportionate opposite change in the volume of traffic). In the most favorable markets for rail, however, such as bulk materials or long-distance passengers, marginal cost pricing will lead to large potential revenue losses with little gain in traffic.

Table A-6. 8

PASSENGER TARIFF FROM ALEPPO

Journey	Class	Single Fare-SP Adult	Child	Soldier/ Student	Piasters/Km Adult
Aleppo to:					
Jisr Al Shughour[1]	1	9.00	4.50	-	7.3
(123.2 kms)	2	6.00	3.00	4.80	4.9
Lattakia[1]	1	12 00	6.00	-	5.9
(202.7 kms)	2	8.00	4.00	6.40	3.9
Al Raqqa[2]	1	7.00	3.50	-	3.4
(205.1 kms)	2	4.50	2.25	3.60	2.2
Deir Ez Zor[2]	1	10.00	5.00	-	2.9
(341.6 kms)	2	6.00	3.00	4.80	1.8
Al Hassakeh[3]	1	15.00	7.50	-	3.2
(471.8 kms)	2	10.00	5.00	8.00	2.1
Hama[4]	1	4.60	2.25	3.05	3.2
(144.3 kms)	2	2.85	1.55	2.10	2.0
Homs[4]	1	6.15	3.05	4.15	3.0
(201.9 kms)	2	3.90	2.05	2.80	1.9

Source: Published tariffs.

1 Effective 1 December 1978.

2 Effective July 1974.

3 Effective 29 January 1977.

4 Effective 4 July 1971.

Table A-6.9

PASSENGER TARIFF (7 APRIL 1979 SERVICES)

Journey	Class[1]	Single Fare-SP Adult	Child	Soldier/ Student	Piasters/Km Adult
Aleppo to:					
Al Raqqa (205.1 kms)	1	35.00	17.50	-	17.1
	2	25.00	12.50	-	12.2
	T	12.00	6.00	9.75	5.9
Deir Ez Zor (341.6 kms)	1	55.00	27.50	-	16.1
	2	35.00	17.50	-	10.2
	T.	18.00	9.00	14.50	5.3
Al Hassakeh (471.8 kms)	1	75.00	37.50	-	15.9
	2	50.00	25.00	-	10.6
	T	24.00	12.00	19.25	5.1
Al Kamishli (547.4 kms)	1	95.00	47.50	-	17.4
	2	55.00	27.50	-	10.0
	T	28.00	14.00	22.50	5.1
Ya'roubia (626.3 kms)	1	125.00	62.50	-	20.0
	2	70.00	35.00	-	11.2
	T	35.00	17.50	28.00	5.6
Baghdad (1,059 kms)	1	202.75	108.50	-	19.1
	2	116.00	65.00	-	11.0
	T	50.25	25.75	40.50	4.7

Source: Published tariffs.

Note: T = Tourist Class.

[1] 1st and 2nd class fares are by sleeping car.

Because the railway is unlikely to be profitable as a whole, market-related tariffs should be adopted where rail is most competitive and marginal cost tariffs at the least competitive or most price elastic extreme. Such a tariff policy, known as "what the traffic will bear," has been widely adopted where railway managements have been free to set their prices. It has the advantages of both minimizing the amount of Government support for the system and encouraging a high level of traffic. It is not likely that any traffic will be charged an extortionary rate as the railway has no real monopoly. If the rate for phosphate movements is set close to road rates, it might be considered unreasonably high, but the line from Mhine to the mines was constructed for this particular movement and a high rate could be justified on that basis alone. The more likely danger is that some rates will be set at uneconomically low levels; i.e., below long-run marginal costs. The identification of these costs is therefore considered below.

Marginal costs are the costs directly attributable to the carrying of a particular traffic - those that would not be incurred if the traffic were not carried. Long-run marginal costs take into account the cost of depreciating assets required to move the traffic in perpetuity. The association of nonmovement costs (indirect costs) with a traffic is, in the Consultants' experience, to a large extent arbitrary. These indirect costs are joint costs that can be allocated in various ways between traffic but that contain a large fixed element and only a small volume-related element. It is reasonable and only a slight simplification to thus exclude indirect costs from marginal costs. In Section A-6.2 the nonmovement element in movement rolling stock depreciation, and nonmovement costs for the 1985 system, at 1980 price levels, is calculated to be 47 percent for freight and 43 percent for passengers on an economic basis, and 50 percent and 46 percent, respectively, on a financial basis. It is important to note that with such a large component of costs unattributable to particular traffic, any railway tariff system related to average costs is largely judgmental in its basis.

In general, movement costs in total are part of marginal costs. In certain special cases, however, a tariff below movement (and rolling stock) costs would be acceptable. An example of such a case is the carrying of freight on an otherwise empty backhaul movement, where the direct cost is negligible providing that the operating schedule of the rolling stock in the opposite direction is unaffected. Another example is when spare seating capacity is available on parts of a throughout passenger journey. Apart from movement costs, long-run marginal costs include the cost of rolling stock provision at replacement rather than historic cost. Whether or not a notional return on capital should be included is a difficult, but important,

technical question. (If the higher tariff appropriate to the inclusion of the return on capital charge causes rail traffic to be diverted to road, the marginal return on capital of the road operators is the one that should be used. This would be a low rate, but if the higher rate reduces the total demand for, and investment in, the transport sector and the funds can be transferred to other investments, it is the rate in these alternative uses that is relevant.)

Marginal costs are calculated in Table A-6.10, both excluding any return on rolling stock investment and with a 12 percent return on capital, the marginal rate of return used throughout the Comprehensive Transport Study. The costs are derived in Tables A-6.3 and A-6.4 of the Final Phase I Report and are those for the assumed 1985 traffic and operating efficiency levels, calculated at 1980 prices. Marginal costs at 1980 traffic and efficiency levels are considerably higher than those given in Table A-6.10 because of the current poor utilization of rolling stock and low train loadings. Probably 50 percent would need to be added to the costs shown to convert them to 1980 efficiency levels.

A distinction needs to be made between marginal costs assuming a particular level of efficiency, and marginal costs when productivity is rising. Because current operating efficiencies are low, during the transition period to the higher 1985 efficiency levels, average costs will be falling and marginal costs will be unusually low as the unused potential of existing assets is brought into use. This short-run marginal cost is of little relevance for pricing policy decisions.

The marginal costs in Table A-6.10 represent the very lowest rates that should be set for a distance equal to the overall average length of haul. In 1985 this is projected to be 290 kilometers for passenger and 260 kilometers for freight traffic. The current domestic freight tariff for a 260-kilometer haul for class 5 commodities (the average rate group) is 7.2 piasters per ton kilometer, which is close to the calculated marginal cost with 1985 efficiencies, including a 12 percent return on rolling stock investment, of 7.4 piasters. The passenger tariff on the Aleppo-Al Kamishli line by ordinary services, however, is about 2 piasters per kilometer for a distance of 290 kilometers, which is well below the marginal cost, even excluding any return on rolling stock capital expenditure of 3.5 piasters per kilometer.

The analysis in this chapter indicates that action is required to amend tariff policy to encourage the most efficient use of the railway's infrastructure and to concentrate on its competitive strengths. Such action can best be taken as part of a general realignment of tariffs for road and rail. A sharp

increase in many passenger rates is indicated. For freight, short-distance tariffs should be raised substantially more than long-distance tariffs. The basic rates in the current domestic freight tariff should be set much higher but with large discounts available at the discretion of the railway's Marketing Department to bring rates down to long-run marginal costs in the most competitive situations.

Table A-6.10

LONG-RUN MARGINAL COSTS, 1985 NETWORK

	Freight		Passenger	
SP/Train-Km	Economic	Financial	Ecoromic	Financial
Marginal Cost Excluding Return on Rolling Stock	16.2	14.1	14.1	12.3
Marginal Cost Including 12% Return on Rolling Stock	29.6	27.5	21.7	19.9
Piasters/Net Ton-Km or Passenger Km				
Marginal Cost Excluding Return on Rolling Stock	4.0	3.5	3.5	3.1
Marginal Cost Including 12% Return on Rolling Stock	7.4	6.9	5.4	5.0

Source: Consultants' estimates.

Note: Costs are at 1980 price levels.

CHAPTER A-7

FINANCE

Chapter A-7

FINANCE

A-7.1 INTRODUCTION

The operating accounts and budgets of CFS are prepared in accordance with the Unified Accounting System for General Organizations laid down by the Ministry of Finance. Under this system, operating expenditures are consolidated for the whole of the railway and itemized by type. Thus, basic wages and salaries are treated as a single item, as are overtime payments, social security contributions, and expenditures on fuel oil, lubricating oil, equipment, and spare parts. While this treatment may be sufficient for central Government purposes, it is of limited value for railway management or for economic analysis. The one category of wages and salaries, for instance, accounts for about 45 percent of all operating expenditures. Consolidated accounts provide little information about the functional end-uses of expenditures, and departmental finance control is eliminated because no departmental budgets are prepared. The comparison of revenues with expenditures for particular traffics or parts of the network is not facilitated by consolidation, nor is the timely preparation of the accounts. Indeed, the 1976 accounts were not finalized as of January 1980, and only operating expenditure budget data are available for the years since 1975.

The position of the capital expenditure accounts is quite different. Expenditure is classified by project, and end-uses are itemized. The accounts are up-to-date, and a detailed comparison of expenditures with budgets and of physical progress with that planned is prepared each quarter. Although capital expenditure is well recorded, there is no depreciation accounting as such. Capital funds are provided by the Government and any operating surplus is transferred to the Government; such surplus is classified as provisions for depreciation. It is not yet clear how the operating account deficit, which occurred in 1978, will be treated in the accounts when they are prepared.

There is a clear and pressing need for up-to-date financial information in a format suitable for management decision-making and monitoring purposes. With the accounting staff preoccupied with the backlog of work in hand, a small management information section should be set up to report initially to the director-general and eventually to the new director of planning and marketing. This section should prepare a quarterly financial statement of operating expenditures and revenues accurate

enough for management purposes, i.e., within 1 or 2 percent. Expenditures need to be itemized by directorate and by major end-use, with comparison shown against the previous year's actual expenditures for the period and against budget, with explanations for major changes. Revenues should be shown by commodity and passenger service. The financial statement should be supplemented by a traffic report showing carryings by commodity in tons and ton kilometers and passenger flows between stations. Such data are already prepared in the Movements Directorate. An operating performance statement should be prepared showing the data given in Tables A-5.2 to A-5.4, together with key performance factors, such as kilometers run per main-line locomotive in service, average load per freight car, and number of freight cars per train. Statistics on passenger train punctuality by line, on average transit time for freight, on wagon turnaround time, and on rolling stock availability are also necessary for management purposes.

Much potentially useful statistical information is already collected, but it is not being made use of by management or collated into performance indicators. Indeed, much of the data is developed at present solely for transmittal to the UIC for inclusion in the UIC Statistical Yearbook. To supplement the quarterly review, an annual analysis needs to be made of costs and revenues by service and commodity for tariff-setting and level-of-service purposes. This would identify the direct costs and revenues of, for instance, cement traffic or the Lattakia-Aleppo passenger service and would show the contribution of particular services to system indirect costs.

To facilitate management control, the responsibility for the preparation and monitoring of annual expenditure budgets should be given to individual directors. Quarterly proposed expenditures should be shown by function with, as an example, rolling stock maintenance classified by type of stock. The present consolidated budget for Government purposes would be better prepared as a summation of departmental budgets under the supervision of the director of finance.

The proposals outlined above will enable management to be more responsive to changes and to strengths and weaknesses by quickly being in a position to identify them and to take appropriate action. Currently, management is provided with little information on which decisions can be made. The need for such data is growing rapidly as the railway moves from the construction stage into full public service. To the greatest extent possible with the available information, the following sections cover the current financial situation of the organization.

A-7.2 REVENUES

The distribution of revenues by traffic reflects the peculiar nature of the tariff structure discussed in Chapter A-6. International freight traffic contributes substantially more proportionately than its volume would suggest, and passenger services produce only a minor component of the total. In Table A-7.1 revenues by major item are shown for years 1973 to 1980. Although final accounting figures are unavailable, the 1977 and 1978 figures are thought to be quite accurate. For 1979 the figures are Consultants' estimates based on actual traffic volumes converted into revenues. The conversion factors used for freight traffic in piasters per ton kilometer are given for each commodity group in Table A-7.2. This table also shows freight revenue projections for 1980, assuming that the CFS freight traffic plan were to be fulfilled. Passenger revenue in 1979 has been based on the actual growth in passenger kilometers from 1978. For the 1980 freight projection, the proposed changes in the commodity code classification of petroleum products and iron and steel have been assumed to be implemented. A possible reduction in the transit tariff rate has not been taken into account. The much lower average revenue per ton kilometer for transit traffic in 1980 is due to the traffic plan's assumption that a higher proportion of the traffic will travel via Midan Ikbis, with a much longer CFS haul and, hence, a lower ton kilometer rate. In general, the Consultants view the plan traffic levels as optimistic; considerably lower freight revenue than shown in Tables A-7.1 and A-7.2 for 1980 is likely, but a substantial improvement over 1979 is nevertheless to be expected. The passenger projection for 1980 is based on the Consultants' expectation of a further 10 percent rise in passenger kilometers, following from a full year's operations to Baghdad (Iraq) and the effect of the higher rates on the Baghdad service than on other trains.

In 1977 total revenue was SP 54.9 million; no less than 56 percent was contributed by transit traffic, 17 percent by domestic freight (including railway construction materials), 10 percent by imports and exports, and 9 percent by passenger services. In 1978 a complete change in composition occurred, with the disruption of transit traffic as a result of the Iraqi border closure. Total revenue fell by 37 percent to SP 34.3 million. Domestic freight revenue rose by SP 1.3 million, and its share of the total rose to 31 percent. The combined transit and imports and exports share fell to 31 percent. Passenger revenue rose by 90 percent, and its share of the total reached 27 percent. In 1979, with the reopening of the transit routes and a strong growth in domestic freight traffic, revenue recovered to surpass the 1977 total, reaching SP 63.7 million. The shares in 1979, as estimated by the Consultants, were as follows:

Table A-7.1

REVENUES

(million SP)

Traffic	1973	1974	1975	1976	1977[1]	1978[1]	1979[2]	1980[2]
Freight								
Domestic	4.70	4.09	5.18	15.84	7.42	10.5	21.7	54.1
Railway Construction Materials	4.26	5.43	6.82	6.85	1.81		4.2	3.1
Transit Europe					23.31		16.8	30.3
Transit TSLI					7.36			
Imports and Exports Europe	7.56	17.30	22.94	22.01	5.10	10.8	6.0	17.7
Imports and Exports TSLI					0.55			
Total Freight	16.52	26.82	34.94	44.70	45.55	21.3	48.7	105.2
Passenger	1.36	2.31	3.27	3.69	4.96	9.4	11.5	13.0
Warehouse Aleppo	0.77	2.08	1.55	2.39	1.71	1.6	1.5	2.0
Miscellaneous	4.55	5.51	3.19	3.93	2.64	2.0	2.0	4.0
Total Revenue	23.20	36.72	42.95	54.71	54.86	34.3	63.7	124.2

1 CFS estimates - Finance.

2 Consultants' estimates based on 1979 actual tonnage.

3 CFS freight plan converted into revenue by Consultants.

Table A-7.2

FREIGHT REVENUES, 1979 AND 1980

Commodity Group	1979[1] Ton-Kms (million)	1979[1] Average Revenue (piasters per ton-km.)	1979[1] Revenue (million SP)	1980[2] Ton-Kms (million)	1980[2] Average Revenue (piasters per ton-km)	1980[2] Revenue (million SP)
Petroleum Products	81	6.9	5.6	225	9.0	20.3
Cement	41	7.0	2.9	44	7.0	3.1
Iron and Steel	27	7.0	1.9	41	11.5	4.7
Cereals	125	4.7	5.9	160	4.7	7.5
Phosphate/Sulfur	-	-	-	193	4.6	8.9
Other Domestic	67	8.0	5.4	116	8.3	9.6
Subtotal	341	6.4	21.7	779	6.9	54.1
Transit	24	70.0	16.8	54	56.1	30.3
Imports and Exports	10	60.0	6.0	32	55.4	17.7
Subtotal	375	11.9	44.5	865	11.8	102.1
Railway Construction Materials	74	5.7	4.2	55	5.7	3.1
Grand Total	449	10.8	48.7	921	11.4	105.2

[1] Consultants' estimates based on actual 1979 tonnage.

[2] CFS freight traffic plan converted into revenue by Consultants.

domestic freight, 41 percent; transit, 26 percent; imports and exports, 9 percent; and passenger, 18 percent - a very different composition from that of 1977.

The average revenues given in Table A-7.2 show that in 1979 transit traffic earned more than 10 times as much on average per ton kilometer as domestic freight. Imports and exports were similarly high rated, and international traffic of 34 million ton kilometers earned SP 1.1 million more than ordinary domestic carryings of 341 million ton kilometers. The revenues of domestic freight varied from 4.7 piasters per ton kilometer for cereals to 8 piasters for general non-bulk products. Reclassification of petroleum products in the commodity code should increase its average rate from 6.9 to 9 piasters, and for iron and steel, a rise from 7 to 11.5 piasters is likely in 1980. For all freight carryings, the average receipt in 1979 was 10.8 piasters per ton kilometer. Average receipts per passenger kilometer were only 2.8 piasters. For comparison, the ordinary average second class fare on British Railways, as of February 1980, was nearly 30 piasters per kilometer.

A-7.3 CURRENT EXPENDITURES

The Unified Accounting System is being used for the 1976 and subsequent accounts. The operating expenditure accounts until 1975 (the last year finalized) show outlays by department. The results for years 1973 to 1975 are presented in Table A-7.3. By far, the largest element of expenditure was labor costs, materials expenditure being significant only in the Traction and Rolling Stock and in the Medical Service Directorates. In 1975 labor costs, including social insurance, amounted to 74 percent of operating expenditure before depreciation. The depreciation provisions represent the operating surplus, to make total operating expenditure equal to revenue, as given in Table A-7.1. A surplus of SP 13 million was recorded in 1975, compared with SP 11.9 and SP 3.3 million in 1974 and 1973, respectively.

Traction and rolling stock was the major expenditure department, accounting for 40 to 45 percent of expenditure before depreciation in 1973 to 1975. The Movements and Fixed Installations Directorates were each responsible for a further 16 to 18 percent.

From 1976 onwards, the only expenditure figures available are the operating budgets. These are shown for years to 1980 in Table A-7.4. The staff element of costs is probably quite accurate until 1979, but actual expenditures on other items, particularly equipment and spare parts, may vary considerably

Table A-7.3

OPERATING EXPENDITURES
(million Sp)

Department	1973	1974	1975
General Directorate			
Staff Costs	0.40	0.43	0.72
Others	0.02	0.01	9.02
Total	0.42	0.44	0.74
Movements			
Staff Costs	3.34	4.10	5.24
Other	0.24	0.38	0.39
Total	3.58	4.48	5.63
Traction and Rolling Stock			
Staff Costs	4.71	6.01	7.52
Materials	2.33	2.74	2.89
Wagon Fees	1.00	2.35	1.69
Others	0.19	0.17	0.16
Total	8.23	11.27	12.26
Fixed Installation			
Staff Costs	2.97	3.68	4.70
Maintenance Materials	0.31	0.21	0.20
Others	0.03	0.09	0.08
Total	3.31	3.98	4.98
Finance			
Staff Costs	1.08	1.26	1.57
Others	0.05	0.06	0.06
Total	1.13	1.32	1.63
Medical			
Staff Costs	0.08	0.05	0.08
Others	0.59	0.27	1.00
Total	0.67	0.32	1.08

Table A-7.3 (continued)

OPERATING EXPENDITURES

(million SP)

Department	1973	1974	1975
General			
Social Insurance	1.53	1.85	2.22
Others	1.02	1.18	1.38
Total	2.55	3 03	3.60
Total Before Depreciation	19.89	24.84	29.92
Depreciation Provision	3.31	11.88	13.03
Grand Total	23.20	36.72	42.95

Source: CFS - Finance and Expenditures.

Note: Staff costs include overtime and allowances.

Table A-7.4

OPERATING EXPENDITURE BUDGETS
(million SP)

	1976	1977	1978	1979	1980	1980[1]
Staff						
Wages and Salaries-Basic	23.6	28.0	27.8	36.0	40.0	62.0
Overtime	1.7	0.5	1.0	1.3	2.2	3.4
Allowances	-	2.0[2]	2.4	2.8	2.8	4.3
Social Security	3.3	4.8	4.8	6.0	6.8	10.5
Staff Medical Services	1.5	1.5	1.6	1.7	1.8	1.8
Clothing	0.1	0.1	0.2	0.2	0.2	0.2
Contingencies, etc.	0.9	-	-	0.4	0.4	0.4
Total Staff	31.1	36.9	37.8	48.4	54.2	82.6
Others						
Fuel Oil	5.0	6.0	6.6	6.0	7.3	7.3
Lubricating Oil	1.4	1.5	1.6	1.8	3.7	3.7
Equipment and Spare Parts	10.4	10.0	11.0	10.0	12.3	12.3
Fees to European Railways	2.0	2.5	3.0	3.0	4.0	4.0
Fees to TSLI Railways	0.2	0.5	0.6	0.3	0.4	0.4
Lighting and Water	0.3	0.3[2]	0.4	0.4	0.4	0.4
Other Expenditures	1.4	3.3[2]	3.6	4.2	5.2	5.2
Total Non-staff	20.7	24.1	26.8	25.7	33.3	33.3
Grand Total	51.8	61.0	64.6	74.1	87.5	115.9

Source: CFS - Finance and Expenditures.

1 Budget adjusted for salary increase of 1 February 1980.

2 Consultants' estimates.

from those shown. For 1980 the budget assumed a 6 percent increase in wage rates and no change in materials prices. In fact, all Government organizations' salaries were increased substantially with effect from 1 February 1980. The increases were:

Salary Component (SP per month)	% Increase
0 - 400	75
401 - 900	50
901 - 1,500	25
1,500 and over	10

Based on the average salaries for March 1979 given in Table A-2.3, at that time the average salary per month was exactly SP 500 for all staff, including those in the General Company for Railways Construction. Applying the above increases brings the average salary to SP 850, a rise of 70 percent. Thus, basic wages and salaries costs for 1980 have been understated by 55 percent. Overtime, allowances, and social security are likely to rise also by this percentage. The 1980 budget is shown in Table A-7.4 in its original form and adjusted for the salary changes. The change adds SP 28.4 million to budgeted costs in 1980, a rise of 32 percent. The staff cost share of total expenditure in 1980 on the revised figures is 71 percent, compared with a budgeted 65 percent in 1979. Fuel and lubricating oil account for 9 percent and equipment and spare parts for 11 percent of the 1980 expenditures. The only other single item of significance is payments to European and TSLI railways for the use of transit rolling stock, which is budgeted at SP 4.4 million.

Total revised budget expenditures for 1980 of SP 115.9 million are 56 percent above the 1979 figure, with a 71 percent increase in staff costs and a 30 percent increase in other items.

A-7.4 CAPITAL EXPENDITURES

The recent and continuing development of the network (discussed in Sections A-3.1 and A-5.2), comprising both large-scale new line construction and rehabilitation of existing lines, has meant that capital expenditures throughout the 1970s have exceeded operating expenditures by a wide margin. Expenditures by project from 1971 to the 1980 budget are presented in Table A-7.5. Capital spending averaged SP 101 million per annum during the period of the 3rd Five-Year Plan from 1971 to 1975. By 1977 this level had been doubled, and in the 1979 budget, it was forecast to double again to reach SP 398 million. In fact, the General Company for Railways Construction, which undertakes

Table A-7.5

CAPITAL EXPENDITURE SUMMARY

(million SP)

Project	1971 to 1975	1976	1977	1978	1979 Budget (Jan.-Sep. actual)		1980 Budget
Lattakia-Aleppo-Al Kamishli	332.0	45.2	52.3	57.0	73	(37)	47.9
Mhine-Phosphate Mines	6.3	26.0	17.2	40.8	68	(20)	24.6
Akkari-Homs-Damascus	61.4	41.3	53.0	67.9	151	(54)	131.5
Tartous-Akkari	43.6	1.8	1.0	2.1	3	(1)	1.1
Aleppo-Homs	-	-	4.3	16.8	79	(7)	80.1
Deir Ez Zor-Albu Kamal	-	0.3	-	-	5	(1)	63.5
Rolling Stock	61.7	46.5	70.7	69.2	19	(8)	132.5
Lattakia-Tartous Feasibility	-	0.2	-	-	1	(1)	0.7
Tadmur-Deir Ez Zor Feasibility	-	0.6	-	-	-		-
Total	505.0	161.9	198.4	253.8	398	(128)	481.9
Hama-Mhardeh[1]	-	-	7.0	10.0	5	(3)	-

Source: CFS, Finance and Expenditures.

1 Financed by Petroleum Ministry: expenditures estimated.

all capital projects apart from rolling stock acquisition, does not yet have the construction capacity to spend at the budgeted rate. Actual spending in 1979 was only about SP 150 million.

The 1980 budgeted expenditure of SP 482 million is unachievable. Although the salary increases of February 1980 will add nearly SP 20 million to the Construction Company's costs for the year, to give a revised total budget of about SP 500 million, the company is unlikely to complete more than SP 200 million of construction work. Adding the full budgeted SP 132 million for rolling stock capital spending in 1980 could reach SP 330 million, but SP 300 million is a more probable figure.

An investment of SP 300 million in 1980, although 38 percent below budget, will represent two and a half times the total operating expenditure for the year. Throughout the 1970s, capital expenditures have been in a similar ratio to operating expenditures. This is an exceptional ratio for a railway and witness to the speed at which the system is being developed. The major portion of expenditure since 1971 has been on new line construction. From 1971 to 1978, of total spending of SP 1,119 million, 43 percent was on construction of the Lattakia-Aleppo-Al Kamishli line, and 20 percent on the Akkari-Homs-Damascus line. Other new lines and renovation projects accounted for a further 15 percent, with rolling stock spending comprising 22 percent of the total. Included in the line construction expenditures are all associated facilities, such as workshops, stations, and offices. A breakdown of expenditures from 1976 to 1978 by item is given in Table A-7.6. For the Lattakia-Al Kamishli project, the large element of stations and workshops expenditure includes the major rolling stock maintenance facilities under construction at Jibrine.

Certain projects are excluded from CFS investment, although they are strictly expenditures on railways. The Hama-Mhardeh line (cost about SP 22 million) was financed by the Ministry of Petroleum and is being built for the transport of fuel oil to the Mhardeh power station. In 1980/81, construction of a 9 kilometer line north of Tartous to a new cement plant is being financed as part of the expenditure on the plant.

Comparison of actual railway spending and physical performance with that proposed in the 3rd and 4th Five-Year Plans is made in Chapter A-8, where post-1980 investment is also discussed.

A-7.5 BALANCE SHEET

The balance sheets for the last three years that have been finalized, 1973 to 1975, are given in Table A-7.7. The presentation has been adjusted slightly from that in the CFS annual

Tabl

CAPITAL
(mill

	1976	1977	1978
Latakia - Aleppo - Al Kamishli			
Land Acquisition	0.50	0.01	11.03
Stations, Workshops, etc.	14.56	24.21	24.66
Headquarters Office Building		4.21	1.70
Russian Materials	-	5.38	0.76
Track Laying	4.18	4.19	5.56
Signals, Telecommunications, and Electricity	1.75	1.70	3.39
Sleepers and Ballast	2.86	3.86	8.75
Fuel Reservoirs and Fuel	0.68	-	-
Equipment and Machinery	11.41	0.33	-
Staff, Office, and Other Items	9.27	8.42	1.13
Total	45.21	52.31	56.98
Tartous - Akkari			
Land Acquisition	0.20	0.10	1.06
Buildings, Structures	1.20	0.89	-
Russian Materials	-	-	-
Track Laying	0.36	-	0.79
Earth Works	-	-	-
Office Furniture	-	-	0.25
Signalling, Telecommunications, and Electricity	0.05	-	-
Total	1.81	0.99	2.10
Rolling Stock			
Locomotives		70.23	6.76
Wagons	46.54	0.44	61.49
Coaches		-	-
Others		-	0.99
Total	46.54	70.67	69.24

Table A-7.6 (continued)

CAPITAL EXPENDITURE
(million SP)

	1976	1977	1978
Akkari - Homs - Damascus			
Land Acquisition	0.48	0.45	0.13
Assembly Center and Crushing Plant	-	1.33	-
Buildings and Production Centers	2.47	0.94	8.92
Concrete and Earthworks	14.45	22.40	33.40
Russian Materials	-	7.26	12.84
Track Laying	0.31	1.37	3.52
Signalling, Telecomm., and Electricity	0.72	1.73	0.12
Sleepers and Ballast	0.71	4.17	4.99
Oils and Fuels	0.60	-	-
Equipment and Machinery	12.00	0.08	3.45
Staff, Offices, and Other Items	9.55	13.22	0.54
Total	41.29	52.95	67.91
Mhine - Tadmur			
Concrete and Earthworks	18.00	13.25	26.24
Buildings and Production Centers	-	-	2.61
Russian Materials	1.02	0.78	11.95
Staff, Offices, and Other Items	6.98	3.14	-
Total	26.00	17.17	40.80
Aleppo - Hama - Homs			
Land Acquisition	-	-	1.03
Concrete and Earthworks	-	0.42	11.71
Russian Materials	-	0.09	1.33
Sleepers and Track Laying	-	-	2.71
Equipment and Machinery	-	-	-
Staff, Offices, and Other Items	-	3.80	0.01
Design	-	-	-
Total	-	4.31	16.79
Deir Ez Zor - Albu Kamal			
Total	0.30	-	-

Table A-7.6 (continued)

CAPITAL EXPENDITURE

	1976	1977	1978
Tadmur - Deir Ez Zor			
Total	0.55	-	-
Lattakia - Tartous			
Total	0.23	-	-
Grand Total	161.93	198.40	253.82

Source: CFS - Finance and Expenditures.

Table A-7.7

BALANCE SHEET END OF YEAR

(million SP)

Assets	1973	1974	1975
Current Assets			
Accounts Receivable			
TSLI Railways	8.62	7.74	4.70
European Railways	1.66	3.26	1.25
Others	2.99	4.02	2.86
Subtotal	13.27	15.02	8.81
Payment Orders Receivable	18.85	25.62	35.87
Cash	0.35	0.18	0.46
Bank Accounts	4.23	9.83	14.42
Other Accounts	0.87	1.27	2.07
Total Current Assets	37.57	51.92	61.63
Fixed Assets (Additions Since 1948)			
Land, Building, Track and Equipment	3.35	3.39	3.39
Locomotives	3.92	3.92	3.92

Liabilities and Net Worth	1973	1974	1975
Current Liabilities			
Accounts Receivable			
TSLI Railways	5.22	6.88	6.97
European Railways	1.66	2.71	1.09
Government	3.21	6.07	7.22
General Establishments	6.11	4.84	4.95
Government Agencies	5.48	5.63	4.98
Others	0.17	0.33	0.38
Subtotal	21.85	26.46	25.59
Payment Orders Payable	2.37	3.28	2.90
Advances from Ministry of Finance	7.63	7.63	7.63
Advances	2.35	2.35	2.35
Suspense Account	7.43	7.82	8.40
Others	0.10	0.18	0.59
Total Current Liabilities	41.73	47.72	47.76
Capital and Net Worth			
Government Grants from July 1948	2.05	2.05	2.05
Government Capital Grant Jan. 1956	0.74	0.74	0.74

Table A-7.7 (Continued)

BALANCE SHEET END OF YEAR

(million SP)

Fixed Assets (Contd.)	1973	1974	1975
Coaches	5.11	5.11	5.11
Wagons	3.53	3.53	3.53
Railcars	0.10	0.12	0.12
Others	1.44	1.63	1.65
Subtotal	17.45	17.70	17.72
Materials and Spare Parts in Store			
Aleppo Central Store	5.34	5.72	10.78
Other Stores	3.27	6.35	4.15
Subtotal	8.61	12.07	14.93
Total Fixed Assets	26.06	29.77	32.65
Total Assets	63.63	81.69	94.28

Capital and Net Worth (Contd.)	1973	1974	1975
Surplus 1948-56 Northern Lines	7.98	7.98	7.98
Funds for Imported Equipment	9.29	9.52	9.52
Reserves	3.81	15.65	28.52
Operating Surpluses 1968/72/73	6.93	6.93	6.93
Less Operating Deficits 1966/67/69/70/71	-8.90	-8.90	-8.90
Total Capital and Net Worth	21.90	33.97	46.84
Total Liabilities and Net Worth	63.63	81.69	94.28

Source: CFS, Finance.

accounts, with cumulative operating surpluses less operating deficits transferred from the assets to the liabilities side of the balance sheet to give a liabilities and net worth position, in accordance with generally accepted accounting principles.

The balance sheet at end-1975 is of little relevance to the true capital account position, with only a very minor portion of the major expenditures incurred by that time entered into the books as fixed assets. Fixed asset expenditure since 1948 is shown as SP 17.7 million (virtually unchanged since 1973); whereas Table A-7.5 shows actual expenditures of SP 505 million for the 1971 to 1975 period alone, at least the rolling stock component of this (SP 61.7 million) should have been entered by end-1975. Operating surpluses for 1974 and 1975 are shown as additions to reserves and are responsible for an increase in capital and net worth of SP 24.9 million between 1973 and 1975.

Current assets rose from SP 37.6 million at end-1973 to SP 61.6 million at end-1975, the main changes being in payment orders receivable and in bank deposits. Current liabilities rose from SP 41.7 million to SP 47.8 million. The only other significant change in the balance sheet over the period was an increase of SP 6.3 million in materials and spare parts in store, mainly at the central stores in Aleppo. The total value of stores at end-1975 was SP 14.9 million, valued at acquisition cost.

The balance sheets, as presented for 1973 to 1975, show a positive position, with a major improvement in the ratio of current assets to current liabilities and in increase in stores, both financed by the operating surpluses of 1974 and 1975. Total assets rise from SP 63.6 million to SP 94.3 million over the period. The real position is quite different. If line expenditures had been entered at the date of opening a section to traffic, by 1975 the Akkari-Tartous and Lattakia-Al Hassakeh lines would have been capitalized, and total assets of perhaps SP 800 million rather than SP 94 million would result, with a corresponding increase in liabilities to the Government. The sufficiency of the operating surpluses, when set against this real asset base, is less marked.

It is important that the annual accounts for years 1976 to 1979 be produced as quickly as possible, with expenditures entered into the books at the time the assets enter revenue-earning service. Equally important is the need for depreciation accounting. Without this, the real profit and loss position is unknown. At least a nominal depreciation account should be constructed for all assets that have been acquired since 1948, written down as appropriate on the basis of generally accepted asset lives for railway way and structures and rolling stock.

The cumulative net underprovision to date in the depreciation account and the annual provision appropriate for the present system would then be apparent. The Finance Department, which is already burdened with the changeover to the Unified Accounting System, will require strengthening as well as external assistance to bring the accounts up to date and to set up a depreciation accounting system.

A-7.6 CASH FLOW

In Table A-7.8 cash flow for years 1973 to 1980 have been constructed. The table notes the assumptions used; in particular, the 1980 revenue and expenditure figures are Consultants' order-of-magnitude estimates, as is capital expenditure for 1979. The operating account, after significant surpluses in 1974 and 1975, went into deficit in 1977 and has remained so since. In 1978 the closure of the Iraqi border resulted in a major deficit of SP 30 million. In 1979 a reduction in the deficit to SP 10 million is estimated to have taken place. For 1980 the deficit is projected by the Consultants to be SP 41 million, again with the closure of the Iraqi border having an important effect on revenue. The operating account cash flow surpluses and deficits are quite minor compared to the investment outlays. Adding capital expenditure produces cash flow deficits ranging from SP 88 million in 1975 to a projected SP 341 million in 1980. The cumulative deficit from 1973 to 1980 totals SP 1,424 million, excluding any interest charges. This deficit compares with a total operating revenue for the period of SP 386 million.

It is to be noted that the injection of funds into the railway system contains a significant non-Syrian element in the form of both direct foreign aid and soft loans for the purchase of rolling stock. The immediate cash flow effect on the national economy is less onerous than that shown in Table A-7.8.

Table A-7.8

CASH FLOW

(million SP)

Item	1973	1974	1975	1976	1977	1978	1979	1980
Operating Revenues[1]	23.2	36.7	43.0	54.7	54.9	34.3	63.7	75.0
Operating Expenditure[2]	19.9	24.8	29.9	51.8	61.0	64.6	74.1	115.9
Operating Surplus	3.3	11.9	13.1	2.9	-6.1	-30.3	-10.4	-40.9
Capital Expenditure[3]	101.0	101.0	101.0	161.9	198.4	253.8	150.0	300.0
Cash Flow Deficit	97.7	89.1	87.9	159.0	204.5	284.1	160.4	340.9
Cumulative Cash Flow Deficit	97.7	186.8	274.7	433.7	638.2	922.3	1,082.7	1,423.6

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1 1979/1980 Consultants' estimates.

2 1976 to 1979 budgets, 1980 budget adjusted for February salary increase.

3 1973 to 1975 average of 1971 to 1975 years. 1979/1980 Consultants' estimates.

CHAPTER A-8

PLANS AND POLICY

Chapter A-8

PLANS AND POLICY

A-8.1 GENERAL

CFS is in the midst of a major expansion and modernization of its network, as described in Sections A-3.1 and A-5.2. In addition to new and reconstructed lines, signalling and telecommunications equipment is being installed, a number of light and heavy maintenance facilities are under construction, and an ambitious rolling stock acquisition program is planned. Much has already been accomplished, following capital expenditure of SP 1,120 million from 1971 to 1978 and further large outlays in 1979 and 1980, but much needs to be done if a basic 1,900 route kilometer network serving the main transport corridors is to be complete by 1985. Investment by project in the 3rd and 4th Five-Year Plans is discussed in Section A-7.4. No details of the railway's proposals for the 5th Plan, 1981 to 1985, were made available to the Consultants. Virtually all the capital expenditure in the plan period is expected to be on completing projects in hand, or under negotiations, together with the rolling stock required for them. With the exception of the lines north of Aleppo and the section from Al Kamishli to Ya'roubia, no major portion of the system is out of the construction phase. The Lattakia-Aleppo-Al Kamishli line is in full operation, but even on this route, considerable finishing works are in progress and the signalling system is only working in parts. The maintenance facilities and marshalling yard at Jibrine will not be in full use for some time to come.

Investment priorities in the short term are clearcut: to complete line projects in hand as expeditiously as possible, to insure that associated signalling and maintenance facilities are brought into operation concurrently, and to obtain sufficient rolling stock to carry the additional traffic efficiently. How much traffic that will be is explored in the following section.

A-8.2 TRAFFIC FORECAST

The railway is potentially in competition with other modes of transport for all its freight and passenger traffic. Some traffic, such as transit freight and phosphates in bulk, are virtually captive to CFS in so far as extremely inefficient operation would be required before it would affect the amount of traffic on offer; but for the remainder, rail is in the market with trucks, pipelines, buses, taxis, private cars, and to a limited extent, aircraft. Choice of mode and the volume of rail traffic on each route thus ultimately depends on the relative inter-modal tariffs and the quantity and quality

of service offered. The division of traffic between the modes (the modal split) is influenced indirectly by Government policy to a large degree; tariffs are regulated, as are public sector salaries, fuel prices, and much of the investment in the transport sector. With tariffs and service quality both heavily influenced by the Government, the modal split will be optimal from an economic point of view if Government policy is neutral between the modes. With transport so much in the political arena and a mix of public and private sector organizations involved, such a result is unlikely in practice, and indeed, it has not been achieved in any of the most developed countries. The existing and future modal splits will therefore result from a mixture of economic, political, and social factors, and the traffic forecast and consequent development plans have to recognize that fact.

The forecasting of railway traffic involves three steps: projection of the future total transport market, definition of the railway network, and estimation of the rail share of each movement. A single projection of the transport market has been made, as described in Volume II. This is a simplification in that the supply:demand interaction is taken as given, whereas in fact, the provision (or lack) of additional links or services generates (or fails to generate) new traffic, particularly passenger and transit freight. Although this can be a critical factor on a particular link, for the system as a whole the network and service assumptions will have only a marginal effect on total traffic. An important assumption in the traffic forecast is that passenger tariffs will increase in real terms. It is probable that by the 1990s, world energy shortages will force a sharp reversal of the current Government policy of subsidizing fuel oil prices, and eventual rationing of the fuel market is a distinct possibility. With tariffs currently very low, real increases are desirable and probably inevitable.

The railway network in operation in 1985 is assumed to include the new and reconstructed sections of the Damascus-Aleppo line and the Deir Ez Zor-Albu Kamal line. For 2000, the Lattakia-Tartous line and a standard gauge from Damascus to Amman are assumed to be in operation. The combined CFS and CFH system is treated as a single network from 1986 onwards.

Estimation of future rail market shares is exceptionally difficult given the limited operating experience with the existing new lines and the coming into service of such major routes as Homs to Damascus and the regauged Damascus to Amman line.

The Consultants' passenger modal split methodology is described in detail in Volume VII. Basically, parameters are derived from existing experience to relate the rail share of traffic between

each zonal-pair to the ratio of the tariff and the travel times between the rail and bus modes. Traffic by private car and by pick-up was assumed not to be a significant market for rail competition. The resultant modal split equation was determined to be for each OD pair:

$$\frac{\text{Public transport volume - rail volume}}{\text{Rail volume}} = 0.433\ 1.43x\ e0.76y$$

Where: x = rail tariff/bus tariff

y = rail time/bus time

This equation implies that given equal tariffs and travel times, the rail share of public transport journeys would be only 21 percent. The relatively low share is not unreasonable as an average because for the shorter journeys, which predominate, the much higher frequency of bus service is a major factor. For longer journeys the equation tends to underestimate the rail share. To allow for this downward bias no modal transfer penalty was added to the rail times and, because many rail journeys actually involve a separate trip to or from the station, this is a compensating favorable factor.

For the range of travel time and tariff ratios, that is, between 0.5 and 1.5 for relative tariffs and 0.3 and 1.5 for relative travel times, the rail share varies between a high of 48 percent and a low of 8 percent.

The tariff ratios for 1985 and 2000 between rail and bus were calculated on two bases: for case A1 it was assumed that both sets of fares would be increased by 2 percent per annum in real terms from assumed 1980 base levels; for case B2 it was assumed that for each mode tariffs in 2000 would be equal to marginal cost. Because the bus tariff in 1980 covers only 35 percent of marginal cost, whereas the rail tariff represents 53 percent, there is a relatively greater increase in bus tariffs and consequently rather higher rail shares in case B2. To reach marginal costs by 2000 the rail tariff would have to increase by 3.1 percent annually from 1980 and the bus tariff by 5.1 percent annually. The marginal cost assumption in case B2 reduces total travel compared with case A1 by 12 percent in 2000, but the higher rail share more than compensates for this to produce 2 percent more rail passengers in case B2 than in case A1.

The modal split equation was applied to all zone-to-zone flows to produce the railway flow patterns. The station-to-station flows are a combination of many zonal-pair flows. In Table A-8.1 examples of the rail flows are given between zones, not between stations, for 1985 and in Table A-8.2 for cases A1 and B2 in 2000.

Table A-8.1

PASSENGER TRAFFIC PROJECTION, 1985

(000 Passengers)

Zonal Pair Nos.	Rail Distance Kms	Location	Railway Traffic
1-22	207	Damascus-Homs	384
1-27	264	Damascus-Hama	280
1-42	404	Damascus-Aleppo	747
1-29	309	Damascus-Tartous	125
22-29	102	Homs-Tartous	261
22-42	197	Homs-Aleppo	368
27-42	140	Hama-Aleppo	497
33-42	205	Lattakia-Aleppo	761
42-51	204	Aleppo-Al Raqqa	823
42-54	342	Aleppo-Deir Ez Zor	344
42-55	475	Aleppo-Al Hassakeh	208
42-57	548	Aleppo-Al Kamishli	208
All Others			2,357
		Total	7,363

Source: Consultants' estimates.

Table A-8.2

PASSENGER TRAFFIC PROJECTION, 2000
(000 Passengers)

Zonal Pair			Railway Traffic	
Nos.	Rail Distance Kms	Location	Case A1	Case B2
1-13	115	Damascus-Dera'a	2259	2520
1-22	207	Damascus-Homs	1217	1410
1-27	264	Damascus-Hama	574	629
1-29	309	Damascus-Tartous	268	302
1-42	404	Damascus-Aleppo	1700	1797
22-29	102	Homs-Tartous	584	600
22-42	197	Homs-Aleppo	870	960
27-42	140	Hama-Aleppo	1073	1187
33-42	205	Lattakia-Aleppo	1633	2016
42-51	204	Aleppo-Al Raqqa	1839	2032
42-54	342	Aleppo-Deir Ez Zor	822	889
42-55	475	Al Hassakeh	469	512
42-57	548	Al Kamishli	496	511
All Others			10,296	9,235
		Total	24,100	24,600

Source: Consultants' estimates.

Total railway traffic in 1985 is forecast to be 7.4 million passengers and 1.95 billion passenger kilometers. In 2000, traffic levels for A1 and B2 are 24.1 and 24.6 million passengers respectively, and 4.9 and 5.0 billion passenger kilometers. By 2000 the average journey length is nearly one-fourth below that of 1979.

The Consultants' forecast of freight transport by commodity, given in Volume II, has been treated for analysis as five commodity groups and transit traffic. The classification of major commodities into these groups is given in Table A-8.3. In 1979, about 56 percent of railway tonnage, excluding rail construction materials, was of group 1, 2, or 3 commodities, 24 percent was of group 4, 9 percent was of group 5, and 11 percent was transit traffic. The share of bulk traffic will rise with the commencement of phosphate movements in 1980 and with a large growth projected for other bulk commodities. The CFS freight traffic plan for 1980, presented in Table A-5.12, gives groups 1, 2, and 3 a share of a little over 68 percent of tonnage and 71 percent of ton kilometerage.

Table A-8.3

COMMODITY CLASSIFICATION

GROUP	COMMODITIES
1	Phosphate, petroleum products
2	Bulk building materials such as sand and gravel
3	Cement, cereals, other bulk goods
4	Intermediate value items - iron and steel, fertilizer, processed food stuffs, farm products, sugar beet, non-bulk building materials
5	High value goods - manufactured products, capital equipment, live animals, meat

Rail is naturally more competitive for the bulk commodities and over longer distances. Group 5 traffic is likely in the long term to be carried in volume by rail only in containers. While high shares of bulk movements are virtually certain between rail-connected points, the share of group 4 traffic that will be attracted is highly sensitive to the relative price and service qualities of road transport.

In Table A-8.4 the projected rail traffic for 1985 is given by group and by origin-destination. In general, the rail share has been taken to rise with distance. Limiting shares on any one origin-destination (the figures are for both directions added together) of 70 percent for groups 1 and 3, 45 percent for group 4, 35 percent for group 2, and 15 percent for group 5 are used. For phosphate movements, fuel oil from Homs to Mhardeh, and transit traffic, specific volumes have been projected based on discussions with CFS officials and on other sources. The total traffic forecast for 1985 is 6.2 million tons, 2.1 billion ton kilometers. Of the tonnage, 75 percent is of bulk commodities groups 1, 2, and 3; 12 percent is of group 4; 2 percent is of group 5; and 11 percent is transit traffic. In comparing the 1985 forecast with the total of 1.9 million tons carried in 1979, the breakdown of the increase is as follows:

Component	Tons (million)
1979 Traffic	1.91
Less Railway Construction Materials	0.44
Base Traffic 1979	1.47
Natural Growth in Base Traffic 1979 to 1985	0.50
Phosphates to Homs/Tartous	1.53
Fuel Oil to Mhardeh	0.40
Increase in Transit Traffic	0.52
New Traffic to Damascus	1.18
Other New Traffic	0.63
Total	6.23

The projection thus implies the development of some new traffic by rail, apart from that due to the opening of the line to Damascus, but far less new traffic than such a large overall growth would suggest at first sight. Rail service to Tartous and Homs has been badly affected recently by line construction and reconstruction work, but given the much improved service to be expected by 1985 and proper attention to marketing, the forecast is considered attainable.

A projection of freight carryings in 2000 has been made with medium and high rail share alternatives being derived. Case A1, the medium projection, is in general lower than the high case

B2 by 25 percent for group 1, 20 percent for groups 2 and 3, 30 percent for group 4, and 50 percent for group 5 commodities. The phosphate flows, the fuel oil flow from Homs to Mhardeh, and transit traffic are the same in both cases. The traffic projections for case B2 are given in Table A-8.5. Transit traffic growth is projected explicitly, as described in Volume II, Chapter 5. An increase in rail shares is forecast between 1985 and 2000. The scope for increases in share is far more limited than that for passenger traffic because of the shares already obtaining in 1985.

The addition of a standard gauge Hijaz line is assumed to result in transit traffic of 0.8 million tons between Tartous and Jordan/Saudi Arabia. Fuel oil movement between Homs and Al Raqqa is considered to be by pipeline for 2000 with onward distribution from Al Raqqa to Deir Ez Zor, Al Hassakeh, and Al Kamishli by rail.

The case A1 projection for 2000 results in a total tonnage of 14.1 million, 5.14 billion ton kilometers. Of the tonnage, 69 percent is group 2 or 3 commodities, 11 percent is group 4, 2 percent is group 5, and 18 percent is transit traffic. With case B2, traffic is 16.5 million tons, 6.19 billion ton kilometers.

A-8.3 3RD AND 4TH FIVE-YEAR PLANS

Before considering investment for the 5th and subsequent Five-Year Plan periods, it is instructive to compare actual performance in the 3rd and 4th Plans with the proposed investments. In Table A-8.6, outlays in each plan by project are set against those originally projected. For the 4th Plan, actual expenditures are included for 1976 to 1978, plus budgeted outlays for 1979 and 1980. Alternatively, the significantly lower outturn expenditures projected by the Consultants for 1979 and 1980, based on actual spending to October 1979, are added. The major problem in making a comparison is that the plan expenditures are at the price levels ruling when the plans were prepared (1970 and 1975), whereas the outturn investments include subsequent inflation. For the 4th Plan, as a conservative estimate, 25 percent would need to be added to 1975 price levels to make them comparable with outturn prices. On this basis, plan expenditure on non-reserve projects becomes SP 1,300 million, about 6 percent above the Consultants' estimated outturn of SP 1,224 million. Within projects, the variation is far greater. Expenditure on the Lattakia-Al Kamishli line exceeded the plan in real terms by possibly 60 percent, while Aleppo-Homs expenditure fell short by about 50 percent, and Mhine-Tadmur spending by 30 percent. Investment in rolling stock and on the Akkari-Damascus line was close to that planned.

Table A-8.4

FREIGHT TRAFFIC PROJECTION, 1985

(000 tons)

Route	Commodity Group 1	2	3	4	5	Transit	Total
Lattakia-Homs	110	-	-	18	-	-	128
Lattakia-Aleppo	77	12	-	78	24	-	191
Lattakia-Damascus	-	23	-	74	33	-	130
Lattakia-Al Raqqa	20	-	-	-	-	-	20
Lattakia-Deir Ez Zor	11	-	-	-	-	-	11
Lattakia-Al Hassakeh	14	-	-	-	-	-	14
Lattakia-Al Kamishli	-	14	-	-	-	-	14
Lattakia-Iraq	-	-	-	-	-	250	250
Tartous-Damascus	-	-	449	66	25	-	540
Tartous-Homs	82	12	-	27	-	-	121
Tartous-Hama	-	12	152	22	-	-	186
Tartous-Aleppo	-	-	103	59	14	-	176
Tartous-Deir Ez Zor	-	-	12	-	-	-	12
Tartous-Iraq	-	-	-	-	-	30	30
Tartous-Phosphate Mines	930	-	-	-	-	-	930
Homs-Damascus	338	25	-	74	-	-	437
Homs-Hama	24	36	-	11	-	-	71
Homs-Aleppo	255	19	-	56	-	-	330
Homs-Al Raqqa	524	10	29	-	-	-	563
Homs-Deir Ez Zor	32	-	-	-	-	-	32
Homs-Al Hassakeh	42	-	-	-	-	-	42
Homs-Al Kamishli	31	-	13	-	-	-	44
Homs-Phosphate Mines	600	-	-	-	-	-	600

Table A-8.4 (continued)

FREIGHT TRAFFIC PROJECTION, 1985

(000 tons)

Route	Commodity Group 1	2	3	4	5	Transit	Total
Homs-Mhardeh	400	-	-	-	-	-	400
Aleppo-Damascus	-	-	-	35	-	-	35
Aleppo-Hama	-	-	-	20	-	-	20
Aleppo-Al Raqqa	-	-	31	24	-	-	55
Aleppo-Deir Ez Zor	-	-	26	19	-	-	45
Aleppo-Al Hassakeh	-	-	13	25	-	-	38
Aleppo-Al Kamishli	-	-	31	13	-	-	44
Damascus-Hama	-	26	-	10	-	-	36
Deir Ez Zor-Kamishli	-	12	-	13	-	-	25
Turkey (Midan Ikbis)-Iraq (Albu Kamal)	-	-	-	-	-	250	250
Turkey (Al Kamishli)-Iraq (Ya'roubia)	-	-	-	-	-	150	150
Others	-	51	70	87	50	-	258
Total	3490	252	929	731	146	680	6228

Source: Consultants' estimates.

Note: Individual flows shown only if over 9500 tons.

Table A-8.5

FREIGHT TRAFFIC PROJECTION FOR 2000, CASE B2
(000 tons)

Route	Commodity Group 1	2	3	4	5	Transit	Total
Lattakia-Aleppo	321	53	143	311	67	--	895
Lattakia-Al Raqqa	-	-	12	10	-	--	22
Lattakia-Al Hassakeh	-	-	-	18	-	--	18
Lattakia-Iraq	-	-	-	-	-	800	800
Lattakia-Damascus	-	40	82	148	128	--	398
Lattakia-Homs	265	10	39	20	15	--	349
Lattakia-Hama	-	-	18	15	-	--	33
Tartous-Damascus	-	23	532	127	108	--	790
Tartous-Homs	213	-	260	80	14	--	567
Tartous-Hama	-	20	20	37	-	--	77
Tartous-Aleppo	-	22	765	120	41	--	948
Tartous-Al Raqqa	-	-	-	-	16	--	16
Tartous-Iraq	-	-	-	-	-	200	200
Tartous-Jordan	-	-	-	-	-	800	800
Tartous-Phosphate Mines	600	-	-	-	-	--	600
Homs-Damascus	705	76	187	149	26	--	1143
Homs-Aleppo	1261	137	341	99	-	--	1838
Al Raqqa-Deir Ez Zor	104	-	-	-	-	--	104
Al Raqqa-Al Hassakeh	153	-	18	20	-	--	191
Al Raqqa-Al Kamishli	164	-	-	-	-	--	164
Homs-Al Raqqa	19	-	32	23	-	--	74
Homs-Deir Ez Zor	-	14	49	10	-	--	73
Homs-Al Hassakeh	18	-	16	26	-	--	60
Homs-Al Kamishli	83	-	61	-	-	--	144
Homs-Phosphate Mines	2400	-	-	-	-	--	2400
Homs-Hama	107	106	23	-	-	--	236
Homs-Mhardeh	500	-	-	-	-	--	500
Homs-Jordan	-	-	-	14	-	--	14

Table A-8.5 (Continued)

FREIGHT TRAFFIC PROJECTION FOR 2000, CASE B2
(000 Tons)

Route	Commodity Group 1	2	3	4	5	Transit	Total
Aleppo-Jordan	-	-	-	39	27	-	66
Aleppo-Damascus	-	57	105	117	82	-	361
Aleppo-Hama	-	12	27	40	-	-	79
Aleppo-Al Raqqa	-	-	182	147	-	-	329
Aleppo-Deir Ez Zor	-	18	108	64	-	-	190
Aleppo-Al Hassakeh	-	-	123	99	-	-	222
Aleppo-Al Kamashli	-	29	225	40	32	-	326
Damascus-Jordan	-	-	-	94	-	-	94
Damascus-Hama	-	18	44	29	19	-	110
Damascus-Al Hassakeh	-	-	-	65	-	-	65
Damascus-Al Raqqa	-	-	-	22	-	-	22
Damascus-Deir Ez Zor	-	-	-	34	-	-	34
Hama-Al Kamishli	-	-	27	-	-	-	27
Hama-Deir Ez Zor	-	-	-	11	-	-	11
Deir Ez Zor-Al Hassakeh	-	15	34	16	-	-	65
Deir Ez Zor-Al Kamishli	-	18	18	40	-	-	76
Turkey(Midan Ikbis)-Iraq (Albu Kamal)	-	-	-	-	-	500	500
Turkey (Al Kamishli)-Iraq (Ya' roubia)	-	-	-	-	-	250	250
Others	-	12	54	57	69	-	192
Total	6913	680	3545	2141	644	2550	16473

Source: Consultants' estimates

Note: Individual flows shown only if over 9,500 tons.

Table A-8.6

3RD AND 4TH FIVE-YEAR PLAN INVESTMENTS

(million SP)

Project	3rd FYP 1971-75		4th FYP 1976-80			Route Kms 3rd FYP		Route Kms 4th FYP	
	Plan	Actual[1]	Plan	A[1]	B	Plan	Actual[2]	Plan	Actual[2]
1. Plan Projects									
Lattakia-Aleppo-Al Kamishli	291	332	130	275	260	-	350	-	81
Akkari-Homs-Damascus	17	61	299	445	350	-	-	-	200
Tartous-Akkari	2	44	5	9	9	-	-	-	-
Deir Ez Zor-Albu Kamal	2	-	1	-	-	-	-	-	-
Others	11	-	2	2	2	-	-	-	-
Mhine-Tadmur	-	6	166	177	145	-	-	-	115
Aleppo-Hama-Homs	-	-	190	180	120	-	-	-	60
Rolling Stock	-	62	252	338	338	-	-	-	-
Total	323	505	1,045	1,426	1,224	-	350	-	456
2. Reserve Projects									
Deir Ez Zor-Albu Kamal	-	-	169	68	5	-	-	-	-
Lattakia-Tartous	-	-	109	-	-	-	-	-	-
Hama-Mhardeh[3]	-	-	22	22	22	-	-	-	22
Total	323	505	1,345	1,516	1,251	500	350	580	478

1 For details see Tables A-7.5 and A-7.6.

2 For details see Table A-5.1.

3 Financed by Ministry of Petroleum.

Notes: FYP = Five-Year Plan.
A = 1976 to 1978 actual, plus 1979/80 budget expenditures.
B = Consultants' estimates of outturn.

A comparison of physical achievements with the plan is difficult because it merely states that 580 kilometers of line will be installed. Lines opened to traffic during the period are forecast by the Consultants to total 478 kilometers, 82 percent of the projected figure. The lengths of these lines are given in Table A-8.6. Considerable work will have been performed on a further 270 kilometers of line, however. It can be concluded that new construction did fall behind that scheduled but mainly as a result of greater-than-anticipated investment on the Lattakia-Al Kamishli line, which itself was probably a carry-over from work expected to have been completed in the 3rd Plan. As a whole, outturn expenditure in the 3rd Plan exceeded budget, in real terms, by about 35 percent (assuming an inflation adjustment for that period of 15 percent). This overrun itself was probably a result of a carry-over of work from the 2nd Plan period on both the Lattakia-Al Kamishli and Tartous-Akkari projects. Completion of 350 kilometers of route was accomplished in the 3rd Plan, compared with an objective of 500 kilometers.

A considerable carry-over of work appears likely from the 4th Plan to the 5th. The discussion in Section A-7.4 concludes that capital expenditure on the order of SP 300 million is likely in 1980, compared with a budgeted SP 482 million. It is important that this overrun be taken into account in finalizing the 5th Plan. It is also vital, with world inflation running at record levels, that the new plan's price base assumptions be clearly stated in order that performance against plan can be properly monitored. As each year's or quarter's results become available, variations from planned expenditures should be divided into those as a result of subsequent inflation and true volume of work changes. For railway expenditures, this division could be incorporated quite simply into the existing detailed analysis of physical accomplishments against plan, prepared quarterly by the CFS Planning Directorate. The railway's reporting procedures for physical accomplishment and expenditure on capital works appear to be first class.

A-8.4 5TH FIVE-YEAR PLAN AND INVESTMENT TO 2000

Previous five-year plans have laid down only very general objectives, and these in terms of purely physical accomplishments. The have lacked two important items: target dates for bringing sections of new line into revenue-earning service, and the traffic forecasts for such lines. Preparation of the plan is the only occasion on which a look beyond one year ahead is taken, and it should therefore be used for a comprehensive review of the current situation and medium-term prospects. In drafting its proposed investments, CFS (along with other transport organizations in their drafts) should be required to submit the traffic projections and technical efficiency assumptions on which the plan is based. For rolling stock investment,

for instance, these would include rolling stock diagrams and an outline future timetable. Without such supporting data, a proposal cannot be judged or its success or failure monitored. In the future, the proportion of expenditure on rolling stock will rise and with it the importance of such supporting analyses.

A plan is thus not complete unless it has two components: a set of physical tasks to be accomplished over a prescribed period for an agreed level of expenditure, and the attainment of a set level of traffic and operating efficiency as a result of that investment. Failure to achieve the latter can be more expensive in the long run than a delay in completing a construction project. The Consultants' assessment of rolling stock investment, for instance, therefore starts with the traffic projections and converts these into units required by assuming train sizes, load factors, and performance of a level felt to be attainable by CFS in the future. The longer-term requirement for line capacity improvements is similarly tied to the traffic projections, the critical factor being the number of trains per section.

Expenditures from 1986 to 2000 have been determined consistent with the traffic levels derived in Section A-8.2. All capital expenditures are given at average 1980 price levels, those used throughout the study for inter-modal comparison purposes. (Average 1980 prices mean average prices for delivery or construction in that year, not a price quoted for orders placed in 1980 for future delivery, unless such a price contains a full escalation clause to cover inflation during the construction period.)

In order to determine the number of trains by line section, the passenger and freight flows given in Tables A-8.1, A-8.2, A-8.4, and A-8.5 were aggregated for each section and converted into trains using the following average loads:

	1979 Actual	1985	2000
Passengers No.	3001	400	600
Freight Net Tons			
Groups 1,2, and 3 Commodities		500	600
Group 4 Commodities	2502	250	350
Group 5 Commodities		150	250
Phosphates	-	820	820

1 Locomotive-hauled services.
2 Ordinary freight services.

Trains per line have been rounded to the nearest even number per day. The average load for freight trains, other than the phosphate trains, works out at a little over 400 net tons for 1985 with transit taken as group 4 and about 500 tons for the medium and high cases in 2000. The average load of 250 tons in 1979 was low considering the high proportion of bulk traffic carried. With further growth in such traffic by 1985, the 400-ton average should be achievable. By 2000 the average load could well exceed 500 tons, but with a large imbalance in traffic flows still likely, such a level is used as the central assumption.

For passenger trains, the opening of intercity services between Damascus and Aleppo should have a marked effect on average loads; a rise from 300 in 1979 to 400 in 1985 is therefore used. In 2000 the volume on the major routes would be such that longer trains would be inevitable, with a consequent rise in average loads. The assumption of 600 passengers per train represents an 80 percent load factor for a 12-coach train composed of a baggage/air-conditioning equipment car, a restaurant car, and two first-class and eight second-class coaches.

The results of the analysis are given in Table A-8.7, which shows the number of daily passenger and freight trains (disregarding the small number of railcar services) per section and overall annual train kilometers. On the Damascus-Aleppo and Aleppo-Al Raqqa sections, volumes are already large by 1985, with 30 daily trains over the Mhine-Homs section and 26 on the Jibrine-Al Raqqa section. Such loadings, although within the capacity of the single-track lines, as discussed in Section A-3.5, require a high standard of operating discipline if punctuality is to be maintained. With 47 percent of the 9.8 million train kilometers in 1985 by passenger trains, precise timetabling will be required to compensate for the difference between passenger and freight train operating speeds.

In the Consultants' opinion, the Damascus-Aleppo line frequency and traffic mix justifies the provision of CTC at the outset, with control from Aleppo and sub-controllers at Homs and Damascus. A contract with an East German company for the provision of signalling and telecommunications on this line, among others, was ratified in May 1980 and immediate consideration should be given to amending the specifications to include a modern CTC system as discussed in Section A-4.6. With present-day technology, a single-line CTC system is little more complex than a locally controlled system, and installation at the same time as the basic signalling system will not add dramatically to capital costs.

To determine rolling stock requirements, the annual train kilometers in Table A-8.7 have been converted into units using the following average annual kilometerages and numbers of vehicle kilometers per train kilometer:

Table A-8.7.

TRAINS PER LINE SECTION, 1985/2000

End Node[1] Numbers	Section CFS	1985 P[2]	1985 F	1985 Total	2000 Case A1 P[2]	2000 Case A1 F	2000 Case A1 Total	2000 Case B2 P[2]	2000 Case B2 F	2000 Case B2 Total
108-101	Damascus-Mhine	14	10	24	28	20	48	30	26	56
101-88	Mhine-Homs	14	16	30	28	30	58	30	36	66
152-125	Homs-Hama	14	16	30	22	16	38	24	20	44
75-135	Hama-Mhardeh	0	2	2	0	2	2	0	2	2
125-56	Hama-Wadihi	14	14	28	22	12	34	24	16	40
56-55	Wadihi-Ansari	20	18	38	32	28	60	34	36	70
160-52	Ansari-Aleppo	32	4	36	50	4	54	54	4	58
52-45	Aleppo-Midan Ikbis	2	4	6	4	4	8	4	4	8
1-18	Jibrine-Al Raqqa	12	14	26	18	20	38	20	22	42
18-27	Al Raqqa-Deir Ez Zor	8	8	16	12	18	30	12	22	34
154-34	Deir Ez Zor-Al Hassakeh	6	2	8	8	6	14	8	8	16
34-38	Al Hassakeh-Al Kamishli	4	2	6	4	4	8	4	4	8
39-44	Al Kamishli - Ya'roubia	0	2	2	2	2	4	2	2	4
56-68	Wadihi-Lattakia	6	8	14	10	16	26	10	20	30
152-95	Homs-Tartous	4	10	14	10	18	28	12	22	34
101-114	Mhine-Phosphate Mines	0	6	6	0	10	10	0	10	10
155-147	Deir Ez Zor-Albu Kamal	4	6	10	8	12	20	8	12	20
95-68	Tartous-Lattakia	-	-	-	6	16	22	6	18	24
Annual Train Kilometers (million)		4.65	5.15	9.80	8.10	8.87	16.97	8.62	10.51	19.13

Table A-8.7 (Continued)

TRAINS PER LINE SECTION, 1985/2000

End Node[1] Numbers	Section CFH	1985 P[2]	1985 F	1985 Total	2000 Case A1 P[2]	2000 Case A1 F	2000 Case A1 Total	2000 Case B2 P[2]	2000 Case B2 F	2000 Case B2 Total
	Damascus-Dera'a	-	-	-	20	8	28	20	8	28
	Dera'a-Jordanian Border	-	-	-	8	8	16	8	8	16
Annual Train Kilometers (million)		-	-	-	0.88	0.38	1.26	0.88	0.38	1.26

Source: Consultants' estimates.

Notes: 1. See Appendix A-3.1 of the Final Phase I Report.

2. Excluding railcar services.

P = Passenger

F = Freight

Annual Vehicle Kms (000)	1979 Actual	1985	2000
Main-line Locomotives:			
Passenger	55	120	120
Freight		100	100
Coaches/Baggage Cars	1001	120	120
Wagons	16	25	25
Vehicle Kms per Train Km			
Main-Line Locomotives:			
Passenger	1.12	1.05	1.05
Freight		1.20	1.20
Coaches/Baggage Cars	7.1	10.0	12.0
Wagons	17.6	20.0	25.0
Average Loaded Wagon Load Tons2	28.4	40.0	40.0

1 Approximate, due to large delivery of new coaches during year.

2 Allowing for 50 percent empty running, overall average wagon load is half tonnage shown.

The CFS system should by 1985 be ideal for intensive rolling stock utilization, with high passenger and bulk freight volumes over medium distances. With efficient diagramming and maintenance of rolling stock, the annual kilometerages assumed could be achieved by 1985 and easily exceeded by 2000. The major improvements required on 1979 performance are in locomotive utilization and in wagon loadings. These should result automatically from the expansion of the system and the growth in bulk traffic. Phosphate, petroleum products, and cement, for instance, load between 53 and 58 tons per wagon against an assumed overall average of 40 tons for 1985 and 2000.

The requirements for rolling stock in addition to that on order (see Table A-3.4), assuming that all existing and new stock achieves the set efficiencies in use, are given in Table A-8.8. Replacement of existing stock is included in the figures after assumed lives of 25 years for main-line locomotives, 30 years for shunting locomotives and coaches, and 40 years for freight wagons. Because most existing stock is relatively new, replacement does not occur until late in the period and little is necessary before 2000. In total, 30 main-line locomotives, 10 shunting locomotives, and 200 freight wagons attain their assumed working lives by 2000.

Table A-8.8

ROLLING STOCK REQUIREMENTS TO 2000

	1981-85[1]	1986-90	1991-95	1996-2000
CASE A1				
Main-line Locomotives	50	30	50	30
Shunting Locomotives	20	15	15	10
Coaches	300	200	200	100
Wagons	600	1500	1600	2200
CASE B2				
Main-line Locomotives	50	35	60	39
Shunting Locomotives	20	15	15	15
Coaches	300	210	215	118
Wagons	600	1850	2170	2920

Source: Consultants' estimates.

[1]In addition to stock shown as "on order" in Table A-3.4, stock "out to tender" is disregarded.

In the period of the 5th Plan, rolling stock requirements are for 50 main-line locomotives, 300 coaches, and 600 freight wagons. The need for shunting locomotives can only be determined by an analysis of station duties, and throughout Table A-8.8 the numbers are notional, with 20 included for the 5th Plan period. CFS has out to tender an order for 80 locomotives of 3,000 hp and 20 shunting units of 1,000 hp. On the basis of the Consultants' analysis, this order exceeds immediate requirements; it will meet demand up until about 1990. Phasing of the order, with delivery of 50 units in 1982/83 and a further 30 in 1986/87, is therefore recommended.

It may be questioned whether a single type of locomotive is adequate for the future, very different requirements of passenger and freight services. A rather smaller passenger locomotive of approximately 2,200 to 2,500 hp, and a bulk freight locomotive of up to 4,000 hp, which would reduce the need for double heading, might be better suited to the projected demand. Clearly, such a proposal may increase per-unit purchase prices and complicate maintenance, but operating economies and a reduced total fleet requirement could more than compensate. The total cost for rolling stock in the 5th Plan, additional to stock already ordered, which may be charged to the period, is estimated at SP 472 million (at 1980 prices) assuming unit costs of SP 3.7 million for a main-line locomotive, SP 2.3 million for a shunting locomotive, SP 0.58 million per coach, and SP 0.12 million per wagon.

For the period 1986 to 2000, rolling stock requirements - other than for replacement - with the case A1/case B2 traffic projections, are: main-line locomotives 80/104, shunting locomotives 30/35, coaches 500/543, and wagons 5,100/6,940.

In Table A-8.9, the years in which line capacity needs to be increased are given for each section. Capacities are derived in Table A-3.4. A constant growth rate in number of trains per section between 1985 and 2000 is assumed, with the 1985 and 2000 volumes given in Table A-8.7. For case A1 traffic, line capacity would be reached in 1992 on the Mhine-Homs section and two years later, in 1994, on the Damascus-Mhine section. In case B2, the capacity would be reached one year earlier in each instance.

The assumption has been made that the line capacities in Table A-3.5 could be increased by 25 percent before double tracking through the use of intermediate block signalling, lengthening of passing sidings, and the provision of additional stations on critical sections for an investment of 10 percent of the cost of double tracking. This improvement postpones double tracking by about five years so that Damascus-Mhine-Homs is double tracked in the mid to late 1990s. The cost of double tracking is assumed to be SP 1.9 million per kilometer. With case B2

Table A-8.9

LINE CAPACITY IMPROVEMENTS, 1985 TO 2000

Line Section	Case A1		Case B2		Cost Million SP[1]	
	Improve	Double Track	Improve	Double Track	Improve	Double Track
Damascus-Mhine	1993	1997/98	1992	1994/95	26	264
Mhine-Homs	1991	1995/96	1990	1993/94	13	128
Jibrine-Al Raqqa	-	-	1998	-	38	-
Wadihi-Lattakia	-	-	1998	-	35	-
Homs-Tartous	-	-	1997	-	20	-

Source: Consultants' estimates.

Note: Dates shown are construction dates.

[1] At 1980 prices, assuming SP 1.9 million per route kilometer for double tracking and SP 0.19 million for improvement.

traffic, line improvements are also required in the late 1990s on the Jibrine-Al Raqqa, Wadihi-Lattakia, and Homs-Tartous sections.

In Table A-8.10 investment requirements are shown by plan periods to 2000 for cases A1 and B2. New lines/track improvement expenditures are derived in Table A-8.9. In addition to the SP 520 million for 1981-85, construction of a single track standard gauge Hijaz line to the Jordanian border at a cost of SP 4 million per route kilometer for the approximately 130 kilometers is included. SP 310 million in the 1986-90 period is for construction of the Lattakia-Tartous line. This was estimated to cost approximately SP 200 million by RITES at 1975 prices, and a 55 percent uplift has been applied to this cost to adjust to 1980 prices. Investment classified as "others" in the 5th Plan is for the addition of CTC to the signalling installations on the Damascus-Aleppo line. For 1986 to 2000, the others category covers all minor improvement projects and an increase in stocks of materials.

Once major line construction ceases, it will be easier to isolate and control investment spending by project. At present, some projects are being treated as part of new line construction when in fact they should stand on their own. Priority should be given after any essential renewal projects to investments that attract new traffic (such as container handling facilities) or improve operating or manpower efficiency. An adequate inventory of spare parts for rolling stock is particularly important. During the time of consolidation of previous major projects that the 6th and 7th Plan periods will represent, a deliberate emphasis on small investment projects is indicated. Relatively minor expenditures can prove highly productive, and such projects should not be sacrificed for larger, more prestigious investments.

In Table A-8.11 annual capital expenditure is given by project for the 5th Plan, 1981 to 1985. It is impossible for the Consultants to estimate accurately expenditures to completion for the major projects now under construction. Given the considerable uncertainty of progress during 1980 on such projects, the figures in Table A-8.11 must be considered broad orders of magnitude only. CFS expenditure estimates were not made available to the Consultants. Finishing works on the Lattakia-Al Kamishli line have been assumed to continue at a diminishing rate to 1984. For Homs-Damascus and Aleppo-Homs, the lines may be opened in 1983 or 1984, but finishing work is unlikely to be complete by 1985.

The construction schedule for the Deir Ez Zor-Albu Kamal line is most uncertain in the light of the Iraq-Iran war. Although a protocol was drawn up by the Syrian and Iraqi Governments on

31 March 1974 for completion of a crossborder line linking Aleppo and Baghdad by 1980, this protocol has not been ratified. The Iraqi section of line was well into the construction phase before the war. Tenders for the Syrian section have been returned, but being based only on the preliminary design specifications contained in the RITES report, bids were unexpectedly high to cover design uncertainties. A turn-key contract may, in consequence, not be let and a final design study may be performed as the next step. Opening of this line could thus well be delayed beyond 1985.

Total investment projected for CFS in the 5th Five-Year Plan is SP 2,170 million (at 1980 prices). The phasing produces peak spending of SP 490 million in 1981 and 1982, followed by a decline to SP 310 million in 1985. In practice, construction delays may lead to a more even spread of expenditure.

A-8.5 EXPENDITURE FORECAST

The traffic projections developed in Section A-8.2 combined with the cost analysis of Section A-6.2 produce a forecast of operating costs at 1980 price levels. The calculated economic operating costs at 1985 efficiency levels are SP 26.10 per freight train kilometer and SP 21.60 per passenger train kilometer. Applying these to the forecast train kilometers given in Table A-8.7 gives a total operating cost of SP 235 million in 1985. This compares with a budget figure of SP 82 million (equivalent to SP 107 million in 1980 prices) for 1979. Financial costs for the two years, allowing for the subsidized price of fuel oil, are SP 216 million and SP 71 million (equivalent to SP 96 million in 1980 prices), respectively. The latter is the SP 74.1 million shown in Table A-7.4, excluding SP 3.3 million in fees to foreign railway administrations.

A similar calculation has been made for the case A1 and case B2 traffic projections for 2000. In these, movement costs per train kilometer are higher because of the longer trains assumed, but nonmovement costs per train kilometer decline due to higher traffic volumes per track kilometer. Overall costs per train kilometer are identical to those for 1985. If operating efficiency were to improve further beyond 1985, apart from that from longer trains, costs would be lower than calculated. For case A1 the operating cost in 2000 rises to SP 435 million and for case B2 to SP 489 million. From 1986 onwards these costs include those for the standard gauge Hijaz line.

In Appendix A-8.1 operating, rolling stock, and other capital expenditures are presented annually from 1979 to 2020 for cases A1 and B2. The figures for years 2001 to 2020 are given to show the incidence of rolling stock replacement expenditures, assuming that the traffic levels reached in 2000 apply throughout

Table A-8.10

INVESTMENT TO 2000
(million SP)

Case	1981-85[1]	1986-90	1991-95	1996-2000
A1				
Rolling Stock	470	435	520	440
New Lines/Track Improvements	520[2]	310	103	328
Others	20	200	200	200
Total	1010	945	823	968
B2				
Rolling Stock	470	500	632	577
New Lines/Track Improvements	520[2]	323	418	93
Others	20	225	240	250
Total	1010	1048	1290	920

Source: Consultants' estimates.

Note: At 1980 prices.

1 In addition to committed projects. Deir Ez Zor-Albu Kamal assumed to be committed. Total for committed projects SP 1680 million; see Table A-8.11.

2 For construction of standard gauge Hijaz line to Jordanian border.

Table A-8.11

5th FIVE-YEAR PLAN INVESTMENT
(million SP)

	1981	1982	1983	1984	1985
CFS					
Lattakia-Aleppo-Al Kamishli	80	50	30	10	-
Mhine-Tadmur	40	20	10	-	-
Akkari-Homs-Damascus	120	120	100	80	50
Aleppo-Homs	120	150	100	60	20
Deir Ez Zor-Albu Kamal	-	10	100	150	150
Signalling and Telecommunications	50	40	40	-	-
Rolling Stock[1]	80	100	100	100	90
Total CFS	490	490	480	400	310
CFH					
Damascus-Jordanian Border	-	70	150	150	150

Source: Consultants' estimates.

Note: At 1980 price levels

[1] For details see Table A-8.8.

the period. Operating expenditures between 1985 and 2000 have been interpolated at a constant growth rate after allowing for the commencement of Hijaz operations in 1986 and for the loss of petroleum traffic to Al Raqqa from 1996 due to the opening of a Homs-Al Raqqa pipeline. For years 1980 to 1984, the effect of line openings has been taken into account, producing the uneven increases. Rolling stock and other capital costs are as given in Table A-8.10. Line capacity improvement expenditures are included in the year before opening and double tracking costs in the two previous years. The Lattakia-Tartous line is assumed to be constructed from 1986 to 1988, providing continuity of work for the construction teams. Rolling stock deliveries are assumed to be spaced to produce an even spread of expenditures.

A-8.6 FINANCIAL POSITION TO 2000

The financial situation of CFS will improve rapidly if the projected traffic and operating efficiency levels are achieved. In Table A-8.12 the annual surplus/deficit on operating account is derived from 1980 to 2000. The analysis is in 1980 prices throughout, with no allowance made for subsequent inflation. The case B2 traffic volumes are used. Operating expenditures are presented in financial terms, that is, with subsidized fuel oil prices. This reduces costs by about 8 percent from the economic costs shown in Appendix A-8.1.

Revenues are derived by directly applying the approximate average 1980 receipts of 7.0 piasters per ton kilometer to domestic freight traffic and 2.9 piasters per kilometer to passenger traffic. A significant increase in the average length of freight haul is expected over the forecast period, reducing receipts due to the taper in the traffic, but this will be offset by a change in the mix of traffic and probably a reclassification of some commodities to higher rated groups. The passenger tariff varies more by date of introduction on a line than by distance travelled. Rates could rise significantly on average when new lines are brought into service, but the projected decline in average journey length alone will be of little effect with the existing tariff policy. The effect of higher passenger tariffs is discussed later in this section.

For transit freight, receipts of SP 90 per ton between Lattakia/Tartous and Iraq, SP 110 per ton between Midan Ikbis and Albu Kamal, SP 70 per ton between Tartous and Jordan, and SP 30 per ton between Al Kamishli and Ya'roubia are used. These rates are lower than existing tariffs because the pressure to cut present rates, which have been inflated by the rise in the Swiss franc, is likely to succeed. They are still well above equivalent domestic tariffs.

Table A-8.12

FINANCIAL PROFITABILITY ANALYSIS
(million SP)

	1980	1981	1982	1983	1984	1985	1988[2] (1986-90)	1993[2] (1991-95)	1998[2] (1996-2000)
REVENUES									
Domestic Freight	35	45	55	70	95	122	165	225	290
Transit Freight	15	25	35	43	50	63	100	140	180
Imports and Exports	8	10	10	10	10	10	10	10	10
Total Freight	58	80	100	123	155	195	275	375	480
Passenger	10	13	17	22	38	53	85	110	130
Miscellaneous	7	9	10	10	10	10	8	8	8
Total Revenue	75	102	127	155	203	258	368	493	618
EXPENDITURES									
Freight Operations	64	76	85	94	110	124	156	197	238
Passenger Operations	62	57	62	69	81	92	114	143	171
Total Expenditure	126	133	147	163	191	216	270	340	409
Surplus/Deficit	-41	-31	-20	- 8	12	42	98	153	209
Less Depreciation of Rolling Stock	23	25	28	31	35	40	48	62	75
Profit/Loss[1]	-64	-56	-48	-39	-23	2	50	91	134

Source: Consultants' estimates.

Note: [1]After rolling stock depreciation, before interest or tax payments.

[2]Trend values for middle year of FYP period, approximately equal to average annual rates over plan.

The revenues shown for import and export traffic are only for traffic overland via Turkey; traffic through the ports is included in domestic freight. Miscellaneous revenue includes that from the transport of railway construction materials and from the warehouse in Aleppo. With the assumptions noted, the expected operating deficit of SP 41 million in 1980 turns into surplus in 1984, a surplus which rises rapidly to SP 209 million by 1998. Revenue in 1985 is 244 percent higher than in 1980 and a further 140 percent growth occurs from 1985 to 1998. The equivalent operating cost increases are 86 percent and 89 percent.

Comparison of revenues and costs show that while freight traffic is already close to covering its allocated operating costs in 1980, even by 1998 passenger traffic at 1980 tariff levels only covers 76 percent of its operating costs. Freight traffic in 1998, thanks in part to high transit rates, covers its costs twice over.

A notional depreciation provision on rolling stock is given in Table A-8.12. The figures are at 1980 replacement costs, assuming straight line write-off over working lines of 25 years for a mainline locomotive, 30 years for coaches and shunting locomotives, and 40 years for wagons. Depreciation in 1980 is SP 23 million, 31 percent of that year's revenue. By 1998 depreciation at SP 75 million falls to 12 percent of revenue because of the much higher rolling stock efficiencies expected from 1985.

In Table A-8.13 the operating surpluses and deficits are combined with the investment expenditures to produce a net cash flow. The investments are taken from Table A-8.11 and Appendix A-8.1 (case B2). Although the railway achieves an operating surplus by 1984, cash flow is negative until the 8th FYP period (1996 to 2000), when a small surplus is achieved. The effects of loans and interest payments are not taken into account. In fact, quite favorable financial terms are available for the purchase of railway rolling stock on international markets, reducing the immediate impact of railway deficits on the national economy. Foreign financial assistance is also likely for new construction, for such as the Damascus-Jordanian border line.

Over a period of 20 years the surplus/deficit projection is critically dependent on the relative movements of railway prices and cost. A projection at constant 1980 price levels implicitly assumes for its realization that all tariffs and costs will rise in line with general inflation. Even small but consistent annual divergence from this assumption will have a major impact by the 1990s. Table A-8.12 specifically excludes such divergences. Those thought by the Consultants most likely to occur are as follows:

Table A-8.13

FINANCIAL PLAN
(million SP)

	1981	1982	1983	1984	1985	1986-90[2]	1991-95[2]	1996-2000[2]
New Line Construction								
Lattakia-Aleppo-Al Kamishli	80	50	30	10	-	-	-	15
Mhine-Tadmur	40	20	10	-	-	-	-	-
Akkari-Homs-Damascus	120	120	100	80	50	3	84	4
Aleppo-Homs	120	150	100	60	20	-	-	-
Deir ez Zor-Albu Kamal	-	10	100	150	150	-	-	-
Damascus-Jordanian Border	-	70	150	150	150	-	-	-
Lattakia-Tartous	-	-	-	-	-	62	-	-
Total New Line Construction	360	420	490	450	370	65	84	19
Rolling Stock	80	100	100	100	90	100	126	115
Other Investments	50	40	40	-	-	45	48	50
Total Investment	490	560	630	550	460	210	258	184
Operating Surplus/Deficit[1]	- 31	- 20	- 8	12	42	98	153	209
Excess/Deficit	-521	-580	-638	-538	-418	-112	-105	25

Source: Consultants' estimates.

Note: [1]See Table A-7.9.

[2]At equivalent average annual rates.

- elimination of the fuel oil subsidy and a rise in the real (net of inflation) fuel oil price on top of this

- a long-term rise in real wages that will not be offset by improvements in working efficiency additional to those already taken into account

- a fall in real transit freight rates due to international competitive pressures

- a rise in passenger tariffs in real terms

The effects of making the above noted changes on the 1998 results are given below:

Assumption	Effect on 1998 Surplus (million SP)
No fuel oil subsidy/real price of fuel oil increases by 2 percent annually from 1980	- 60
Real wage costs rise by 2 percent annually from 1980 (if labor cost is 60 percent of unadjusted financial operating expenditure in 1998)	-105
Transit rates fall by 25 percent	- 45
Passenger tariff reaches 1980 marginal cost of 6.1 piasters per km by 2000, with 5.7 piasters in 1998	+126
Net effect if all above occur	- 84

A-8.7 RAIL FERRY SERVICE

At the time this report was being prepared, consideration was being given to the inauguration of rail ferry service from Volos, Greece to Syria, operating initially in a lift-on, lift-off mode. The Consultants discussed the proposal with officials in Greece and reviewed a detailed study prepared by Transmark. A very low volume of traffic is forecast--144,000 tons, including containers, in 1990.

APPENDIX A-8.1

RAILWAY EXPENDITURES, 1979 to 2000

Appendix A-8.1

RAILWAY EXPENDITURES, 1979 to 2000

1. Case A1

Year	Operating	Rolling Stock	Other Capital	Year	Operating	Rolling Stock	Other Capital
1979	107	--	--	2001	435	31	40
1980	125	--	--	2002	435	31	40
1981	145	80	--	2003	435	31	40
1982	160	100	80	2004	435	31	40
1983	177	100	160	2005	435	31	40
1984	208	100	150	2006	435	50	40
1985	235	90	150	2007	435	50	40
1986	266	87	140	2008	435	50	40
1987	277	87	150	2009	435	50	40
1988	288	87	140	2010	435	50	40
1989	299	87	40	2011	435	92	40
1990	311	87	40	2012	435	92	40
1991	324	104	53	2013	435	92	40
1992	337	104	40	2014	435	92	40
1993	350	104	66	2015	435	92	40
1994	363	104	40	2016	435	90	40
1995	378	104	104	2017	435	90	40
1996	376	88	104	2018	435	90	40
1997	390	88	172	2019	435	90	40
1998	404	88	172	2020	435	90	40
1999	420	88	40				
2000	435	88	40				

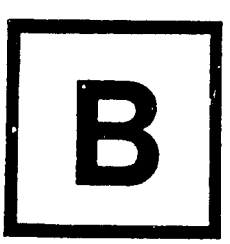
Source: Consultants' estimates.

RAILWAY EXPENDITURES, 1979 to 2000

2. CASE B2

Year	Operating	Rolling Stock	Other Capital	Year	Operating	Rolling Stock	Other Capital
1979 to 1985 as Case A1				2001	489	31	50
1986	268	87	145	2002	489	31	50
1987	281	110	155	2003	489	31	50
1988	294	87	145	2004	489	31	50
1989	307	87	45	2005	489	31	50
1990	322	129	58	2006	489	50	50
1991	338	104	45	2007	489	50	50
1992	354	104	71	2008	489	50	50
1993	370	156	114	2009	489	50	50
1994	387	104	246	2010	489	50	50
1995	406	164	182	2011	489	92	50
1996	408	88	50	2012	489	99	50
1997	426	153	70	2013	489	92	50
1998	445	88	123	2014	489	92	50
1999	467	160	50	2015	489	103	50
2000	489	88	50	2016	489	90	50
				2017	489	90	50
				2018	489	105	50
				2019	489	90	50
				2020	489	122	50

Source: Consultants' estimates.



PART B

CHEMIN DE FER HIJAZ

CHAPTER B-1

CONCLUSIONS AND RECOMMENDATIONS

Chapter B-1

CONCLUSIONS AND RECOMMENDATIONS

B-1.1 INTRODUCTION

Part B covers the narrow gauge (1,050 millimeter) network. The conclusions and recommendations are given in this chapter. Subsequent chapters deal with organization, system, operations and maintenance, traffic, and finance.

A map of the system is given in Plate B-3.1 of Chapter B-3.

B-1.2 GENERAL

The Hijaz network has been the victim of political events in the region. Once it was part of a flourishing railway system serving Palestine, Jordan, Lebanon, Syria, and for a short period, Saudi Arabia. In 1948 the important line to Haifa was cut at the Palestinian border, and in 1976 the key route to Beirut was closed at the Lebanese border. With access to the Mediterranean cut off and connection with the standard gauge system at Rayak in Lebanon also broken, the major purpose of the railway was lost. Since 1976 freight traffic has declined to virtually nothing. In 1979 a landslide cut the residual branch line to the Lebanese border in half, and a further temporary cut in this line was made in Damascus in 1980 in connection with roadworks.

The system is thus in a depressed state, and despite recent dieselization and re-equipment with modern rolling stock, the line as it now exists cannot begin to compete with road transport. Completion of the new CFS line to Damascus is unlikely to lead to significant traffic because of the break of gauge and freight transshipment required. The branch lines to Serghaya, Bosra, and the border with Palestine do, however, have considerable tourist potential and consideration should be given to their being kept in service on this basis. The narrow gauge main line from Damascus to Dera'a has no economic basis to continue in operation, and eventual closure appears inevitable.

The traffic potential of the main-line system, as part of an integrated standard gauge system, is more promising, however. There is a large passenger movement on the Damascus-Dera'a-Amman corridor, for which the railway could be expected to be competitive, and considerable potential freight traffic.

B-1.3 RECOMMENDATIONS

Clearly, with the feasibility study of a standard gauge line in progress, the Consultants' recommendations are of an interim nature pending the results of that study. They are presented below in the order in which they appear in this report, with a reference to the section where they appear in parentheses. The recommendations are:

- Stations on the Kadam-Military Base Line should be properly maintained to prevent expensive repairs at a later date and to improve the environment for passengers (B-4.2).

- The earthslide between Al Fijeh and Al Tekieh should be corrected as proposed in Appendix B-4.1 of the Final Phase I Report.

- Overall maintenance should be limited to a level consistent with the safe operation of current traffic volumes (B-4.4).

- A team should be formed to study and carry out a scrapping program of surplus rolling stock and machinery at Kadam workshops and throughout the system (B-4.5).

- Diesel rolling stock should be utilized wherever possible (B-4.5).

- Younger workers should continue to be recruited at Kadam workshops to benefit from the skills of the elite older technicians and artisans (B-4.5).

- The Kadam-Military Base traffic control system should be operated from a central panel (B-4.6).

The following recommendations apply only if it is decided to develop a standard gauge line:

- The design standards for the line should be consistent with those adopted for the Homs-Damascus line.

- Chemin de Fer Hijaz (CFH) personnel should be given priority in staffing the Damascus division of CFS (B-2.3).

- A carriage and wagon repair shop should be constructed in Damascus to utilize the skilled CFH workforce (B-2.3).

CHAPTER B-2

ORGANIZATION

Chapter B-2

ORGANIZATION

B-2.1 GENERAL

In January 1980, a contract between the Governments of Syria, Jordan, and Saudi Arabia and a West German consortium was signed for a feasibility study of the construction of a standard gauge railway between Damascus and Medina via Amman. If this line is proceeded with, the existing 1,050 milimeter gauge route from Damascus to Amman will be abandoned. While the feasibility study is in progress, development of the present system is effectively frozen. The Consultants did not wish, with the limited resources available for railways in the Comprehensive Transport Study, to anticipate the results of such a major feasibility study. Recommendations for the present system therefore concentrate on short-term improvements of an interim nature. The transport network in 2000 is considered both with and without a standard gauge line. For 1985, the 1,050 milimeter gauge system is assumed to be still in operation. It is unlikely that a major section of new line could be completed by that date, although construction could be well underway.

B-2.2 LEGISLATIVE POSITION

The General Establishment of Hijaz Railway is referred to in the report by its international railway designation - CFH. The Damascus-Serghaya line is sometimes known as CDS (Chemin de fer Damascus-Serghaya) but is here included throughout as CFH. The establishment has its headquarters at Kanawat Station, Damascus.

The legislative position of CFH is relatively complex. On independence, the establishment was given its legal personality by Law No. 316 of 12 May 1947. It was formed as an Islamic Estate directly responsible to the Prime Minister. Amendments to the Islamic Estate provision, to the Government minister responsible, and to the composition of the board of directors were made in Decree No. 3 of 15 July 1953, Law No. 155 of 31 March 1954, Law No. 67 of 19 April 1955, Law No. 192 of 1958, and Decree No. 7 of 18 January 1953. The next major legislation concerning the system, however, was Law No. 235 of 17 July 1960, under which the Damascus-Serghaya line was transferred from CFS to CFH responsibility, with provision for a separate account to be maintained for it, with the line bearing 30 percent of total CFH expenditure. The Damascus-Serghaya line was originally acquired by the Syrian Government in 1955, when it purchased the Syrian sections of the DHP system from a private

French company (agreement of 19 July 1955 approved by Law No. 127 of 1955). The entire DHP system in Syria was first assigned to CFS under Law No. 223 of 1956, but it clearly made more sense operationally for the narrow gauge line to be operated in common with the Hijaz Railway, hence Law No. 235.

Under Article 3 of Decree No. 31 of 24 November 1962, the accounting requirement for the Serghaya line was changed to the following:

> CFH will maintain a separate account for Damascus-Serghaya line, which will bear in addition to its own expenditures 25 percent of the overall general expenditures (general management, accounting, supplies, revenues inspection, and central departments for traffic and transport, motive power, track and structures).

The decree also empowered the Ministry of Finance to grant loans to CFH to meet any deficit in its annual balance sheet.

Under Decree No. 20 of 6 August 1964, CFH was provided with a new constitution setting out its functions and responsibilities in more detail. It was placed under the Ministry of Communications, the Minister of which was appointed Chairman of the Board of Directors. Decree No. 30 of 6 February 1965 amended Decree No. 20 in particular by specifying that CFH be considered again to be an Islamic Estate (Article 1).

The final piece of legislation is Decree No. 2749 of 11 November 1975, which provides that the umbrella law for general organizations, companies, and establishments (Decree No. 18 of 15 February 1974) will apply to CFH. Under this latter decree, a board of directors internal to the organization is provided for. The establishment is placed under the Ministry of Transport by Decree No. 2749, and its capital is limited to SP 115 million, which is to consist of its net assets and provisions allocated by the Government.

The legal status of CFH is an interim one pending the implementation of the Riyadh Agreement of 20 February 1955 between Syria, Jordan, and Saudi Arabia, which provides for a combined management to operate a reconstructed railway through the three territories. The Riyadh Agreement was codified in Law No. 67 of 19 April 1955 and further approved by Decree No. 88 of 7 August 1966. It is presumed that, should the reconstruction of the railway proceed, this agreement will govern its operation and management.

B-2.3 MANAGEMENT STRUCTURE

The present management structure is illustrated in Plate B-2.1. There are six departments reporting through the General

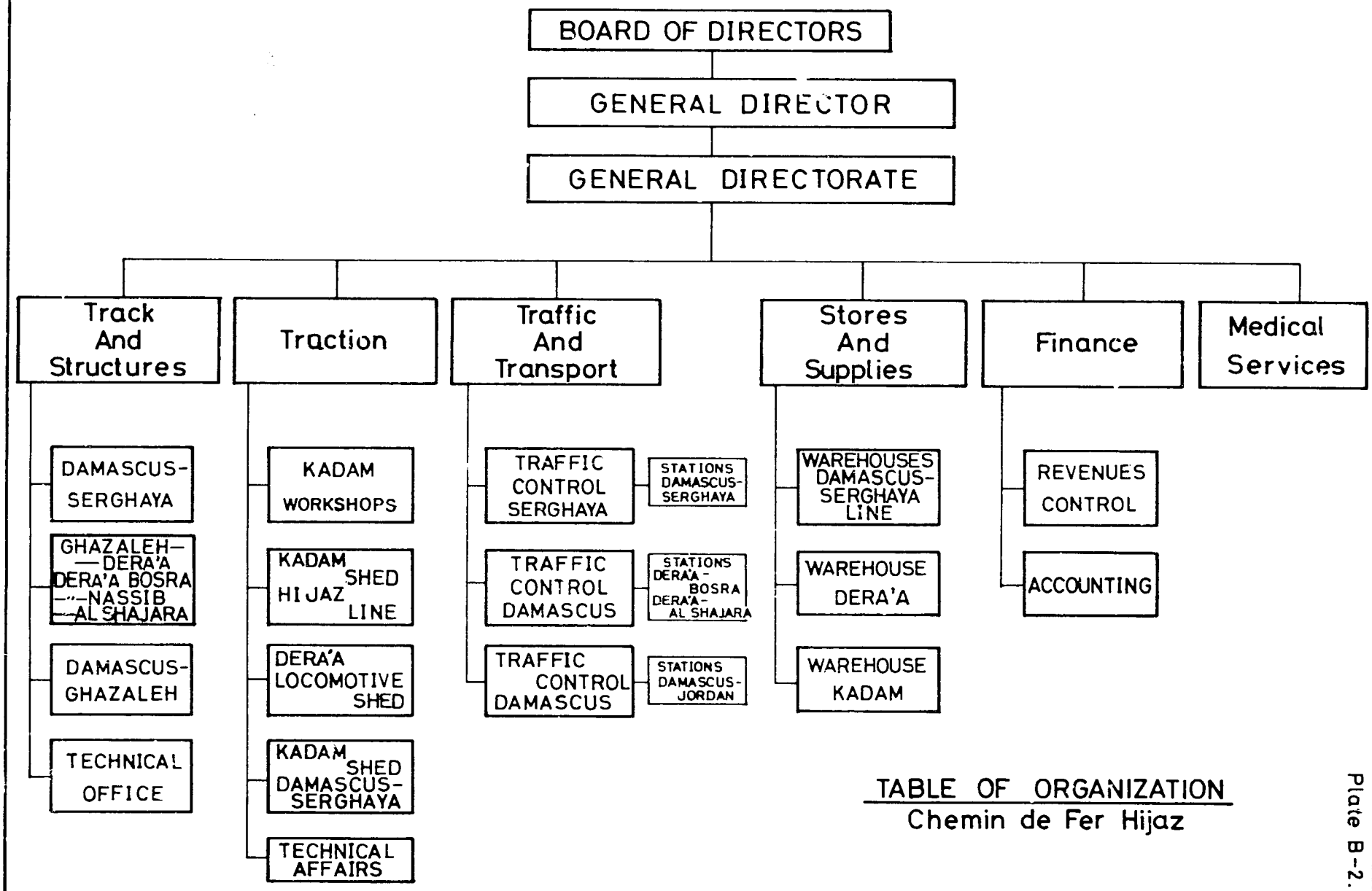


TABLE OF ORGANIZATION
Chemin de Fer Hijaz

Plate B-2.1

Directorate to the General Director. These are: Track and Structures, Traction, Traffic and Transport, Finance, Stores and Supplies, and Medical Services. The extensive workshops at Kadam are part of the Traction Department. The operating departments are organized on a line basis, with separate accounts and statistics also prepared for the Damascus-Serghaya line. Under the 4th Five-Year Plan, it was proposed that employment would rise from 744 in 1975 to 1,146 in 1980, but the loss of Beirut traffic was not then anticipated.

If the CFH main line is converted to standard gauge, it is particularly important that the skilled workforce in the workshops at Kadam not be allowed to disintegrate in the interim period. Early consideration should therefore be given to setting up a major repair and maintenance workshop for standard gauge carriages and freight wagons at Damascus to absorb the Hijaz employees. This would free Jibrine and Aleppo facilities to concentrate on locomotive repairs and maintenance.

CHAPTER B-3

SYSTEM

Chapter B-3

SYSTEM

B-3.1 NETWORK DESCRIPTION

The CFH network comprises a total of 342 route kilometers of 1.050 meter gauge line. Apart from 34 kilometers of line opened in 1976 (Kadam-Qatana) and 34 kilometers opened in 1925 (Komgerez-Bosra), the network was constructed prior to World War I. The original railway extended from Beirut to Medina via Damascus, Dera'a, and Amman, with a branch line from Dera'a to Haifa.

For the purpose of inventorying the system, the Consultants divided it into five lines designated 1 through 5. This basically segregates the network into lines with specific track and/or geographical characteristics. The route kilometers by line are summarized in Table B-3.1. A map of the system showing all stations and station-to-station distances and the Consultants' line numbers is reproduced in Plate B-3.1. A description of the lines follows.

Line 1 Kanawat-Lebanese Border

This line was constructed in the late 19th century to link Beirut and Damascus. The line traverses mountainous terrain with maximum grades of 3 percent and a minimum curvature radius of 100 meters. For many years it served as a major freight route from Beirut to Damascus and the south.

The line was closed to through traffic to Beirut in 1976 and has had little use since, apart from a daily passenger service to Serghaya. This service itself was limited to operating only to Al Fijeh in 1979 due to a serious landslide under the track in Wadi Barada, which is thought to have been caused by excavations for road widening below the railway line. Maintenance work has been deferred, and it will require considerable expenditure to put the line in a safe condition.

Line 2 Kadam-Military Base

This line was opened in 1976 to serve primarily a military base. It was laid in 24-meter sections on concrete ties with 30-kilogram rail. The maximum grade is 2.4 percent with a minimum curvature radius of 300 meters.

A traffic control system is installed. Because of its location, this line could be developed to form part of a future Damascus transit system.

Table B-3.1

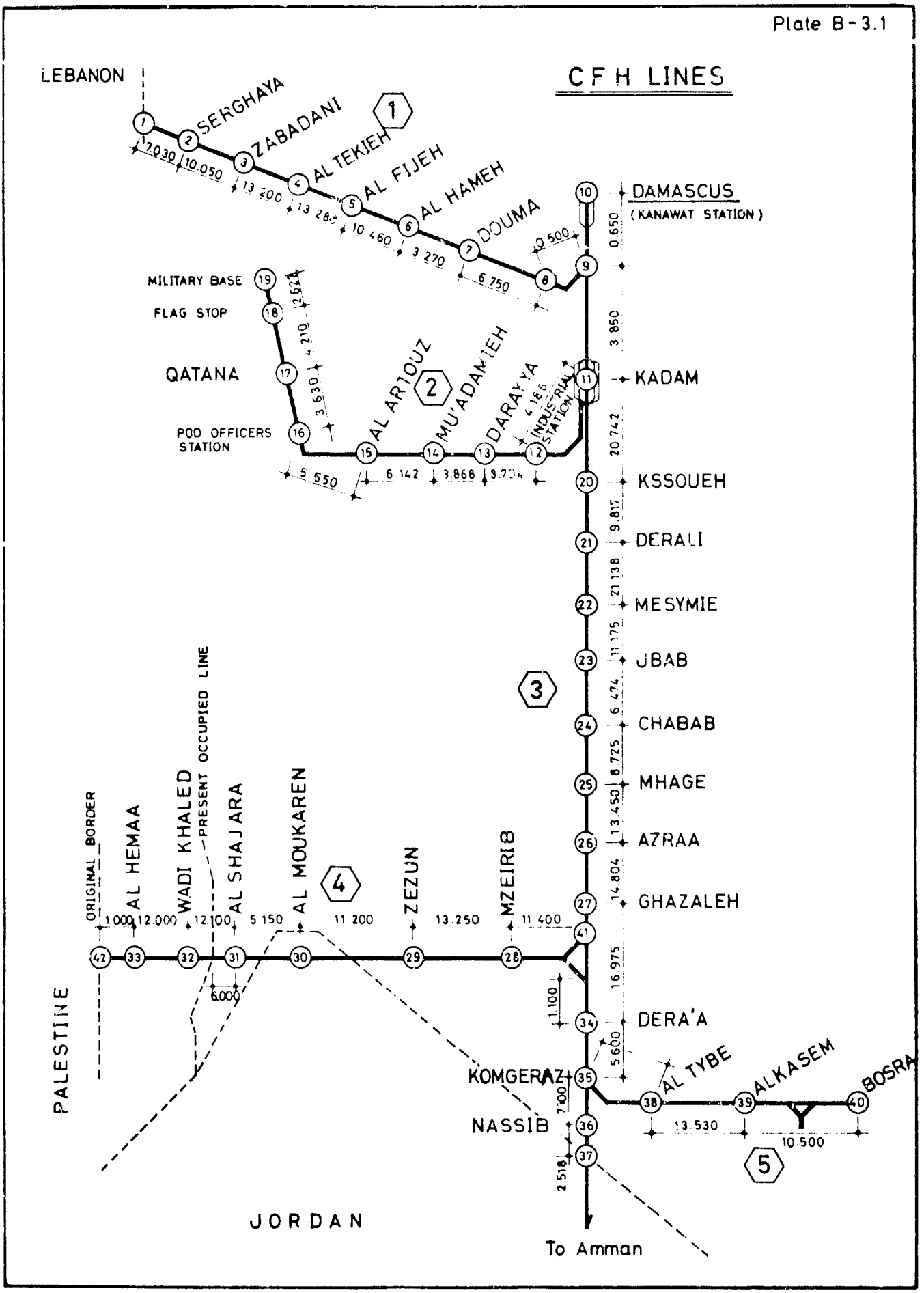
LINE NODES AND KILOMETER POINTS

Numbers in parentheses after names are node numbers as shown on Plate B-3.1.

	Total Kms
Line 1	
79.490 Lebanon Border (1)-144.030 Switch Line 3 (9)	64.540
Line 2	
0.000 Kadam (11) - 33.917 Military Base (19)	33.917
Line 3	
0.000 Damascus (Kanawat Station) (10)-4.500 Kadam (11)	4.500
0.000 Kadam (11) - 138.518 Jordan Border (37)	138.518
Line 4	
94.500 Original Palestine Border (42) -160.600 North Leg Wye Line 3 (41)	66.100
Line 5	
0.000 Komgerez (35) - 34.000 Bosra (40)	34.000
Total	341.575

Sources: CFH - Track and Structures. Line and Node Number Designation - LBII Railway Consultants.

Plate B-3.1


CFH LINES
LEBANON
SERGHAYA
ZABADANI
AL TEKIEH
AL FIJEH
AL HAMEH
DOUMA
DAMASCUS
(KANAWAT STATION)
MILITARY BASE
FLAG STOP
QATANA
POD OFFICERS STATION
AL ARTOUZ
MU'ADAMIEH
DARAYYA
INDUSTRIAL STATION
KADAM
KSSOUEH
DERALI
MESYMIE
JBAB
CHABAB
MHAGE
AZRAA
GHAZALEH
DERA'A
KOMGERAZ
NASSIB
AL TYBE
ALKASEM
BOSRA
ORIGINAL BORDER
AL HEMAA
WADI KHALED
PRESENT OCCUPIED LINE
AL SHAJARA
AL MOUKAREN
ZEZUN
MZEIRIB
PALESTINE
JORDAN
To Amman

Line 3 Kanawat-Jordanian Border

The construction of this line, the Hijaz Railway, prior to World War I connected Damascus with Amman and Medina. The flow of both freight and passenger traffic made this line a major route until recent years. During the past few years, it has continued to have scheduled passenger service between Damascus and Amman but freight service has declined to the point where it is handled entirely on mixed passenger trains.

Line 4 Dera'a-Palestinian Border

This line was constructed prior to World War I, connecting Haifa with the Damascus to Medina line. The line was severed at the Palestinian border in 1948. Since then, only a weekly passenger service has been operated between the months of February and June, and maintenance has been deferred. The line passes through spectacular scenery and has considerable tourist potential.

Line 5 Komgerez-Bosra

This 34-kilometer branch line was constructed in 1925. During the last 10 to 15 years, both passenger and freight service have declined to a point where only one daily return train is operated from Dera'a to Bosra.

B-3.2 TRACK AND STRUCTURES INVENTORY AND STANDARDS

The compilation of a track and structures inventory was simplified in that all the necessary data were available from the Track and Structures Department. The compilation of the inventory would have been facilitated if track charts had been used. The benefits of track charts are discussed in Section A-3.2.

Prior to the preparation of the inventory, the Consultants carried out a visual inspection of the whole CFH system. Track characteristics sheets, on which all track and structures inventory data are listed progressively from station to station, have been prepared. To utilize the inventory data for computer use, each station is assigned a node number, and a coding sheet has been prepared assigning numbers to various track and structures characteristics. In the Final Phase I Report the following detailed information was provided:

- Table B-3.2 provided the key to the coding of the inventory sheets. A Track and Structures Inventory Summary Sheet has been prepared for each line for the data listed on the station-to-station characteristics sheets.

- The summary sheet for each line together with a sample station-to-station inventory sheet was provided in Appendix B-3.1. The complete set of station-to-station inventory sheets is available in the Consultants' files.

- Plates B-3.2 and B-3.3 showed designs of the pre-stressed concrete tie and rail fastener used on the Qatana line and of the clearance diagram. A roadbed and ballast section was shown in Plate B-3.4.

B-3.3 ROLLING STOCK INVENTORY AND STANDARDS

The rolling stock fleet divides into two sharply different components: a relatively small amount of modern diesel age equipment delivered in the 1970s and a considerable amount of original steam age stock built between the late 19th century and World War I. An inventory of the complete fleet as of 1 January 1980 is given in Table B-3.2. The design and standards of the stock reflect the time periods of their construction. Much of the original rolling stock is still in operational condition, which is a tribute to the maintenance and rebuilding capability of the CFH workshops at Kadam.

Prior to the closing of the Haifa line in 1948, considerable freight traffic was hauled, but since the suspension of services to Beirut in 1976, the system has been virtually passenger only, with freight handled in small amounts on passenger trains. The freight fleet of 209 closed vans, 148 open vans, 79 flats, 25 tank wagons, and 9 animal cars is thus now little used.

The original passenger fleet consists of 48 wooden coaches, 7 baggage cars, and 4 petrol-driven railcars. Much of this stock is not now in regular use, but until 1979 it was used for most trains. It is still in service to Amman and on the Serghaya line.

Rolling stock acquired in the 1970s comprises 5 diesel-electric locomotives of 1,720 hp, 2 diesel-hydraulic shunters of 280 hp, 6 64-seat diesel railcars of 570 hp. and 26 80-seat coaches. The coaches are tain lined and can be pulled by the railcars or the locomotives. The railcars can also be hauled by the locomotives, if necessary. Steam power was replaced by diesel on the Damascus-Dera'a and Amman services in 1979, and railcars have been in use on the Qatana line since its opening in 1976. For the existing service pattern, and pending the results of the feasibility study on conversion of the line to standard gauge, the present fleet is sufficient.

Table B-3.2

ROLLING STOCK INVENTORY, 1 JANUARY 1980

1. Diesel Electric Locomotives

HP/ Class	No. of Units	Delivered	Tare Weight (tons)	Axles	Length (meters)	Constructed
1720	5	1978	72	6	16.5	Germany-Romania

2. Diesel Hydraulic Locomotives

HP/ Class	No. of Units	Delivered	Tare Weight (tons)	Axles	Length (meters)	Constructed
280	2	1972	24	4	6.4	Germany

3. Steam Locomotives

HP/ Class	No. of Units	Delivered	Tare Weight (tons)	Wheel Arrange-ment	Length (meters)	Constructed
1020	5	1918	67	4-8-0	18.8	Germany
740	2[1]	1907	54	2-8-0	16.3	Germany
560	3[2]	1907	54	2-8-0	16.3	Germany
560	4	1907	57	2-8-0	17.6	Germany
895	3	1917	53	2-8-0	18.4	Germany
370	1	1907	41	2-6-0	12.7	Germany
370	2	1907	32	2-6-0	8.4	Germany
315	5[2]	1905	25	0-6-0	8.4	Germany
415	5[2]	1895	31	2-6-0	8.8	Switzerland
480	3[2]	1892	32	2-6-0	9.3	Switzerland
595	2[2]	1907	35	2-8-0	11.4	Switzerland

Table B-3.2 (Continued)

ROLLING STOCK INVENTORY, 1 JANUARY 1980

4. Diesel Railcars

HP/ Class	No. of Units	Delivered	Seats 1st	Seats 2nd	Seats 3rd	Tare Weight (tons)	Length (meters)	Constructed
570	6	1974	64	-	-	43	20.5	Hungary

5. Petrol Railcars

HP/ Class	No. of Units	Delivered	Seats 1st	Seats 2nd	Seats 3rd	Tare Weight (tons)	Length (meters)	Constructed
110/90	4[1]	-	8	-	52	15	9.7	France

6. Coaches (New)

Class	No. of Units	Delivered	Seats 1st	Seats 2nd	Seats 3rd	Tare Weight (tons)	Axles	Length (meters)	Constructed
Regular	26	1974	80	-	-	25.5	4	20.2	Hungary

7. Coaches (Old)

Class	No. of Units	Seats 1st	Seats 2nd	Seats 3rd	Tare Weight (tons)	Axles	Length (meters)	Constructed
First Class	1	34	-	-	17.7	4	12.3	Belgium
Regular	1	10	12	-	12.5	4	12.3	Belgium

Table B-3.2 (Continued)

ROLLING STOCK INVENTORY, 1 JANUARY 1980

7. Coaches (Old) - (Contd.)

Class	No. of Units	Seats 1st	Seats 2nd	Seats 3rd	Tare Weight (tons)	Axles	Length (meters)	Constructed
Regular	2	12	23	-	19.0	4	15.3	Belgium
Regular	1	4	6	44	19.0	4	15.3	Belgium
Regular	10	-	-	64	17.5	4	15.3	Belgium
First Class	1	18	-	-	16.5	4	12.0	Germany
First Class	1	20	-	-	16.5	4	12.0	Germany
Regular	2	8	18	-	16.5	4	12.0	Germany
Regular	3	-	-	60	17.0	4	15.3	Germany
Regular	1	8	29	-	20.5	4	15.3	Belgium
Regular	1	-	-	48	9.0	4	12.8	"
BF	1	-	40	-	9.5	2	9.3	"
BF	1	-	40	-	10.0	2	9.3	"
TF	1	-	-	40	9.5	2	9.3	"
TF	2	-	-	50	9.5	2	9.3	"
TF	1	-	-	40	8.1	2	9.3	"
TF	1	-	-	40	8.9	2	9.3	"
TF	1	-	-	40	8.2	2	9.3	"
TF	1	-	-	40	8.1	2	9.3	"
TF	1	-	-	40	9.1	2	9.3	"
TF	1	-	-	40	8.4	2	9.3	"
TF	1	-	-	40	9.0	2	9.3	"
TF	2	-	-	40	9.3	2	9.3	"
TF	1	-	-	40	9.5	2	9.3	"
TF	1	-	-	50	9.5	2	9.3	"
ABF	1	17	23	-	10.0	2	10.2	"
ABF	1	12	18	-	11.0	2	10.2	"
ABF	1	12	18	-	10.1	2	10.2	"
ABF	1	12	18	-	10.0	2	10.2	"
Regular	4	18	17	-	20.5	4	15.8	"
Total	48							

Table B-3.2 (Continued)

ROLLING STOCK INVENTORY, 1 JANUARY 1980

8. Baggage Coaches

No. of Units	Tare Weight (tons)	Capacity (tons)	Axles	Length (meters)	Constructed
5	12.0	12	4	11.0	Belgium
1	6.0	3	2	8.4	Belgium
2	7.5	4	2	9.2	Belgium

9. Vans - Freight Vehicles

No. of Units	Tare Weight (tons)	Capacity (tons)	Axles	Length (meters)	Constructed
2	9.5	15	4	11.0	Belgium
6	9.5	15	4	10.2	"
1	9.0	15	4	10.2	"
2	10.5	15	4	10.2	"
12	11.0	15	4	10.2	"
2	10.0	15	4	10.2	"
1	9.0	15	4	10.2	"
1	9.0	15	4	11.8	"
3	10.0	15	4	10.2	"
19	11.0	20	4	11.0	"
13	9.5	15	4	11.0	"
20	10.5	15	4	11.0	"
3	9.0	15	4	11.0	"
13	10.0	15	4	11.0	"
4	10.5	15	4	11.0	"
1	9.8	15	4	11.0	"
8	9.5	15	4	11.0	"
2	9.0	15	4	12.1	"

Table B-3.2 (Continued)

ROLLING STOCK INVENTORY, 1 JANUARY 1980

9. Vans - Freight Vehicles (Contd.)

No. of Units	Tare Weight (tons)	Capacity (tons)	Axles	Length (meters)	Constructed
1	10.5	15	4	10.2	Belgium
5	11.0	15	4	11.0	"
10	6.0	10	2	6.0	"
27	10.0	15	4	11.0	"
2	10.9	15	4	12.0	"
2	7.5	5	2	10.0	"
18	6.0	10	2	6.0	"
1	9.0	14	4	9.0	"
11	9.0	14	4	9.0	"
11	9.0	10	4	9.0	"
8	9.0	10	4	9.0	"
209					

10. Open Vans - Freight Vehicles

No. of Units	Tare Weight (tons)	Capacity (tons)	Axles	Length (meters)	Constructed
3	8.5	15	4	11.0	Belgium
23	7.5	15	4	11.0	"
3	8.5	25	4	11.0	"
1	9.0	15	4	11.0	"
2	10.0	15	4	11.0	"
9	10.0	25	4	11.0	"
3	8.5	20	4	11.0	"
2	8.0	15	4	11.0	"
1	7.5	15	4	11.0	"

Table B-3.2 (Continued)

ROLLING STOCK INVENTORY, 1 JANUARY 1980

10. Open Vans - Freight Vehicles (Contd.)

No. of Units	Tare Weight (tons)	Capacity (tons)	Axles	Lengths (meters)	Constructed
1	9.0	20	4	11.0	Belgium
21	10.0	25	4	11.0	"
1	10.0	15	4	11.0	"
3	7.5	15	4	11.0	"
1	10.0	15	4	11.0	"
1	8.5	15	4	11.0	"
4	10.5	15	4	11.0	"
3	10.0	25	4	11.0	"
21	5.0	10	2	6.6	"
34	5.0	10	2	6.6	"
5	8.0	15	4	9.0	"
6	8.0	15	4	9.1	"
148					

11. Flats - Freight Vehicles

No. of Units	Tare Weight (tons)	Capacity (tons)	Axles	Length (meters)	Constructed
3	7.5	15	4	11.0	Belgium
16	9.0	15	4	11.0	"
1	9.5	15	4	11.0	"
1	7.5	15	4	11.0	"
5	9.0	15	4	11.0	"
24	8.5	15	4	11.0	"
1	10.5	20	4	11.0	"
1	10.2	20	4	11.0	"

Table B-3.2 (Continued)

ROLLING STOCK INVENTORY, 1 JANUARY 1980

11. Flats - Freight Vehicles (Contd.)

No. of Units	Tare Weight (tons)	Capacity (tons)	Axles	Length (meters)	Constructed
9	7.5	15	4	11.0	Belgium
2	8.5	15	4	11.0	"
1	9.0	15	4	11.0	"
3	8.0	15	4	11.0	"
6	9.0	15	4	11.0	"
1	4.5	10	2	7.5	"
3	4.5	10	2	7.5	"
2	7.5	15	4	9.5	"
79					

12. Animal Units - Freight Vehicles

No. of Units	Tare Weight (tons)	Capacity (tons)	Axles	Lengths (meters)	Constructed
2	10.5	15	4	11.0	Belgium
1	10.5	15	4	11.0	"
2	10.0	15	4	11.0	"
4	10.0	15	4	11.0	"
9					

Table B-3.2 (Continued)

ROLLING STOCK INVENTORY, 1 JANUARY 1980

13. Tanks (Water) - Freight Vehicles

No. of Units	Tare Weight (tons)	Capacity (tons)	Axles	Length (meters)	Constructed
1	9.2	9.5	4	11.0	Belgium
4	11.0	14.5	4	11.0	"
1	11.1	14.5	4	11.0	"
1	9.0	14.7	4	11.0	"
1	9.3	14.5	4	11.0	"
1	10.8	16.0	4	11.0	"
9					

14. Tanks (Petroleum) - Freight Vehicles

No. of Units	Tare Weight (tons)	Capacity (tons)	Axles	Length (meters)	Constructed
1	13.1	17.9	4	11.0	Belgium
1	9.4	14.6	4	11.0	"
1	12.1	21.1	4	11.0	"
1	9.8	14.2	4	11.0	"
1	12.1	18.1	4	11.0	"
1	16.4	12.9	4	11.0	"
1	14.9	12.3	4	11.0	"

Table B-3.2 (Continued)

ROLLING STOCK INVENTORY, 1 JANUARY 1980

14. Tanks (Petroleum) - Freight Vehicles (Contd.)

No. of Units	Tare Weight (tons)	Capacity (tons)	Axles	Length (meters)	Constructed
1	14.2	10.5	4	12.1	Germany
1	10.0	12.9	4	12.2	"
1	8.8	8.5	4	12.2	"
1	16.4	18.2	4	8.8	"
1	15.5	18.5	4	8.2	"
1	11.6	12.5	4	6.2	"
1	11.8	12.5	4	6.2	"
1	7.3	12.0	4	6.5	"
1	7.3	12.2	4	6.5	"
16					

Source: CFH, Traction.

1 One not operational.

2 Not operational.

B-3.4 SIGNALLING AND COMMUNICATIONS INVENTORY AND STANDARDS

The CFH network, except for Line 2, Kadam-Qatana, is operated as a manual block system where the blocks are established by train order or special instruction. Line 2, which was completed in 1976 from Kadam to the Military Base, is operated under a modified TCS. This system utilizes track circuits that are remote controlled from six TCS stations along the route. The entire operation is monitored by a movements officer, or train dispatcher, at Kanawat Station who also monitors the movement of all trains on the system.

The telecommunications system between stations and the central dispatching office at Kanawat consists of hand-crank telephones and line poles that carry the necessary circuit line wires along the routes. Service can be considered fair under favorable weather conditions.

CHAPTER B-4

OPERATIONS AND MAINTENANCE

Chapter B-4

OPERATIONS AND MAINTENANCE

B-4.1 GENERAL

The CFH management has been confronted with major changes in the overall operation of their network since World War II. First, the Dera'a to Haifa line was severed at the Palestinian border in 1948. Second, the most important line, Beirut to Damascus, which connects at Rayak with the standard gauge line to Homs and Aleppo, was closed to through traffic at the Lebanese border in 1976. The closing of these two lines to through traffic has changed the operating character of the system from one of transit freight and passenger traffic to one of basically local passenger traffic.

The Consultants have spent considerable time at the CFH offices in Kadam and have performed a physical examination of the entire system. Senior staff memebers have been most helpful, as have the line supervisors, foremen, and employees from all departments. This on-the-job examination of the system has disclosed the following:

(1) Rules, regulations, and standards required for both the operation and maintenance of the system are kept current and are adjusted, as necessary, when new technology and modern equipment is phased into the system.

(2) The characteristic of professionalism is noted in the employees from the rank of senior staff officers to that of minor technicians. This characteristic is manifest in the overall discipline of the employees, the cleanliness of the shops and offices, and the neat appearance of the employees.

(3) As discussed in Section B-3.3, the steam age motive power and rolling stock purchased prior to World War I has been well maintained, and most of it is in operating condition today. This is further testimony to the railway's professionalism over the years.

B-4.2 TIMETABLING AND TRAIN PERFORMANCE

Line 1 Damascus-Lebanese Border

The former service, limited to one return passenger train operating four afternoons a week between Kanawat and the temporary terminus at Al Fijeh, was discontinued in 1980. This service operated as a day excursion, being powered by an 1890 vintage steam-tank engine with a consist of from 1 to 12 wooden passenger coaches, and it is well patronized in the summer

months. The line passes through very picturesque scenery in the Barada River Valley.

Prior to 1976, 6 to 10 scheduled freight trains operated from Beirut to Damascus, with a large percentage of the traffic being transit between Lebanon and Jordan.

Line 2 Kadam-Military Base

This line has a designed train capacity of 24 trains a day in each direction. Three scheduled round trip trains are operated between Kanawat-Kadam and the Military Base. The train usually consists of one 570 hp diesel railcar, and when traffic demands, an additional railcar or trailing coach is added. The line was constructed to serve a much larger military complex than exists today. The intermediate stations are not located conveniently to serve existing local population centers. The ingress and egress to the stations is poorly finished, and little non-military traffic is attracted.

The stations are manned by a stationmaster who lives on the upper level of the building, and an assistant is employed to operate the train control panel and handle the sale of tickets. The stations on this new line have not been maintained to the high standards noted elsewhere on the network. They are not clean, windows are broken, the station clocks do not operate, and as a whole, there is an atmosphere of neglect and decay.

The passenger timetable is given in Table B-4.1.

Line 3 Kanawat (Damascus)-Jordanian Border

The predominant traffic on this line is passengers, although a small amount of freight does move between Jordan and Syria on the passenger trains. Two daily return passenger services operate between Damascus and Dera'a; in addition, twice-weekly return trains run between Damascus and Amman. The timetable is shown in Table B-4.2.

Train No. 11 departs Damascus at 08:10 on Sundays and Thursdays and runs on from Dera'a to Amman as Jordanian train No. 5. The coaches are of the old type; the CFH locomotive is removed from the train at Dera'a and is replaced by a Jordanian diesel locomotive. The new Syrian passenger equipment cannot be used on this service because of incompatibility of the coupling devices and braking systems with the Jordanian locomotive. This rolling stock returns on train No. 6 on Mondays and Fridays, leaving Amman at 08:00 and arriving at Dera'a at 10:28, becoming CFH train No. 12 arriving at Kanawat at 13:27. The train consists of up to eight coaches, a baggage car, and several freight vans. Train No. 29 departs Kanawat at 08:10 daily, except on Sundays and Thursdays, arriving at Dera'a at 12:30. It is

formed of new diesel railcars, and this rolling stock returns to Damascus on train No. 30 (except Mondays and Fridays), leaving Dera'a 14:02 and arriving Kanawat at 18:06. On Fridays the stock returns on train No. 22, leaving Dera'a at 16:33, arriving Kanawat at 19:28. The equipment going to Dera'a on Mondays returns on train No. 18 on Tuesdays.

Train No. 17 leaves Kanawat daily at 15:00 with new diesel stock, arriving Dera'a 17:54. This stock lies overnight in Dera'a and returns on train No. 18 (except Friday), leaving Dera'a at 05:40, arriving Kanawat at 08:35. On Friday the stock returns on train No. 22, leaving Dera'a at 16:33, arriving Kanawat at 19:28. Trains originating at Amman, Dera'a, and Damascus usually leave punctually, although time is sometimes lost on route.

Line 4 Dera'a-Palestinian Border

This line originally ran from Dera'a to Haifa, a distance of 160 kilometers. Today the line terminates at the station of Al Shajara, which is located 40 kilometers west of Dera'a. The only traffic on this line in recent years has been a seasonal passenger train. This train operates one round trip from Dera'a to Al Shajara on Friday of each week from February to June. The train leaves Dera'a at 08:00, arriving Al Shajara at 10:30. It departs Al Shajara at 16:00, arriving Dera'a at 18:00. Steam power and old type coaches are used.

Line 5 Dera'a-Bosra

This line is served by one daily passenger train that usually consists of a gasoline-powered railcar with a trailing coach. The train leaves Dera'a at 15:00, arriving Bosra at 16:30. The following morning the train leaves Bosra at 06:30, arriving Dera'a at 08:00. Special trains are run from Damascus to Bosra during the September festival days. These trains leave Kanawat Station at 13:00, arriving Bosra at 18:00. The trains return the same day, leaving Bosra at 20:00 and arriving Damascus at 01:00. These trains consist of multiple-unit diesel railcars.

B-4.3 OPERATING PROCEDURES, RULES, AND SECURITY

The operating rules in effect today were last reviewed in 1968. The system, except for Line 2, is operated as a manual block. Line 2 has a modified TCS. The operation of all lines is monitored from the movements office at Kanawat Station.

The signalling and telecommunications system is discussed in Section B-3.4.

Table B-4.1

TIMETABLE KANAWAT - MILITARY BASE

Train No.	Kanawat (Km 0.0)	Kadam (Km 4.5)	Military Base (Km 38.4)
Westbound			
89	05.50	06.14	06.47
91	11.00	11.14	11.56
93	13.28	13.42	14.24
Eastbound			
90	07.57	07.45	07.12
92	13.14	13.04	12.14
94	15.30	15.18	14.24

Source: CFH, Traffic and Transport.

Table B-4.2

TIMETABLE DAMASCUS - DERA'A - AMMAN

Train No.	From	To	Departs	Arrives	Days Operated
Southbound					
11	Kanawat (Km 0.0)	Dera'a (Km 127.8)	08.10	11.01	Sunday, Thursday
5	Dera'a	Amman	11.26	14.14	Sunday, Thursday
29	Kanawat	Dera'a	08.10	12.30	Excluding Sunday, Thursday
17	Kanawat	Dera'a	15.00	17.54	Daily
Northbound					
18	Dera'a	Kanawat	05.40	08.35	Daily excluding Friday
6	Amman	Dera'a	08.00	10.28	Monday, Friday
12	Dera'a	Kanawat	10.41	13.27	Monday, Friday
30	Dera'a	Kanawat	14.02	18.06	Excluding Monday, Friday
22	Dera'a	Kanawat	16.33	19.28	Friday

Source: CFH, Traffic and Transport.

From many observations of train operation, the Consultants conclude that operating rules are enforced uniformly. As a result, there are few accidents.

Since all the trains operated are passenger or mixed trains, a good safety record is essential. The security is minimal at Kanawat, Kadam, and Dera'a terminals and shops, however.

B-4.4 TRACK MAINTENANCE

The railway network for track maintenance purposes is divided into three sections: (1) from Kadam to Kanawat on Line 3 and Line 1 from Kanawat to the Lebanese Border; (2) Line 2 (Kadam-Military Base) and south to Ghazaleh on Line 3; and (3) from Ghazaleh to the Jordanian Border on Line 3 in addition to Lines 4 and 5. (See Plate B-3.1 for line descriptions.)

In general, all the track is maintained to an adequate and safe condition for the existing traffic levels and speed limits.

Long-term recommendations for track and structures maintenance are not relevant until the result of the feasibility study on conversion to standard gauge is available. Pending this, the following short-term recommendations only are made:

- Correct the earthslide on Line 1 between Al Fijeh and Al Tekieh.

- Upgrade the maintenance of stations on Line 2, Kadam to Military Base.

- Limit maintenance to a minimum level consistent with safe operation of current traffic volumes at existing operating speeds.

B-4.5 ROLLING STOCK MAINTENANCE

The CFH staff, over the years, have done an excellent job in maintaining their original motive power and rolling stock, which dates mainly from 1892 to 1918.

The locomotive shop, transfer table, overhead gantry crane, machine shop, car shop, etc., are well laid out. Although these shops are very old, being in fact the first major industrial plant constructed in Damascus, they are well designed with good lighting and ventilation systems. The primary emphasis of the locomotive shop has been that of rebuilding and maintaining the steam locomotives. This aspect is being drastically phased down with diesel equipment having been purchased during the 1970s.

The shop personnel are skilled craftsmen and appear to be older than one would normally expect to find in a shop today,

although there is a nucleus of younger men who seem to be well trained and capable of carrying on a high standard of maintenance in the future.

The primary emphasis in the car shop is also in rebuilding and maintaining the older passenger and freight equipment. Here again this class of work is being phased down with the purchase of the new passenger coaches.

The new diesel locomotive maintenance facilities consist of one track in the car shop that has an inspection pit. This track will accommodate the service of two locomotives at one time. Two tracks in the car shop are also being used for maintaining the new passenger cars.

A new laboratory has been set up and equipped with modern instruments and machines to facilitate the service and maintenance of the diesel locomotives and diesel railcars. This facility is being expanded to cover all the aspects of testing fuel oils, lubricating oils and greases, cooling water, etc.

Long-term recommendations relative to motive power and rolling stock will not be relevant until the results of the feasibility study on gauge conversion are known. The following short-term recommendations are made:

- The management should establish a team, comprising staff officers, to study and carry out a program of scrapping old steam locomotives, wagons, equipment, and machinery that has been retired or should be retired. The scrap accumulation in Kadam yard is adversely affecting operations and overall efficiency.

- The new diesel locomotives, diesel railcars, and new passenger coaches should be utilized, wherever possible, to reduce operating and maintenance costs.

- Management should continue to bring young people into all departments to be trained by the elite class of older technicians and artisans.

B-4.6 SIGNALLING AND TELECOMMUNICATIONS MAINTENANCE

The whole of the network, as discussed in Section B-3.4, is operated as a manual block system, except for Line 2 (Kadam to Military Base), which is operated as a modified TCS. This system utilizes track circuits with remote-controlled electric main-line switches and is controlled from six TCS stations located at: Industrial Station, Darayya, Mu'adamieh, Artouz, Officers Station, and Qatana.

The Consultants have been advised that this modified TCS has been difficult to maintain. The problems seem to arise because the system is operated from six control panels, each located at a separate station. Each of these panels is operated by a station agent, or an assistant, and the panels are vulnerable to operational abuse, dust, moisture during inclement weather, and vandalism. The Consultants recommend that the TCS be operated from one central panel located where it can be properly housed, operated, and maintained by a staff of trained technicians. A similar recommendation has been made for the new CFS signalling system.

CHAPTER B-5

TRAFFIC

CHAPTER B-5

TRAFFIC

B-5.1 GENERAL

The narrow gauge, the condition of the track, and the age of much of the equipment restrict CFH trains to maximum speeds of around 60 kilometers per hour. The current passenger timetable for Damascus-Qatana services is given in Table B-4.1; the timetable for the Damascus-Dera'a-Amman route is in Table B-4.2. On the Serghaya line, one return train operates four times weekly as far as Al Fijeh, pending repair of the landslide north of that station. On the main Damascus to Dera'a route, the fastest service averages only 45 kilometers per hour and the rail distance of 127 kilometers is actually 20 kilometers longer than by road. The rail route was forced to make a long detour immediately south of Damascus for military reasons at the time of construction. With such low speeds over relatively short distances and a frequency of from one to three return services per day, it is virtually impossible for the train to attract passengers from buses and taxis except by setting extremely low fares. The rail market is limited to occasional optional journeys and excursion-type traffic, with the only exception being the transport of soldiers to the military base at Qatana, for which that line was designed.

Little growth in traffic is likely unless the system is converted to standard gauge or the line to Beirut is reopened. With standard gauge services from Damascus to Amman linking up with the new CFS line from Aleppo to Damascus, the picture would be changed completely.

B-5.2 PASSENGER TRAFFIC

Traffic from 1969 to 1978 by line is given in Table B-5.1. The peak year in the period was 1970, when 0.58 million passengers were carried. The average journey length was 44 kilometers, to give a volume of 26 million passenger-kilometers. A gradual fall in traffic occurred until 1974; the number of passengers then decreased by 27 percent in two years, despite the opening of the Qatana line, as a result of the suspension of services to Lebanon in 1976. The Serghaya line lost 40 percent of its traffic in that year alone. In 1977 and 1978 traffic recovered a little and stabilized at 0.40 million passengers. The average journey was longer than in 1970 at 56 kilometers, resulting from the growth of traffic on the longest route, Damascus to Amman. On average, this was 94 percent higher from 1976 to 1978 than for the 1969 to 1971 period. Passenger-kilometers in 1978 totalled 22 million.

Table B-5.1

PASSENGER TRAFFIC, 1969-1978

Line	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
Passengers (000)										
Damascus-Dera'a-Bosra	294.4	275.6	259.6	258.6	219.0	241.5	190.5	144.2	182.6	169.5
Syria-Jordan	16.4	24.1	17.1	0.8	24.2	31.6	42.0	36.4	36.9	38.3
Damascus-Serghaya-Beirut	232.3	280.7	275.7	292.6	280.0	227.6	218.2	131.3	118.2	114.1
Damascus-Qatana	-	-	-	-	-	-	-	53.6	61.3	75.0
Total	543.1	580.4	552.4	552.0	523.2	500.7	450.7	365.5	399.0	396.9
Passenger Kms (million)										
Damascus-Dera'a-Bosra/Jordan	14.8	16.2	8.8	8.9	14.1	15.1	13.8	11.2	15.4	15.3
Damascus-Serghaya-Beirut	7.9	9.6	9.6	7.0	10.2	8.6	9.0	4.9	4.4	4.5
Damascus-Qatana[1]	-	-	-	-	-	-	-	1.7	2.0	2.4
Total	22.7	25.8	18.4	15.9	24.3	23.7	22.8	17.8	21.8	22.2

Source: CFH, Traffic and Transport.

[1] Consultants' estimates.

In Table B-5.2 traffic by line is given monthly for 1977 to 1979. Little seasonal variation is evident, except on the Serghaya line, where it is marked, traffic being highly concentrated on the summer months. Train formation reflects this, with as little as one passenger coach being hauled in winter and ten or more on Fridays in summer. In the peak month of July in 1977 and 1978, traffic was approximately 20 times that of the lowest month, December. Traffic between Syria and Jordan also showed a peak in July, with additional services operated in connection with the Damascus International Fair.

In 1978, 52 percent of passengers were carried on the Damascus-Dera'a-Amman line (including a small number on the Bosra branch), 29 percent used the Serghaya line, and 19 percent used the Qatana branch line. In terms of passenger-kilometers, the shares were 69 percent, 20 percent, and 11 percent, respectively, for the three lines.

B-5.3 FREIGHT TRAFFIC

Freight traffic has declined sharply since 1975 to negligible proportions: Carryings by line in tons and ton-kilometers are given in Table B-5.3 for the years 1969 to 1978. The Serghaya and Dera'a lines are treated independently in the statistics, and some of the tonnage is double counted in the table, being through Jordan-Lebanon traffic. In 1969, 75,000 tons of freight were carried on the Serghaya line and 101,000 tons on the Dera'a line, but in 1978 the former line carried no freight traffic and the Dera'a line carried only 7,500 tons. No separate freight services are now operated, but some freight is still carried on passenger trains. The average length of haul in 1978 was 120 kilometers.

Train kilometers operated on the system and by line, excluding those on the Qatana branch, are given in Table B-5.4 for the years 1969 and 1974 to 1978. Over the period 1969 to 1978, there was a 40 percent decline overall, composed of a 72 percent fall on the Serghaya line and a 22 percent loss on the remainder of the system. The major part of the decline occurred between 1975 and 1976 following the cessation of through services to Beirut. Total train-kilometers paralleled the fall in traffic, with traffic units (passenger plus ton-kilometers) per train-kilometer falling only from 83 in 1969 to 70 in 1978. The very low average train loadings throughout the last decade are clear from the traffic units per train-kilometer figures given in Table B-5.4.

B-5.4 TRAFFIC FORECAST

The Consultants' preliminary freight and passenger forecasts are presented in Section B-5.4 of the Final Phase I Report.

Because they have been superseded by the full-scale feasibility study referred to earlier, they were not refined in Phase II.

The CFH and CFS networks were treated for forecasting purposes as a single system from the assumed date of completion of conversion to standard gauge. The traffic forecasts for the combined system are discussed in Section A-8.2.

Table B-5.2

PASSENGER TRAFFIC BY MONTH

(000)

Line	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1977													
Damascus-Dera'a-Bosra	13.2	13.9	15.9	21.3	15.9	15.8	15.0	14.8	14.5	14.5	13.0	14.7	182.6
Syria-Jordan	3.0	2.3	2.2	2.3	2.3	3.7	5.0	4.4	3.4	2.3	3.7	2.1	36.9
Damascus-Serghaya	1.7	2.2	4.0	7.7	10.0	22.5	30.3	18.0	11.4	6.1	2.7	1.6	118.2
Damascus-Qatana	5.5	4.9	4.9	4.6	5.6	8.1	7.5	3.4	3.4	3.9	6.5	3.1	61.3
Total	23.4	23.3	27.0	35.9	33.8	50.1	58.0	40.6	32.7	26.8	25.9	21.5	399.0
1978													
Damascus-Dera'a-Bosra	13.3	12.1	[illegible].5	17.2	12.6	14.3	15.0	15.8	14.7	13.4	11.9	11.7	169.5
Syria-Jordan	2.7	1.9	2.4	2.3	2.0	4.4	6.5	3.2	5.2	2.4	3.4	1.9	38.3
Damascus-Serghaya	1.6	2.2	5.2	10.1	14.5	26.8	27.8	7.6	9.4	5.7	1.9	1.3	114.1
Damascus-Qatana	4.2	4.3	6.5	6.9	8.2	6.8	7.2	5.1	5.9	5.4	6.7	7.8	75.0
Total	21.8	20.5	31.6	36.5	37.3	52.3	56.5	31.7	35.2	26.9	23.9	22.7	396.9
1979													
Damascus-Dera'a-Bosra	14.1	13.0	16.8	16.2									
Syria-Jordan													
Damascus-Serghaya	2.6	2.5	7.1	11.4									
Damascus-Qatana	9.1	8.1	7.6	8.7	8.2	5.4	4.9	5.2					
Total	25.8	23.6	31.5	36.3									

Source: CFH, Traffic and Transport.

Table B-5.3

FREIGHT TRAFFIC, 1969-1978

Line	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
Freight Tons (000)										
Damascus-Dera'a-Amman	101.0	78.8	53.6	58.8	59.0	90.4	72.2	21.6	16.0	7.5
Damascus-Serghaya-Beirut	75.0	61.2	44.8	41.0	45.6	53.0	28.0	0.1	-	-
Total	176.0	140.0	98.4	99.8	104.6	143.4	100.2	21.7	16.0	7.5
Freight Ton Kms (million)										
Damascus-Dera'a-Amman	13.7	10.0	7.3	7.8	7.4	11.5	6.1	2.1	1.4	0.9
Damascus-Serghaya-Beirut	4.6	3.7	2.6	2.4	2.7	3.0	1.6	-	-	-
Total	18.3	13.7	9.9	10.2	10.1	14.5	7.7	2.1	1.4	0.9

Source: CFH, Traffic and Transport.

Table B-5.4

TRAIN-KILOMETERS
(000)

Line	1969	1974	1975	1976	1977	1978
Damascus-Dera'a, etc.	321	310	307	244	250	249
Damascus-Serghaya, etc.	173	142	107	55	48	49
Total	494	452	414	299	299	297
Traffic Units[1] (million)	41.0	38.2	30.5	18.2	21.2	20.7
Traffic Unit/Train-Km	83.0	85.0	74.0	61.0	71.0	70.0

Source: CFH, Traffic and Transport.

1 Passenger-kilometers plus ton-kilometers.

CHAPTER B-6

FINANCE

Chapter B-6

FINANCE

B-6.1 INCOME AND EXPENDITURE

The financial situation of the present system is of little or no relevance to the economics of a standard gauge line and is in consequence dealt with briefly. In Tables B-6.1 and B-6.2 the income and expenditure accounts are presented for the basic CFH system and for the CDS section, referred to here as the Dera'a line and Serghaya line accounts.

Large losses in relation to total revenue occurred on each line for the 1975 to 1977 period. For the Dera'a line, revenues covered roughly half of operating expenditure, while Serghaya line revenue was only, on average, one-eighth of expenditure. With operating revenues being a relatively minor portion of total revenue, the main item of which for both lines was income from rent of property, the situation on purely railway account was extremely bad. In 1975, for the two lines combined, operating revenues totalled SP 0.9 million and total expenditures were SP 8.7 million; by 1977 little change had occurred, with revenues of SP 1.2 million and expenditures of SP 9.0 million. With limited train service in progress, the major component of expenditures was staff costs, 84 percent of the total in 1977.

B-6.2 CAPITAL INVESTMENT

Actual capital expenditures for the period 1974 to 1978 and budgeted spending for 1979 and 1980 are given by project in Table B-6.3. Total expenditure in the 4th Five-Year Plan period, 1976 to 1980, is estimated at SP 14.7 million, but of this, SP 7.5 million is budgeted for the feasibility study in 1980 of the standard gauge system. Remaining spending was chiefly on the purchase of diesel locomotives and railcars. Investment is virtually frozen pending the results of the feasibility study.

Expenditures on a possible standard gauge CFH mainline from 1986 onwards are discussed in Chapter A-8.

Table B-6.1

INCOME AND EXPENDITURE - DERA'A LINE

(million SP)

Income	1975	1976	1977	Expenditure	1975	1976	1977
Operating Revenue	0.88	1.23	1.16	Wages and Salaries	4.35	5.45	5.18
Income from Services	0.61	0.34	0.45	Allowances, etc.	0.10	0.11	0.13
Rent	1.46	1.41	1.85	Social Security	0.79	1.24	0.85
Other Income	0.40	0.30	0.42	Staff Costs	5.24	6.80	6.16
Total Revenue	3.35	3.28	3.88	Fuel	0.26	0.26	0.27
Less Expenditure	6.30	7.65	6.92	Spares and Equipment	0.47	0.38	0.21
Operating Deficit	-2.95	-4.37	-3.04	Maintenance	0.03	0.07	0.01
Depreciation Provision	-0.15	-0.17	-0.19	Others	0.30	0.14	0.27
Deficit after Depreciation	-3.10	-4.54	-3.23	Total Expenditure	6.30	7.65	6.92

Source: CFH, Finance.

Table B-6.2

INCOME AND EXPENDITURE - SERGHAYA LINE

(million SP)

Income	1975	1976	1977	Expenditure	1975	1976	1977
Operating Revenue	0.01	0.04	0.06	Wages and Salaries	1.09	1.30	1.16
Income from Services	0.25	0.09	0.11	Allowances, etc.	0.02	0.02	0.02
Rent	0.04	0.04	0.17	Social Security	0.21	0.44	0.20
Other Income	0.04	0.03	0.02	Staff Costs	1.32	1.76	1.38
Total Revenue	0.34	0.20	0.36	Fuel	0.12	0.07	0.06
Less Expenditure	2.40	2.54	2.07	Spares and Equipment	0.26	0.02	0.06
Operating Deficit	-2.06	-2.34	-1.71	Maintenance	-	-	-
Depreciation Provision	0.00	0.00	0.20	Others	0.70	0.69	0.57
Deficit after Depreciation	-2.06	-2.34	-1.91	Total Expenditure	2.40	2.54	2.07

Source: CFH, Finance.

Table B-6.3

CAPITAL EXPENDITURE

(million SP)

Project	1974	1975	1976	1977	1978	1979[1]	1980[1]
Diesel Locomotives - 3 units	0.13	0.49	0.67	0.03	3.08	-	-
Railcars - 13 units	0.50	0.54	1.99	0.08	-	-	-
Machinery and Equipment	0.11	0.35	0.67	-	-	-	0.70
Track and Structures	-	1.20	-	-	-	-	-
Feasibility Study	-	-	-	-	-	-	7.50
Others	-	-	-	-	-	0.02	-
Total	0.74	2.58	3.33	0.11	3.08	0.02	8.20

Source: CFH, Finance.

[1] Budgeted figures.