Financing Commercialization of Technology in Jordan

Bureau for Private Enterprise
U.S. Agency for International Development

Prepared by: *David Neideffer*
Edgar C. Harrell

Sponsored by: *Financial Markets Project*
Project Number: 940-2005
Prime Contractor: Arthur Young

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FINANCING COMMERCIALIZATION OF TECHNOLOGY

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David Neidiffer
Edgar C.Harrell
2/15/87

Introduction

The major opportunities in the developing countries for commercialization of technology are in the adaption and improvement of known and proven technologies. Design, prototype development, engineering, market testing, the entrepreneur that will drive that technology into the market place and assure its quality rather than research predominates. The venture aspect of commercializing technology, as distinct from the business or entrepreneurial aspect, is to distinguish and choose correctly from among available technologies which one is the best for a given market opportunity. Many local businessmen have ideas about developing new products for distinct markets taking advantage of local materials, market relationships, or market tastes, but they need guidance on assessing the cost and feasibility of developing those products, either on the basis of imported or locally derived technology. Success is the result of combining the right business person with the right technology for the right market.

Most developing countries have attempted to strengthen their R&D capabilities by establishing government R&D research centers. Although research has been accomplished, less technology than anticipated has been commercialized either through licensing or joint venturing for production. This experience is not uncommon in developed countries. Both market and financial analysis has been lacking in setting the research agendas by government financed and managed R&D laboratories and those that know markets -- private businessmen -- enter the decision-making cycle too late.

In addition to establishing R&D laboratories, governments have attempted to encourage the private sector to upgrade its technological base by fiscal measures -- tax incentives for licensing imported technology, preferential tariffs on imported equipment

and tax incentives on R&D expenditures. These fiscal incentives have proven only partly successful for a variety of reasons: unrealistic ceiling on royalty fees allowed in licensing have discouraged on-going relationships between those who own technology and can continually upgrade it and those who license it; tariff preferences for imported equipment have lead to inappropriate technology in the context of the prevailing costs of labor and capital in the importing country; and tax incentives on R&D have been of short duration or perceived as such by business people and the administration of those incentives has been cumbersome and time consuming.

A logical first question is: should governments and international funding agencies adopt measures and programs to stimulate development of technologies by the private sector in developing countries? Government expenditures and incentives for technology development are generally justified because: 1) social returns due to external benefits such as diffusion of specific knowledge and development of specialized manpower and innovative management skills are greater than private returns; 2) investments in technology are often considerably riskier than those for other activities; and 3) even when private entrepreneurs are willing to invest in technology, gaps in the capital market inhibit their financing of these activities.

This paper focusses primarily on filling the gaps in the financial market for technology development and commercializing that technology into usable and useful products and processes. With proper analysis of the technological options and the cost and feasibility of adapting those technologies to specific market opportunities, the primary risks of investing in manufacturing products based on new technology should be commercial: market price and business acumen. How much risk the financier is willing to take will depend on his or her source and cost of money and what are his or her objectives for return on investment over what time period.

Financing Technology Development

For the small entrepreneur development of technology is mostly self financed with the help of family and friends. Increasingly, universities and large corporations in the U.S. will assist entrepreneurs in commercializing technology developed in their laboratories. Specialized companies such as University Patents and Research Corporation have established contracts with universities where they will assess, patent and license university technology on a contract-fee basis. Corporations such as G.E. have licensed and financed employees to develop and commercialize technology the company has shelved and some corporations, such as G.E. and Monsanto, for example, and more recently some universities, have developed venture capital funds to finance start-ups using their technology or that derived from other sources. Using Section 174 of the tax code, particularly after the Snow decision of 1974, R&D limited partnerships have become popular and some large funds, such as Prutech, specialize in the development and commercialization of technology. State authorities have also intervened in this market, such as Connecticut Private Development Corporation, which provides conditional grants for technology development for local entrepreneurs, the Corporation being repaid from royalties on successful ventures. This array of financial mechanisms, with the exception of family and friends, is absent in the developing world. Some attempts have been made by governments and international lending agencies such as IBRD and AID, to fill this gap at various stages of the technology development cycle with varying degrees of emphasis and success.* The most notable are:

* See Appendix E, "Sharing of Risks" for additional information

Given the risk aversion philosophy of most financial institutions, particularly those established and operating in developing countries, reducing the technology risk and shortening the time horizon between when these institutions provide financing and when they can expect a return, will hasten their participation in financing commercialization of technology -- the end result of which is new productive investments, new jobs, upgraded skills, expanded markets and new export earnings.

BIRD-F

A binational fund was established by the governments of the U.S. and Israel on an endowment basis with initial capitalization of US$50-million (now $110 million). The number of new projects financed is limited to the income of the endowment and royalties from successful projects. Major characteristics of BIRD-F are:

- product-process development, only enter the technology development cycle between prototype development to market testing
- collaborative projects - US-Israel private companies
- no start-up financing for production - only technology development financing
- royalties for payments on success. Conditional grant - no obligation to repay if unsuccessful, no collateral required
- small independent staff, (5 professionals) which provide excellent business and technology assessments and introduction to appropriate business partners
- strong technological infrastructure in both countries
- products developed are mostly for export with short and unique technological competitive life spans
- Board - all government, approve each project
- incremental funding based on approved technology development plan - will provide both FX and local currency financing. Up to 50% of costs will be covered by BIRD with maximum size of investment by BIRD of $1.5 million over a 3-year period
- no role by staff in management of projects, but strong monitoring role in implementing and modifying approved project (technology) development plans
- no U.S. marketing offices
- good client base - U.S. companies know Israel and vice versa. Much of the early technology development -- idea to initial prototype development -- was financed by the

Office of the Chief Scientist, Government of Israel. Many of BIRD-F projects are graduates of this early financing which was supported by an IBRD loan.

- level of technology development financed - medium
- will finance idea development and pre-feasibility on a limited scale
- staff comes from business or technology development firms
- BIRD has initiated 135 projects to date. 54 have led to sales: 12 over $1-million, 5 over $5-million and 2 over $50-million. Sales resulting from all projects which have received support from BIRD total about $240-million through 1986. BIRD was established in May, 1977.

A copy of the latest BIRD annual report and its handbook to businessmen in preparing project proposal are attached as Appendices A & B.

PACT

A binational fund established in 1986 by AID and ICICI, an Indian development bank. (ICICI is 50% government-owned). PACT is quite similar to BIRD-F except:

- ICICI can provide follow-on equity financing for start-up production from its own resources
- managed by ICICI internally
- Board is private, but Board does not approve individual projects
- U.S. marketing office
- no endowment -- number of projects will be limited by initial grant, $10 million, and royalties from success-
- operating expenses for staff covered by ICICI (3 professionals)
- no idea development or pre-feasibility study money yet
- level of technology - medium, probably below level in

Israel, and most products and processes developed will be internal (India) market
- finance prototype to market testing - 50% of costs, up to maximum from PACT of $1.5 million - predominately rupee financing
- good client base from customers already served by ICICI (assets $2.5 billion)
- staff comes from development and commercial banking experience
- will probably require collateral and some repayment whether development of technology is successful or not from recipients of approved conditional grants
- good business analysis capability; limited ability to analyze technology; ability to find best partners is not tested

KTDC (Korea Technology Development Corporation)

- established on basis in part by loan from IBRD in 1981, KTDC is 28 - 30% government owned, 70% private companies
- large staff - about 50 professionals, many come from commercial banks
- KTDC aims to promote, appraise and finance existing private industry projects to upgrade their technological capability. As part of its activities, KTDC will finance businesses to commercialize results of their own R&D efforts, subcontract directly with research institutes for R&D on behalf of businesses or finance the adaptation of imported technology
- assess opportunities and provide brokering if appropriate but this is limited and KTDC works primarily with Japanese-Korean and US-Korean opportunities
- three types of financing:
  a) conditional lending (collateral for 30 - 40% of loan). If successful, full repayment of loan plus

royalty (which is greater than the interest on a conventional loan); if fail, repay only part of principal (30 -40%). The payment for successful projects is based on KTDC earning 23% return.

b) credit conventional loan (collateral or non-collateral) - pay interest at about the same rate as charged by development banks. These loans are not always collateralized and no royalty payment is required. Since the final borrower assumes the FX risk, many opt for credit conventional loan rather than conditional loans.

c) equity, but not widely used to date, and only for small, innovative companies which are basically start-ups. Equity is generally in the form of convertible debentures, with KTDC having the option to convert to equity within 5 years.

KTDC will enter technology development cycle at pre-prototype stage; it will also finance later stage developments and first product commercialization with equity for new companies.

Of 600 projects financed to date, 40 are equity and 40 are conditional loans. Only 10 projects have failed; 7 have been fully repaid.

KTDC does much of its conventional conditional loans and equity financing from domestic borrowing (by raising money in the Korean bond market or by borrowing from the government at low interest rates).

The IBRD loan to KTDC is at a variable rate with a modest spread to KTDC. Since the government has a ceiling on the domestic lending rate and requires fixed interest rate lending the government subsidizes KTDC spreads on sub-loans from the IBRD. The amount of subsidy provided by the government is declining.

As of 1985, KTDC had capital of $32.39 million and had provided $220.93 million in financing to 600 projects.

KTDC was a revolutionary financial institution within the context of the Korean capital market when it was established. KTDC actively looked for investment opportunities with small businesses and KTDC would lend to private businesses without requiring full collateral.

The initial capital for KTDC came from the government. KTDC was further capitalized by about 70 private companies in a unique manner in 1981. Under Korean law, private companies could set aside 1% of sales or 20% of profits in one year for investments in R&D over 4 years. The total R&D expenses could be written off as an expense the first year, but companies were penalized heavily if they did not utilize the tax write-off R&D reserve fund within 4 years. In 1981 the government allowed companies to use these R&D reserve funds for capitalization of KTDC.

KTDC recently established a venture capital subsidiary, KTIC, under a new Korean law to foster venture capital. This a high risk taking, equity financier for firms in new businesses driven by technology, such as automobile component parts.

Lessons Learned

1. KTDC must work very closely with firms which are developing technology under conditional loan or equity financing from KTDC, generally small companies. New engineers hired by KTDC do not have the experience to fully provide the guidance required by these companies in order to protect KTDC's investment.
2. Fees earned from business assessments and brokering have been very limited. A copy of KTDC's 1984 annual report in is Appendix C.

K-TAC (Korea Technology Advancement Corporation)

A government company incorporated in 1974 which promotes the commercial utilization of the research and development on production technology of the Korea Advanced Institute of Science and Technology. (KAIST) and other publicly-supported research institutions. K-TAC evaluates commercial potential, markets the technology and initiates projects through equity investments or sales of KAIST technology. K-TAC operates primarily on a commission basis; it will do consulting for private companies on a fee basis. K-TAC will provide equity-finance for start-ups based on KAIST or imported technology. The average size of K-TAC's equity investment was about 300,000-400,000 $US in 1982. KAIST technology is taken to the pilot project stage before marketed by K-TAC and KAIST will provide warranties to the purchasers of its technology through K-TAC. K-TAC generally co-finances projects with the Korea Development Finance Corporation (KLP). Like KAIST, KLP is a stockholder in K-TAC. K-TAC was established in 1974. As of 1985, K-TAC had a capitalization of $1.8 million and had invested in 17 projects.

KDIC (Korean Development Investment Corporation)

KDIC is a private venture capital, equity investor which focusses on financing small and medium sized businesses, but is not limited to products based on new technology. KDIC was established in 1982. KDIC is a first or second round financier, not a financier of technology development. Investors include JAFCO, DEG, ADB, IFC, Westinghouse and originally American Can who sold out. Westinghouse is reported to own 30% of the equity. As of 1985 KDIC had a capitalization of $10.27 million and had invested in 75 projects.

KDIC's objectives are:

1. To improve the technological profile of Korean firms by financing projects utilizing innovative technology;
2. To promote export-oriented, small company development;
3. To add to the shortage of equity financing available to Korean firms.

KDIC has resisted investments in riskier, small scale projects and has attempted to establish itself by investing in companies managed by proven entrepreneurs.

FONEI (Mexico)

A government trust fund administered by Banco de Mexico (the central bank) FONEI runs the largest of Mexico's industrial technology development financing programs. FONEI supplies money for loans for equipment purchasers and technology development through commercial banks. They will provide up to 100% of the cost of specific industrial technology development projects and 80% for equipment purchases. Their large equipment lending program allows movement along the successive stages of technology innovation to equipment purchasing and their well-trained staff allows them to identify opportunities for technological innovation based on equipment purchased for specific purposes in Mexico. The commercial bank can take the risk on the loan or obtain a guarantee from FONEI for up to 90% of the finance provided by FONEI by paying a guarantee fee. FONEI also provides some grant financing along with loans for risky technology development projects.

In 1985 FONEI instituted a conditional loan program for technology development projects. If unsuccessful, 25% must be repaid; if successful a repayment schedule including royalties is worked out among FONEI, the participating commercial bank and the borrower. The program was supported by a loan from the IBRD. Before the initiation of the conditional loan program, FONEI had

a bias toward larger, less risky projects since they required repayment of the loan even if the individual project fails.

CDTI (Center for the Development of Industrial Technology, Spain)

This is a government agency established initially within the Ministry of Industry and Energy. It is now autonomous. CDTI provides conditional loans to enterprises for research and development. When CDTI was first established with a loan from the IBRD, they had to seek out projects for financing; now companies come to them. Under the conditional loan, if the project financed did not lead to a marketable new product or service, the principal is repaid, but interest is forgiven. If successful, CDTI is repaid plus a royalty charge on net sales. Investments are made at the pre-market phase. CDTI participates in market and technology forecasts studies and assessments, generally by outside experts. CDTI now provides a conventional lending program. It has about 40 employees.

Examples of projects:

a) a prototype of a medical infusion group;
b) a process for the direct production of sterilized red peppers

A typical project financing for CDTI is:

CDTI	34%
Sponsor	50%
Spanish government	16%

CDTI generally lends at 14%, term loan and requires substantial collateral. The average size of project is $500,000.

Lessons Learned:

1. Project evaluation should give more weight to innovative and commercial aspects of the proposals and to the technical and

managerial capacity of the sponsors and less weight to collateral.

2. Project implementation plan should have well-defined bench marks of progress against well-defined tasks.
3. Early links should be established with financial institutions like Sefinnova for financing for scaling up equipment, prototypes, product samples, pilot plants and industrial scale manufacturing.

SEFINNOVA (Spanish Society for the Financing of Innovation)

A private venture capital firm capitalized by private financial institutions. It provides equity and convertible debenture financing timed to coincide with the commercial launching of a new product-process or services. It does not finance start-ups at the R&D, patent, or idea level. Established in 1978, its initial capital was $5.8 million; it employed a professional staff of 9. In a second capital subscription, the bank shareholders also provided long-term debt financing commitments for funding investments by Sefinnova in the form of convertible debentures and other equity-linked debt instruments. Between 1978-83, Sefinnova made on the average 3 investments per year averaging $80,000 per investment. Appraisal fees averaged $30,000/year, operating expenses about $300-325,000/year.

What is Required for Financing Commercialization of Technology?

Technology infrastructure - essential - technically-trained people with problem-solving experience, engineers (electrical, mechanical), production managers, electricians, fabricators, farm machinists, lab technicians, people who find solutions based on academic-training and practical experience in a technical field. Country should have well-developed metrology, industrial standards and quality assurance programs if exports or import substitution products in an open market are the goal.

Business types and social structure - essential - problem-solving, risk takers, innovative, with country's social goals that put high value on profit, market share, capital accumulation investment, competition among firms, between firms, between government and private sector and a government policy environment which doesn't discriminate against private sector in pricing, allocation or capital and access and pricing of foreign exchange (FX).

Government Policy - essential - A government policy environment which does not discriminate against the private sector in allocation of capital and FX, does not create major bureaucratic hurdles for the private sector in licensing of technology, and does not maintain a substantially overvalued currency. High rates of inflation will discourage private investment in R&D and new product development.

Fiscal incentives - not essential but potentially very helpful - equitable treatment of R&D expenses and depreciation on R&D equipment; ready access to FX for imported research equipment and payment of fees and licenses; tax credits for R&D on new product development, either for domestic or export markets; permanency of fiscal incentives; effectiveness of administering fiscal incen-

tives; special treatment for venture capital firms and funds and no double taxation of capital gains.

Imported or domestic technology - not essential - will influence how a financing institution operates. Source of the technology will be determined in large part by consumer tastes, potential markets for product developed, technology infrastructure and fiscal incentives or disincentives, and government regulations. The country should be open to the importation of technology.

Financial market - essential - commercial banks, non-depository financial institutions, development banks, venture capital, merchant banks and stock market. The type of projects, terms, collateral, risks, degree of involvement in management, project assessment capability will be affected by depth , breath and openness of financial market and who capitalizes a fund for, or finances directly, commercialization of technology and at what stages (see Appendix E).

Market - essential - size and location, competition, tastes of consumers of products developed, and the products developed will be determined by cost, quality, packaging, servicing, marketing relationships, and tastes. How stable are the advantages, what is the competition? This will influence what R&D is financed and how the R&D process is staffed and managed.

Jordan

Jordan has invested heavily in improving its scientific and engineering infrastructure. Yet Jordan is still a major importer of engineering services and has not diversified its export earning base much beyond resource endowed products such as phosphates, potash, and agriculture or its principal markets much beyond the Arab world. This section analyzes the environment for financing technology development in Jordan, and suggests a possible structure of a fund for investing in technology development. Any private or semi-government funding for commercializing technology should be augmented by a government initiated program in metrology, industrial standards and quality assurance and an review, and if warranted, a change in the fiscal incentives provided to Jordanian businessmen for R&D and for employing engineers, technicians and scientists in new product and process development, particularly for export or import substitution markets.

To effect a restructuring of the economy, the tax system should be consistent with objectives of maintaining revenues while increasing and channelling savings into productive investments which lead to greater employment and production for export markets as well as cost-competitive import substitution. However, the impact of the current structure and level of Jordanian incentives is not well know with respect to such household and firm choices as:

- consumption vs. saving
- investment in productive assets vs. investment in consumer durables
- production for the domestic market vs. export vs. import substitution and importation vs. domestic production
- investment in R&D and new product development vs. short term financial instruments and trading enterprises

Since 1975, the Jordanian Dinar has been pegged to the SDR. Although this has resulted in a stable currency value, it has also kept the Jordan Dinar (JD) at a much higher value than would be in the case under a freely floating system. This, combined with high tariffs, outright bans on certain categories of imports, and poor administration of customs drawback schemes, makes the risk/return profile of investment for the domestic market more attractive than for the export market.

In sum, as part of an effort to restructure the economy to emphasize innovation, an examination of and selective changes in Jordan's fiscal system would be appropriate.

Jordan's government's sectoral strategy has shown a preference for market forces and private initiative ("free enterprise") as indicated in objectives as described in the AID Mission's CDSS and Technical Services/Feasibility Studies project paper (July 27, 1986). This second document also outlines the relationship to the AID strategy statement.

The Private Sector* in Jordan accounts for a significant and stable proportion of total income, employment, investments, and exports. (See Tables A-C)

There is a range of small manufacturers who are successful in the local market who evidence a high entrepreneurial drive and who are interested in expansion. In reviewing the barriers to their development, product design capability, quality control and marketing skills featured prominently in every discussion. There

*"Private Sector" is used herein to define firms in which private interests control more than 50% of share capital. Excluding from the "private sector" firms where the government owns between 20-49% does not significantly change the relative shares of employment, GDP, exports and investment.

TABLE A
EMPLOYMENT: GOVERNMENT VS. PRIVATE SECTOR
(IN THOUSANDS)

	1983 Employment	Sector Distribution	Estimated % of Sector		Estimated % of Total	
			Gov't	Private	Gov't	Private
Agriculture	51.2	10.1%	0.0%	100.0%	0.0%	10.1%
Mining	4.6	0.9%	75.0%	25.0%	0.7%	0.2%
Manufacturing	51.2	10.1%	9.0%	91.0%	0.9%	9.2%
Construction	76.9	15.1%	0.0%	100.0%	0.0%	15.1%
Trade*	48	9.4%	2.0%	98.0%	0.2%	9.2%
Finance, Real Estate Business Services	10	2.0%	0.0%	100.0%	0.0%	2.0%
Other Services**	24.4	4.8%	0.0%	100.0%	0.0%	4.8%
Electricity & Water	9.5	1.9%	81.0%	19.0%	1.5%	0.4%
Transportation & Communications	41.6	8.2%	52.0%	48.0%	4.3%	3.9%
Public Administration and Defense	191.6	37.5%	100.0%	0.0%	37.5%	0.0%
TOTAL	509	100.0%			45.1%	54.9%

* Includes hotels and restaurants
** Includes community, social and personal services, non-profit institutions, and domestic services

TABLE B
GDP: GOVERNMENT VS. PRIVATE
(IN MILLIONS OF JD'S)

	1984 GDP	Sector Distribution	Estimated % of Sector		Estimated % of Total	
			Gov't	Private	Gov't	Private
Agriculture	111	8.4%	0.0%	100.0%	0.0%	8.4%
Mining	44	3.3%	90.0%	10.0%	3.0%	0.3%
Manufacturing	193	14.6%	30.0%	70.0%	7.3%	7.3%
Construction	127	9.6%	0.0%	100.0%	0.0%	9.6%
Trade*	241	18.3%	10.0%	90.0%	1.8%	16.5%
Financial, Real Estate, Business Services	124	9.4%	0.0%	100.0%	0.0%	9.4%
Other Services**	54	4.1%	0.0%	100.0%	0.0%	4.1%
Electricity & Water	32	2.4%	90.0%	10.0%	2.2%	0.2%
Transportation & Communication	152	11.5%	70.0%	30.0%	8.0%	3.5%
Public Administration and Defense	241	18.3%	100.0%	0.0%	18.3%	.0%
TOTAL	1319	100.0%	N/A	N/A	40.6%	59.4%

* Includes restaurants and hotels
** Includes community, social and personal services, non-profit institutions, and domestic services

TABLE C
EXPORTS: GOVERNMENT VS. PRIVATE SECTOR
(IN MILLIONS OF JD'S)

	1984 Exports	Sector Distribution	Estimated % of Sector		Estimated % of Total	
			Gov't	Private	Gov't	Private
I. GOODS						
Agriculture	41.8	6.1%	0.0%	100.0%	0.0%	6.1%
Mining	87.1	12.8%	100.0%	0.0%	3.0%	9.8%
Manufacturing	132.1	19.4%	34.0%	66.0%	7.3%	12.1%
TOTAL I	261	38.3%	50.0%	50.0%	10.3%	28.0%
II. SERVICES						
Transportation*	307.8	45.2%	100.0%	0.0%	25.8%	19.4%
Government	7.8	1.1%	100.0%	0.0%	0.7%	0.4%
Insurance (non-merchandise)	17	2.5%	0.0%	100.0%	0.0%	2.5%
Other	87	12.8%	0.0%	100.0%	0.0%	12.8%
TOTAL II	419.6	61.7%	66.4%	34.6%	26.5%	35.2%
TOTAL I & II	680.6	100.0%	N/A	N/A	36.8%	63.2%

* Includes freight and insurance, other transportation, and travel

were, of course, other complaints, often strident in tone ranging from licensing to the dumping of inferior products on the Jordanian market by foreign exporters. Those complaints are amenable to both policy change and technical assistance.

AID/Jordan proposed programs will address:

1. The lack of coordination among existing private sector associations.
2. Financial Constraints: The objective is to improve finanical intermediation: by mobilizing capital for new products and new ventures in the private sector (Venture Capital/Private Development Bank); and by providing a wide range of technical assistance and training to Intermediate Financial Institutions in such areas as project lending, cash flow and risk analysis, and secondary markets for bonds, loans, and mortgages.
3. Small Entrepreneurial Development: This new project will involve entrepreneurial training, establishment of new improved fiancing mechanisms, and regional planning in support of small enterprises.
4. Productivity Center: The center will assist local businesses in developing marketing plans and will provide information on possible export markets.
5. Feasibility Studies: Technical assistance will be provided for firm level analysis of the feasibility of new products and markets.
6. Investment Promotion: A limited amount of funding will be provided to government agencies and local businesses deemed capable of launching investment promotion efforts.

The Jordan Mission's Private Sector Development Program is summarized in Annex D.

Some Pluses and Minuses for Commercialization of Technology in Jordan

A. Pluses:

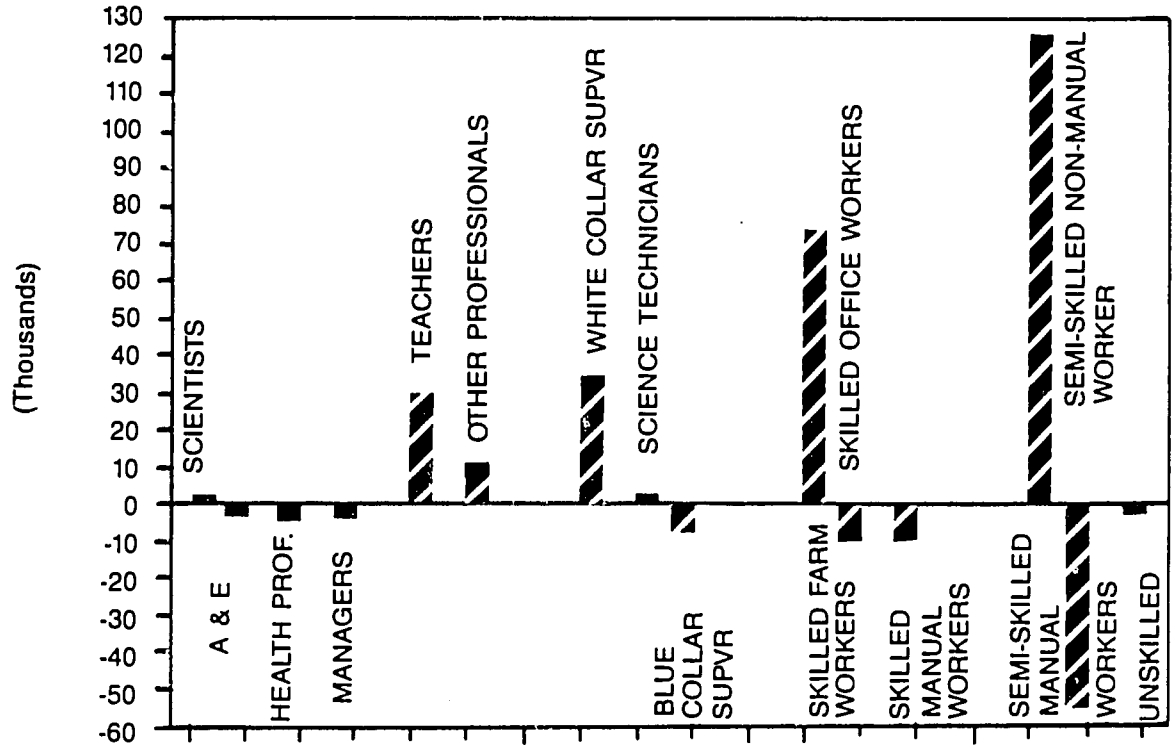
1. High educational level of Jordanians, many are not fully employed (Table D);
2. Engineers (all types, including product design engineers) are available, many with experience. They perceive limited productive opportunities in Jordan;
3. Pragmatic new manufacturers with work experience abroad;
4. Good and relatively sophisticated financial system;
5. Stable political environment;
6. Excellent physical and social infrastructure;
7. Basically open, free market economy;
8. Small scale industries that can produce good quality products for high value added markets that provide flexibility in changing product mix to meet changing market opportunities;
9. New government's stated willingness to assist private businessmen and political willingness to consider partial privatization of government enterprises.

B. Minuses

1. Limited financing (including insurance) for exports of goods and services beyond nine months (except Iraq);
2. Inadequate experience and means in defining markets, designing products for markets and marketing new products and services (marketing is not taught in business schools);
3. Lack of attention to and appreciation of the importance of product standards, quality control and quality assurance, either by private businessmen, workers or public sector officials;
4. Highly leveraged capital structure of businesses, lack of equity, and lack of risk capital for new, unproven businesses;
5. Decline in demand and increased competition in well-developed markets for Jordan's traditional exports of goods and services.

Table D

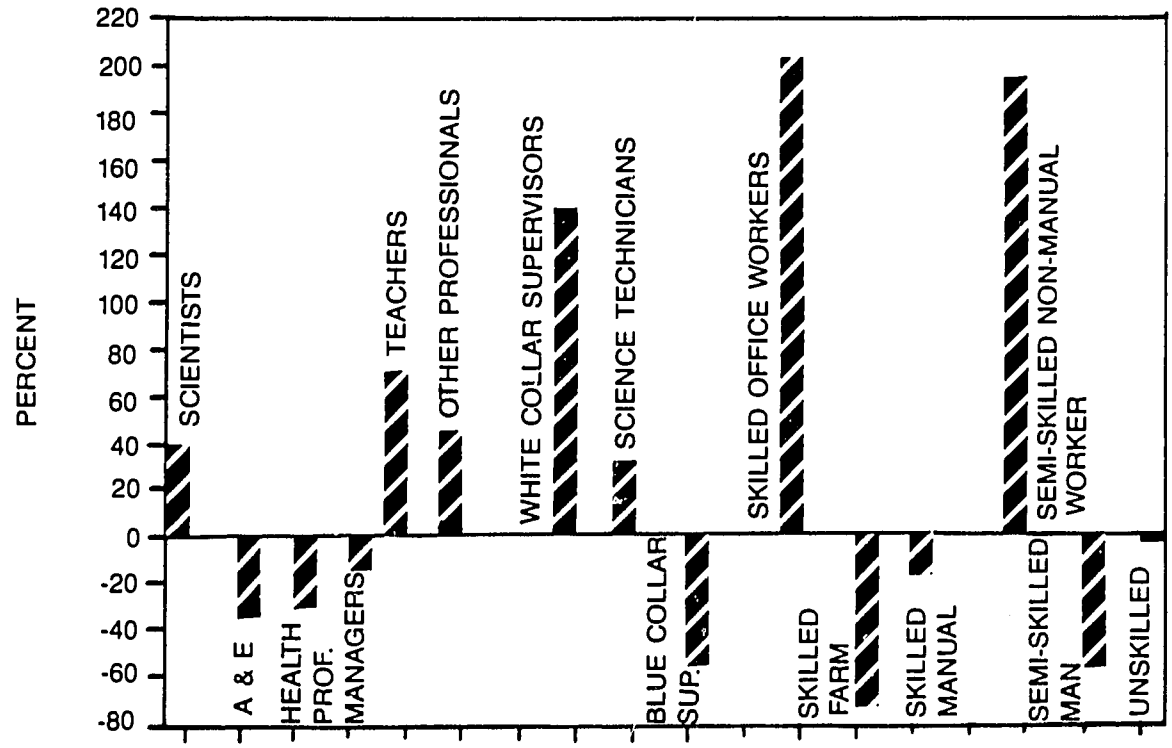
MANPOWER SURPLUSES & SHORTAGES
(000's)



MANPOWER SURPLUSES & SHORTAGES
(As % Labor Demand/Labor Supply)

URPLUS AS % LABOR
EMAND FOR
CCUPATION

HORTAGE AS %
ABOR SUPPLY
OR OCCUPATION



The Environment (Jordan)

Technology Infrastructure - good, particularly in engineering and laboratory technicians. Good experience in mining and chemical processing area, electronics, solar heating systems, agricultural machinery. Technicians and engineers who have worked in the Gulf states and returned to Jordan are a good target entrepreneurial group. University facilities in science and engineering and vocational training is good. Metrology, industrial standards and quality assurance programs are not well-developed yet.

Business types and social structures - some problem-solving, innovative businessmen but limited. Social values only partly supportive of problem-solving and risk-taking. Competition among firms, between firms, between government and private sector depends on sector, but has been limited in agricultural marketing, and mining, but is now more open in light manufacturing and new product areas. Policy environment is reasonably good.

Fiscal incentives - not bad, not good. R&D expenses can be written off; R&D equipment can be depreciated. Accelerated depreciated, carry over of R&D expenses, tax credits and multiple write-offs for R&D expenditures are not provided. Present fiscal incentives probably do not play a major role in decisions on R&D and new product development.

Imported or domestic technology - largely imported. Some capacity for domestic R&D, particularly at Royal Scientific Society, pharmaceutical companies, mineral processing companies. High value placed on imported over domestic technology. Product standards and administration of quality standards on imports and exports is a significant weakness and discourages R&D and risk-taking on new product development.

Financial market - commercial banks, non-financial banking institutions and development banks reasonably well-developed but conservative and small businesses have limited access to them. Some merchant banking, but to date, limited. Stock market is small but has potential for growth. The government pension fund is a potential investor in R&D and new companies but has limited technology assessment capability. Little risk money available from private or government sources for new product development; some for process or product adaptation. No venture capital. Some R&D done in government-owned companies, some in private companies but limited. Risk financing, particularly for small companies, and analytical capability to assess technological options in the context of perceived market opportunities are big gaps.

Market - not large and Jordanian businessmen are not aggressive at developing new market niches, either domestic or export. Transportation costs for external market are high except to neighboring Arab countries and Gulf states. Jordanians do not have a marketing, packaging or advertising mentality. Any financier of technology development would have to provide insights on markets and marketing. The competitive advantage of new products will be short except in markets financed and encouraged by government to government agreements, i.e., Iraq. The domestice market is easily penetrated by imports and consumers prefer imported goods. Products based on Jordanian technology would have a limited market life cycle in the present environment.

Structure of the Fund (J.T.D.F. - Jordan Technology Development Fund)

Purpose

A fund to provide risk capital to private companies for new product and process development in Jordan.

Services Provided

1. Conditional loans and equity to finance process or product adaptation with qualifying Jordanian private businessmen and equity to finance new business start-ups or expansions based on technology developed with qualifying small Jordanian private businesses with a specific focus on:
   a) Exports or import substitution where efficient;
   b) Employing Jordan's engineers, scientists and technicians.

2. Technology and business plan assessments (fee basis)

3. Introduction to suitable business or product development partners (fee basis)

Capitalization

$5-million equivalent, 50% from Jordanian pension funds and insurance companies and 50% from private banks, financial and non-banking financial institutions and private businesses.

The fund could be capitalized from the following sources:

- private or government pension funds

- insurance companies
- private banks
- financial and non-financial institutions
- private businesses, either as equity or as tax credits unused on R&D expenditures (this would require a change in the tax code)
- development agencies
- the engineering association or private engineering firms as equity
- university pension funds
- contribution by RSS to rights to technology it developed which could be sold or licensed by the fund on a split royalty basis
- IBRD

The fund could finance technology development or adaptation by conditional loans, by conditional loans convertible into equity or by equity. The fund should not provide more that 50% of the cost up to some maximum, say $750,000 equivalent. Under a conditional loan the fund would be repaid the loan plus a royalty on gross sales on the successful product or process developed. In case of failure, all or part of the loan could be forgiven. In lieu of repayment of the loan or payment of the royalty, the fund could accept equity in the company on a mutually agreed price per share based on future earnings of the company. If banks or pension funds are a major investor in the fund, they may require some repayment irrespective of whether the technology is successfully developed and marketed or not. Conditional loans without collateral where the loan is forgiven in the case of failure of the technology, either for technical or market reasons, is the preferred vehicle for small, innovative businesses.

The operating cost for management (salaries, rent supplies, travel, telephone, telex, depreciation) would run about $250,000-300,000 per year. This could be financed during the early years

by the shareholders separately, by a development agency such as AID for the first three years, or from the interest earned on the $5-million contributed to the initial capitalization of the fund. Compensation to the management of the fund should be partly dependent on performance with management sharing risks for success with the shareholders.

Management

Board of Directors (7 people) representing the outside investors, prominent Jordanian businessmen, the engineering association, the Royal Scientific Society, the Minister of Trade and Industry, and the president of the fund.

Investment Committee - 5 people, 3 from management of the fund, 2 outsiders (one financial, one technical)

Technical Advisory Committee - 5 people, two from U.S. scientific community, two from Jordanian scientific community and a U.S. venture capitalist

The Board provides over-all policy guidance and approval of investments over $500,000, the investment committee is chaired by the president of the fund and makes decisions on all investments under $500,000.

Staff

3 professionals, (president, financial expert, engineer), bookkeeper/secretary, out-side legal counselor. President should be technically-trained with operating and managing experience in private company, preferably overseas. A correspondent relationship on a contractually basis with a U.S. firm would be established for finding business and research partners and assessing

market and technology options. Part of compensation to the U.S. firm would be based on performance and the U.S. correspondent could be asked to contribute to the equity of the fund.

Investment

Conditional loan

Shared 50% financed by fund and 50% by private company sponsor or sponsors. Maximum size of product or process development investment, $750,000. Average size of investment of fund in product of process development is $200,000 with many in the $50,000-200,000 range.

50% of fund investment is conditional loan, with repayment obligation regardless of success except for small businesses and 50% is a grant which carries royalties on gross sales, stock options and right of first refusal on equity financing for start-up. If the project is successful, equity could also be taken in lieu of the royalty payments.

The fund's investment would be distributed on the basis of an approved technology development plan, with benchmarks to review progress during the development period. It is envisioned that the fund would invest in three branches and could provide both local and foreign exchange financing.

Equity for Commercialization of Technology

It is envisioned that a separate and purely private venture capital firm will be established to provide equity financing for companies commercializing technology successfully developed with financing from the fund. The president of that corporation should be a member either of the Board or the investment committee of the fund, preferably the investment committee.

PROJECTED INCOME STATEMENT

			$US		
REVENUE	1988	1989	1990	1991	1992
Commission on Business Assessment	10,000	20,000	30,000	30,000	30,000
Commission on Brokering	5,000	10,000	15,000	15,000	15,000
Royalties			50,000	100,000	150,000
Dividends			20,000	40,000	50,000
Capital Gains					100,000
TOTAL OPERATING REVENUE	15,000	30,000	115,000	185,000	345,000
OPERATING COSTS					
Salaries	150,000	200,000	230,000	230,000	230,000
Other Cash Operating Costs (G&A)	60,000	80,000	92,000	92,000	92,000
Depreciation Amoritzation	0	0	0	0	0
TOTAL OPERATING COSTS	210,000	280,000	322,000	322,000	322,000
OTHER INCOME					
Interest Income	123,500	104,000	78,000	227,000	182,000
PROFITS BEFORE TAXES					
Taxes					
Net Profit (Loss)	(71,500)	(146,000)	(129,000)	90,000	205,000

Assumptions

Sales Revenue

1. $10,000 per assessment, $250/man/day 40 man/day fee assessment
2. 5% on equity for finding partner, average equity $100,000
3. 5% on gross sales with sales of average successful project of $1,000,000; one success in 1990 with one additional in each of 1991 and 1992
4. 10% dividend on equity, with two equity investments averaging $100,000 in 1990, 4 on 1991 and 6 in 1992
5. 100% capital gains from sale of 1 equity in 1992, average size of equity $100,000

No assumption is made about interest on portions of loans not forgiven in unsuccessful projects or about interest on loans in addition to royalties in successful projects. No assumption is made about revenue for selling or licensing the rights to RSS technology.

Operating Costs

1. Salaries $180,00/year G&A $70,000 (40% of salaries and benefits) and depreciation and amortization negligible. Staff consists of 2 professionals, and contract with a U.S. firm and secretary/bookkeeper in 1988, adding a professional in 1989 and a semi-professional in 1990. Average professional salary, including benefits, $50,000, contract $25,000, and secretary/bookkeeper $25,000. Car, telephone, telex, mini-computer, desks, files, office space, utilities are assumed leased and included in 40% G&A.

Interest Income

1988 - $2,000,000 subscribed and earns 6.5%. 1 project financed, disbursement of $100,000

1989 - 3 projects financed, disbursement of $400,000, interest earned $104,000

1990 - 6 projects financed, disbursements of $800,000, interest earned of $78,000

1991 - 12 projects financed, disbursements $1,500,000, additional $3,000,000 subscribed to fund, interest earned $227,000

1992 - 15 projects financed, disbursements, $2,200,000, interest earned $182,000

A broad approach to achieving the objectives of this program-technology innovation - would include items not included in the cost estimates of the fund. These are:

- A study to identify fiscal incentives to promote R&D by all qualifying Jordanian firms. This study could also identify tax credit mechanisms for R&D that would facilitate private firms providing capitalization to JTDF as was the case for KTDC in Korea
- an appraisal of the market values of RSS developed and owned technology
- advisory assistance to the appropriate Royal Jordanian Government ministries and offices on developing and enforcing quality standards
- education programs, i.e., seminars, factory visits to promote the acceptance of quality control and quality assurances throughout the Kingdom
- a marketing study reimburseable grant to the Fund to identify product specifications, packaging, distribution channels and market niches for Jordanian produced goods and services for Jordanian industries
- supplementary support for on the job training to upgrade the skills of Jordanian engineers for contributing to the objectives of this program.

Appendices

A. BIRD Handbook

B. BIRD 1986 Annual Report

C. KTDC 1984 Annual Report

D. The Jordan Mission's Private Sector Development Program

E. "Sharing of Risks" from Strategy in AID's Commercialization of Technology Programs, 9/20/85

1986 BIRD Foundation Status Report

The purpose of the BIRD Foundation, established by the governments of the United States and of Israel in May 1977, is to provide financial support to U.S. company – Israeli company teams who see good prospects for individual benefit through their joint development and commercialization of innovative (nondefense) products or processes based on industrial R&D.

Support from BIRD takes the form of grants to each of the two companies on a cost-sharing basis. Should the project lead to commercial revenues for the companies, BIRD recovers its investment – and sometimes a little more – in the form of royalties. If, for any valid reason, no revenues eventuate, no return of the grant is due.

Although BIRD is the child of two government parents, it operates much in the manner of a private source of support for the R&D phase of the life cycle of an innovation. Its goals, however, are to stimulate and promote mutually beneficial activity between the private sectors of U.S. and Israeli high-technology industry rather than to make a profit directly. The gains to both economies and the increased tax revenues accruing to the two governments as a result of successful projects are profit enough.

The performance of BIRD-supported projects, 135 initiated so far, can be summarized as follows: 54 have led to sales – 12 of over $1 million, 5 of over $5 million and 2 of over $50 million. Sales resulting from all projects which have received support from BIRD total about $240 million through 1986. Royalties received or due total about $2.5 million.

Once a lonely outpost in uncharted binational industrial R&D territory, BIRD has become the model for many such arrangements, actual or putative, between its founders and other countries. To the extent that the model has become one deemed worthy of replication, many share the credit, but not least the perhaps intrepid U.S. and Israeli company participants. Their joint efforts have demonstrated – unequivocally, we believe – that funds deriving from public sector sources can be, in the right framework, a powerful catalyst for private sector economic growth. We salute them.

A.I. Mlavsky
EXECUTIVE DIRECTOR

Fibronics International Inc. and Fibronics Ltd.,
developing advanced equipment for Integrated Local Networks.
(Photograph by Clint Clemens, U.S.A.)

Board of governors

Mr. Yehoshua Forer
CHAIRMAN
Director General
Ministry of Industry
and Trade, Israel

Dr. Ernest Ambler
MEMBER, EXECUTIVE COMMITTEE
Director
National Bureau of Standards
Department of Commerce
Washington, D.C., U.S.A.

Mr. Yigal Ehrlich
CHAIRMAN, EXECUTIVE COMMITTEE
Chief Scientist
Ministry of Industry
and Trade, Israel

Mr. Dan Halperin
Minister for Economic
Affairs
Israel Embassy
Washington, D.C., U.S.A.

Dr. David C. Mulford
Assistant Secretary for
International Affairs
Department of Treasury
Washington, D.C., U.S.A.

Ambassador John D. Negroponte
Assistant Secretary for Oceans
and International
and Environmental
and Scientific Affairs
Department of State
Washington, D.C., U.S.A.

We welcome Mr. Yoram Blizovsky who has just replaced Mr. Forer. We greatly appreciate the contributions which Mr. Forer has made to the Foundation. Dr. Edward L. Brady, Associate Director for International Affairs, NBS, has, throughout BIRD's existence, been especially helpful. It is with pleasure that we acknowledge his efforts on our behalf.

Chava Doukhan Ira Grinberg

Ed Mlavsky

Liora Katzenstein Sol Cohen

Ruth Baum

Operations

Dr. A.I. ("Ed") Mlavsky
EXECUTIVE DIRECTOR

Ira M. Grinberg
ASSOCIATE DIRECTOR

Dr. Liora Katzenstein
ASSOCIATE DIRECTOR

Solomon H. Cohen
ACCOUNTING MANAGER

Chava Doukhan
EXECUTIVE SECRETARY

Ruth Baum
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Dr. Jordan J. Baruch
ADVISOR - U.S.

Dan Tolkowsky
ADVISOR - ISRAEL

Harold Katz
COUNSEL

Baviy, Millner & Co.
AUDITORS

MUSICOM[®] - music courses through computer-aided education, by Xanadu Ltd. and Roland Corporation, U.S.

Every project supported by BIRD involves a partnership - temporary, conditional or permanent – between a U.S. company and an Israeli company. In the course of initiating 135 projects, BIRD has accumulated a portfolio that has come to include a wide variety of companies involved in a somewhat bewildering array of technologies and innovations.

Although all of the projects are listed herein with brief titles, such a stark catalog can hardly be expected to convey the rationale for or complexities of any particular project or pairing of companies. With the gracious consent of the participants, therefore, some case histories are presented.

The projects and partnerships described, though diverse in nature, indicate the gains to be derived from the marshalling of complementary skills and capabilities. This is as true, if not truer, for commonly owned companies as it is for *ad hoc* partnerships, since for the former there is less potential for divergence of interests.

It is submitted that what emerges from the BIRD experience generally and from the true-life adventures related below in particular, is that there are many natural fits to be found between companies in the U.S. and the talents available in Israel. In the right framework, binational cooperation is a net positive sum game.

This is no news to the more than 150 U.S. companies that have already established subsidiaries or formal affiliates here, but less obvious, perhaps, to those U.S. companies which have yet to explore the possible benefits of a more arms-length involvement. To their attention, in particular, we commend the following.

Israel, though small, abounds in highly trained and motivated technical personnel, in innovativeness and in the proven capability to develop and manufacture sophisticated technical products that can compete in world markets. Its internal markets, however, are too small to justify the expense of developing such products. And the lack of detailed knowledge of and access to major markets that characterize its small companies, in particular, leads to a classical "Catch 22": without a physical presence in a major market area, one cannot generate growth; but without growth, one cannot afford that presence.

By contrast, although the U.S. market for sophisticated technical products is huge, it is also highly competitive. For companies there to grow, they need a continuous flow of new products. By cooperating with an Israeli company, especially with support from BIRD, the U.S. company has the opportunity of acquiring new products at minimal cost, and the Israeli company has a means for entering major markets not otherwise easily accessible to it.

In choosing only a few projects to describe, we perforce run the risk of disappointing our many other grantees. We beg their recognition of our dilemma and can but hope that they too will find the choices interesting and informative.

HORIZON 1100 - a bright new look in patient monitoring, by Mennen Medical Ltd. and Mennen Medical Inc.

Computer-Based Science Courseware, by Prentice-Hall, Inc. and Edunetics Ltd.

Much as the more mature of us (in age, that is) have fond if somewhat distorted memories of the pupil-teacher interaction, the inexorable trend is towards the pupil-computer interaction. If it is to be so, let us have the best the computer has to offer.

Edunetics, an Israeli company of pedagogues, didacticians and software specialists, developed a highly innovative means for the rapid creation of curricula material for computer-aided instruction.

Prentice-Hall, a division of Simon & Schuster, the largest educational publisher in the U.S., recognized in the Edunetics technology the seeds of a major revolution in means for the production of curricula material in a manner that makes the computer an extension of the teacher; the result – a viable partnership in the education process.

As many other companies had discovered and more continue to rediscover, it is a far from easy task to create an impeccable product that answers such a complex need with a new technology. But the combination of Prentice-Hall, with its encyclopedic knowledge (sic!) of the American education system and requirements, and Edunetics with its powerful tools for rendering supplied pedagogy into lively, accurate and attractive computer output, is arguably a unique one.

A proposal from the two companies to develop a series of packages for Life Science/Biology, Earth Science and Physical Science, mostly for junior high schools, was submitted to BIRD. As is our custom, the proposal was evaluated by the U.S. National Bureau of Standards for technical content, by the Office of the Chief Scientist, Israel Ministry of Industry and Trade, and by the BIRD staff. The proposal subsequently received approval from the Board of Governors.

Just as courtship and marriage are quite distinct phases in a relationship, so are agreement to a joint project and its actual implementation. Communications problems that arise are of two types: the formal problems of transferring information regularly and accurately across large distances, and the more subtle problems of bridging cultures, especially in a project so market-specific as this one. Let it simply be said that these problems were not notable by their complete absence.... But, after a first year in which product development went ahead side-by-side with problem recognition and – praise the mark! – solution, the project is in full swing, with numerous quite excellent products entering the market at an accelerating rate.

Edunetics will continue to develop new products, closely specified in form and content by Prentice-Hall, and Prentice-Hall will continue to market them; both companies will benefit. And BIRD, which receives a royalty on sales to a modest maximum, is quietly confident that this maximum will eventuate.

Computer-Based Science Courseware - the first group of products, by Edunetics Ltd. and Prentice-Hall, Inc.

Vetalpha – A Milk Fever Preventative, by ANIMED Research and Development Inc. and Teva Pharmaceutical Industries Ltd.

Picture, if you will, a soft-eyed ruminating cow, the very model of serenity and contentment. But its owner is less serene. Around calving time, his best milk producers are prone to a disease called milk fever. This nasty little number causes a quite drastic reduction in milk output. (Not for us to know, but the cows probably don't enjoy it much either...)

Based on work originally performed at a university in the U.S., Israel's largest pharmaceutical company, Teva, developed a specific compound for the prevention of milk fever disease – 1-alpha hydroxyvitamin D3, or "Vetalpha" – that proved to be both safe and effective. Teva markets the product in Europe, but all eyes are on the United States where there are some 10 million dairy cows. (Israel's many problems do not include a high incidence of the disease – Kibbutzim cosset their cows....)

ANIMED (formerly Cardio Pet, Inc.) was founded in 1980 to provide specialized services and products to veterinarians and veterinary clinics. While still small (true no longer....), it quickly established powerful access to the major U.S. markets for animal health care, to which the veterinarian is the major supplier of prescriptions.

At the time that ANIMED first became aware of Vetalpha and Teva, it was too small a company to afford comfortably the to-ing and fro-ing necessary to develop a transatlantic partnership. Nonetheless, based on meetings with both companies, we quickly arrived at the opinion that here was a BIRD project in the offing, if not of the more common type. So, under a special provision of BIRD operating procedures, ANIMED was given a small pre-grant award to assist in coming to Israel for detailed discussions with Teva.

Those discussions led to the conclusion that a detailed market survey would be a prerequisite in any project that justified the expense of seeking the necessary approvals for the use of Vetalpha in the U.S.A., and in the modification and scale-up of the manufacturing process to meet the qualitative and quantitative demands of that market.

Under another funding mechanism, for tests of feasibility, BIRD cost-shared with the companies in the conduct of that market survey. The findings were very encouraging, sufficiently so for the companies to produce and BIRD's Board to approve a proposal for the whole project.

The project is now in its third and final year. In the not too distant future, Americans will be buying milk that never would have materialized but for the efficacy of Vetalpha and the sterling work of Teva and ANIMED in bringing it to the U.S. dairy farmer.

An interesting footnote to this BIRD epic is that ANIMED has become a public company which, at time of this writing, was operating at about the $20 million a year level. We bet it's more by now!

Future beneficiaries of Vetalpha, by Teva Pharmaceutical Industries Ltd. and ANIMED Research and Development Inc.

Message Management Computer System, by Comverse Technology Inc. and Efrat Future Technology Ltd.

The telephone, while ubiquitous, is also so apparently well-identified as to its function that its much wider potential as an information terminal is barely yet being exploited.

The principals of Efrat, established in Israel in 1982 by Israelis who had acquired extensive experience in the telecommunications industry in the U.S., were amongst the earliest to first speculate and then focus on this extraordinary potential. Specifically, they conceived, as a first product, a message management system that digitizes voice, stores it as is stored any other string of bits and bytes, distributes it under the control of a computer and smart software, and reconstitutes it to voice to permit the chosen recipient to receive information on the familiar telephone.

As a second and more ambitious product, Efrat conceptualized a large-scale fault-tolerant message management system for cellular radio and for telephone companies. After a successful search for a U.S. partner whose major roles would be to provide detailed specifications for the requirements of a system to meet U.S. needs and customs, and to sell, instal and maintain such systems in the U.S., Efrat and its prospective partner submitted a proposal to BIRD.

The proposal was reviewed as described above and, about eight to ten weeks later as is typical, was considered by the Board of Governors. It was approved for an immediate start.

But a mandatory requirement for any joint project is that the companies must come to an agreement that governs their relationship not only during the BIRD-supported development phase, the easy part in a way, but also during the subsequent commercialization phase. Because Efrat and its partner-elect proved to be so close in character and ambition as to be potential competitors, no such agreement could be reached.

A crucial consideration for all potential applicants (and yes, let's admit it, for BIRD too) is that no proposal should be submitted unless there is such an agreement between the companies or, at a minimum, a clear basis for one.

Efrat, in the course of the development and analysis of the required marketing strategy and means for its first product, TRILOGUE®, a small VSF system, concluded that it would strive for its own corporate presence in the U.S., for close access both to customers and to sources of investment – and so Comverse was born; it now thrives. In defiance of conventional biology, it has become the parent company.

Once Comverse had acquired a critical mass, the previously approved but never implemented BIRD proposal was updated, resubmitted and once more approved.

The project is in full swing, this time between a healthier and more mature Efrat, and a partner designed *ab initio* to have the complementary capabilities to augur success.

TRILOGUE® - a message management computer system by Efrat Future Technology Ltd. and Comverse Technology Inc.

UNISON by Martin Marietta Data Systems (MMDS) and International Business Software Ltd. (IBS)

Information management, we are told, is the key to business success. While it might be considered heresy to express even the smallest doubt about the value of computers in information management, a consequence of the very speed and capacity of those dumb monsters has been the proliferation of information to be handled and the ever-increasing demands for the management service. The software must somehow catch up.

Exhibiting prescience as well as sagacity back in 1967, Mathematica Inc. first developed the Rapid Access Management Information System, RAMIS, a then innovation in data processing for the inexperienced practitioner. Its successor, RAMIS II, (by Mathematica Products Group) has, for nearly ten years now, been available to the growing community of sophisticated and demanding customers. The company is now part of MMDS.

In principle, almost any software package designed for use on a mainframe can be adapted, with compromises, to be accessed by and operate on the ubiquitous microcomputer. But to achieve an appealing balance between performance, convenience and cost is not a task for the easily daunted.

Back in 1983, a young Israeli company, IBS, brought to the attention of the RAMIS II group the fact that there are many talented computer scientists and software specialists in Israel, and that there exists a unique organization (that's us!) that supports joint developments of the kind that would transform RAMIS II into "UNISON", a version for microcomputers and for UNIX.

Viewed from the U.S. company side, the prospects of greatly reducing the total cost of the development, partly by BIRD's contribution to the expense, partly by the Israeli company's participation, were very appealing. Only when and if the product comes to be a commercial success does the full expense need to be realized. Accordingly, the two companies submitted a proposal to BIRD, received approval, and split the work between them.

As has been hinted above, joint developments at long range cannot be expected to be accomplished without a few problems here and there. But, as proved to be the case, the advantages of access to new talent pools and of meaningful off-balance sheet financial assistance, far outweighed those sometimes pesky problems.

During the course of the three-year project, IBS has grown up to its name ("International"), early versions of UNISON have entered the market, and the companies – and BIRD, of course – have high expectations of sharing in the benefits of a well-conceived and efficiently executed development.

UNISON - the full capabilities of RAMIS II via the personal computer.
by Martin Marietta Data Systems and International Business Software Ltd.

Data-Over-Voice Modems, by ADC Telecommunications, Inc. and RAD Data Communications Ltd.

There's that telephone again! It does, of course, allow the transmission of data as well as voice, but not usually at the same time. Enter the data-over-voice modem.

For more than 50 years, ADC has supplied the telecommunications industry with the quality electromechanical and, in more recent years, the electronic products that it demands. ADC's monotonic growth in sales, to about $125 million in 1985, reflects the skill of the company not only in satisfying well-identified industry needs, but also in anticipating technological trends.

Interestingly, the explicit policy of the company with respect to new technology embraces the concept of receptivity to new developments from the outside – the very antithesis of that old bugaboo the "not-invented-here" syndrome.

This – in our view highly enlightened – mind-set encouraged ADC to react positively to a new concept for a low-cost data-over-voice modem presented to them by RAD. RAD, founded in 1980, develops, manufactures and exports to six continents a line of products for the telecommunications industry. Privately owned, its sales in 1986 will be about $10 million.

The necessary ingredients for a joint project, and for an approach to BIRD, were clearly present. ADC's major contributions would be in product specification, test and sales, but also in supervision of the creation and acquisition of a custom LSI chip; RAD's major responsibility would be for product development and manufacture, but also for sales to the local market.

The BIRD Board of Governors had no hesitation in approving the project. Although this is a highly competitive field, what more can one reasonably ask than that there be two proven companies with complementary skills and a common goal, undertaking a well-planned foray into a growing market? They deserve to succeed. (Actually, they already are succeeding.)

DATA-OVER-VOICE MODEM - by RAD Data Communications Ltd. and ADC Telecommunications, Inc.

Oil Well Logging Tool Using NMR, by Numar Inc. and Numalog Ltd.

Since Mother Earth is a finite sphere that can't possibly contain more than a certain amount of oil, and since, sooner or later, all that is there will need to be found, the present situation in the industry doesn't, we submit, warrant any cessation of the search for improved techniques of exploration.

Numar Inc. was established by Dr. Melvin Miller to pursue practical applications of a highly innovative and proprietary magnet configuration that produces a strong field outside the magnet. One especially attractive possibility implicit in such a structure is the measurement of the nuclear magnetic resonance (NMR) behavior of the region outside an oil bore-hole since this NMR behavior is known to correlate with the permeability of the medium to the flow of liquids.

Having had one successful career as a technical entrepreneur and company manager, Mel Miller can hardly be described as the most risk-averse individual one is likely to run into. True to form, some might aver, he decided that the benefits of creating a subsidiary in Israel, Numalog Ltd., to take advantage of the unusual concentration of talent in the fields of magnetics in general and NMR in particular, outweighed the problems to be anticipated in splitting the effort between two small companies remotely located from each other. Of course, among the benefits from such an arrangement were the prospects of support from BIRD and from the various incentive programs offered by the Government of Israel to those who do establish subsidiaries here.

Most potential customers for sophisticated bore-hole instrumentation - and there really is no other kind that works in light of the highly hostile environment in which such instrumentation must operate – are large in size and therefore few in number. To address such a customer list, one requires a group of highly knowledgeable individuals, but not a large one. Numar Inc., is therefore small by design and not just by history.

Even so, support of such an ambitious project between two start-up companies may be deemed by some to be a BIRD eccentricity. We think not. In our association with the companies we have seen a raw technical concept progress from a computer simulation to a laboratory demonstration that presages a breakthrough in the industry, and an organizational concept progress to the point where the two companies are established and equipped to implement their roles in completing the development and commercializing it. We are confident of their success.

OIL WELL LOGGING TOOL - nuclear magnetic resonance technique for quantifying oil recoverability, by Numar Inc. and Numalog Ltd.

The six stories above describe full-scale projects.

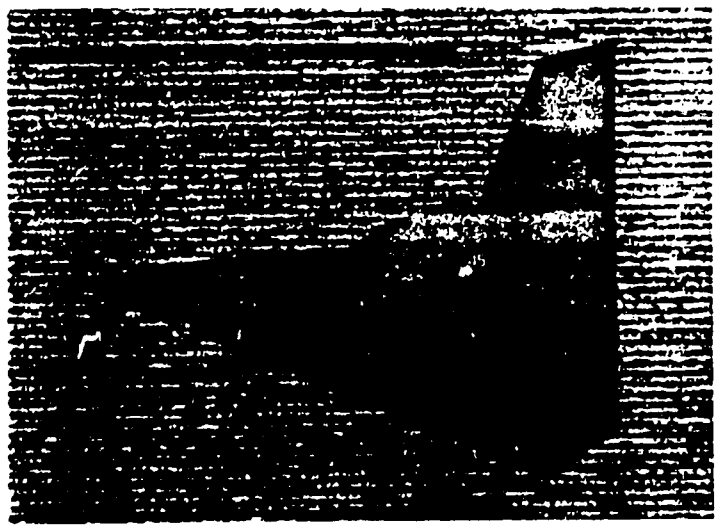
The total budget for full-scale projects, namely the sum of the expenses to be incurred by the two companies to bring the proposed product(s) or process to the point of commercial readiness, ranges from about $250,000 to about $3,000,000 over a one to three-year period, with BIRD typically contributing 40% of each company's expenses.

Buried in the text is the information that proposals for full-scale projects are evaluated, in confidence, by the U.S. National Bureau of Standards for technical content, by the Office of the Chief Scientist, Israel Ministry of Industry and Trade, and by BIRD. Such projects require Board of Governors approval, an overall process which typically takes eight to ten weeks from the time a proposal is received.

Also alluded to above are "pre-grant awards" and "tests of feasibility". The former, maximum $10,000, are made – sparingly, let it be noted – to assist small companies with out-of-pocket expenses incident on proposal preparation. The latter, maximum $30,000 from BIRD as its 50% cost-share, are awarded where basic technical or market data need to be acquired before the decision can be made as to the value of preparing a formal proposal for a full-scale project. Both types of awards are made by the Executive Director: Board approval is not required.

Another very important funding mechanism available to the Executive Director is for the support of "mini-projects" which, at a total cost to the two companies of about $150,000 or less, have good prospects of leading to a commensurate volume of saleable products.

The mini-project, to which BIRD will contribute $75,000 or 50% of the total project cost, whichever is less, is often the ideal vehicle for two companies to use on a journey whose first destination is worthwhile, but who contemplate longer and more adventurous forays into innovation-land.



COLOR DISPLAY GENERATOR - by Liacom Ltd. and Liacom Inc.

Listed on the following pages, by year of start, are the 87 full-scale projects, 34 mini-projects and 14 tests of feasibility we have funded.

- Full-Scale Project
- ● Full-Scale Project having sales
- Mini-Project
- ■ Mini-Project having sales
- Test of Feasibility
- ◆ Test of Feasibility leading to a Full-Scale Project

1979

● **KEY BX**
PENTACOM INC., NY & TELRAD LTD.

● **Computerized Irrigation Systems**
MOTOROLA INC., IL & MOTOROLA ISRAEL LTD.

Cardiac Diagnostic Imaging System
ELSCINT INC., MA & ELSCINT LTD.

● **Implantable Pacemakers**
MENNEN MEDICAL INC., NY & OMIKRON LTD.

● **CO-OPT**
CREATIVE OUTPUT INC., CT & CREATIVE OUTPUT LTD.

Viscosity Measurement System
OVUTIME INC., MA & ISCAR LTD.

1980

Magnesia Production
GENERAL REFRACTORIES CO., PA & ISRAEL CHEMICALS LTD.

Ceramic Switches
SUPCO INC., NJ & GALAI LABORATORIES LTD

Pathogen-Free Poultry Feed
HIGH-VOLTAGE ENGINEERING CORP., MA & MATMOR LTD.

● **Solar Energy Station**
LUZ INTERNATIONAL LTD., CA & LUZ INDUSTRIES (ISRAEL) LTD.

Power Concept for Cardiac Imaging System
ELSCINT INC., MA & ELSCINT LTD.

1981

Machining Center
HCC INDUSTRIES, CA & CONLOG CONTROL LTD.

VM Cryogenic Pump System
VEECO INSTRUMENTS INC., NY & RICOR LTD.

Wound & Burn Healing Monitors
FARRALL INSTRUMENTS INC., NB & ATLAS RESEARCHES LTD.

● **RAYSTAR – Laser Plotter**
LEO BEISER INC., NY & SCITEX CORPORATION LTD.

● **Freshwater Prawn**
GENERAL MILLS INC., MN & APT (ISRAEL) LTD.

Management Software Systems
BOOLE & BABBAGE INC., CA & ADVANCED TECHNOLOGY LTD

LOCKHEED-CALIFORNIA CO., CA & DEUTSCH INDUSTRIES LTD.

◆ GRIFFIN CORPORATION, GA & BIOSEARCH LABORATORIES LTD
ACCUTEST CORPORATION, MA & C.I. INSTRUMENTS LTD.
HYDRO-BOTANICALS CO., NY & KIBBUTZ INDUSTRIES ASSOCIATION

1982

● **High-Speed Data Modems**
WIDEBAND DATA CORPORATION, CA & PHASECOM (ISRAEL) LTD

● **Microporous Materials**
GELMAN SCIENCES INC., MI & GELMAN SCIENCES TECHNOLOGY LTD.

● **PHOTOCCLUSION™**
VISHAY INTERTECHNOLOGY INC., PA & VISHAY ISRAEL LTD.

● **Digital Transducers**
CELESCO INC., CA & TEDEA LTD

● **Computerized Plating System**
FIRST WORLD MARKETING INC., NY & TECHNO INSTRUMENTS LTD

● **Graphic Displays**
MODGRAPH INC., MA & LIACOM LTD

Slow-Release Fungicides
GRIFFIN CORPORATION, GA & BIOSEARCH LABORATORIES LTD

Utilization of Poultry Waste
DIXIE STEEL CO., AL & B.Z.T. LTD (KIBBUTZ INDUSTRIES)

● **Novel Photoresists**
MACDERMID INC., CT & MACDERMID ISRAEL LTD

GTE LABS INC., MA & YISSUM R&D CO
T.I.G. INC., NY & TEK-DYN LTD.

1983

Long Shelf-Life Tomato
LSL INC., CA & HAZERA SEEDS LTD.

• MICADO – Office Automation Systems
CONDOR COMPUTER CORPORATION, MI & OSNAT COMPUTERS LTD.

• CAD-CAM for Garment & Shoe Industry
BETA SCIENTIFIC INC., CT & BETA ENGINEERING & DEVELOP. LTD.

Clinical Immunoassay Kits
LIFE TECHNOLOGIES INC., OH & RAMOT LTD.

• Intelligent Bedside Patient Monitor
MENNEN MEDICAL INC., NY & MENNEN MEDICAL LTD.

• Computerized Center Pivot Irrigation
MOTOROLA C&E INC., IL & MOTOROLA ISRAEL LTD.

Robotic Devices
DESIGNATRONICS INC., NY & IMCO LTD.

• Data Collection Factory Management System
DECISION SYSTEMS INC., NJ & VA ANA DATA COLLECTION LTD., ELTA LTD.

High-Speed Image Processor
NTL IMAGING SYSTEMS INC., CA & ELPACK 2000 (COMPUTERS) LTD.

• UNISON
MARTIN MARIETTA DATA SYSTEMS, INC. & I.B.S. LTD.

• Components for Irrigation Systems
NIRPET ENGINEERING INC., CA & GALCON LTD.

• Superfinisher Machine Tools
CBI INTERNATIONAL INC., NY & PLADOT EIN HAROD

Profilometer
AA GAGE INC., MI & M.L.I. (IL) LTD.

• Pick, Place & Palletizing Robot
UNIMATION/WESTINGHOUSE INC., CT & ROBOMATIX LTD.

■ High-Capacity Fertilizer Pump
HAYS EQUIPMENT CO., GA & T.M.B. LTD.

■ Design Software for Irrigation Systems
NATIONAL IRRIGATION CO., NJ & WEIZMAN INDUSTRIES LTD.

EPROM Module for Atlas Systems
DOLCH LOGIC INSTRUMENTS INC., CA & DIGITRONICS LTD.

■ Multiplexer System
FIBRONICS INTERNATIONAL INC., MA & FIBRONICS LTD.

Gatekeeper Kitting
INDATA CORPORATION, MA & LOGISTICA SYSTEMS & COMPUTERS LTD.

UNIQUE INFORMATION SYS. INC., IL & MASHOV LTD.

♦ AA GAGE INC., MI & M.L.I. (IL) LTD.

1984

MICROSTAR Data and Audio Switch
COMCENTER CORPORATION, CA & KOLNET SYSTEMS LTD.

Polymeric Heart Valve Prosthesis
ABIOMED INC., MA & OMIKRON SCIENTIFIC LTD.

• VLSI Fast Fourier Transform
ZORAN CORPORATION, CA & ZORAN MICROELECTRONICS LTD.

• Video Mapping Systems
PERCEPTRONICS INC., CA & SIMTECH LTD.

• EB-2000 – Computerized Teaching System
TECHNOVATE INC., FL & DEGEM SYSTEMS LTD.

Vetalpha as a Milk Fever Preventative
ANIMED INC., NY & TEVA LTD.

• KEREN – A Management System for Printing
POLYCHROME CORPORATION, NY & ARIELI LTD.

• Data-Over-Voice Modems
ADC TELECOMMUNICATIONS INC., MN & RAD DATA COMMUNICATIONS LTD.

■ Remote Alarm System
SCITEQ ELECTRONICS INC., CA & XANADU LTD.

■ MCSA Equipment Maintenance Software System
GRUMMAN DATA SYSTEMS, NY & CSA LTD.

Diagnostic Assay for Channel Catfish Virus
FIRST MISSISSIPPI CORPORATION, MS & IGS LTD.

Novel Diamond-Tipped Drills
ISCAR METALS INC., NJ & DEGANIA DIAMONDS LTD.

■ Programmable Counter/Timer
KEITHLEY INSTRUMENTS INC., OH & TABOR LTD.

■ Credit Card-Operated Taximeter
GENERAL BEARING CORPORATION, NY & MIDDLE EAST ELECTRONICS LTD.

■ Robotics Audio-Visual Programs
PREP INC., NJ & ESHED ROBOTEC LTD.

■ INTERTEST PL/I for IBM/CICS Systems
ON LINE SOFTWARE INTERNATIONAL, NJ & SEMECH TSS LTD.

■ Low-Capacity Fertilizer Pump
PLANT FOOD SYSTEMS INC., FL & T.M.B. LTD.

■ APTOOLS for COBOL
MITCHELL MANAGEMENT SYS. INC., MA & MILAN SOFTWARE INDUSTRIES (1976) LTD.

ORMAT SYSTEMS INC., MA & ORBOT SYSTEMS LTD.

OHIO MEDICAL INC., WI & SRD LTD.

♦ ANIMED INC., NY & TEVA LTD.

1985

Novel Herbicides
FMC CORPORATION, NJ &
LUXEMBOURG CHEMICALS LTD.

- **Remote Control Mobile Robots**
  21ST CENTURY ROBOTICS INC., GA &
  SIVAN LTD.
- **Computer-Based Science Courseware**
  PRENTICE-HALL INC., NJ &
  EDUNETICS LTD.
- **CIDS-PAC/S3X Software**
  PARA RESEARCH INC., MA &
  TAPI INFORMATION SYSTEMS LTD.
- **ALCIDE® Product Development**
  ALCIDE CORPORATION, CT &
  KOOR FOODS LTD.

Superfinisher Tool Accessories
GBI INTERNATIONAL INC., NY &
PLADOT EIN HAROD

Inspection System for PC Boards
PRECISION CIRCUITS INC., NJ &
P.C.B. LTD.

Advanced Defibrillator System
DATASCOPE CORPORATION, NJ &
MICROBIT LTD.

Adaptors for ILAN
FIBRONICS INTERNATIONAL INC., MA
& FIBRONICS LTD.

- **Automatic Wafer Dicing System**
  KULICKE & SOFFA INDUSTRIES INC.
  PA & KULSO LTD.
- **Power Plant Data Base Management**
  CYGNA CORPORATION, CA &
  REITER SOFTWARE SYSTEMS LTD.

Superfast Professional Graphics
T.A.T. GRAPHIC GROUP INC., CA &
GALAXY GRAPHICS LTD.

32 Bit Block Floating FFT Chip
ZORAN CORPORATION, CA &
ZORAN MICROELECTRONICS LTD.

GaAs Crystal Development
FERROFLUIDICS CORP., NH &
FERROFLUIDICS LTD.

Solid Modeling CAD/CAM System
CROMEMCO INC., CA &
MICROCAD LTD.

Intensive Care Patient Terminal
MENNEN MEDICAL INC., NY &
MENNEN MEDICAL LTD.

- **Polarographic Analyzer**
  EG&G PRINCETON APPLIED
  RESEARCH, NJ & JORDAN VALLEY
  APPLIED RADIATION LTD.

Document Processing System-Oracle RDBMS
ORACLE CORPORATION, CA &
JOHN BRYCE (GLASGOW) LTD

Computerized Alarm System for Cars
MICRO BALANCED PRODUCTS CORP.,
NJ & CONCOD LTD.

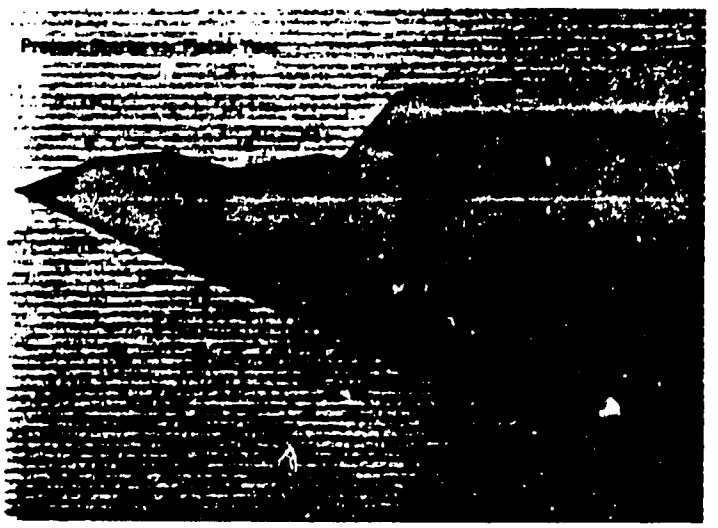
- **3-D Vision System**
  MICROMINT INC., CT &
  ESHED ROBOTEC LTD.

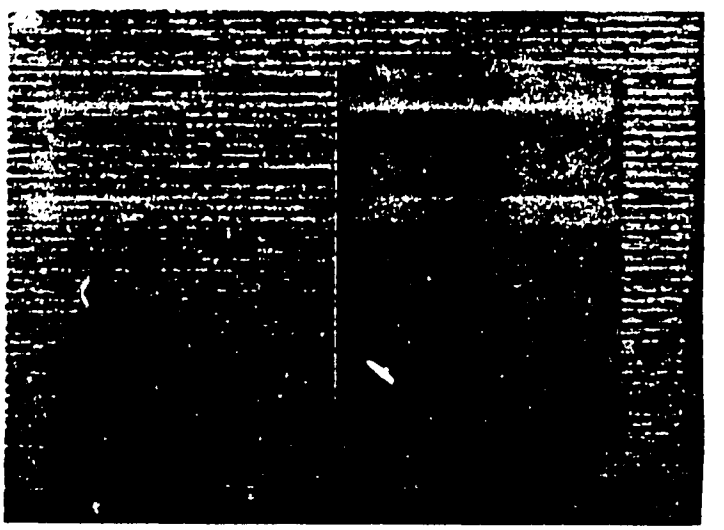
New Filter Elements for Irrigation
ESSEF CORPORATION, OH &
DESIGN & DEVELOPMENT LTD.

TADOAR – Electronic Mail
I.B.S. (U.S.A.), NY & TADIRAN LTD.

- **Computer Greeting Cards**
  JUST FOR YOU INC., CA & L.K.P. LTD.

- SIGHT & SOUND INC., WI &
  XANADU LTD.
  ODETICS INC., CA &
  AGA SERVOLEX LTD.





1986

- **Digital Circuit Multiplication System**
  ECI TELECOM INC., FL & ECI LTD.
- **Science Courseware Development**
  PRENTICE-HALL INC., NJ & EDUNETICS LTD.

Industrial CO_2 Laser
C-E INDUSTRIAL LASERS INC., MA & M.L.I. (IL) LTD.

Message Management Computer System
COMVERSE TECHNOLOGY INC., NY & EFRAT FUTURE TECHNOLOGY LTD.

Interactive Text for Pre-Press Systems
SCITEX AMERICA CORP., MA & SCITEX CORPORATION LTD.

Computer Equipment Management System
INTERNATIONAL SYSTEMS SERVICES CORP., NY & CONTAHAL LTD.

Switched Data Communications Network
GENERAL INSTRUMENTS CORP., NY & PHASECOM (ISRAEL) LTD.

Kit for Blood Platelet Function
ACCURATE CHEMICAL & SCIENTIFIC CORP., NY & INT'L BIO-TECHNOLOGIES LTD.

Insurance Claims Administrative System
POLICY MGMT. SYSTEMS CORP., TX & PMS (ISRAEL) LTD.

Interactive Electronics Learning System
TECHNOVATE INC., FL & DEGEM SYSTEMS LTD.

Oil Well Logging Tool
NUMAR CORPORATION, PA & NUMALOG LTD.

- **Musicom® – Computerized Music Education**
  ROLAND CORPORATION, U.S., CA & XANADU LTD.

Microwave VCO's
GENERAL MICROWAVE CORP., NY & GENERAL MICROWAVE ISRAEL CORP.

Advanced Computer Graphics Devices
LIACOM INC., MA & LIACOM LTD.

- **Stand-Alone Motion Controller**
  GALIL MOTION CONTROL INC., CA & ELMO ENGINEERING LTD.

Heating/Cooling Electronic Thermostats
WATSCO INC., FL & ELDAR ELECTRONICS LTD.

Moire MTF Instrumentation
APOLLO LASERS INC., CA & ROTLEX OPTICS LTD.

AUI Compatible Fiber Ethernet
CHIPCOM CORPORATION, MA & LANNET DATA COMMUNICATIONS LTD.

Screening Tests for Gastrointestinal Infectious Diseases
SYVA COMPANY, CA & IDL LTD.

Local Gateway Communications System
ADACOM CORPORATION, KS & RAMIR TECHNOLOGIES LTD.

Civil Rubidium Standards*
FREQUENCY ELECTRONICS INC., NY & TIME AND FREQUENCY LTD.

Electromyography (EMG) System*
BIO-LOGIC SYSTEMS CORP., IL & BIO-LOGIC SYSTEMS CORP. LTD.

C-Sort – A Sort-Merge Utility*
SRM COMPUTERS INC., NJ & I.B.S. LTD.

Programmable Function Generator
KEITHLEY INSTRUMENTS INC., OH & TABOR LTD.

Computerized Speakerphone/Message Unit
GENERAL TELECOMPUTER CORP., FL & TELECOMPUTER CORP. LTD.

Computerized Radio Frequency Matrix
NORTH HILLS ELECTRONICS INC., NY & ELISRA ELECTRONIC SYSTEMS LTD.

Curing of Microporous Products
ENERGY SCIENCES INC., MA & GELMAN SCIENCES TECHNOLOGY LTD.

Low Pressure Water Filter
ESSEF CORPORATION, OH & D.I.P. R&D LTD.

- **Energy Efficient Fluorescent Fixtures**
  MAXIMUM TECHNOLOGY INC., CA & M.A.T. ENERGY ENGINEERING LTD.

Epitest – An *In Vitro* Toxicity Test Kit
CLONETICS CORPORATION, CO & ORGENICS LTD.

- **Hotel Room Electronic Locking Device**
  PDQ INDUSTRIES INC., PA & SELRON LTD.
- **Poultry House Computerized Climate Control**
  ACME ENG'G & MFG CORP., OK & ROTEM AGRICULTURAL COMPUTERS LTD.

Computer Video Music Generator
JUST FOR YOU INC., CA & L.K.P. LTD.

DCL-64 Software for Gould Environment
INTERNATIONAL SOFTWARE CORP., CO & TICI SOFTWARE SYSTEMS LTD.

SESAME Access System
CYBRA CORP., NY & A&S SOFTWARE

◇ ELECTRO-CATHETER CORP., NJ & VASAC MEDICAL LTD.

*Approved

BIRD derives its primary income from an original endowment of $60,000,000 and, as of November 1, 1984, from an additional endowment of $50,000,000, the total of $110,000,000 having been contributed equally by the governments of Israel and the United States.

The original endowment yields quarterly dividends to the Foundation at rates that were fixed in 1975. The additional endowment now yields semiannual dividends at a basic rate of 8.5% pa. This rate drops to 7.5% pa if LIBOR drops below 6.5%; it increases to 9.5% pa if LIBOR exceeds 10.5%. Total primary income for FY 1986 (October 1, 1985 - September 30, 1986) will be about $7,630,000, comprising $3,230,000 and $4,400,000 from the original and additional endowments, respectively.

The resources available to the Foundation for investment in projects comprise primary income less about 5% for operating expenses, plus royalties from successful projects. On projects initiated more than about three years ago, the maximum amount of royalties due from any project was the amount of the grant, in constant dollars. Since then, the maximum has been increased to 150% of the grant, also in constant dollars.

The table below shows the face value of grant contracts, of actual cash disbursements for FY 1979 – 1986, not including funding to completion of any multiyear projects, and of royalties received or due. (FY 1986 figures are actual to June 30, 1986 plus estimates for the balance of the fiscal year.)

FOR THE FISCAL YEAR	GRANT CONTRACTS		GRANT PAYMENTS		ROYALTY REPAYMENTS	
	FOR YEAR	CUMULATIVE	FOR YEAR	CUMULATIVE	FOR YEAR	CUMULATIVE
1979	$1 313	1 313	300	300		
1980	$1 964	3 277	1 263	1 563		
1981	$3 127	6 404	2 682	4 245	16	16
1982	$3 044	9 448	2 982	7 227	248	264
1983	$5 801	15 249	4 223	11 450	554	818
1984	$4 976	20 225	4 588	16 038	207	1 025
1985	$7 086	27 311	6 607	22 645	848	1 873
1986	$7 300	34 611	7 300	29 945	650	2 523

($ thousands)

(TOP)
NOVEL PHOTORESISTS - by MacDermid Israel Ltd and MacDermid Inc.

(MIDDLE)
VSP 161 - A Fast Fourier Transform VLSI, by Zoran Corporation and Zoran Microelectronics Ltd

(BOTTOM)
AUTOMATIC WAFER DICING SYSTEM - by Kulso Ltd. and Kulicke & Soffa Industries Inc.

Designed by David Margolin, Produced by Duographix Ltd. Tel Aviv

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ISRAEL - US

BINATIONAL INDUSTRIAL RESEARCH AND DEVELOPMENT FOUNDATION

HANDBOOK

1985

BIRD was established in May 1977 with an endowment of $60,000,000 provided equally by the Governments of the United States and Israel "... to promote and support joint, nondefense, industrial research and development activities of mutual benefit to Israel and the United States. All applied science activities in the process through which an innovation becomes a commercial product. " shall be within the scope of Foundation support

The endowment has since been increased by $50,000,000 ($25,000,000 from each government), reflecting the success of the Foundation in promoting joint activities between U S and Israeli technology-based companies

ISRAEL-UNITED STATES BINATIONAL INDUSTRIAL RESEARCH AND DEVELOPMENT FOUNDATION HANDBOOK 1985

TABLE OF CONTENTS

I. INTRODUCTION

Although binational foundations are many and diverse, BIRD was the first to provide a mechanism whereby funds originating from government sources are channelled directly into companies within the industrial sectors of the two countries to stimulate the joint creation and commercialization of innovative technical (nondefense) products and processes from which both countries can derive pragmatic economic benefit.

As is described in detail below, the basic mode of operation of the Foundation is coinvestment with U.S. company-Israeli company teams in joint projects which have high commercial potential.

As provided by the Agreement establishing the Foundation (Appendix A), BIRD is operated by an Executive Director and a small staff, headquartered in Israel. The Director reports to a Board of Governors, comprising three ex officio senior government officials from each country.

While this Handbook purports to contain all of the information necessary for prospective applicants, the entire BIRD concept is sufficiently unusual that a face-to-face meeting with our staff in Israel, or with our colleagues of the Israel Investment Authority in the U.S., is recommended as a precursor to any formal application.

The BIRD staff accepts with pleasure its responsibility to aid applicants in all phases of qualification for support. We will assist in identifying and contacting prospective project partners and, should they so desire, we will work with applicants in formulating proposals so as to minimize the chances that meritorious projects fail to be recognized as such.

BIRD activities are described in annual status reports, available on request. As the latest report portrays, there are many projects, about 25% of them already enjoying commercial success, and a wide range of participating companies. For the latter, apparently, the effort of grappling with our modest formalities was deemed a worthwhile investment to join the burgeoning group of successful U.S.-Israel company teams.

II. PRINCIPLES OF OPERATION

Any pair of operating companies, one each from Israel and the U.S., may submit a proposal (business plan) for joint development and commercialization of any nondefense, innovative, technology-based product or process that has the potential of yielding rewards commensurate with the investment and risks.

Under conditions of confidentiality (see Appendix B for a typical Confidential Disclosure Agreement), the proposal is evaluated by the Office of the Chief Scientist, Ministry of Industry and Commerce, Israel; by the U.S. National Bureau of Standards, Washington, D.C.; and by the BIRD staff. The Executive Director then submits his specific recommendations to the Board of Governors. Although the Board typically convenes semiannually, proposals are welcomed, evaluated and acted upon rapidly throughout the year.

If the technical proposal and business plan, prepared in accordance with the guidelines in IV below, are convincing in the context of the proposing team, BIRD will share, typically 50:50, with each of the partners in the total cost of bringing the proposed product or process to the point of commercial readiness. A current limitation in project size is that this total cost not exceed $800,000 per year for a maximum of three years. As a guide to potential proposers, we note that the average total project cost has been about $1,000,000 over a two-year period, with BIRD contributing about $500,000.

In addition to burdened direct labor and materials, the budget may include consulting services, subcontracts, premarketing expenses, necessary travel, outlays to meet regulatory requirements, special equipment, etc., but not standard equipment and facilities which practitioners of the relevant technologies may be expected to own or to provide. No expenses incurred prior to the effective date of a funding contract can be included in the project budget.

While the Board's decisions are based on the same criteria that are used by intelligently managed R&D-based companies and by venture capitalists, an important additional consideration is the extent to which each of the project partners has critical

and complementary roles in the overall process of developing and commercializing the proposed innovation. Consonant with BIRD's charter to encourage joint binational projects, the Board's threshold for positive investment decisions is lower than that characteristic of the private sector investor. Despite this, results from the BIRD portfolio indicate a success rate that the latter would not disdain.

Once a project has been approved by the Board, a Cooperation and Project Funding Agreement is entered into by the proposing partners and the Foundation. A draft of a typical contract is included as Appendix C.

(A limitation deriving from the Agreement establishing the Foundation is that sponsored projects may not be conducted in geographic areas which came under the administration of the Government of Israel after June 5, 1967, and may not relate to subjects primarily pertinent to such areas.)

A. QUALIFYING PROJECTS

To qualify for BIRD support, a project shall:

- involve the development, through R&D, of an innovative product or process which promises tangible, direct benefit for the national economies of Israel and the United States,
- be proposed by a U.S. company-Israeli company team, each member of which has a critical role and capability in the development and commercialization,
- be capable of reaching the point of readiness for commercialization at a total development cost of not more than about $800,000 per year for not more than three years.

An important general criterion is that the proposing partners have, or have ready access to, the technical, industrial and financial resources both to implement the project and to benefit from the commercial potential intrinsic to a successful development.

B. QUALIFYING APPLICANTS

The clearest case of a qualified applicant is a company with R&D and manufacturing facilities, and a demonstrated capability in selling its product, typically developed in response to specifically identified market needs or opportunities. Qualified applicants, one from each country, should apply as a team on the basis of an agreement that permits them to obligate themselves singly and jointly in a contract with the Foundation for that project. Companies based either in Israel or the U.S. may approach BIRD with the expectation of receiving assistance in finding suitable partners in the other country.

Israeli or U.S. companies with subsidiaries or affiliates in the other country may submit proposals jointly with such subsidiaries or affiliates, provided there is clear evidence that the project will indeed be a joint effort and that there will be active participation by both entities. (To qualify, companies must present satisfactory evidence of ownership or control by nationals of the United States or Israel.)

We recognize that promising innovations frequently originate with individuals, small groups or start-up companies that may have difficulty in meeting all of these criteria. Please be assured that we will exert our best efforts to assist such innovators in qualifying for sponsorship.

C. NATURE OF COOPERATION

Because of the wide range of projects and partnerships that may qualify for BIRD support, there are no hard and fast rules for the detailed nature of the cooperation between the partners. They must make their own best judgement as to the most cost-effective division of activities to accomplish the technical and commercial goals of the project. For example, if the bulk of the R&D is to be performed by one partner (typically in Israel), the contribution of the other partner may emphasize marketing, and hence detailed product specification, sales and service. Manufacturing may be by either or both partners or by subcontractors. Institutions or nonmanufacturing companies may act as subcontractors in the R&D or testing phases of the project.

For many Israeli companies, a qualified U.S. corporate participant to assist in specific product definition, in gathering market intelligence, and in sales and service, is vital to maximize the potential benefit from ideas produced by those companies. For

many U S companies, the prospects exist for adding to product lines by gaining access to Israeli-generated concepts and products without the need for hiring new specialists An additional incentive is that products manufactured largely in Israel qualify for duty-free entry into E E C countries

Since BIRD is, both by name and nature, an entity whose raison d'etre is mutual benefit through cooperation, proposals must be explicit in defining the activities in which each partner will engage and the rationale for the proposed division of tasks

III. BIRD AWARDS

A. FULL-SCALE PROJECTS

Projects whose total cost exceeds $100,000 require approval by the Board of Governors On approval, a one-year Cooperation and Project Funding Agreement (Appendix C) is entered into by the proposing partners and the Foundation The Agreement describes the work plan, the project budget, the payments due the proposer the repayments due the Foundation from sales or other income resulting from the project, the reporting requirements, etc

Where the project, as originally proposed, requires more than one year for completion, BIRD will view favorably a request for a second (and, where applicable, a third) year Agreement, subject to healthy progress and to a continuing good market prognosis for the product (or process)

To ensure that any project that is to be continued from one year to another does so without interruption, the following steps are necessary a) during the tenth or eleventh month of the year in question, a project review meeting be held with the Foundation staff b) the companies submit a budget and a work plan for the following year, which submittals will become part of the Cooperation and Project Funding Agreement for that year

The BIRD cost-share, typically 50% of the total project cost, is made in the form of a so-called Conditional Grant (in U S dollars), connoting that the recipients agree to make payments to the Foundation as a negotiated percentage of revenues eventuating from the project, as described in Appendix C and up to the limit therein stated - no revenues, no payments

The BIRD grant is typically made in three installments, as follows on execution of the Cooperation and Project Funding Agreement - an initial payment of up to 40% of the Conditional Grant, on receipt and (timely) approval of the semiannual technical and fiscal reports from both companies (prepared according to Appendix E) - a second payment of up to 40% on receipt and approval of annual (final) technical and fiscal reports - the balance due Further details of the payment schedule are spelled out in Appendix C

B. MINI-PROJECTS

Projects whose total cost to the two proposing companies is $100,000 or less and whose duration is one year or less do not require Board of Governors approval Each year, the Executive Director may make a number of awards of up to $50,000 per mini-project as a 50% cost-share contribution Proposals for such mini-projects should be prepared with the guidelines in IV in mind, but need only be as extensive as is consistent with clarity Every such project approved by the Executive Director will be subject to the execution of a Cooperation and Project Funding Agreement (Appendix C)

C. PROPOSAL PREPARATION AWARDS

When two potential partners are confronted with considerable expense in preparing a proposal because of the need to visit each other specifically in that context, or because a preliminary market study is necessary, BIRD can provide some financial assistance In very special cases, the amount of this assistance may be as much as $10,000, as long as this promotes the preparation and submission of a proposal for a full-scale project of a quality likely to be approved by the Board Such awards, however, are made sparingly, they are intended specifically to assist small companies for whom proposal preparation costs are burdensome (A typical Proposal Preparation Award Agreement is included as Appendix D 1)

Award applications will be considered only if both potential partners to a project are identified and furnish evidence of their interest in cooperating under BIRD sponsorship. The application should be in the form of a letter proposal which describes the general nature of the proposed project and the intended roles of the partners and includes an estimate of the cost and duration of the full-scale project. An itemized budget for the proposal preparation activities must also be included.

D. TEST OF FEASIBILITY PROJECTS

In cases where preliminary investigations are required to determine the technical feasibility or market acceptability of a new product or process concept, the Foundation may grant up to $25,000 as its 50% share of carrying out the feasibility tests. Such awards are made on the understanding that a formal proposal for a full-scale project will be submitted by the recipients for consideration by the Board if the feasibility results are positive. (A typical Feasibility Test and Proposal Preparation Agreement is included as Appendix D.2.)

Applications for test of feasibility awards, which must be submitted jointly by the project partners, should include brief but clear descriptions of the following:

- the companies
- the innovation and its commercial prospects
- the nature of the requirement for a feasibility test
- the details and duration of the proposed experimental program, including itemized budget
- an estimate of the cost and duration of a full-scale project to develop the innovation to the point of commercial readiness.

Should the feasibility effort lead to a BIRD-supported full-scale project, the amount awarded on the test of feasibility project will be added to the Conditional Grant for purposes of payments due the Foundation.

IV. THE PROPOSAL

Before a formal proposal is submitted, there will typically have been a number of discussions with BIRD staff and visits by the latter to either or both of the proposing companies. However, while impressions gained from these contacts are important in the last analysis, the formal evaluations and the Board's decisions must be based solely on the proposal as submitted.

The following format should be used in preparing proposals.

PROPOSAL FORMAT

A. COVER PAGE (specimen attached)

B. ABSTRACT (suggest 250-500 words)

The abstract should summarize:

- the specific objectives of the project
- the commercial value of the proposed product or process
- the capabilities and records of performance of the companies in related areas

C. THE INNOVATION

This section should address the following:

- what is the idea? (A brief description with no jargon)
- how are things in this area done today? What are the limitations of current practice?
- what is unique about this product and why do you believe it will be successful?
- how much will it cost and how long will it take to develop the product to the point of commercial readiness?
- what is the patent situation, including background patents and the potential for new patents? Are there any obligations to other agencies who have supported any part of the innovation development?

D. PROPOSED R&D PROGRAM

Experts from the U.S. National Bureau of Standards and the Office of the Chief Scientist, Israel Ministry of Industry and Commerce, will critically evaluate the proposal with respect to technical feasibility and the quality of effort that will be applied. Accordingly, this section must describe the specific work that is proposed to achieve the objectives of the program.

The presentation should be organized under the headings "Analysis of the Problem" and "Proposed Approach".

a. Analysis of the Problem

The purpose here is to establish a credible basis for the proposed program. Its objectives should be analyzed in the context of the state of the art, with the intent of defining specific problem areas. Considerations include:

(i) Definition of the required properties and functions of the end item for use in the service environment.

(ii) The achievements necessary to accomplish the objectives.

(iii) Availability of suitable techniques or requirements for new developments.

(iv) Technical and economic constraints.

b. Proposed Approach

This section should be sufficiently detailed that one skilled in the art can evaluate it. It should include:

(i) A general plan of the proposed effort.

(ii) For each task, the objective and the specific approach proposed should be clearly described, with supporting data where appropriate. Since the final objective is a product or process, tasks addressed should include prototyping, pilot production techniques or equipment, testing and evaluation, etc.

E. PROGRAM PLAN

A chronological schedule of program activities should be presented in graphical form, with the estimated time required for the completion of each task and with the milestones clearly indicated.

Specific task assignments of each of the two companies and of any R&D subcontractors and consultants should be delineated, together with a management plan for coordinating these activities. The plan should encompass the entire period of a multiyear program.

The Program Plan will be incorporated into the Cooperation and Project Funding Agreement and used by the Foundation in monitoring project progress.

F. THE MARKET

Presumably any company or pair of companies willing to fund or to cost-share a major portion of an R&D project would do so only on the basis of a market analysis and projection that convinces them that the potential rewards are commensurate with the risks. There are many painful and expensive experiences, however, that attest to the fact that such analyses are not always properly conducted in the context of defined market needs and opportunities.

While we appreciate the uncertainties implicit in predictions of future markets and possible competition for any new product or process, we need to be persuaded that the companies have made a thorough analysis of the market prognosis. Such an analysis will typically include the following considerations, which should be addressed in this section of the proposal:

- what market need is served?
- what performance features and selling price, and hence manufacturing cost, must be attained to penetrate that market?
- what is a reasonable projection of the rate of growth of sales of the product or process? What is the basis for this projection?
- what barriers, e.g. regulatory, might be encountered?

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- what competition exists or can be imputed?

This does not purport to be a complete list. The basic message is that developing innovative concepts for commercial gain is an intrinsically risky, uncertain, but occasionally highly rewarding undertaking whose prospects of success can be immeasurably improved by acute, objective and early consideration of the market arena.

G. COMMERCIALIZATION - PLANS AND PROSPECTS

It is obviously of benefit to those faced with investment decisions regarding new technology if a single index can be derived which provides a "figure of merit" for deciding on a particular investment, or for choosing from amongst various alternatives.

For our purpose we wish to know how the companies have analyzed the financial exposure and potential return that they expect from the proposed project. What is the estimated investment cash flow and the projected earnings cash flow? Can the companies reasonably cope with the peak and aggregate investments that commercial success will entail? To what extent will partial achievement of sales goals be adequate to merit the initial investment?

A preliminary financial analysis which indicates the potential gain from successful implementation of the proposed project can be made using the technique illustrated in the addendum to this Part IV. This procedure, or any other approach which has, at a minimum, the quantities identified therein, is acceptable.

Given an encouraging prognosis for the project, it remains to plan and implement the commercial program. Some of the questions which should be discussed are as follows:

- will both companies engage in manufacture of the product or part of the product?
- who will sell to which market regions?
- do either or both companies currently have a suitable sales and service network, or does this need to be created ab initio?
- to what extent are the necessary resources for commercialization available within the companies?
- if additional resources will be required, how is it proposed to acquire them?

H. COOPERATION AND BENEFITS

The proposed division of tasks between the two companies presumably will have been discussed in earlier sections. Please summarize here the mode and extent of cooperative activity that is envisaged.

Key to BIRD's participation in a program is the clear expectation of mutual benefits. An important factor in evaluating the proposal therefore, will be the extent to which commercialization of the innovation will aid both Israel and the U.S. in the form of new export markets, new employment opportunities, new capital formation, productivity improvements, etc.

Please discuss these issues in the context of the agreement between the companies with respect to their agreed-upon roles in the commercialization process.

I. ORGANIZATION AND MANAGEMENT PLAN

This section should contain a brief presentation of the proposed management procedures for the program, including the internal review procedures and overall management plan that will ensure, barring unforseeable circumstances, implementation to design specifications, on time and within budget.

Provide an organization chart for the program and indicate the relationship of this ad hoc organization to the formal hierarchies in the companies. Identify the key project personnel and their responsibilites in the program.

J. THE COMPANIES AND THE PROJECT PERSONNEL

In the last analysis, the determining factor in the successful commercialization of innovations is the people and the companies involved. Please provide information about each of the companies, including the following:

- record of performance in similar or related undertakings,

- degree to which the proposed project can be absorbed into the existing structure of the company
- relationship of the proposed project to other company projects that receive support from outside agencies
- financial information which demonstrates that the companies can not only contribute their share of the project cost but have resources available for the commercialization phase (For public companies Annual Reports will serve in lieu of specially prepared information)
- resumes of key personnel
- any additional information felt to be germane, including, for example, product brochures, expressions of interest by potential customers in the products or processes to be developed, etc

K PROJECT BUDGET

Separate budgets should be presented for each company's activities for each year of the project as proposed. The budgets for the first year should be as detailed as possible, using the attached format. Budgets presented for a second or third year should include a clear statement of what inflation factors, if any, have been included.

Only those phases of the project up to, but not including, actual production and sales should be included in the budgets.

PROPOSAL

(Specimen Cover Sheet)

TO: ISRAEL-UNITED STATES BINATIONAL INDUSTRIAL RESEARCH AND DEVELOPMENT FOUNDATION

FROM: Israeli Company, Address

U S Company, Address

TITLE:

PROJECT BUDGET:

	YEAR 1	YEAR 2	YEAR 3	TOTAL
Project Cost	_____	_____	_____	_____
Grant Request	_____	_____	_____	_____

SUBMITTED BY: Israeli Company officer (signature)

U S Company officer (signature)

DATE SUBMITTED:

PREFERRED DATE FOR PROJECT FUNDING:[1]

[1] Please do not request a start date which is less than three months from the date of submission of the Proposal.

PROJECT BUDGET FORMAT[1]

		Gross Annual Salary (inc Social Benefits)	% on Proj	Cost to Proj	Totals
I.	**DIRECT LABOR** (by category)				
	Employee 1				
	Employee 2, etc				
				$ A	
	Overhead (O H) at 25%[2]			$.25A	
	Total Direct Labor + O H				$1.25A
II.	**EQUIPMENT**[3]				
	Item 1				
	Item 2, etc				
					$B
III.	**EXPENDABLE MATERIALS & SUPPLIES**				
	Major Items 1,2, etc				
	General				
					$C
IV.	**TRAVEL**[4]				
	Foreign				
	Domestic				
					$D
V.	**DATA PROCESSING COSTS**				
					$E
VI.	**SUBCONTRACTS**				
	No 1				
	No 2, etc				
					$F
VII.	**CONSULTANTS**				
	Name 1				
	Name 2, etc				
					$G
VIII.	**OTHER EXPENSES**				
	Item 1				
	Item 2, etc				
					$H
	TOTAL				$ T
	General & Administrative Expense (G&A) at 5%[2]				$ .05T
	PROJECT BUDGET				$1.05T
	Projected expenditure, first 6 mo				$ X
	Projected expenditure, second 6 mo				$1.05T-X

NOTES:

(1) Separate Budget for each company and each year

(2) O H and G&A includes all indirect costs and services, including secretarial, rent, utilities, etc

(3) Special equipment necessary for the project. Purchase of standard catalog equipment requires special justification

(4) Foreign travel budget should specify number of trips, destinations, purpose, etc

ADDENDUM - CASH FLOW ANALYSIS

The cash flow analysis described below is based on INNOVATION Milton D Rosenau Jr © 1982 by Lifetime Learning Publications Belmont California 94002 a division of Wadsworth Inc Reprinted by permission of the publisher

The ten-year period used in the charts below is chosen to cover the development phase and sales growth to a peak followed by a drop in sales as the product becomes obsolescent

It is important that the whole life-cycle period of the product be considered since the concept of liquidating the venture in the last year (Line 13) is used in calculating an Internal Rate of Return Truncation of the period can lead to quite misleading results

With reference to the accompanying charts

LINE 1 Company Sales - Prepare using either the value of new product or process substitution to prospective customers the volume of similar products market share multiplied by market size or number of units multiplied by selling price per unit Based on market study research and experience

LINE 2 Manufacturing Cost - Prepare using either the cost of similar products processes the development costs multiplied by an experienced-based markup factor or a detailed breakdown and manufacturing plan It may be helpful to use an order mix simulation if the order rate is not uniform

LINE 3 Development Expenses - Include development and start-up expenses Estimates should be based either on a comparison with similar developments or on a detailed product (process) development plan Contingency might usefully be included

LINE 4 Operating Expense - Prepare using historical ratios or detailed operating plans for the product (process) Continuing R&D selling costs advertising etc are typical elements General and Administrative expense should be included

LINE 5 Capital Expenditures - Prepare using detailed plans or prior experience Transportation and installation expenses should be included if applicable as well as contingency

CALCULATIONS

LINE 6 Depreciation - Can be done in a variety of ways Shown in the charts is A percent of the total accumulated capital expenditure (Line 5) through the year in which the depreciation is calculated Straight-line depreciation is merely a useful approximation and other depreciation method used by your company (e g sum-of-the-years-digits) may be substituted For a 5-year life A=0 2 for an 8-year life A=0 125 etc

LINE 7 Gross Profit - Equals Line 1 minus Line 2

LINE 8 Before Tax Income - Equals Line 7 minus Line 3 minus Line 4 minus Line 6

LINE 9 Income Tax - Equals B percent (your company's actual tax rate) multiplied by Line 8

LINE 10 Net Income - Equals Line 8 minus Line 9

LINE 11 Operating Cash Flow - Equals Line 6 plus Line 10

LINE 12 Working Capital Increases - Equals C percent of the difference between the current year's sales and the prior year's sales C percent is an approximation of the working capital increase required to fund inventories and receivables attendant on growing sales A useful approximation is 30 percent the range 25-35 percent covers most of the cases although there will be exceptions especially for significant materials costs Use your experience base or a detailed plan for the product (process) including carrying times and costs Note that this line is zero if sales do not increase, and it is negative when sales decline

LINE 13 Total Cash Flow - Equals Line 11 minus Line 5 minus Line 12, in all but the last year In the last year the same formula is used but also the sum of Line 12 in all years up to and including the last year is added This has the

effect of liquidating the venture in the last year and selling off all the assets on the books

LINE 14 Cumulative Cash Flow - Equals the sum of Line 13 cumulatively to date In the early years of the project this will be negative The year in which it turns positive indicates the payback period in years

LINE 15 Discounted Cash Flow - Requires multiplication of the discount factor by the total cash flow of Line 13 for each year (e g for a discount factor of 25 percent Line 13 in year 1 is multiplied by 1 00 Line 13 in year 2 is multiplied by 0 80 Line 13 in year 3 is multiplied by 0 64 etc) The sum of these multiplied numbers is then added up at the extreme right to become the Cumulative Discounted Cash Flow for that discount percent also known as the Net Present Value at that discount percent Please use the discount percent that is most applicable to your company in determining the Net Present Value

INTERNAL RATE OF RETURN

The Internal Rate of Return (IRR) is the discount percent at which the Net Present Value is equal to zero Thus use the graph on page 16 to interpolate between the values of discount percent to estimate that value of the discount percent at which the Net Present Value is equal to zero It is merely necessary to find a positive and a negative value of the Net Present Value and plot these on the graph with an appropriate discount percent to estimate the IRR In general it is best to start with the 25 percent line to perform the multiplications If the resulting net present value is negative the next discount percent that should be used is the 10 percent line If the 25 percent value is positive the 40 percent line should be used next Thereafter one or two more discount percents can be used to improve the estimate of IRR Once the basic numbers required for the calculation have been generated it is straightforward to assess the effect on the IRR of changes such as a slower (faster) rate of growth of sales higher (lower) manufacturing costs etc The use of such so-called Sensitivity Analysis is very revealing We encourage you to use it

CASH FLOW - SAMPLE CALCULATION

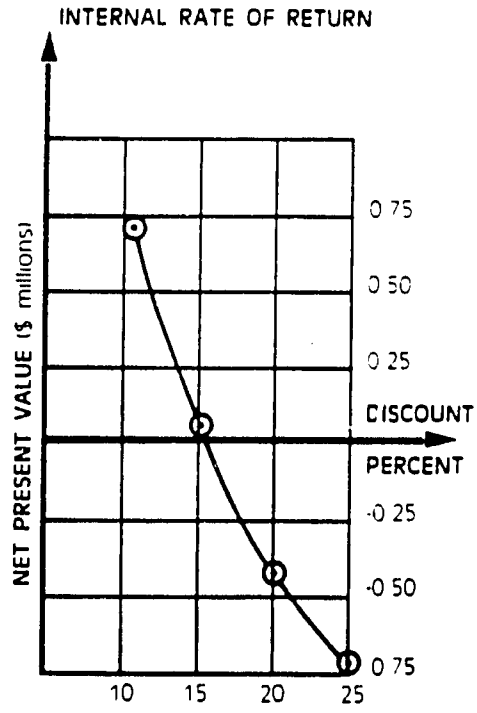
	QUANTITY	DERIVATION	($ millions) YEAR (N) 1	2	3	4	5	6	7	8	9	10
1	COMPANY SALES	ESTIMATE	-	-	1	2.5	4	6	6	5	3.5	2
2	MANUFACTURING COST	ESTIMATE	-	-	0.4	1	1.6	2.4	2.4	2	1.4	0.8
3	DEVELOPMENT EXPENSE	ESTIMATE	0.4	0.4	0.5		-	-	-	-	-	-
4	OPERATING EXPENSE	ESTIMATE	-	-	0.3	0.75	1.2	1.8	1.8	1.5	1.05	0.6
5	CAPITAL EXPENDITURE	ESTIMATE	0.6	0.6	-	-	-	-	-	-	-	-
6	DEPRECIATION	$\sum_{1}^{N} 5$	0.12	0.24	0.24	0.24	0.24	0.12	-	-	-	-
7	GROSS PROFIT	1-2	-	-	0.6	1.5	2.4	3.6	3.6	3	2.1	1.2
8	BEFORE TAX INCOME	7-3-4-6	(0.52)	(0.64)	(0.44)	0.51	0.96	1.68	1.8	1.5	1.05	0.6
9	INCOME TAX	0.5x8*	-	-	-	-	-	0.78	0.9	0.75	0.53	0.3
10	NET INCOME	8-9	(0.52)	(0.64)	(0.44)	0.51	0.96	0.9	0.9	0.75	0.52	0.3
11	OPERATING CASH FLOW	6+10	(0.4)	(0.4)	(0.2)	0.75	1.2	1.02	0.9	0.75	0.52	0.3
12	WORKING CAPITAL INCREASES	0.3x(1N-(1N-1))	-	-	0.3	0.45	0.45	0.6	0	(0.3)	(0.45)	(0.45)
13	TOTAL CASH FLOW	11-5-12	(1.0)	(1.0)	(0.5)	0.3	0.75	0.42	0.9	1.05	0.97	1.35
		PAYBACK										
14	CUMULATIVE CASH FLOW	$\sum_{1}^{N} 13$	(1.0)	(2.0)	(2.5)	(2.2)	(1.45)	(1.03)	(0.13)	0.92	1.89	3.24

* Income tax losses carried over to fourth, fifth and sixth years

15 DISCOUNTED CASH FLOW (DCF) & NET PRESENT VALUE (NPV)

YEAR		1	2	3	4	5	6	7	8	9	10	
DISCOUNT PERCENT		DISCOUNT FACTOR (DF)										CUMULATIVE DCF = NPV = (LINE 13) x DF
10%	DF	1 00	0 91	0 83	0 75	0 68	0 62	0 56	0 51	0 47	0 42	
	EX*	(1 0)	(0 91)	(0 42)	0 23	0 51	0 26	0 50	0 54	0 46	0 57	0 74
15%	DF	1 00	0 87	0 76	0 66	0 57	0 50	0 43	0 38	0 33	0 28	
	EX	(1 0)	(0 87)	(0 38)	0 20	0 43	0 21	0 39	0 40	0 32	0 38	0 08
20%	DF	1 00	0 83	0 69	0 58	0 48	0 40	0 33	0 28	0 23	0 19	
	EX	(1 0)	(0 83)	(0 35)	0 17	0 36	0 17	0 30	0 29	0 22	0 26	(0 41)
25%	DF	1 00	0 80	0 64	0 51	0 41	0 33	0 26	0 21	0 17	0 13	
	EX	(1 0)	(0 80)	(0 32)	0 15	0 31	0 14	0 23	0 22	0 16	0 18	(0 73)
30%	DF	1 00	0 77	0 59	0 46	0 35	0 27	0 21	0 16	0 12	0 09	
	EX											
35%	DF	1 00	0 74	0 55	0 41	0 30	0 22	0 17	0 12	0 09	0 07	
	EX											
40%	DF	1 00	0 71	0 51	0 36	0 26	0 19	0 13	0 09	0 07	0 03	
	EX											

*EX = Sample calculation



In this example, the payback period is eight years and the IRR is approximately 16%

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APPENDIX A

AGREEMENT BETWEEN THE GOVERNMENT OF ISRAEL AND THE GOVERNMENT OF THE UNITED STATES OF AMERICA ESTABLISHING THE ISRAEL-UNITED STATES BINATIONAL INDUSTRIAL RESEARCH AND DEVELOPMENT FOUNDATION

The Government of Israel and the Government of the United States of America,

Recalling the close ties in scientific and technological cooperation which have developed over many years between the two countries,

Recognizing the importance of peaceful industrial research and development for strong and vigorous economies in the two countries,

Convinced that applied scientific cooperation between the two countries in industrial research and development will strengthen the bonds of friendship and understanding between their peoples and advance the state of industrial research and development to the benefit of both countries, and

Convinced of the desirability of establishing a binational mechanism to continue and intensify cooperation between the two countries in industrial research and development,

Have agreed as follows

Article I

ESTABLISHMENT

A There is hereby established the Israel-United States Binational Industrial Research and Development Foundation, hereinafter called the "Foundation"

B The principal office of the Foundation shall be located in Israel

Article II

OBJECTIVE

The objective of the Foundation shall be to promote and support joint, nondefense industrial research and development activities of mutual benefit to Israel and the United States

Article III

SCOPE OF COOPERATION

The scope of industrial research and development activities which the Foundation may promote and support shall include all applied science activities in the process through which an innovation becomes a commercial product, including, but not limited to, product engineering and manufacturing start up

Article IV

POWERS OF THE FOUNDATION

The Foundation shall be a legal entity and shall have all powers necessary to carry out its objective, including, but not limited to, the power to

(1) promote and support, by funding or otherwise, joint industrial research and development projects, hereinafter called "projects",

(2) make loans and grants,

(3) enter into contracts,

(4) provide services,

(5) acquire, hold, administer and dispose of real and personal property,

(6) receive, hold, and disburse funds, and open bank accounts,

(7) accept contributions of property, funds, and services, and

(8) employ personnel

Article V

BOARD OF GOVERNORS

A A Board of Governors, hereinafter called the "Board", shall be the governing

body of the Foundation and shall be responsible for determining the Foundation's program including the fields of cooperative research which will be supported by the Foundation and the Foundation's financial and managerial policies. Subject to the provisions of this Agreement, the Board shall have authority to

(1) adopt bylaws and rules of procedure

(2) establish regulations defining the policies, organization and procedures of the Foundation,

(3) appoint an Executive Director

(4) approve the annual budget and research program of the Foundation indicating, inter alia, the research and development fields to which priority is to be given

(5) accept contributions of property, funds and services,

(6) establish the principal office of the Foundation,

(7) approve project and other expenditures by the Foundation and agreements pertaining to projects to be funded by the Foundation, and

(8) exercise and delegate any other power of the Foundation not otherwise assigned by this Agreement.

B The Board shall consist of six members, three representatives of Israel and three representatives of the United States. Except as may be otherwise designated by the respective Governments, the three representatives of Israel shall be the Director General of the Ministry of Finance, the Director General of the Ministry of Commerce and Industry, and the Chief Scientist of the Ministry of Commerce and Industry, or their designees, and the three representatives of the United States shall be the Assistant Secretary for Science and Technology, Department of Commerce, the Assistant Secretary for Oceans and International Environmental and Scientific Affairs, Department of State, and the Assistant Secretary for International Affairs, Department of the Treasury, or their designees.

C The Chairman of the Board shall be elected for a term of one year by the Board from among the Board members. The Chairmanship shall alternate each year between representatives of Israel and the United States.

D The Board shall normally meet once each year, but meetings of the Board may be held at such times and places as the Board may from time to time determine.

E The Board shall act by vote of at least two-thirds of its entire membership. Members of the Board may vote by proxy.

F Members of the Board shall serve without compensation from the Foundation, but the Board may authorize the payment by the Foundation of the necessary expenses of any members in attending Board meetings and in performing other official duties for the Foundation.

G The Board shall provide for annual audits by independent auditors of the accounts of the Foundation. The reports of such audits, which shall be submitted to both Governments, shall contain certification as to the accounts of the Foundation and evaluate the Foundation's internal control and auditing system.

Article V

EXECUTIVE DIRECTOR

A The Executive Director shall be the chief executive officer of the Foundation. He shall be responsible for the operations and staff of the Foundation, and act in accordance with the policies, directives and delegations of the Board.

B The Executive Director shall employ, oversee and dismiss members of the professional and administrative staff subject to the approval of the Board.

C The Executive Director shall, among other things,

(1) evaluate proposals for projects submitted to the Foundation, and prepare and submit recommendations and draft agreements concerning project proposals to the Board for its approval,

(2) prepare and submit to the Board for its approval an annual budget and

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AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D C 20523

17 February 1987

Mr. Lew Reade
Director
USAID/Jordan
Department of State
Washington, DC 20520

Dear Lew:

We are herein transmitting the document on a fund for developing and commercializing technology in Jordan you requested. This document benefitted much from discussion with you and your staff in January; it is totally consistent with you private sector development program. If a fund as proposed is adopted, you will leave in place an institution and a business culture that could have far reaching implications for Jordan's development during the remainder of this century.

We will be returning to Jordan during the third week of March to modify the document on the basis of you and your staff's comments.

We look forward to seeing you in March.

Sincerely yours,

David L. Neideffer /cr
David L. Neideffer

Edgar C. Harrell /cr
Edgar C. Harrell

/cr

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research program, including long-range plans for use of the Foundation's resources.

(3) prepare and submit to the Board for its approval an annual report, including an audited financial statement, on the activities of the Foundation and

(4) implement decisions of the Board

D Any power of the Executive Director under this Agreement or delegated to him by the Board may be delegated by him to other officers of the Foundation, except as otherwise prescribed by the Board

E The Executive Director may obtain assistance from outside professionals, such as certified public accountants and technological experts, in evaluating proposals and auditing and monitoring projects sponsored by the Foundation

F The Executive Director shall organize, through a small budget item, various activities, such as consultant visits, information exchanges, and similar activities, to facilitate the achievement of the Foundation's objective

G The Executive Director shall maintain an appropriate system of internal control, including books and records which reflect the transactions of the Foundation and show the current financial condition of the Foundation. Such system shall include adequate internal financial and operational audits. The books, records, and internal audit reports shall be available for review by authorized representatives of both Governments

H The Executive Director shall maintain close liaison with the Chief Scientist of the Ministry of Commerce and Industry of Israel and the Science Attache of the United States Embassy in Israel and keep them fully informed of the Foundation's activities

Article VII

FINANCIAL ASPECTS

A The original endowment of the Foundation shall consist of the following

(1) Israeli pounds equivalent to thirty million dollars ($30,000,000) at the official rate of exchange on the date of payment to be contributed by the Government of Israel.

(2) Israeli pounds equivalent to thirty million dollars ($30,000,000) at the official rate of exchange on the date of payment to be contributed by the Government of the United States

B The original endowment shall be provided to the Foundation within seven calendar days after all necessary authorizations have been obtained by the two Governments. The U.S. contribution is conditional on prior receipt of the payments referred to in paragraph H below

C (1) Israeli pounds derived from the accelerated payment by Israel to the United States of Public Law 480 debts without maintenance of value provisions referred to in paragraph H below and an equal amount contributed by the Government of Israel shall be deposited in an account ("Endowment Account A") in the Bank of Israel and shall earn interest at the rate of four percent (4%) per annum, payable quarterly in arrears. This interest rate shall be adjusted annually in proportion to the change in the Israel Consumer Price Index in the twelve months preceding the adjustment. The first adjustment shall take place one year after this Agreement enters into force pursuant to Article XI A

(2) Israeli pounds derived from the accelerated payment by Israel to the United States of Public Law 480 debts without maintenance of value provisions referred to in paragraph H below and an equal amount contributed by the Government of Israel shall be converted by the Government of Israel into U.S. dollars and deposited in a dollar account ("Endowment Account B") in the Bank of Israel. The dollar account shall earn interest at the rate of five and one-half percent (5.5%) per annum, payable quarterly in arrears.

(3) All income earned from Endowment Accounts A and B and from all other sources which is not to be used immediately for the operations of the

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Foundation shall be deposited with the Bank of Israel or invested in obligations issued or guaranteed by the Government of Israel, the Government of the United States or an instrumentality of either Government. Such investments shall be made by the Executive Director pursuant to policies established by the Board and shall be made in such manner as will maximize earnings, consistent with their security and liquidity.

D. The Foundation shall use its investment and other income for the operation of the Foundation. In addition, with the approval of the Board, not more than ninety million (90,000,000) Israeli pounds may be drawn from Endowment Account A for the operations of the Foundation.

E. Except as the Board shall otherwise determine, to the extent that, at the end of any fiscal year, the dollar value of the net liquid assets of the Foundation are in excess of the equivalent of one hundred twenty million dollars ($120,000,000) at the official rate of exchange, the excess shall be distributed in equal shares to the two Governments within 30 days after the Board's approval of the financial statement for that year. Such distributions will be taken from assets of the Foundation other than those in Endowment Accounts A and B and will be made to the United States in dollars or in Israeli pounds convertible into dollars. Distributions to the Government of Israel shall be made in Israeli pounds.

F. The Government of Israel shall permit the Foundation to exchange Israeli pounds for convertible currencies required for expenses and financings of the Foundation's activities outside of Israel and permit their transfer if no foreign currency funds are available to the Foundation.

G. Income from Endowment Account B as well as other income originated in nonIsraeli currency can be invested in Israel or in the United States by the Executive Director, pursuant to policies established by the Board. The Government of Israel shall permit the transfer of foreign currency required for such investments in the United States.

H. The Government of Israel shall pay on the date this agreement enters into force to the Government of the United States Israeli pounds in an amount equivalent to thirty million dollars ($30,000,000) at the official rate of exchange on that date by way of acceleration of those payments still outstanding on certain Public Law 480 debts for the years 1976 to 1977 as set forth in Appendix A. Additional accelerated payment of remaining installments of Public Law 480 debts with maintenance of value, in the inverse order of their maturity, shall be used to the extent necessary to bring the total accelerated payments to thirty million dollars ($30,000,000).

Article VIII

OPERATIONS

A. The Foundation's operations shall consist mainly of the selection, approval and monitoring of projects funded in whole or in part by the Foundation. All proposals for such projects shall be submitted through the Executive Director to the Board for approval.

B. Each proposal considered by the Board shall:

(1) be submitted by Israeli or United States entities,

(2) show a mutually beneficial relationship between Israeli and United States entities,

(3) demonstrate the technical and economic feasibility of the project,

(4) contain evidence that the applicant(s) is capable of carrying out the project, either alone or through partial subcontracting to universities, industrial research institutes or other qualified entities, and

(5) indicate that the applicant(s) will contribute, from its own resources, or resources available to it, a significant portion of the financial resources required to carry out the project.

C. Each proposed project considered by the Board shall:

(1) promise a tangible, direct benefit for the national economies of Israel and

the United States, such as significantly increased exports, maximized value added or new markets.

(2) be of interest to both Israeli and United States industry, because, for example, it would result in a new need in the world market being met or the exchange of materials between Israeli and United States industries being increased.

(3) be of general interest to an entire industrial field,

(4) directly or indirectly contribute to additional development of products, processes or markets, and

(5) have tangible, direct benefits for both countries (A project shall be considered to have tangible, direct benefits to both countries if it meets one of the following criteria

(a) It is submitted jointly by an Israeli and a United States firm or by a joint venture of Israeli and United States firms

(b) It will require expenditures for goods and services in both countries

(c) It meets any other criteria established by the Board.)

D Projects sponsored by the Foundation may not be conducted in geographic areas which came under the administration of the Government of Israel after June 5, 1967, and may not relate to subjects primarily pertinent to such areas

Article IX

EXEMPTIONS

A United States citizens employed by the Foundation or engaged in projects in Israel sponsored by the Foundation, and accompanying members of their families if such citizens and such members are not permanent residents of Israel, shall be exempt from Israeli income taxes (including contributions required by the National Insurance Law of Israel), on income derived from the Foundation

B Travel by Israeli and United States citizens, who are not permanent residents of Israel, in connection with the official business of the Foundation or in connection with a project sponsored by the Foundation shall be exempt from the Israeli travel tax

C Permanent residents of Israel, travelling principally in connection with official business of the Foundation, shall enjoy the same reductions of travel tax as are accorded Israeli scientists employed by institutions of higher learning travelling on behalf of their institutions

D The Government of Israel shall accord exemptions (a) from Israeli income tax and property tax on the Foundation and (b) from Israeli customs, duties, excises, surtaxes and other taxes levied on importation (1) of goods (including furniture, equipment, supplies and scientific and educational articles) intended for use of the Foundation and (2) scientific equipment to be owned by the Foundation and intended principally for use in a project sponsored by the Foundation

E If it develops that the Foundation or the projects sponsored by it are affected by lack of additional tax exemptions, the two Governments will consult together with a view to taking such action as may be mutually agreed to remedy the situation

Article X

OTHER SCIENTIFIC COOPERATION

Nothing in this Agreement shall be construed to prejudice other arrangements for scientific cooperation between the two countries

Article XI

ENTRY INTO FORCE AND DURATION

A This Agreement shall not enter into force until after the Congress of the United States has appropriated the funds with which the United States will make its contribution to the original endowment of the Foundation. The Government of

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the United States shall notify the Government of Israel promptly after the United States has taken all action necessary to permit the United States to make its contribution to the endowment of the Foundation and the Government of Israel shall notify the Government of the United States promptly after it has taken similar action Thereafter this Agreement shall enter into force on the date when both Governments make their contributions to the endowment as specified in Article VII This Agreement shall remain in effect for five years from the date of its entry into force, and shall continue thereafter unless terminated by mutual agreement or by one year's notice in writing by one Government to the other

B The Regulations concerning Policies, Organization and Procedures of the Foundation and the Rules of Procedure of the Board attached to this Agreement shall become effective from the date of entry into force of this Agreement and shall remain in effect until changed by the Board

C In the event of termination of this Agreement, each Government shall be entitled to one-half of the assets of the Foundation in Endowment Account A, one-half of the assets in Endowment Account B, and one-half of all other assets As soon as possible after the termination, the property of the Foundation shall be sold and the sale proceeds and any other assets and funds (other than those in Endowment Accounts A and B) shall, after payments of all obligations, be divided equally between both Governments However, (1) any industrial and intellectual property assets of the Foundation shall be divided or disposed of as the Governments may agree, and (2) records or documents of the Foundation shall be disposed of as the Board shall decide, subject to the approval of the Governments

D In the event of termination,

(1) Each country's share of assets, other than those in Endowment Accounts A and B, shall be repaid as soon as those assets can be reduced to liquid form

(2) The Israeli share of assets in Endowment Accounts A and B shall be repaid in full to the Government of Israel on the date of termination

(3) If the Foundation is terminated prior to 1990, the United States share of assets in Endowment Accounts A and B shall be repaid in equal semiannual installments drawn in equal proportion from each account beginning on the date of termination The installments shall be based on a prorating of the repayment over the period from the date of termination to 1990 Until repayment, the United States share of the assets shall remain in their respective Endowment Accounts As provided in Article VII above, the value of such assets shall be maintained by the Government of Israel and shall earn interest The assets and their interest earnings shall be paid to the Government of the United States semiannually

(4) If the Foundation is terminated during or after 1990 the United States share of the assets in Endowment Accounts A and B shall be repaid in full to the Government of the United States on the date of termination

(5) All repayments to the Government of the United States, other than those from Endowment Account A which shall be in Israeli pounds, shall be in U S dollars

Done in duplicate at Jerusalem this third day of March, 1976

For the Government of Israel

By _____

For the Government of the United States of America

By _____

APPENDIX B

CONFIDENTIAL DISCLOSURE AGREEMENT

Agreement made this day of 19 by and

BETWEEN

The ISRAEL-UNITED STATES BINATIONAL INDUSTRIAL RESEARCH AND DEVELOPMENT FOUNDATION a legal entity created by Agreement between the Government of the State of Israel and the Government of the United States of America and promulgated into law by the Israeli Knesset in 1978 under the title of the Law of the BINATIONAL INDUSTRIAL RESEARCH AND DEVELOPMENT FOUNDATION effective May 18th 1977 (hereinafter referred to as the "Foundation")

AND

(Israeli Company)

AND

(U S Company)

(hereinafter referred to collectively as the "Proposer")

WHEREAS the Proposer intends to submit to the Foundation its Proposal for the development of a technology or product (herein the "innovation") together with its request for certain funding by the Foundation of the work and

WHEREAS such Proposal and subsequent data disclosures in the course of the work if financed may contain proprietary or commercial confidential information (herein "information")

Now therefore the parties hereto agree as follows

1 The Proposer shall disclose the information to the Foundation only in accordance with the regulations and requirements of the Foundation and in the form prescribed

2 The Foundation agrees to use its best efforts to maintain the confidentiality of information so given and to make disclosure and use such information only for purposes of evaluating the Proposal in accordance with Foundation practices and procedures or as may further be agreed in a Funding Agreement between the parties In no event however shall the Foundation be liable for inadvertent disclosure

3 Information as to which the Proposer claims proprietary rights or which he deems to be commercial confidential shall be clearly identified as such in any submission by appropriate legend on the cover page and on each page on which such information appears

3.1 Unless the Proposer otherwise formally requests such information may be incorporated in and become part of any award or grant instrument

3.2 The Foundation shall not be liable on account of disclosure of any information unless the Foundation's conduct shall constitute a deliberate appropriation of Proposer's proprietary rights

4 The Foundation's obligations pursuant to Pars 2 and 3 above shall expire three years following the execution of this Agreement or expiration of the period of any Funding Agreement between the parties whichever is later

5 This Agreement shall not apply to any part of the information

a) which has become or becomes part of the public domain or is publicly disclosed other than through the fault of the Foundation or

b) which was in possession of the Foundation or available to it from a public source prior to its disclosure by Proposer or

c) which is subsequently made available to the Foundation by a third party not under any confidential obligation to the Proposer

6 This Agreement is made in Israel and shall be governed by the laws of the State of Israel

Signed the day and date above first given

for the Israeli Company	for the U S Company	for the BIRD Foundation

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APPENDIX C

COOPERATION AND PROJECT FUNDING AGREEMENT

PREAMBLE

Agreement made this day of 19 by and

BETWEEN

The ISRAEL-UNITED STATES BINATIONAL INDUSTRIAL RESEARCH AND DEVELOPMENT FOUNDATION, a legal entity created by Agreement between the Government of the State of Israel and the Government of the United States of America, and promulgated into law by the Israeli Knesset in 1978 under the title of the Law of the BINATIONAL INDUSTRIAL RESEARCH AND DEVELOPMENT FOUNDATION, effective May 18th, 1977 (hereinafter referred to as the "Foundation")

AND

(Israeli company)

AND

(U.S. Company)

severally and jointly (hereinafter collectively referred to as the "Proposer" and separately as the "Participants")

WHEREAS the Foundation has been established under an Agreement between the Government of the United States of America and the Government of the State of Israel to promote and support joint nondefense industrial research and development of mutual benefit to the United States and Israel; and

WHEREAS the Proposer has heretofore submitted to the Foundation a proposal (hereinafter the "Proposal") entitled (proposal title) and on the basis of said Proposal has applied to the Foundation for certain funding assistance for the development of the product (or process) therein described (and hereinafter referred to as the "Innovation"); and

WHEREAS the Foundation has examined and duly approved the Proposal and is willing to provide certain funding for the implementation of the Proposal on the terms and conditions hereinafter set forth.

Now therefore the parties hereto agree as follows

A. General

A.1 The preamble to this Agreement shall be deemed an integral part hereof

A.2 The Participants shall be bound and obliged jointly and severally, as herein provided

A.3 The Executive Director of the Foundation is empowered by its Board of Governors to execute this Agreement and to perform all acts under the terms hereof on behalf of the Foundation

A.4 The following document is incorporated by reference and made a part of this Agreement

The Proposal, dated the day of , 19 , as stamped with the Foundation's approval of the day of , 19 . Nonetheless, should any provision of said Proposal be inconsistent with any other provision of this Agreement, the provisions otherwise set forth in this document shall control

A.5 The following document is referenced, and incorporated by reference only as portions may be specifically referred to and incorporated hereafter

The BIRD Foundation Handbook, 1985

B. Project Financing

B.1 The Foundation hereby agrees to fund, by Conditional Grant, the implementation of the Proposal in the maximum sum of $ or % of the actual expenditures on the project, as contemplated in the Approved Proposal Budget set forth in Annex A hereto, whichever is less, and at the times and as may otherwise be set forth in Annex B hereto

B.1.1 The percentage of the actual expenditures on the project which the Foundation

provides shall hereinafter be described as the "Foundation's pro rata share"

B.2 The Proposer shall provide in timely fashion all budgetary funds in excess of those provided hereunder by the Foundation

B.3 Proposer shall make payments to the Foundation based on Gross Annual Sales derived from the sale or other marketing or commercial exploitation of the innovation including leasing, commencing with the first such commercial transaction. Such payments shall be made on the following basis: a) The Conditional Grant referred to in Sub Sec B.1 above shall be repaid in U.S. dollars at the rate of % of the first year's Gross Annual Sales and in succeeding years at the rate of % of the Gross Annual Sales, such repayments to be in equivalent dollars valued at time of repayment. The rate of change of value shall be that designated in Annex C hereto. b) When repayment of conditional grant funds has been completed according to Sub Sec B.3.a) the rate of further payments shall be % such payments to continue until an amount equal to one-half of conditional grant funds, in equivalent dollars valued at time of repayment (Annex C), shall have been paid to the Foundation.

B.3.1 The term "Gross Annual Sales" shall include all specific export incentives or bonuses paid the Proposer on account of sale of the innovation for export, but shall not include sums paid for commissions, brokerage, value added and sales taxes on the sale of the finished product, or transportation and associated insurance costs, if same have been included in the gross sales price.

B.3.2 The innovation shall be deemed to have been sold, marketed or otherwise commercially exploited if the innovation or any improvement, modification or extension of it is put to the benefit of a third party, whether directly or indirectly, and whether standing alone or incorporated into or cojoined with other hardware or processes, and for which benefit the said third party gives something of value. This provision shall not apply to transactions between the Participants and their subsidiaries. Should such subsidiary resell the innovation separately identified or incorporated in a system, the sales price shall be the price to third parties from the subsidiary making the sale, such sales price being defined by the same criteria as sales are defined for purposes of "Gross Annual Sales" in Sub Sec B.3.1 above. If the innovation is a part of a product sold, marketed or otherwise commercially exploited, the sales price for purposes of payments according to Sub Sec B.3 shall be the sales price of that product multiplied by a factor whose numerator is the manufacturing cost of the innovation and whose denominator the manufacturing cost of the product. If there shall have been established a market price for the innovation, such price shall be the basis for payments according to Sub Sec B.3., notwithstanding the incorporation of the innovation in another product.

B.4 All payments due the Foundation shall be calculated on a semiannual calendar basis, and statements rendered with payment in and within 90 calendar days following the end of each semiannual period. Payments to the Foundation per Sub Sec B.3 shall commence at the end of the semiannual period during which the first sale was made. All late payments shall bear interest at the average prime rate prevailing at the Chase Manhattan Bank, N.Y.C., during the period from the date payment was due until actually made, + 1%.

B.5 However, should the technology or innovation developed under this Agreement be sold outright to a third party, the proceeds of the sale shall be applied as received against Proposer's obligation for payments to the Foundation per Sub Sec B.3. Payments due and not made following receipt of proceeds shall bear interest at the average prime rate prevailing at Chase Manhattan Bank, N.Y.C., + 1%.

B.6 License agreements involving patented invention(s) or technology developed in whole or in part during this Foundation-supported project shall be subject to Annex F.

C. Application of Funds

C.1 Machinery or equipment purchased in whole or in part with Foundation funds shall belong to the Proposer, but shall nonetheless be clearly identified and used only for Proposal purposes unless the Foundation otherwise permits in writing. The Proposer shall insure and maintain all such equipn and machinery, and shall

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exercise reasonable care in its use

Upon expiration of the term of this Agreement, or after termination of this Agreement per Sec J , whichever is sooner if Proposer sells or otherwise disposes of such machinery and equipment, the Foundation shall receive its pro rata share of the proceeds If the Proposer elects to retain this machinery and equipment, it shall pay the Foundation its pro rata share of the fair market value Such sums, which shall be deemed payment against Proposer s obligations per Sub Sec B 3 may be withheld from the Conditional Grant

C 2 The Proposer shall make no long-term financial commitments for leases, salaries, purchase of long lead items or otherwise for the project unless such proposed commitment has been clearly identified in the Proposal or has been approved in writing by the Foundation subsequent to approval of the Proposal and prior to such commitment

C 3 Proposer shall utilize Foundation funds for international travel only in accordance with the Approved Proposal Budget, Annex A Deviations require prior written approval of the Foundation

D. Conduct of the Project

D 1 The Proposer agrees to do the work set out in the Proposal in accordance with good standards relevant to such undertakings, and shall expend funds received hereunder only in accordance with such Proposal and the requirements of this Agreement

D 2 The Proposer agrees to comply with the Program Plan for the Innovation as set forth in Annex D hereto

D 3 The Proposer hereby appoints as Project Manager and as Associate Project Manager for the implementation of the project during the period of this Agreement and in accordance with the Program Plan, Annex D

D 4 The Proposer shall not make substantial transfers of funds from one budget item to another, change key personnel or their duties and responsibilities or diminish their time allocated to the work hereunder without prior written approval by the Foundation which approval shall not be unreasonably withheld

D 4 1 Should any key person be absent from his work or should such absence be expected, for 90 days or more, or should there be any significant reduction in the total personnel force assigned the project under the Proposal, the Proposer shall forthwith notify the Foundation

E. Reporting Requirements

E 1 The Proposer shall submit to the Foundation, in writing, the following reports

a semiannual fiscal report and technical report within 30 days following the expiration of each semiannual period,

b summary report (final report) submitted within 60 days following termination of this Agreement, or the end of each year of support if the Agreement is extended

E 1 1 Such reports shall be in form and substance as provided in Formats for Technical and Fiscal Reports, BIRD Foundation Handbook, 1985, Appendix E

E 2. Proposer shall provide, at its expense, briefings on the progress of the work hereunder within 45 days following request by the Foundation Such briefings shall accord with the form and depth as the Foundation may reasonably request

F. Publications

F 1 Any publication of data or other information derived from the work hereunder, or any publication related to the work, but not including product literature or manuals, shall contain the following legend or approved equivalent

> "The (work) on which this (article, publication) is based was supported in part by a grant from the Israel-United States Binational Industrial Research and Development Foundation (BIRD address) The views and information contained herein are

those of the authors and not necessarily those of the Foundation. The Foundation assumes no liability for the contents of this document by virtue of the support given.

F.2. To the extent so required to permit the Foundation free dissemination of such publications or information which the Foundation is privileged to disseminate pursuant to the Foundation Handbook, the Proposer shall be deemed hereby to waive any claim with respect to such dissemination for infringement of any copyright it may have or may obtain.

F.3. The Proposer shall furnish to the Foundation two (2) copies of all publications resulting from Foundation-supported work as soon as possible after publication.

G. Proprietary Information

Proprietary information clearly identified as such, submitted to the Foundation in the Proposal, in any report or verbally, or obtained by Foundation personnel observation pursuant to any request or briefing, shall be treated by the Foundation as confidential. At the request of Proposer or either Participant, a confidential disclosure agreement may separately be entered into by the parties.

Nothing contained in the foregoing shall restrict the right of the Foundation to make public the fact of the Foundation's support for the project, and the identification of the Participants therein. The details of any such publication, however, shall be subject to approval by the Participants.

H. Patents and Royalties

H.1. If Proposer or either of the Participants elects to apply for letters patent on any or all inventions resulting in whole or in part from performance of Foundation-supported activity, such applicant shall, at his own expense, so apply in the United States and in Israel, and in such other countries and at such times as he may deem appropriate.

H.2. Any Participant who retains rights in an invention and who obtains a patent thereon in accordance with Sub Sec H.1, shall pay to the Foundation a royalty as set forth in Annex E hereto on sales of any product embodying the invention or any product made by practicing the invention.

The Foundation's rights hereunder shall apply whenever such patents are obtained and shall survive termination of this Agreement.

I. Right of the Governments of Israel and the United States

I.1. Regardless of the patent rights acquired by Participants by mutual agreement or pursuant to Sub Sec H.1, the Governments of the United States and of Israel shall each have a nonexclusive, irrevocable, royalty-free license to make or have made, to use or have used, and to sell or have sold any such invention specified throughout the world for all governmental purposes, provided, however, that in any contracting situation involving an invention made under this Agreement, the Government of Israel shall give preference to the Participant retaining the entire right, title, and interest in the invention in Israel, and provided, that "governmental purposes" shall not include manufacture of such invention where it is commercially available at reasonable prices. Notwithstanding the foregoing, except for military purposes or in emergency situations, neither the Government of the United States nor the Government of Israel nor the Foundation shall have the right to sell or otherwise dispose of in any third country any product incorporating an invention or made by practicing an invention without the prior written permission of the Participant which has acquired the entire right and interest in the invention in third countries. Such Participant shall not withhold permission where appropriate royalties are paid by the Foundation or government(s) concerned.

I.2. In addition to the patent rights specified in Sub Sec I.1, the Foundation reserves for itself and the Governments of Israel and the United States the right to use the innovation, technical information, data and know-how arising out of, or developed under, this Agreement for any noncommercial purpose, and without charge.

I.5 In order that the rights of the Foundation and the Governments of Israel and the United States described herein shall be exercisable the Participants agree that any component element or other part of the system described as the Innovation in the Preamble to this Agreement whose use is necessary to the full enjoyment of the Innovation will be made available at reasonable prices by the Participants either as a commercially purchasable item or by special arrangement and will be sold to the Foundation and or the Government of Israel and or the Government of the United States also at reasonable prices

Agreements relating to the development of computer program products shall include clauses under this Section I which state that neither of the governments shall have the right to obtain a license to use the Innovation without paying the license fee normally imposed by the Participants in the ordinary course of business and executing the standard license agreement unless the Participants elect not to market the Innovation

J. Revocation of Agreement

J.1 The Foundation may revoke any award in whole or in part for fundamental breach as defined in Israeli law or for cause as defined in U.S. law whichever law is applicable to this Agreement

J.2 Upon receipt of notice of revocation for fundamental breach (cause) the Proposer may cure the default in and within thirty calendar days after the date of receipt of the notice

J.3 Notwithstanding any other provision in this Agreement to the contrary the Foundation shall not be obliged to provide any further funding after notice until and unless the said default is cured and so demonstrated to the reasonable satisfaction of the Foundation

J.4 Should the Agreement terminate for reason of fundamental breach (cause) in addition to the Foundation's rights under Sub Sec J.5 the Foundation and the Governments of Israel and the U.S. shall be entitled to all its rights pursuant to Sec I as may have vested on the date when all sums due the Foundation under Sub Sec J.5 are fully paid

J.5 If the Foundation shall revoke as aforesaid, all funds given Proposer per Sub Sec B.1 above shall become due immediately without need for demand. Such funds which do not by terms of this Agreement bear interest shall be repaid with interest at the average prime rate prevailing at Chase Manhattan Bank N.Y.C. - [illegible] from date of notice of revocation

J.6 The Proposer may not terminate this Agreement or abandon the project without the prior written consent of the Foundation

J.7 Upon termination of this Agreement for any reason the entire budgeted sum has not been expended the Proposer shall forthwith return to the Foundation its pro rata share of such unexpended portion If not repaid forthwith such sum shall bear interest as per Sec J.5

K. Financial Records

K.1 The Proposer shall maintain business and financial records and books of account for the work hereunder separate and apart from other business records of the Proposer Such books and records shall be in usual and accepted form

K.2 Books and records of the work hereunder shall show Proposer's contribution Upon request by the Foundation the Proposer shall provide evidence of his compliance hereunder

K.3 The Foundation may examine or cause to be examined, the financial books vouchers, records and any other documents of the Proposer relating to this Agreement at reasonable times and intervals during the term of this Agreement and for a period of one (1) year following termination, or for so long as payments per Sub Sec B.3 Sub Sec B.5 or Annex F or of patent royalties are due or may become due the Foundation whichever shall be the later

L. Suits Against the Foundation

L.1 The Proposer shall defend all suits brought against the Foundation its officers or

personnel indemnify them for all liabilities and costs and otherwise hold them harmless on account of any and all claims, action, suits, proceedings and the like arising out of or connected with or resulting from the performance of this Agreement by the Proposer or from the manufacture, sales, distribution or use by the Proposer of the innovation, whether brought by Proposer or its personnel or by third parties

L 2 The Proposer agrees that persons employed by it in connection with the research project shall be deemed to be solely its own employees and that no relationship of master and servant shall be created between such employees and the Foundation, either for purposes of tort liability, social benefits, or for any other purpose. The Proposer shall indemnify the Foundation and hold it harmless from court costs and legal fees, and for any payment which the Foundation may be obliged to make on a cause of action based upon an employee-employer relationship as aforesaid

M. Miscellaneous Conditions

M 1 The Foundation makes no representation, by virtue of its funding the work hereunder or receiving any payments or royalties as a result of this Agreement, as to the safety, value or utility of the innovation or the work undertaken, nor shall the fact of participation of the Foundation, its funding or exercise of its rights hereunder be deemed an endorsement of the innovation or of the Proposer, nor shall the name of the Foundation be used for any commercial purpose or be publicized in any way by the Proposer except within the strict limits of this Agreement

M 2 The Proposer may not assign this Agreement or any of the work undertaken pursuant to it without the prior written consent of the Foundation, which consent shall not be unreasonably withheld

M 3 This Agreement shall be construed under the laws of The forum for the resolution of any dispute arising from this Agreement shall be the State of Israel or Washington, D C in the U.S., as the moving party may elect

Execution of this Agreement shall be taken as submission to the forum selected pursuant to this Section

M 4 Unless the parties to a dispute shall agree otherwise, the dispute shall be referred to arbitration under the rules of the American Arbitration Association if the forum is the U S and under the rules of the Israel Arbitration Law if the forum is Israel

M 5 Proposer undertakes to comply with all applicable laws, rules and regulations of the State of Israel and the United States of America and will apply for and obtain all necessary licenses and permits for the carrying out of its obligations hereunder

M 6 Notices, communications and reports shall be hand delivered or mailed by prepaid first-class mail (airmail if transmitted internationally) addressed to

a The Israel-U S Binational Industrial Research and Development Foundation, P O B 39104, Tel Aviv, 61390, Israel

b (Israeli Company)

c (U S Company)

N. Effective Date

N 1 The effective date of this Agreement shall be the day of , 19 Unless sooner terminated by the Foundation per Sec J, this Agreement shall terminate one year following the effective date

N 2 The Proposer shall be responsible for the cost of all stamps to this document as may be required by Israeli law

Signed the day and date above first given

for the Israeli Company	for the U.S Company	for the BIRD Foundation

ANNEX A
(APPROVED PROPOSAL BUDGET)

ANNEX B
PAYMENT OF CONDITIONAL GRANT

1 First Payment - On signing - 80% of the Foundation's pro rata share of the projected expenditures for the first six months, per Annex A, but not more than 40% of the Conditional Grant per Sub Sec B 1

2 Second Payment - After submission and approval of the semiannual technical and fiscal reports, or after actual expenditures on the Project have equalled or exceeded the projected expenditures for the first six months, whichever is later - 80% of the Foundation's pro rata share of projected expenditures for the second six months, per Annex A

However, if at the required time of submission of the semiannual technical and fiscal reports, work on the Project or expenditures thereon prove to be materially behind plan, per Annex D and Annex A, respectively, the Foundation will review the Project with Proposer and determine a suitable course of action with respect to further payments against the Conditional Grant, if any

3 Third Payment - After receipt and approval of the annual technical and fiscal reports - the balance due Proposer up to the total sum of the Conditional Grant per Sub Sec B 1

ANNEX C
LINKAGE OF CONDITIONAL GRANT REPAYMENTS

The monies given as a Conditional Grant shall be linked in value until repayment to the following index (relevant industry index) hereinafter, "index"

As each increment of the grant is given, it shall thereafter be linked to the base index last published prior to the date of payment Upon payment of the last increment of the Conditional Grant due, all prior payments shall be brought to the same base index as the last payment

Just prior to each occasion of payment of a portion of Proposer's obligations under Sub Sec B 3 , the unpaid balance due BIRD shall be brought from the prior base to the index last published before such payment, which index shall then be the base This procedure shall be repeated on the occasion of each payment until Proposer's obligations for payments under Sub Sec B 3 shall have been discharged

ANNEX D
(PROGRAM PLAN)

ANNEX E
ROYALTY PAYMENTS

1 ROYALTY RATE The Royalty Rate in accordance with Sub Sec H 2 shall be %

2 ROYALTY BASE

a) Where the product sold consists of the innovation and such innovation consists essentially of, or depends primarily on, a patented invention or inventions made in whole or in part during the performance of Foundation-supported work on the Project, the Royalty Base shall be the selling price of the product as defined in Sub Sec B 3 2

b) Where the product sold consists of an assemblage of subsystems or entities, the Royalty Base shall be the selling price of the product multiplied by a fraction, the numerator of which shall be the manufacturing cost of those subsystems or entities which incorporate a patented invention or inventions made in whole or in part under this Project, and the denominator of which shall be the manufacturing cost of the product sold.

c) If, however, a market price shall have been established for any subsystem or

entity which incorporates a patented invention or inventions made in whole or in part under this Project and which is sold separately, sold as part of the innovation, or sold as part of any other product. such market price shall be the Royalty Base

3 ROYALTY The Royalty due shall be the Royalty Rate multiplied by the appropriate Royalty Base

4 ROYALTY PAYMENTS

a) No royalty payments shall be made on sales between Participants

b) Royalty payments shall commence only when the aggregate of royalties which might otherwise have become due, shall exceed the amount of Proposer's obligation with respect to payments according to Sub Sec B 3 of this Agreement However, should Proposer's obligations for payments to the Foundation per Sub Sec B 3 not be fully discharged any such deficiency shall be made up from royalty payments on any other innovation developed under this Project, if any which were forgiven in accordance with the first sentence of this paragraph

5 TERMS OF ROYALTY PAYMENTS

The obligation to make royalty payments in the full amount under this Agreement shall continue for the life of the last to expire patent issued on any invention made in whole or in part under this Foundation-supported Project

6 Royalty payments shall be made on a semiannual calendar basis, commencing at the end of the semiannual period during which any royalty first becomes due

ANNEX F

LICENSE AGREEMENTS

1 If any patented invention or inventions made in whole or in part during this Foundation-supported Project becomes the subject of any license agreement between Proposer, or either Participant and a third party, the licensor shall pay to the Foundation % of all payments received by him under such license agreement

2 If any technology developed but not including any patented invention or inventions made in whole or in part during this Foundation-supported Project becomes the subject of any license agreement between Proposer or either Participant, and a third party, the licensor shall pay to the Foundation % of all payments received by him under such license agreement, as and when received Payments under Annex F1 and this Annex F2 shall be deemed payments against Proposer's obligations under Sub Sec B 3

3 Notwithstanding the above provisions of Annex F, the total liability of Proposer for payments to the Foundation shall not exceed % in equivalent dollars as defined in Annex C of conditional grant funds actually awarded hereunder

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APPENDIX D.1

PROPOSAL PREPARATION GRANT AGREEMENT

Agreement made this day of 19 by and

BETWEEN

The ISRAEL-UNITED STATES BINATIONAL INDUSTRIAL RESEARCH AND DEVELOPMENT FOUNDATION a legal entity created by Agreement between the Government of the State of Israel and the Government of the United States of America, and promulgated into law by the Israeli Knesset in 1978 under the title of the Law of the BINATIONAL INDUSTRIAL RESEARCH AND DEVELOPMENT FOUNDATION, effective May 18th 1977 (hereinafter referred to as the "Foundation"),

AND

(Israeli Company)

AND

(U.S. Company)

corporations duly organized under the laws of the State of Israel and the United States respectively (hereinafter collectively referred to as the "Proposer");

WHEREAS the Proposer has submitted to the Foundation its preliminary proposal for the receipt of Foundation funds for the research and development as therein described and

WHEREAS the Foundation has recommended that the Proposer prepare a more detailed proposal and is willing to fund such further preparation as herein described.

Now therefore the parties hereto agree as follows

1. The preamble to this Agreement shall be deemed an integral part hereof.

2. The following documents are incorporated by reference and made a part of this Agreement:

   a) The Letter-Proposal submitted by Proposer to the Foundation and dated the day of 19 .

   b) The BIRD Foundation Handbook 1985.

3. The Foundation hereby gives and grants to the Proposer the sum of U.S. dollars (hereinafter called "grant funds") subject nonetheless to all of the terms and conditions herein contained.

3.1. 60% of said grant funds shall be paid over to the Proposer forthwith upon execution of this Agreement and 40% shall be paid over to the Proposer upon receipt by the Foundation of a more detailed proposal in form as described in the BIRD Foundation Handbook 1985 and an accounting for the use of grant funds.

4. The Proposer agrees to apply said grant funds directly to preparation of a more detailed proposal based on Proposer's Letter-Proposal referred to in Sec. 2 above and in accordance with the approved budget submitted for such additional proposal effort.

4.1. Proposer shall not deviate substantially from the Letter-Proposal without the prior written consent of the Foundation.

5. The Proposer shall submit its more detailed proposal as herein contemplated no later than [ ] months following execution of this Agreement.

5.1. The Foundation will not monitor formally the progress of Proposer's work hereunder. However Foundation personnel will provide informal guidance as Proposer may reasonably request.

6. The Foundation may, upon the giving of notice in writing thirty days in advance, revoke any part of the grant funds not yet paid over.

6.1. Upon receipt of such notice, the Proposer shall forthwith commence termination in an orderly fashion of all work hereunder. At the end of said thirty days, and within fifteen (15) days thereafter Proposer may submit a detailed statement showing costs to it on account of work hereunder. The Foundation will pay to the Proposer a sum equal to costs in excess of the portion of the grant funds already paid over, but in no event shall the Foundation be obliged to pay to the

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Proposer a total sum in excess of the grant funds authorized under Sec 3 above

7 The parties agree that this Agreement is executed in Israel shall be governed by Israeli law and within the jurisdiction of Israeli courts

8 The Proposer shall bear the full cost of stamp duties with respect to this Agreement

Signed the day and date above first given

For the Israeli Company	For the U S Company	For the BIRD Foundation

APPENDIX D.2

FEASIBILITY TEST AND PROPOSAL PREPARATION GRANT AGREEMENT

PREAMBLE

Agreement made this day of 19 by and

BETWEEN

The ISRAEL-UNITED STATES BINATIONAL INDUSTRIAL RESEARCH AND DEVELOPMENT FOUNDATION a legal entity created by Agreement between the Government of the State of Israel and the Government of the United States of America and promulgated into law by the Israeli Knesset in 1978 under the title of the Law of the BINATIONAL INDUSTRIAL RESEARCH AND DEVELOPMENT FOUNDATION effective May 18th 1977 hereinafter referred to as the Foundation

AND

(Israeli Company)

AND

(U S Company)

severally and (jointly, hereinafter collectively referred to as the Proposer and separately as the Participants)

WHEREAS the Foundation has been established under an Agreement between the Government of the United States of America and the Government of the State of Israel to promote and support joint nondefense industrial research and development of mutual benefit to the United States and Israel and

WHEREAS the Proposer has heretofore submitted to the Foundation a preliminary proposal (hereinafter the Proposal) entitled (proposal title) and on the basis of said Proposal has applied to the Foundation for certain funding assistance for technical (and or marketing) feasibility tests of the concepts therein described and for the preparation of a full proposal for further support should the feasibility tests prove successful and

WHEREAS the Foundation has examined and duly approved the Proposal and is willing to provide certain funding for the implementation of the Proposal on the terms and conditions hereinafter set forth

Now therefore the parties hereto agree as follows

1 The preamble to this Agreement shall be deemed an integral part hereof

2 The following documents are incorporated by reference and made a part of this Agreement

a) The Proposal dated the day of 19 as stamped with the Foundation's approval of the day of 19

b) The BIRD Foundation Handbook 1985

3 The Foundation hereby agrees to fund the implementation of the Proposal in the maximum sum of $ or % of the actual expenditures on the project as contemplated in the Approved Proposal Budget set forth in Annex A hereto whichever is less

3.1 The Proposer shall provide in timely fashion all budgetary funds in excess of those provided hereunder by the Foundation

3.2 The work to be undertaken under this Agreement is described in Annex B hereto (includes preparation of detailed proposal according to the BIRD Foundation Handbook 1985)

3.3 Proposer agrees to apply budgetary funds as set forth in Annex A to undertake the work described in Annex B

3.4 The Foundation shall pay the Proposer according to the schedule shown in Annex C to this Agreement

4 The Foundation may revoke any award in whole or in part, for fundamental breach as defined in Israeli law, or for cause as defined in U S law whichever is applicable to this Agreement

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4.1. Upon receipt of notice of revocation for fundamental breach (cause) the Proposer may cure the default in and within thirty calendar days after the date of receipt of the notice

4.2 Notwithstanding any other provision in this Agreement to the contrary the Foundation shall not be obliged to provide any further funding after notice until and unless the said default is cured and so demonstrated to the reasonable satisfaction of the Foundation

4.3. If the Foundation shall revoke as aforesaid all funds given Proposer per Sec 3 above shall become due immediately without need for demand. Such funds which do not by terms of this Agreement bear interest, shall be repaid with interest at the average prime rate prevailing at Chase Manhattan Bank, N.Y.C. + 1% from date of notice of revocation

4.4 The Proposer may not terminate this Agreement or abandon the project without the prior written consent of the Foundation

4.5. If upon termination of this Agreement for any reason the entire budgeted sum has not been expended, the Proposer shall forthwith return to the Foundation its pro rata share of such unexpended portion. If not repaid forthwith such sum shall bear interest as per Sec 4.3

5 In the event that the Foundation enters into a Cooperation and Project Funding Agreement (per Appendix C, BIRD Foundation Handbook, 1985) with Proposer or with at least one of the Participants to conduct a project according to the detailed proposal referred to in Annex B, Proposer or that Participant agrees that the amount to be repaid under Sub Sec B.3.a.i of said Agreement shall be the Conditional Grant referred to therein, plus the amount given Proposer under this Agreement

6 The parties agree that this Agreement shall be governed by Israeli (U.S.) law and within the jurisdiction of Israeli (U.S.) courts

7 The Proposer shall bear the full cost of stamp duties with respect to this Agreement

8 The effective date of this Agreement shall be the day of , 19 . This Agreement shall terminate (time) from the effective date

Signed the day and date above first given

for the Israeli Company	for the U.S. Company	for the BIRD Foundation

APPENDIX E
FORMATS FOR TECHNICAL AND FISCAL REPORTS

A. Technical Reports

Technical reports submitted to the Foundation will be treated as confidential to the extent described in the Confidential Disclosure Agreement (Appendix B) Nonetheless proprietary or commercially sensitive information should be identified as such The purpose of the technical reports is to enable the Foundation to monitor project progress and to assist it in decisions relating both to continued funding of the project and to new projects which may be proposed by either or both project partners

I SEMIANNUAL REPORT - 2 copies

Semiannual reports are to be submitted within 30 days following the expiration of each semiannual period Timeliness conciseness and emphasis on comparison of project progress versus the Program Plan (Annex D of the Cooperation and Project Funding Agreement) should be key features of these reports typically 5-10 pages in length Results of unusual interest should be highlighted

Report Outline

1 Standard BIRD cover page (given on page 38)

2 Objectives - state the overall objectives of the project and the specific objectives of the work performed in this six-month period

3 Summary of accomplishments (including inventions) - this section should be an informative discussion of the methods and essential results of the investigation or development

4 Results - briefly describe, with reference to the Program Plan, the results obtained during the reporting period on an activity-by-activity basis Point out any results that may have a significant impact on future activities or expenditures

5 Graphical comparison of results versus Program Plan - show graphically the actual status and explain deviations from plan (Explain all symbols used in the Program Plan)

6 Outline of plans for next six-month period - show any rescheduling or additions to activities on the Program Plan and indicate which, if any, of the originally planned activities or tasks are being terminated or redirected Discuss with graphical illustrations the impact that rescheduled activities are likely to have on the original Program Plan during the next six-month period

7 Published reprints - attach a copy of any reprint that is based in whole or in part, on the work conducted on the BIRD project

8 Patents - indicate if any patents have been filed

II ANNUAL REPORT (other than final report) - 2 copies

Annual reports are to be submitted within 60 days following the end of each year of support The annual report will be typically 10-20 pages in length

Report Outline

1 Standard BIRD cover page (given on page 38)

2 Table of Contents

3 Objectives - state the overall objectives of the project and of the work performed during the twelve-month period

4 Summary of accomplishments (including inventions) - this section should be an informative discussion of the methods and results of the investigation or development The summary should be self-sufficient and understandable to someone who reads nothing else in the report

5 Results - describe, with reference to the Program Plan, the results obtained during the reporting period on an activity-by-activity basis Identify and describe results that represent significant variations from the Program Plan

6 Graphical comparison of results versus Program Plan - show graphically the actual status and explain deviations from plan

7 Discussion of cooperation between the companies - discuss the activities conducted during the reporting period that have enabled the U.S. and Israeli companies to keep abreast of each other's progress. Has the division of tasks or responsibilities between the two companies been integrated to mutual benefit? Any problems that have developed in this regard should be noted, with possible suggestions for their mitigation

8 Market and commercialization plans - if not covered earlier in the report, identify any important changes in the market or your plans for commercialization that have developed during the twelve-month period. Explain such developments and the impact they will have on the overall Program Plan (plan to commercialization) and overall budget

9 Published reprints - attach a copy of any reprint (not submitted in a previous report) that is based, in whole or in part, on the work conducted on the BIRD project. Include a report on any inventions or patents filed

III. FINAL REPORT - 2 copies

The final report, to be submitted within 60 days following termination of the Agreement, should be in two parts. Part I should be prepared according to the Report Outline for Annual Reports. Part II should describe the outcome of the project in commercial terms. To be included are the market acceptance of the product(s) or process(es) developed, current sales and cash flow forecasts, new product opportunities and any further activities planned jointly by the project partners.

IV. INFORMAL REPORTS

In addition to the formal reports required under the contract, the Foundation welcomes prompt and informal reporting of significant project events, whether favorable or otherwise. As a contributor to the project, we would like to be current in our knowledge of its status. When there are favorable variations from the Program Plan, we can make an early start on project continuation or extension. When unforseen problems occur, our early awareness will enable us to work with the Project Manager or team in any necessary rescheduling of the Program Plan.

B. Fiscal Reports

The format for the fiscal reports specified in the Cooperation and Project Funding Agreement is described below. All reports are to be submitted in 2 copies.

Report Outline

1 Standard BIRD cover page (given on page 39)

2 Salaries and Social Benefits

Professional employees engaged in the project should be identified by name.

3 Equipment (itemized list)

4 Expendable Materials and Supplies

5 Travel

a. Foreign

b. Domestic

6 Data Processing

7 Subcontracts

8 Consultants

9 Other Expenses

Expenditures in all categories should be shown versus the Approved Budget for the relevant period, as per Annex A to the Cooperation and Project Funding Agreement.

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(Standard Cover Page for Technical Reports)

ISRAEL-UNITED STATES BINATIONAL INDUSTRIAL
RESEARCH AND DEVELOPMENT FOUNDATION

TITLE

_____

_____

_____

SUBMITTED BY

_____(Israeli Company)

_____(U.S. Company)

TYPE OF REPORT*

_____

PERIOD COVERED

_____

PROJECT START DATE

_____

Signatures

Project Manager

_____

Authorized Company Official

_____

Associate Project Manager

_____

Authorized Company Official

_____

Date submitted _____

*Semiannual Annual Final

(Standard Cover Page for Fiscal Reports)

ISRAEL-UNITED STATES BINATIONAL INDUSTRIAL
RESEARCH AND DEVELOPMENT FOUNDATION

TITLE

_____

_____

_____

SUBMITTED BY

_____(Israeli Company)

_____(U.S. Company)

TYPE OF REPORT*

_____

PERIOD COVERED

_____

PROJECT START DATE

_____

Total Contract Budget	$ _____
BIRD Commitment	$ _____
Amount Received to Date	$ _____
Budget for Semiannual Period	$ _____
Actual Expenditure for Semiannual Period	$ _____
Estimated Budget for next Six-Month Period	$ _____

We confirm that this report is prepared from separate bookkeeping accounts in which all the project expenditures were recorded. The Project Manager's signature is his confirmation that all the listed items and expenditures were made within the framework of the project.

Signatures

Project Manager	Accounting Official	Company's Authorizing Official
_____	_____	_____

Date Submitted_____

*Semiannual, Annual

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THE BIRD FOUNDATION

ISRAEL
3 Tevuot Ha'aretz Street,
Tel Aviv

MAIL Dr A I Mlavsky
Executive Director
P O Box 39104
Tel Aviv 61390 Israel
PHONE 03-470710
TELEX 361417 BIRDF IL

U S A
Government of Israel
Investment Authority
Empire State Building,
350 Fifth Ave
New York, NY 10001
c/o Economic Minister
Above address

PHONE 212-560-0610
TELEX 423021 ICTO UI

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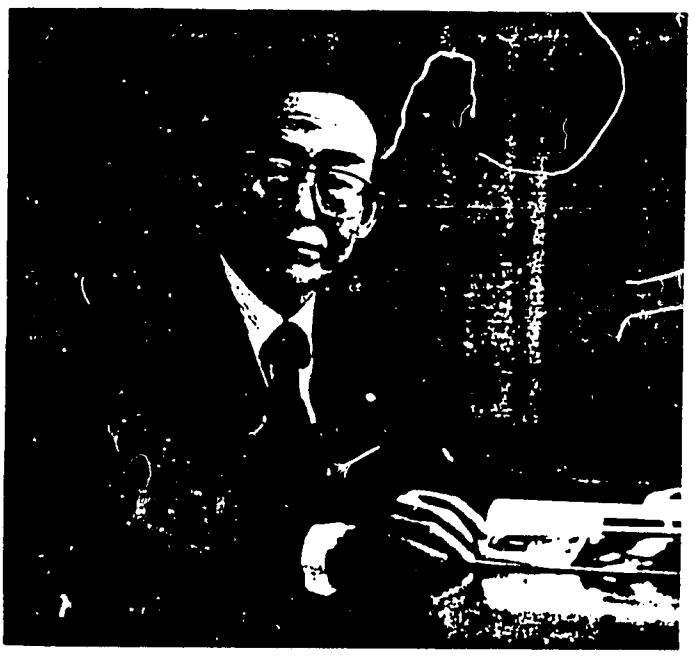
KTDC 1984 ANNUAL REPORT

Korea Technology Dvelopment Corporation

CONTENTS

money" to invigorate and encourage industrial research and development.

Of particular interest in the year ahead is that a representative office will be opened in Pusan, scheduled for March this year. The new office will help to strengthen our strategic position and aid in the delivery of our support. KTDC also plans to set up an overseas representative office in the United States to reinforce our international activities to maximise potential for technology transfer through collaboration with other venture capital companies and technological promotion institutions. These two particularly far-reaching business developments of 1985 are designed to broaden KTDC's presence in the most active region of the country, and the most advanced and active country in the world.



Finally, we would like to take this opportunity to extend our sincere appreciation for your kind cooperation and look forward to your continuing support.

Thank you.

February 27, 1985

Chang D. Kim

Chang-Dal Kim
Representative Director
and President

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KTDC IN OUTLINE

ESTABLISHMENT

The Korea Technology Development Corporation (KTDC) was incorporated on April 28, 1981 under the Korea Technology Development Corporation Act (KTDC Act). It was created through the joint efforts of the Government, business and financial communities and IBRD for the purpose of fostering the development of a technology-intensive industrial structure and to provide private enterprises with sufficient financing facilities. KTDC's functions and activities, however, have diversified in the course of time, enabling us to meet the growing demands of our customers.

CAPITAL

At its inception in 1981, KTDC's authorized capital was Won 15.0 billion which has now grown to Won 50.0 billion in 1984, of which Won 22.8 billion has been broadly subscribed by private enterprises, banking institutions, and the Government totalling 187 shareholders.

MANAGEMENT

The responsibility for the policy and general direction of KTDC's business rests with the Board of Directors, currently consisting of the Chairman of the Board, the President, the Executive Director and eight non-standing Directors. The President is responsible for KTDC's overall operations. The Board has delegated some of its authority to an Executive Directors' Committee consisting of standing directors.

FUNCTIONS

KTDC finances in several areas of technological activities:

- R&D costs incurred either internally or through contracts with external research institutes
- Initial costs of commercializing new technology and/or investigation and arrangements related thereto
- Import of technology and the adaptation of technology to existing technology
- Engineering costs associated with the construction of industrial facilities
- Recruiting and utilizing foreign specialists and technical advisors, and/or training of domestic RD&E personnel at home or abroad.

KTDC also provides special services in areas of:

- Technical advisory services to the industrial enterprises mentioned above and technical feasibility surveys for RD&E activities
- Activities incidental to technological development commisioned by the Government and international institutions.

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TYPES OF FINANCING

To promote RD&E projects which inherently involve substantial risks coupled with expected high returns. KTDC has to share both the risk of failure and the benefits of success. With this in mind, KTDC offers the following types of financial supports:

- Conventional loans

  Regular loans to be repaid according to certain predetermined conditions (interest rate, grace period, repayment period, etc.)

- Conditional loans

  Financial instruments that allow profit and risk sharing with project sponsors. Such "loans" will normally be "repaid" through royalty payments from sales revenues if the project is successful, including a reasonable return on the loan. If the project does not result in sales revenues, KTDC recovers only a portion of the principal from the sponsors.

- Equity investments

  Equity participation in companies set up to commercialize RD&E results.

FUND SOURCES

KTDC finances its operation by issuing technology development financing debentures, borrowing government funds, IBRD loans, and by using its own capital.

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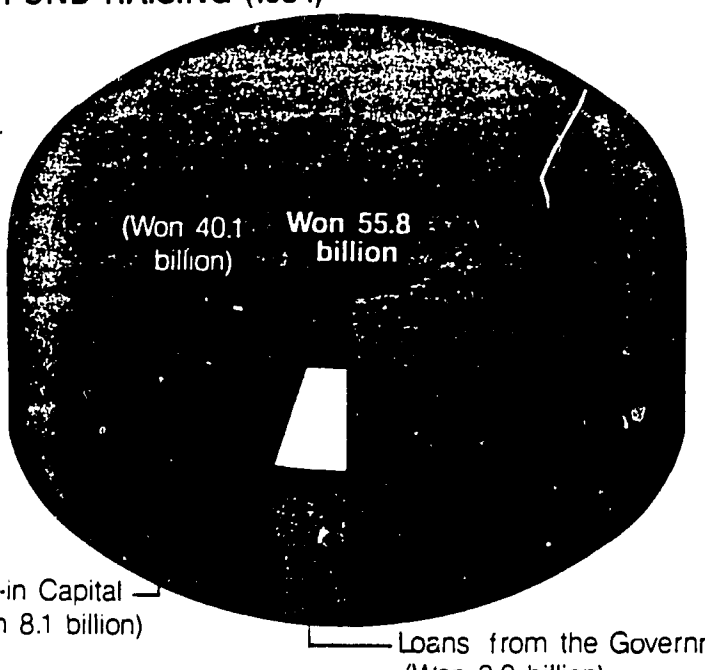
FINANCIAL RESOURCES

KTDC continued its drive to mobilize financial support to meet the ever increasing demand for technological development of Korean industries. The results of these efforts were highly satisfactory.

The financial resources were comprised primarily of capital, technological development financing debentures and loans from the Government, and the World Bank. During 1984, the resources mobilized aggregated to Won 55.8 billion. Of the total, the local currency resources totalled Won 40.1 billion, consisting of Won 8.1 billion in paid-in capital, Won 30.0 billion in technology development financing debentures and Won 2.0 billion in loans from the Government. Foreign exchange resources were withdrawn to the amount of US$ 19 million from the first IBRD loan for the year.

As a result, the accumulated total financial resources that were available to KTDC at the end of 1984, amounted to Won 111.2 billion. They comprised paid-in capital totalling Won 22.8 billion, floatation of technology development debentures worth Won 55.5 billion and borrowings from the Government aggregating Won 6.0 billion and withdrawl from the first IBRD loans to the amount of Won 26.9 billion (US$ 35 million).

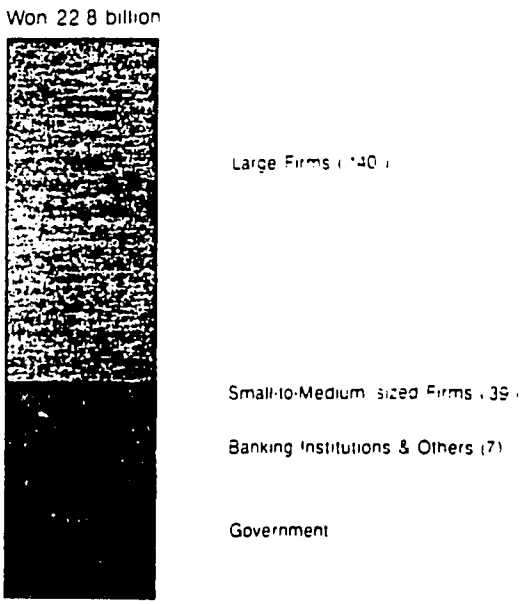
FUND RAISING (1984)



HARE CAPITAL

1984 was a year of new turn in terms of the paid-in share capital.

Revision of the KTDC Act enabled the authorized capital to be increased from Won 15.0 billion to Won 50.0 billion. Over the same period, Won 8.1 billion was added to the KTDC's capital, which pushed paid-in capital up to Won 22.8 billion at the end of the year. Of the additional capital, Won 2.0 billion was subscribed by the Government and Won 6.1 billion was contributed by private industrial firms. Such strong capitalization is viewed as KTDC's first step towards entering mass-level operations. Particulary noteworthy is that 20 small-to-medium sized industrial firms joined KTDC as new shareholders and the total number of shareholders increased to 187. This remarkable growth reflects the wide support from the private industrial sector.



Note: Figures in parenthesis indicate number of shareholders

ECHNOLOGICAL DEVELOPMENT FINANCING DEBENTURES

KTDC is authorized to issue technological development financing debentures and depends largely on this source for its financial resources.

During 1984, KTDC was able to float debentures totalling Won 30.0 billion; Won 11.0 billion in the first floatation, Won 10.0 billion in the second floatation, and Won 9.0 billion in the third floatation. Payment of the principal and interest on these debentures was guarranteed by the Government. The interest differential between the cost of debenture issuance and the KTDC's on-lending rate recommended by Government policy was replenished by the Government.

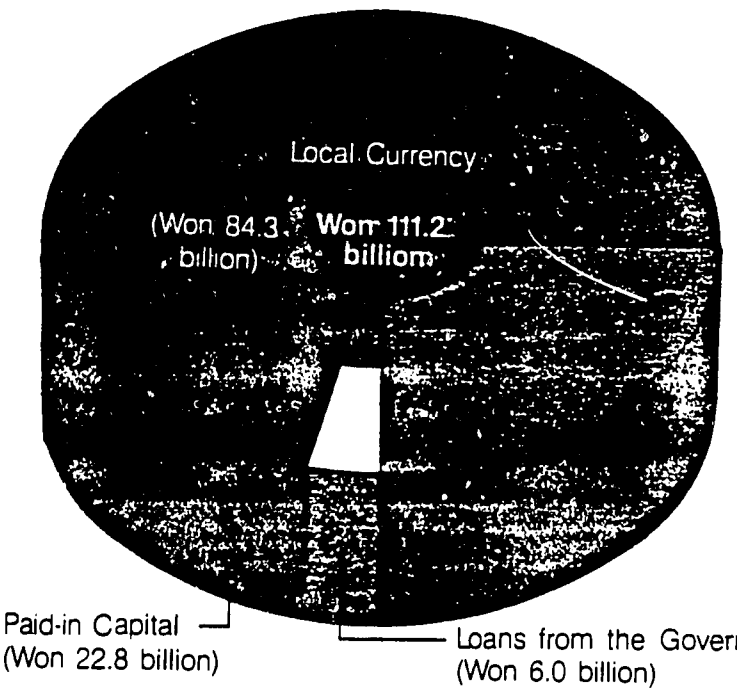
OANS FROM THE GOVERNMENT

KTDC is able to borrow funds under the Government's special loan program. During 1984, it borrowed fiscal funds of Won 2.0 billion. As a result, the outstanding balance still owed to the Government was Won 6.0 billion at the end of 1984. It has been agreed that future borrowings and the outstanding borrowings under the loan program will be at a new interest rate of 5.5% p.a. as of Jan. 1, 1985. This rate is considerably lower than the rate applied in previous years.

BRD LOANS

Of the foreign exchange resources for 1982-1984, the first IBRD loan of US$ 50.0 million had been exhausted in full and US$ 35.0 million had been withdrawn by the end of 1984. The second IBRD loan of US$ 50.0 million was successfully secured from the World Bank on November 1, 1984 to enable KTDC to meet the demands of industry in the form of foreign currency for 1985-1986.

FUND SOURCES ('81 ~ '84)



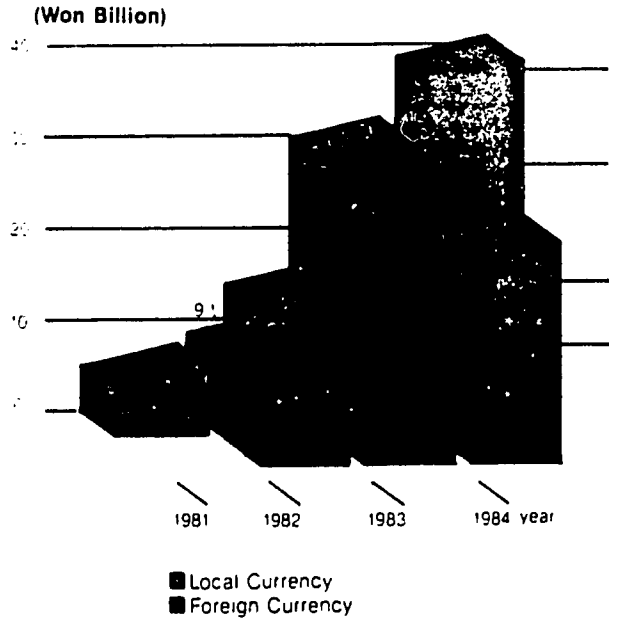
LENDING AND INVESTMENT OPERATION

KTDC has approved 184 projects totaling an equivalent of Won 57.0 billion; Won 37.9 billion in local currency and US$ 23.8 million in foreign exchange, which show an increase of 14% in the amount approved and 30% in the number projects supported.

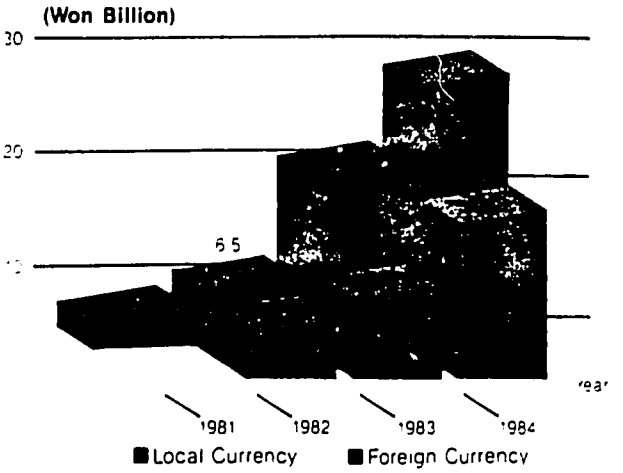
During 1984, KTDC's total disbursements amounted to an equivalent of Won 42.8 billion; Won 27.1 billion in local currency and US$ 19 million in foreign exchange. The difference between the amounts approved and the amount of disbursements is due to the process of the projects according to which our funds are disbursed.

During the four years since KTDC's establishment, total financing has been approved for 463 projects equivalent to Won 135.1 billion including foreign currency funds of US$ 68.9 million and local currency funds of Won 80.9 billion. Total disbursement for the 4 years has been amounted to Won 79.0 billion including Won 52.1 billion in local currency and US$ 35.0 million in foreign exchange which shows a 116% increase from Won 36.6 billion of the previous year.

TRENDS OF APPROVAL



TRENDS OF DISBURSEMENT

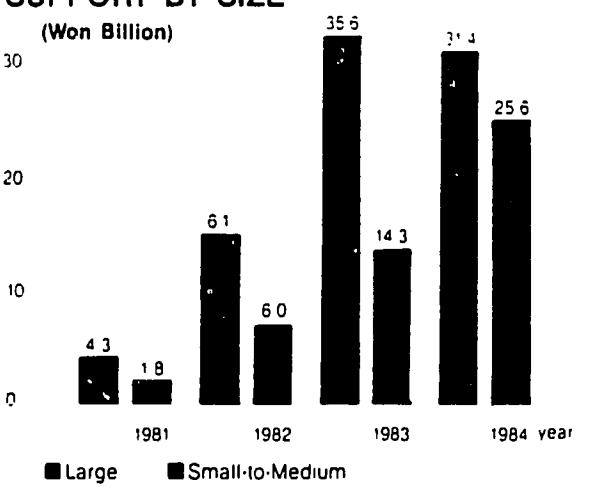


GREAT EMPHASIS ON LOANS FOR SMALL-TO-MEDIUM SIZED ENTERPRISES

Of the total funds approved, Won 25.6 billion was earmarked for small-to-medium sized enterprises, which accounted for 45% of the total amounts approved, a 79% increase over the previous record.

This is, we believe, a result of KTDC's efforts to induce and support R&D activities of small-to- medium sized firms with the belief that technology development of small-to-medium sized firms is a cornerstone of economic development in Korea.

SUPPORT BY SIZE



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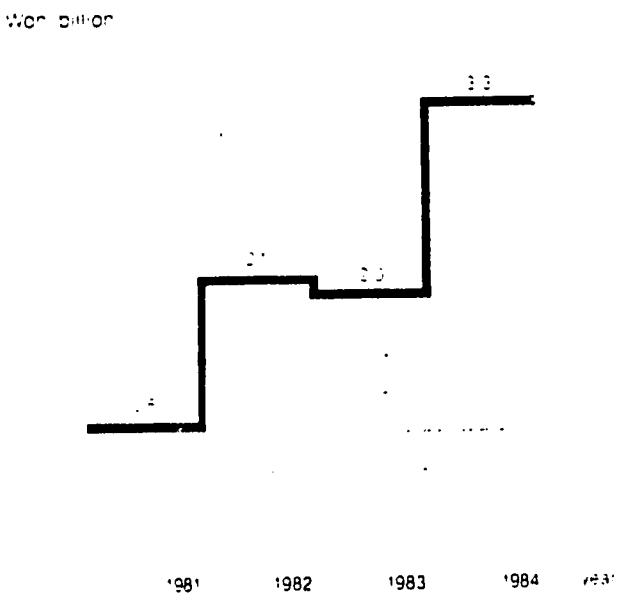
QUITY INVESTMENTS AND CONDITIONAL LOANS

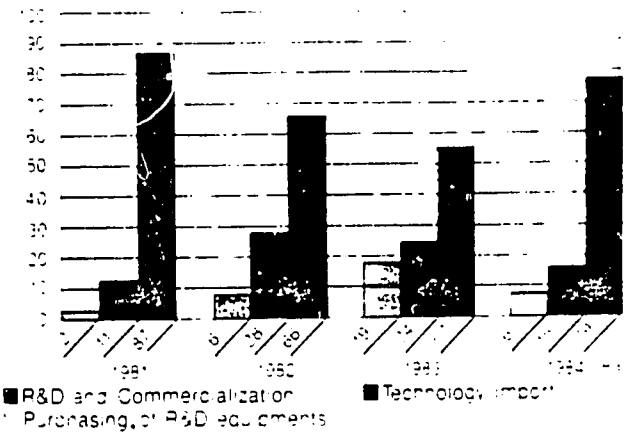
To promote R&D projects of industry which inherently involve substantial risks, KTDC offers financial support of investments and conditional loans.

Over the year, Won 2.7 billion was invested in equity for 16 projects through accepting convertible debentures or sharing stocks in companies, and Won 0.6 billion was invested in 6 projects through various conditional loans.



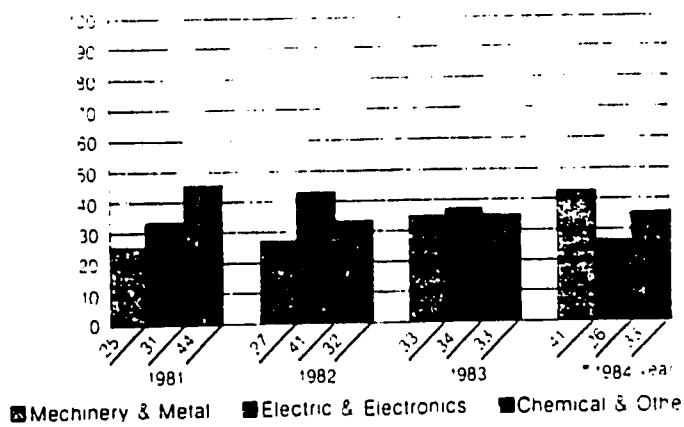
ONTINUED SUPPORT FOR R&D AND COMMERCIALIZATION

In 1984, the breakdown of projects approved by category showed that Won 45.3 billion, (79% of total amounts approved) went to R&D activities and commercialization of R&D results, Won 8.4 billion (15%) to technology imports and training, and Won 3.3 billion (6%) to purchasing of R&D equipments



ALANCED FINANCING TO ALL INDUSTRIAL SECTORS

Of the total funds approved, Won 23.5 billion was approved for 71 projects of the metal and machinery industry, Won 14.7 billion for 55 projects of the electric and electronics industry, and Won 18.8 billion for 58 projects of the chemical and other industries, each of which accounts 41%, 26% and 33% respectively.



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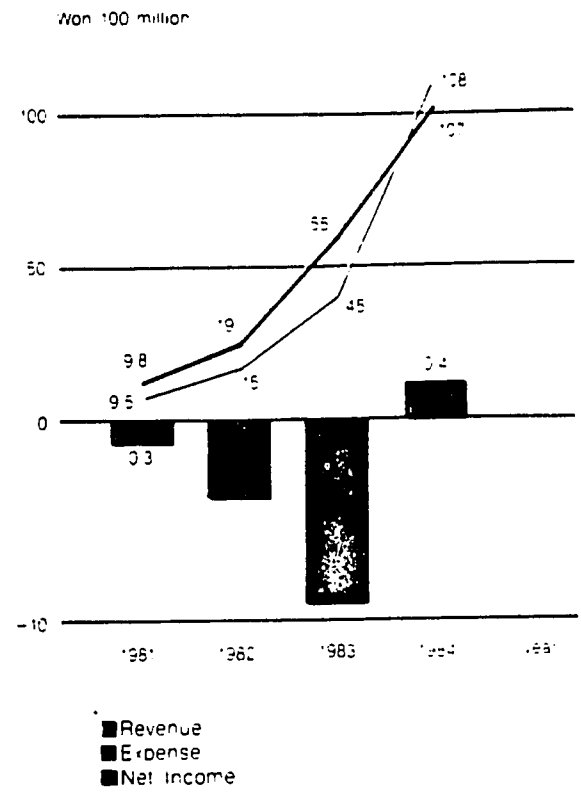
RESULTS OF OPERATIONS

The year of 1984 witnessed a tremendous growth in the KTDC's financial results both in terms of gross revenue and in net income.

Total revenue for the year established a new record of Won 10.8 billion, an increase of 140% over the preceding year's level, while total expenses for the year amounted to Won 10.7 billion, 94% higher than in the preceding year.

As a result, net income before tax recorded a profit of Won 34.5 million from the previous year's net loss totalling Won 954 million.



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OTHER ACTIVITIES

TECHNOLOGY BROKERAGE SERVICE

KTDC puts strong emphasis on making available advanced foreign technology to local business firms and promoting commercialization of the outcome of research from academia, and public research institutes as well as from industrial researchers across the nation. KTDC also assists in arranging technology transfer to foreign companies interested in competitive technologies possessed and developed by the local business firms.

In 1984, KTDC received 34 inquires; 10 related to international transfer of technology and 24 to technical cooperation among local industrial firms. Three of these inquires resulted in technical agreements and 9 are at present under negotiation.

INTERNATIONAL SEMINAR ON VENTURE CAPITAL

In order to promote technological development through venture capital investments and foster understanding of the overseas venture capital communities in the United States and Japan, KTDC arranged a two-day international seminar on venture capital on October 12, 1984. Some 150 delegates and guests representing financial institutions, government bodies, academia and industrial concerns attended including some prominent speakers from the United States and Japan.

Presentations by foreign experts and the president of KTDC were made and panel discussions and free discussions followed. The topics included venture capital strategies, the role of government policies in venture capital development and the role of Korean enterprises in the venture capital market.

CONFERENCE FOR SMALL-TO-MEDIUM SIZED INDUSTRIES

With a view to encouraging technological development in SMIs by widening and intensifying direct contact between the industries and government authorities, KTDC organized a conference which was attended by the Minister of Science and Technology.

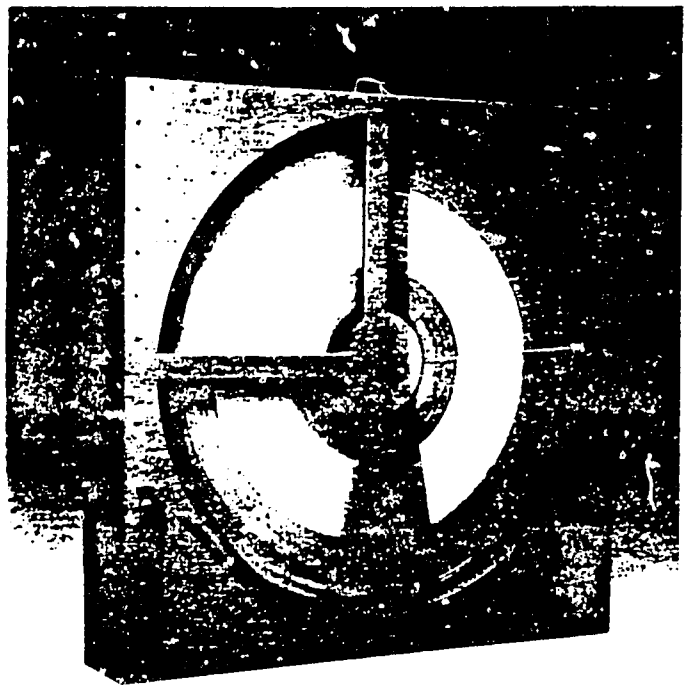
An introduction to the Government's policy regarding technological development in SMIs was made, and free and in-depth discussion on their status and technological development brought forth practical approaches to promoting their activities. The conference was designed to provide a forum where representatives from Government authorities and small-to-medium sized firms could exchange ideas and discuss mutual problems.

CONFERENCE FOR KTDC'S PORTFOLIO INVESTMENT COMPANIES

KTDC, as always, provided various supports such as financial, technical and managerial services to its client companies. The conference, attended by some 20 delegates of the portfolio investment companies, was held on November 21, 1984 with the objective of strengthening the cooperative relationships between those companies in addition to promoting more suitable and innovative financial support.

DEVELOPMENT OF A DEHYDRATOR AND A HEAT-EXCHANGER

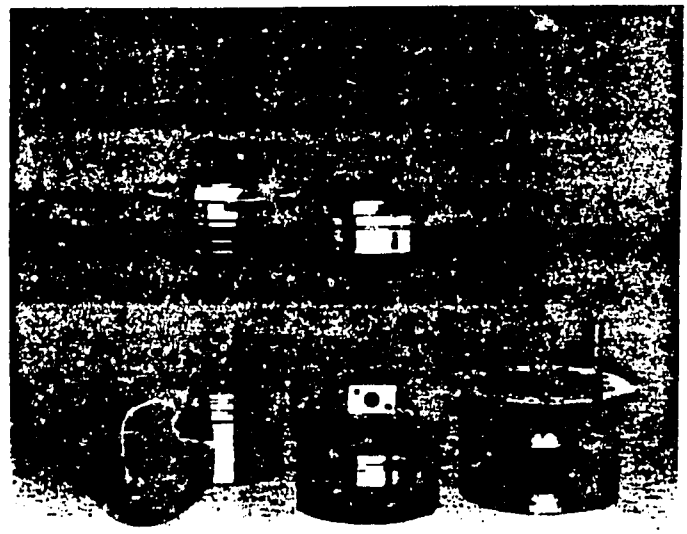
Dehydrators and heat-exchangers are pieces of equipment designed to mechanically regulate moisture, dust and temperature in accordance with the special requirements of a building. They are effective not only in increasing production quality and productivity but also in saving energy through recovery of wasted heat. The demand for these products shows ever increasing trend, and KTDC financed Won 150 million representing 81 percent of the total development cost.



DEVELOPMENT OF A ENGINE POWER PACK FOR DIESEL LOCOMOTIVES

The engine power pack, which consists of cylinder liner, cylinder head and piston ring, is a core part of an internal combustion engine for diesel locomotives. It requires high durability under high load over 3,500 LP as well as high precision for high performance engine applications.

Despite of the cost the domestic railway authority has to date imported all necessary power packs at a total cost of about US$ 1.5 million a year. The locally produced power pack manufactured under the company's own patent is internationally competitive in terms of price and quality. As a result we estimate exports to reach over US$ 0.3 million a year to the U.S., Taiwan and Pakistan in addition to replacing imports power packs on the domestic market.



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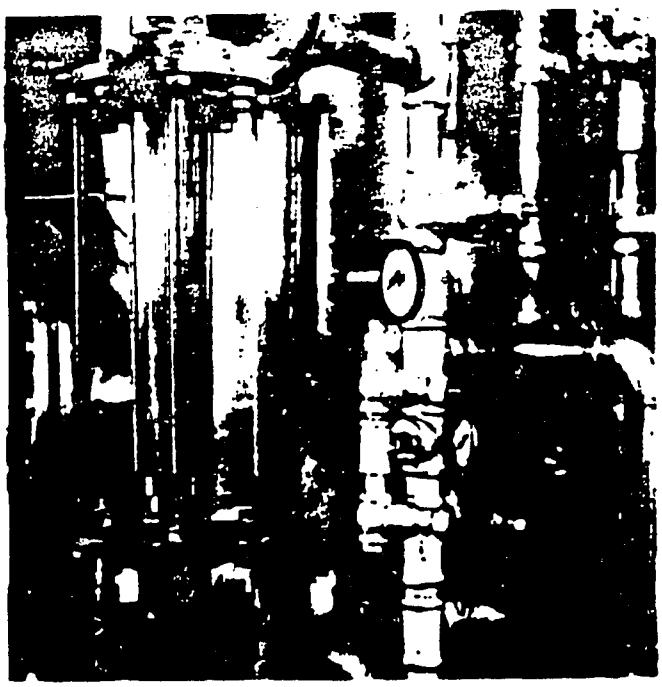
HE DOMESTIC PRODUCTION OF CUPROUS CHLORIDE

The domestic production of cuprous chloride, the major raw material for a bluish dyestuff called phthalocyanine blue, was initiated by the project sponsor in 1981. The present process of dry production, however, entails higher production costs due mainly to heavy investment required in equipment designed to control the sophisticated reaction that takes place between chlorine gas and electrolyzed copper at high temperature. The sponsor, therefore, is developing an up-to-date wet process utilizing such cheap raw materials as copper scraps and residual cuprous liquid, thereby considerably lowering the manufacturing cost.

The sponsor also plans to improve the yield rate of stannous sulfate, another major product used as a metal electroplating agent through development of effective processes retaining and controlling its easy-to-oxidize properties.

KTDC financed Won 290 million for the successful implementation of the proposed project through which such advantages as cost reduction, greater flexibility in use of raw materials and quality up-grading are expected.



EVELOPMENT OF LOAD CELL AND ITS RELATED PRODUCT

The Load Cell, a transducer which converts applied pressure into an electrical signal, is a technology and labor intensive product of which the application covers wide range of industrial equipment such as electronic weighing scale, electronic hopper scale and other various factory automation facilities.

Development and production of the Load Cell by domestic enterprises is highly desirable, especially considering its importance as a sensor element and the technical difficulties involved in its production.

KTDC financed Won 700 million in the form of venture capital and expects the company's sales volume to reach Won 2.0 billion in 1986 maintaining growth rate of 30%, which will assure KTDC a moderate return on investment.

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FINANCIAL STATEMENTS

BALANCE SHEET

ASSETS

		1984	1983
I.	**CURRENT ASSETS**	**43,376,477,420**	17,315,331,859
	Cash on hand and in banks	**3,899,282**	3,043,508
	Time deposits	**586,917,766**	750,000,000
	Commercial paper	**16,669,900,683**	6,327,901,822
	Beneficiary certificates	**15,380,826,069**	8,509,000,000
	Accrued receivables	**1,782,074,775**	1,042,124,019
	Short-term portfolio	**8,316,475,321**	—
	Less: Allowance for possible losses	**(81,664,753)**	—
	Other current assets	**738,048,277**	683,262,510
II.	**INVESTMENT AND OTHER ASSETS**	**66,547,074,052**	37,076,604,423
	Investment		
	Conventional loans	**60,891,111,914**	33,287,328,995
	Conditional loans	**2,348,885,366**	2,081,198,866
	Equity investments	**609,652,338**	195,925,000
	Less: Allowance for possible losses	**(655,888,825)**	(374,497,266)
	Others	**1,717,994,568**	472,588,800
	Other assets		
	Lease deposits	**586,648,000**	591,648,000
	Telephone rights and other	**1,048,670,691**	822,412,028
III.	**FIXED ASSETS**	**98,300,269**	**91,719,519**
	Vehicles	**50,185,435**	50,185,435
	Less: Accumulated depreciation	**(37,520,234)**	(30,113,805)
	Furniture and fixtures	**170,152,689**	136,008,965
	Less: Accumulated depreciation	**(84,517,621)**	(64,361,076)
IV.	**DEFERRED ASSETS**	**639,841,582**	**312,994,692**
	Stock issue costs	**173,531,846**	98,807,374
	Debenture issue costs	**466,309,736**	214,186,818
	TOTAL ASSETS	**110,661,693,323**	**54,796,650,493**

LIABILITIES

		1984	1983
I.	**CURRENT LIABILITIES**	**2,231,608,983**	**944,117,719**
	Withholding taxes	**19,477,146**	17,681,680
	Accrued expenses	**1,677,816,453**	551,893,444
	Unearned income	**504,813,148**	374,542,595
	Accounts payable	**26,074,919**	—
	Taxes payable	**3,427,317**	—
II.	**LONG-TERM LIABILITIES**	**86,944,035,705**	**40,556,538,309**
	Debentures	**53,723,624,999**	24,134,750,000
	Borrowings from the Government	**6,000,000,000**	4,000,000,000
	Borrowings from IBRD	**26,937,004,980**	12,285,556,827
	Employees' severance liabilities	**283,405,726**	136,231,482
	TOTAL LIABILITIES	**89,175,644,688**	**41,500,656,028**

SHAREHOLDERS' EQUITY

I.	**CAPITAL STOCK**	**22,834,187,000**	**14,678,672,000**
	Common stock—par value: ₩ 1,000		
	Authorized: 50 million shares		
	Issued and outstanding: 22,834,187 shares in 1984 and 14,678,672 shares in 1983		
II.	**DEFICIT**	**(1,348,138,365)**	**(1,382,677,535)**
	Deficit after prior period adjustments	**(1,382,677,535)**	(428,211,210)
	Net income for the year	**34,539,170**	(954,466,325)
	TOTAL SHAREHOLDERS' EQUITY	**21,486,048,635**	**13,295,994,465**
	TOTAL LIABILITIES AND SHAREHOLDERS' EQUITY	**110,661,693,323**	**54,796,650,493**

STATEMENT OF INCOME AND DEFICIT

		1984	1983
I.	**OPERATING REVENUE**	**10,736,039,785**	**4,514,398,833**
	Interest income on conventional loans	**5,104,410,876**	1,934,344,702
	Royalty income from conditional loans	**16,280,580**	38,013,169
	Interest income on deposits and others	**1,801,882,770**	1,465,848,529
	Commission Income	**599,513,228**	336,740,155
	Government subsidization on interest differential	**1,869,310,730**	507,647,549
	Income from foreign exchange conversion	**1,344,641,601**	231,804,729
II.	**OPERATING EXPENSE**	**9,951,850,603**	**5,106,372,718**
	Interest expense on government loans	**457,020,530**	316,945,201
	Interest expense on debentures	**3,799,932,138**	1,808,092,826
	Interest expense on IBRD loans	**2,306,305,316**	867,770,577
	Commission expense	**183,051,827**	279,743,240
	Provision for possible losses on portfolio loans	**363,056,312**	253,959,226
	General and administrative expense	**1,560,262,077**	1,335,674,086
	Loss from foreign exchange conversion	**1,282,222,403**	244,187,562
III.	**OPERATING INCOME**	**784,189,182**	**(591,973,885)**
IV.	**NON-OPERATING INCOME**	**55,688,720**	**23,506,384**
	Commission income	**20,046,617**	16,129,532
	Other income	**35,642,103**	7,376,852
V.	**NON-OPERATING EXPENSE**	**813,335,809**	**386,100,979**
	Amortization of stock issue costs	**125,494,438**	58,697,170
	Amortization of debenture issue costs	**286,701,572**	107,093,409
	Amortization of discount on debentures	**397,874,999**	219,750,000
	Miscellaneous losses	**3,264,800**	560,400
VI.	**ORDINARY INCOME**	**26,542,093**	**(954,568,480)**
VII.	**SPECIAL GAINS**	**11,424,394**	**102,155**
	Gain on disposition of fixed assets	**—**	102,155
	Gain on disposition of non-business fixed assets	**11,424,394**	—
VIII.	**INCOME BEFORE TAXES**	**37,966,487**	**(954,466,325)**
IX.	**TAXES**	**3,427,317**	**—**
X.	**NET INCOME**	**34,539,170**	**(954,466,325)**
XI.	**DEFICIT AT BEGINNING OF YEAR**	**(1,382,677,535)**	**(428,211,210)**
XII.	**DEFICIT AT THE END OF YEAR**	**(1,348,138,365)**	**(1,382,677,535)**

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STATEMENT OF CHANGES IN CASH POSITION

SOURCES OF CASH

	1984	1983
I. FINANCIAL TRANSACTIONS INVOLVING INFLOW OF CASH		
Cash provided from operations	**1,839,193,744**	(513,465,745)
Net income per statement of income	**34,539,170**	(954,466,325)
Add: Charges not affecting cash		
Depreciation	**27,582,974**	32,360,848
Provision for employees' severance liability	**169,229,630**	58,764,630
Provision for possible losses on portfolio loans	**363,056,312**	253,959,226
Loss on translation of foreign currency	**1,282,222,403**	244,187,562
Amortization of stock issue costs	**125,494,438**	58,697,170
Amortization of debenture issue costs	**286,701,572**	107,093,409
Amortization of discount on debentures	**397,874,999**	219,750,000
Amortization of prepaid front-end-fee	**40,190,497**	39,970,877
Accured expenses	**1,125,923,009**	359,049,397
Payable taxes	**3,427,317**	—
Deduct: Income not affecting cash		
Unearned income	**(661,245,466)**	(700,925,655)
Income on translation of foreign currency	**(1,344,358,717)**	(231,804,729)
Deduct: Income involving changes in cash		
Gain on disposal of non-business fixed assets	**(11,424,394)**	(102,155)
Decrease of current assets	**28,581,012**	—
Decrease of investment and other assets	**5,823,579,885**	620,348,850
Decrease of fixed assets	**—**	5,500,000
Increase of current liabilities	**132,554,330**	244,235,355
Increase of long-term liabilities	**46,934,418,857**	33,334,281,526
Increase of capital stock	**8,155,515,000**	4,860,162,000
Total	**62,913,842,828**	**38,551,061,986**
II. FINANCIAL TRANSACTIONS NOT INVOLVING INFLOW OF CASH		
Decrease of investment and other assets	**8,506,038,515**	208,399,262
Increase of current liabilities	**25,586,608**	—
Total	**8,531,625,123**	**208,399,262**
TOTAL SOURCES OF CASH	**71,445,467,951**	**38,759,461,248**

APPLICATIONS OF CASH	1984	1983
III. FINANCIAL TRANSACTIONS INVOLVING OUTLAY OF CASH		
Increase of current assets	**54,785,767**	674,626,633
Increase of investment and other assets	**45,032,882,081**	25,506,441,064
Increase of fixed assets	**34,143,724**	19,089,058
Increase of deferred assets	**738,377,400**	441,612,346
Decrease of current liabilities	**—**	752,030
Decrease of long-term liabilities	**22,055,386**	2,782,861
Total	**45,882,244,358**	**26,645,303,992**
IV. FINANCIAL TRANSACTIONS NOT INVOLVING OUTLAY OF CASH		
Increase of current assets	**107,286,302**	—
Increase of short-term portfolio	**8,316,475,321**	—
Increase of investment and other assets	**107,198,000**	208,399,262
Increase of deferred assets	**665,500**	—
Total	**8,531,625,123**	**208,399,262**
TOTAL APPLICATIONS OF CASH	**54,413,869,481**	**26,853,703,254**
INCREASE OF CASH	**17,031,598,470**	**11,905,757,994**
TOTAL	**71,445,467,951**	**38,759,461,248**

BRIEF HISTORY OF DEVELOPMENT

December 24 KTDC increased its paid-in capital to Won 22.8 billion.

December 19 KTDC increased its share capital from Won 15.0 billion to Won 50.0 billion through the amendment of the KTDC Act.

February 27 Mr. Chang-Dal Kim was elected as Representative Director and President.

February 15 KTDC was empowered to undertake technology evaluation of proposals for cooperative research between public research institutes and industrial firms under the auspiece of National R&D Program.

April 28.
The Inaugural Meeting of Shareholders was held.

December 31.
The KTDC Act was promulgated.

BOARD OF DIRECTORS

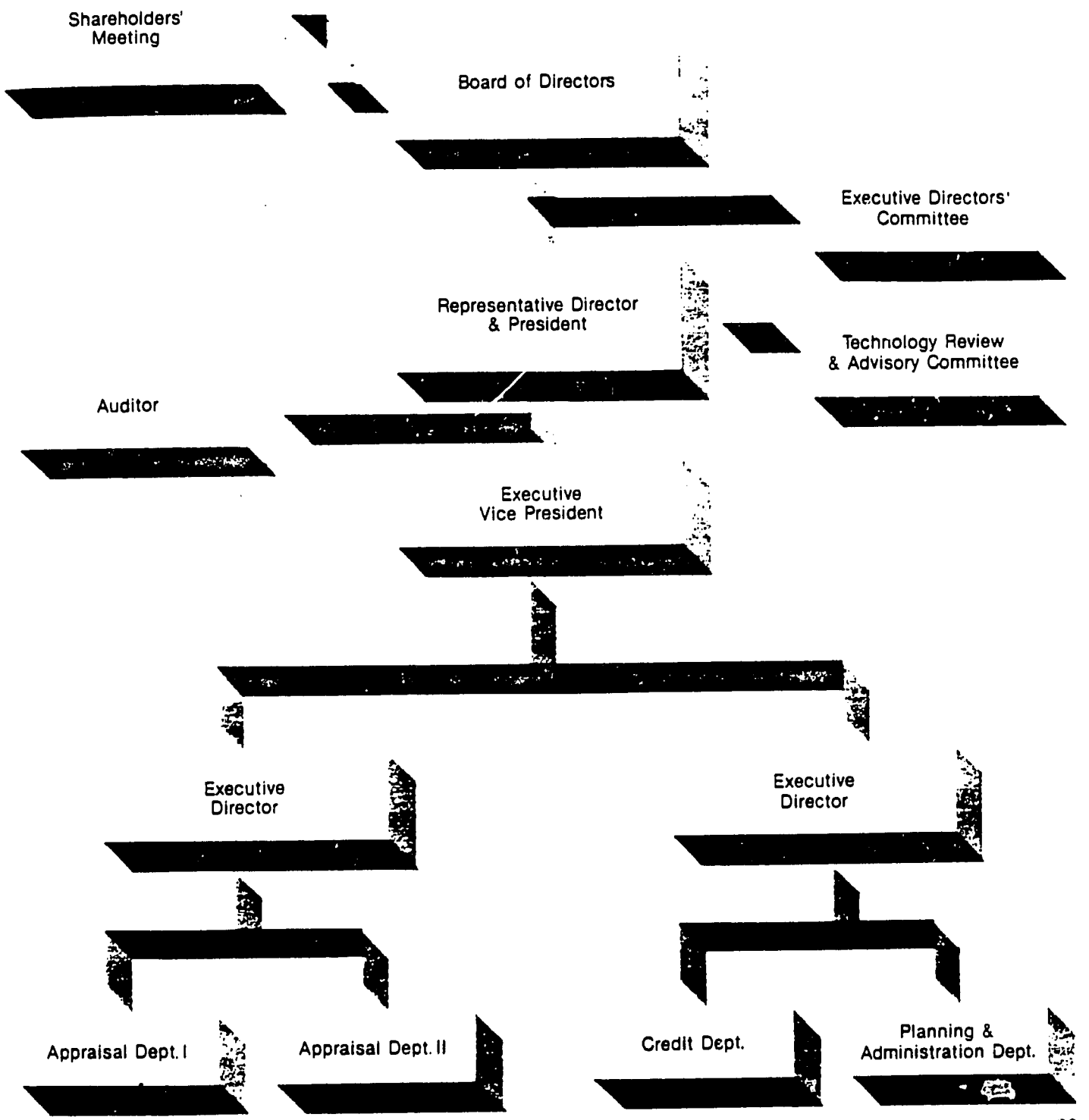
☐ Board of Directors

Chairman	**Chung Ju-Yung**	Chairman, Federation of Korean Industries Chairman, Hyundai Group
Representative Director and President	**Kim Chang-Dal**	
Executive Director	**Kim Tong-Won**	
Director	**Cho Kyung-Mok**	Vice Minister, Ministry of Science & Technology
Director	**Ryu Ki-Jung**	President, Korea Federation of Small Business
Director	**Huh Shin-Ku**	Chairman, Korea Industrial Research Institute President, Gold Star Co., Ltd.
Director	**Kang Jin-Ku**	President, Samsung Semiconductor & Telecommunications Co., Ltd.
Director	**Song In-Sang**	Chairman, Tongyang Nylon Co., Ltd.
Director	**Kim Woo-Choong**	Chairman, Dae Woo Group
Director	**Yang Chung-Mo**	Chairman, Kukje Group
Director	**Chey Jong-Hyon**	Chairman, Sun Kyong Group

☐ Auditor

Kim Chae-Kyum — President, Ssang Yong Cement Industrial Co., Ltd.

ORGANIZATION



SHAREHOLDERS

A-Point Co., Ltd.
Ae Kyung Fat and Processing Co., Ltd.
Ann Gook Pharmaceutical Co., Ltd.
Anam Industrial Co., Ltd.
Asia Cement Manufacturing Co., Ltd.
Bank of Seoul and Trust
Boo Kook Steel and Wire Co., Ltd.
Boryung Pharmaceutical Co., Ltd.
Byucksan Corp.
Cheil Sugar Co., Ltd.
Cheil Synthetic Textiles Co., Ltd.
Cho Kwang Trading Co., Ltd.
Choheung Bank
Chonbang Co., Ltd.
Chong Kun Dang Corp.
Chun Heung Electric Industrial Co., Ltd.
Commercial Bank of Korea
Dae Il Chemical Co., Ltd.
Dae Ryung Ind. Inc.
Dae Sung Industrial Co., Ltd.
Daedong Gear Co., Ltd.
Daedong Heavy Ind. Co., Ltd.
Daedong Ind. Co., Ltd.
Daesin Ind. Co., Ltd.
Daewoo Heavy Industries Ltd.
Daewoo Shipbuilding and Heavy Machinery Ltd.
Daeyoung Electronics Industrial Co., Ltd.
Dai Han Printing Ink and Paint Manufacturing Co., Ltd.
Dai Won Kang Up Co., Ltd.
Dong A Motor Co.
Dong Ah Construction Industrial Co., Ltd.
Dong Won Metal Ind. Co.
Dong A Pharmaceutical Co., Ltd.
Dongbang Oil and Flour Mills Co., Ltd.
Dongsan Construction and Engineering Co., Ltd.
Doosan Computer Co.
Doosan Glass Co., Ltd.
Doosan Grain Co., Ltd.
Doosan Industrial Co., Ltd.
Doosan Manufacturing Co., Ltd.
Doshin Industrial Co., Ltd.
Federation of Korea Machinery Industry Cooperatives
Gold Star Cable Co., Ltd.
Gold Star Co., Ltd.
Gold Star Electric Co., Ltd.
Gold Star Instrument and Electric Co., Ltd.
Gold Star Precision Co., Ltd.
Gold Star Tele-Electric Co., Ltd.
Gosandang Pharmaceutical Co.
Government
Green Cross Medical Equipment Corp.
Hai Tai Confectionary Co., Ltd.
Halla Construction Co., Ltd.
Han Jin Transportation Co., Ltd.
Han Jung Chemical Co., Ltd.
Han Kook Tire Manufacturing Co., Ltd.
Han Kuk Glass Industry Co., Ltd.
Han Kuk Yakult Milk Products Co., Ltd.
Hando Industrial Co., Ltd.
Hanil Bank
Hanil Development Co., Ltd.
Hanil E-Wha Co., Ltd.
Hanil Synthetic Fiber Industrial Co., Ltd.
Hankuk Diesel Kiki Co., Ltd.
Hans Toy Co., Ltd.
Hanyang Metal Industrial Co., Ltd.
Hanyang Food Co., Ltd.
Hyosung Aluminium Co., Ltd.
Hyosung Heavy Industries, Ltd.
Hyosung Motors and Machinery Ind. Co.
Hyundai Construction Co., Ltd.
Hyundai Electrical Engineering Co., Ltd.
Hyundai Engine Manufacturing Co., Ltd.
Hyundai Engineering Co., Ltd.
Hyundai Heavy Industries Co., Ltd.
Hyundai Motor Co.
Hyundai Precision and Industry Co., Ltd.
Hyundai Rolling Stock Co., Ltd.
Hyundai Steel Pipe Co., Ltd.
Inchon Iron and Steel Co., Ltd.
Jedong Industries Ltd.
Jin Young Press Machine Co., Ltd.
Keang Nam Enterprises Ltd.
Kia Industrial Co., Ltd.
Kolon (Nylon) Inc.
Kong Young Sa Co., Ltd.
Korea Agricultural Chemicals Co., Ltd.
Korea Air Terminal Service Co., Ltd.
Korea Aircraft Service Co., Ltd.
Korea Bearing Industrial Co., Ltd.
Korea Chemical Industrial Co., Ltd.
Korea Electronics Co., Ltd.
Korea Explosives Co., Ltd.
Korea Express Co., Ltd.
Korea Fertilizer Co., Ltd.
Korea First Bank, Ltd.
Korea Gae Sung Industrial Co., Ltd.
Korea Green Cross Corp.
Korea Heavy Machinery Industries Ltd.
Korea Industrial Research Institute
Korea International Product Service Inc.
Korea Pacific Chemical Corp.
Korea Petrochemical Industry Co., Ltd.
Korea Plastic Industry Corp.
Korea Shipbuilding and Engineering Corp.
Korea Steel Chemical Co., Ltd.
Korea Tacoma Marine Industries Ltd.
Korea Urban Development Co., Ltd.
Korea Zinc Co., Ltd.
Korean Air Lines Co., Ltd.
Kukdong Oil Co., Ltd.
Kukje Construction Co., Ltd.
Kukje Corp.
Kyohaksa
Kyong-Ki Chemical Industrial Co., Ltd.
Kyung Shin Ind. Co., Ltd.
Kyungbang Ltd.
Life Housing and Construction Co., Ltd.
Lotte Aluminium Co., Ltd.
Lotte Confectionery Co., Ltd.
Lotte Fuji Film Co., Ltd.
Lotte Machinery Manufacturing Co., Ltd.
Lucky Ltd.
Mi Ju Co., Ltd.
Miwon Co., Ltd.
Nam Buk Electric Co.
Nam Kwang Construction Co., Ltd.
Nhong Shim Co., Ltd.
Oriental Brewery Co., Ltd.
Oriental Chemical Industrial Co., Ltd.
Oriental Precision Co., Ltd.
Ottogi Foods Co., Ltd.
Pacific Chemical Industrial Co., Ltd.
Poong Jeong Industrial Co., Ltd.
Poong San Metal Manufacturing Co., Ltd.
Poong Sung Electric Co., Ltd.
Pumyang Co., Ltd.
Pungkuk Oil Co., Ltd.
Sam Ho Construction Co., Ltd.
Sam Yang Tire Inc.
Sam-U Dies and Machinery Manufacturing Co., Ltd.
Sammi Drop Forging Co., Ltd.
Sammi Integrated Special Steel Co., Ltd.
Sampoong Industrial Development Co., Ltd.
Samsung Chemical Industrial Co., Ltd.
Samsung Electron Devices Co., Ltd.
Samsung Electronics Co., Ltd.
Samsung Electronics Parts Co., Ltd.
Samsung Semiconductor and Telecommunication Co., Ltd.
Sei Myung Electric Trade Co.
Seil Industry Co.
Seoul Auto Body Industrial Co.
Seoul Cast Iron Industry Co., Ltd.
Seoul Meter Industry Co., Ltd.
Seoul Miwon Co., Ltd.
Shin Chang Electric Co., Ltd.
Shin Dong-A Construction Co.
Shin Won Tong Sang Co., Ltd.
Shin Young Electric Co., Ltd.
Shin-Ah Electric Co., Ltd.
Song Won Industrial Co., Ltd.
Ssangyong Cement Industrial Co., Ltd.
Sung Mi Telecommunication Electronics Co., Ltd.
Sung Shin Cement Industrial Co., Ltd.
Tae Hwa Co., Ltd.
Tae Kwang Industrial Co., Ltd.
Tae Sung Methanol Industrial Co., Ltd.
Tai Han Electric wire Co., Ltd.
Taineung Corp.
Tong Yang Cement Manufacturing Co., Ltd.
Tong Yang Commercial Co., Ltd.
Tong Yang Moolsan Co., Ltd.
Tong Yang Nylon Co., Ltd.
Tong Yang Polyester Co., Ltd.
Union Steel Manufacturing Co., Ltd.
Whacheon Machinery Works Co., Ltd.
Woo Sung Chemical Ind. Co., Ltd.
Wuon Poong Industrial Co., Ltd.
Youl Chon Printing Co., Ltd.
Young Chang Akki Co., Ltd.
Young Poong Corp.
Young Poong Mining Co., Ltd.
Young-Il Chemical Co., Ltd.
Youngsin Metal Industrial Co., Ltd.
Yu Han Corp.
Yukong Ltd.
Zung Won Co., Ltd.

UNITED STATE AGENCY FOR INTERNATIONAL DEVELOPMENT

AMMAN/JORDAN

The Private Sector Development Program

CURRENT ECONOMIC CONDITIONS

(THE NEW ECONOMIC REALITIES)

EXTERNAL FACTORS

- Reduced Arab Gulf Official Development Assistance (Down 65%)
- Reduced remittances (Down 50%)
- Weakness in major external markets for Jordan's agriculture and light manufactures - (Iraq, etc.)
- Low world commodity prices for Jordan's extractive products

INTERNAL FACTORS

- High population growth (2nd highest in the world)
- Large numbers of educated people coming into the labor market
- Slowness by GOJ in adopting policy and practices changes
- Developing crisis of confidency by business

LEADING TO

- Rising unemployment
- Low foreign exchange reserves

PROSPECT FOR

FOREIGN EXCHANGE EARNINGS OR SAVINGS

- In the Public Sector - NIL (Only by "belt tightening")
- In the mixed sector - MODERATE (Countertrade or barter exports of extractive)
- In the Private Sector - HIGH (through exports or legitimate import substitution)

INCREASED EMPLOYMENT

- In the Public Sector - LOW (Presently employs 50% of workforce)
- In the mixed sector - LOW (Presently overmanned and inefficient)
- In the Private Sector - POSS

THUS, REFOCUS DEVELOPMENT OBJECTIVES TOWARDS

Private Sector employment; and

Earning or savings of foreign exchange through private business development

SECTORS OF INTEREST

Manufacturing

Services

Agribusiness

AREAS OF CONCERN

1. Government policies and practices

2. Design of products/services

3. Problems in production
   - A. Efficiency
   - B. Plant layout
   - C. Quality assurance/control
   - D. Inventory control
   - E. Manufacturing engineering

4. Marketing
   - A. Domestic
   - B. Export (Niches)
   - C. Regional
   - D. New markets

5. Financing

Sharing of Risks

Funds supported by governments for financing technology development have attempted various formulae for sharing of costs/benefits with the private sector. The BIRD Foundation has been successful. They offer conditional loans where BIRD Foundation and the private companies (U.S. and Israeli) share 50 50 of the costs; BIRD Foundation and the private companies can each loose its share (50%) but BIRD Foundation has an upside gain for success of an additional 50% paid as royalties on sale of products sold. FINEP in Brazil will provide approximately 50% of the financing through loans at 2-4% to small companies, 8% to large companies with a correction for inflation that essentially means that 80% of the loans to small businesses are forgiven. There is no upside gain as in the case of BIRD Foundation. The IBRD provided a loan to CDTI in Spain to finance the development of indigenous technology in the private sector to meet local needs. CDTI makes loans to enterprises for research and development work, these loans are forgiven if the work is not successful. They will finance up to 60% of the costs. If the work does lead to marketing of a new product or service, the principal is repaid at the rate of 5% of net sales. The profits to CDTI come from a charge of 2.5% of the net sales for the period equal to the time elapsed from closing of the project to the end of the repayment of the principal. CDTI works closely with Sefinnova, a venture capital firm, financed in part by IFC. KTDC (Korean Technology

Development Corporation) was financed in part by an IBRD loan. It will finance research, development and engineering in private industry through loans, sometimes without collateral, and through equity funds to companies set up to exploit new research and development results. The loans for technology development are partly forgiven if the development is unsuccessful. KTFC (Korea Technology Finance Corporation) is a subsidiary of the Korean Development Bank which finances investments in high technology industries. IFC has provided financing to KDIC (Korea Development Investment Corporation) which is a venture capital firm which provides first and second round financing to firms after the technology has been developed.

One rough estimate of shared financing at each stage of the development is:

Stage	Private/A.I.D.
1	0/100
2	30/70
3	70/30
4	100/0

Equally important are the collateral requirements, repayment terms, and treatment by country of R&D expenditures. If the emphasis is on small businesses, it will be important to structure the financial arrangement so that it is off balance sheet; that is, the financing does not increase the company's liabilities relative to its total assets.

R&D Limited Partnerships

Another approach for financing technology development with the private sector is R&D Limited Partnerships. Using tax write-off provisions of Section 174 of the Internal Revenue Service Code, a U.S. investor, a limited partner, can deduct R&D costs as incurred, rather than capitalize them as part of the products' cost. A general partner manages the limited partners' funds for product or process development, and if successful, the limited partners gain additional income in the form of royalties, equity, etc., which, if the partnership is structured correctly, are treated as capital gains and not ordinary income to the investor. This off balance sheet financing of new products and processes is particularly attractive to small and medium size companies. Since base line technology is generally required for product and process development, federal laboratories, universities and even large corporations can earn royalties from the partnership both on base line technology and on products or processes developed. This arrangement has not been used to date for developing products or processes for developing countries' needs or markets. But it could be. The financing leverage for A.I.D. in commercializing technology through the process is substantial. However, because developing countries' markets will be perceived as higher risk than the U.S., A.I.D. will have to play a role which may be as limited as a facilitator of identifying opportunities through it's overseas mission

networks, to financing a business plan and certain operating costs of the general partner, to perhaps to lending money to the partnership providing leverage and potentially higher returns to the limited partnership investors.

Technological development opportunities for funding could come from venture funds mentioned above, from universities, LDC or U.S., from international research centers, from small and medium size businesses, U.S. or LDC, or from other sources. Most of the investment funds for product or process development through R&D Limited Partnerships would come from private investors. The same principles on risk sharing outlined above would apply. The difficult issues for structuring R&D Limited Partnerships are identifying the market and the general partner who is responsible for overseeing the selection of projects and funding and managing the R&D activities and partnership activities for the investors.

Next Steps

How to get started. One approach would be to take four-five countries (Jamaica, Costa Rica or the Dominican Republic, India or Pakistan, Thailand, Kenya, Turkey) representing different conditions and then establish intermediaries or structure an R&D Limited Partnership.

I. Financial Intermediaries

1. Define goals and objectives of a financing institution in a particular country;

2. Look at financing available for each stage (1-4) and institutional capability to provide such financing;

3. Review breadth of market potential and of technology available or being developed and introduced, and capability to do so;

4. Review laws and regulations on:

a. capital gain versus income

b. repatriation of funds

c. depth and breadth of capital markets

d. government approval on

-- joint ventures

-- joint research project

-- licensing

e. patent and trademark protection

f. fiscal policies;

g. treatment of off balance sheet financing by the accounting professional, lending institution and government tax policy.

5. Agree on the structure, capitalization and operating guidelines for such an institution;

6. Find the management.

II. R&D Limited Partnership

1. Develop a solicitation for an R&D Limited Partnership;

2. Develop a preprospectus for a R&D Limited Partnership program;

3. Identify a lead investor or general partner;

4. Decide on A.I.D.'s involvement in a blind pool and in individual, project specific R&D Limited Partnerships;

5. Market the program, being country (countries) or sector (sectors) or technology (technologies) specific.