SPACE COMMERCIALIZATION ACTIVITIES

of

NASA, ESA, CNES and NASDA

Prepared for the

Ministry of State for Science and Technology

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1.0 INTRODUCTION

Canada has been able to compete well in marketing space-related technology and applications. Success in this area can be attributed directly to

- the in-house program in space communications of CRC and its development of capability in the private sector by underwriting the initial R and D risks.

- the in-house programs of CCRS, which performed the same function in respect of remote sensing.

- the in-house expertise of NRC which led to the development of the Canadarm and the capability of Canadian industry to participate in such endeavours as Space Station.

Other countries have followed the same route, and have also developed indigenous space capability in their respective industries.

However, not all countries have fared equally well as the competition increases. The Europeans and Japan have developed a strategy which they are following faithfully and carefully that will position their industries to capitalize on expected future opportunities in space. The key element in both cases is commitment. They are both supporting pre-commercialization activities in industry through directed contracts in selected fields, thus building competence leading toward future development.

The U.S. program has suffered as a result of the Challenger accident. The resulting reviews have demonstrated a belief that the U.S. is falling behind in the race for commercialization, and that a new strategy must be developed. There is a thread running through the analyses that suggests a lack of direction and commitment, which is causing industry's interest in space to wane.

Notwithstanding this view, the U.S., more than other countries, has made public its policies regarding support for commercialization. It has taken a number of initiatives to support industry and the academic community that have not obviously been taken by others.

All countries involve their industries. In Japan, the internal management processes ensure that industry is part of space decisions. In Europe, ESA maintains a constant level of R and D activity that has spin-off benefits for all member countries. High risk R and D is supported by the common fund. Individual countries who participate in ESA programs develop their own approaches toward commercialization.

1.1 Study Objective

The purpose of this assignment is to obtain a broad overview of the policies and practices employed by other countries in support of space commercialization. The findings can then be compared to the Canadian position in this area, to determine if the path we are following will permit us to remain competitive with other countries.

The following sections address the mandates of NASA, ESA and NASDA in respect of support for commercialization, and the way in which each has interpreted its particular mandate. The actions of CNES in this connection are also reviewed.

Whether it is because of proximity, language or perhaps national style, more information is available regarding U.S. activities in this area than it is for the others.

2.Ø METHODOLOGY

Information has been gathered courtesy of External Affairs and Science Counsellors Abroad. This has been augmented by documenmtation, provided by Science Counsellors, MOSST, and government sources. Conversations have taken place with Science Counsellors and others to verify observations and clarify positions.

The result of the above is presented below.

We have also provided a tabular display, showing the mandates and interpretations in abreviated form.

3.0 RESULTS

3.1 NASA

Mandate

National Aeronautics and Space Administration Act, 1958. Permits NASA "..to enter into and perform such contracts, leases, cooperative agreements, or other transactions as may be necessary in the conduct of its work and on such terms as it may deem appropriate, with any agency, or instrumentality of the United States ... or with any person, firm, association, corporation or educational institution."

National Aeronautics and Space Administration Authorization Act, 1985.
Amends the Space Act to include commercial development of space. "The general welfare of the U.S. requires that NASA seek and encourage, to the maximum extent possible, the fullest commercial use of space."

Policy Statements

NASA Guidelines Regarding Early Usage of Space for Industrial Purposes, June 25, 1979. "Since substantial portions of the U.S. technological base and motivation reside in the U.S. private sector, NASA will enter into transactions and take necessary and proper actions to achieve the objectives of national technological superiority through joint actions with United States domestic concerns."

National Space Policy, NSDD-42, July 12, 1982. "The United States Government will provide a climate conducive to expanded private sector investment and involvement in civil space activities..."

State of the Union Address, January 25, 1984. "We will soon implement a number of executive initiatives, develop proposals to ease regulatory constraints, and with NASA's help, promote private sector investment in space."

National Space Strategy - NSDD-144, August 15, 1984. "To stimulate private sector investment, ownership, and operation of civil space assets, the U.S. government will facilitate private sector access to civil space systems. and encourage the private sector to undertake commercial space ventures without direct Federal Subsidies."

NASA Commercial Space Policy, October 1984. "Expand private sector investment in commercial space endeavours by reducing the technical, financial and institutional risks of doing business in space."

Commercial Space Launch Act (Public Law 98-575). This Act established that the U.S. Government fully endorses and will facilitate the commercialization of U.S. ELV's.

In 1985, appropriations for "Research and development", for "Space flight, control and data communications" or for "Construction of facilities" may remain available without fiscal year limitation.

In 1985, the Administrator may "provide no-cost flights, for any commercial or foreign user of the space Transportation System who is involved in research, development or demonstration programs with the National Aeronautics and Space Administration."

In 1985, the "administrator shall have the authority to offer reasonable customer incentives consistent with policy goals.."

Interpretations

NASA will enter into Joint Endeavour Agreements with the private sector if the results of the projects are not held company confidential. NASA will provide free launch and free cargo space on the STS.

Commercial R and D projects aimed at proof of concept determination are afforded a full package of support including STS integration services.

NASA will not provide free or reduced-rate flights for competitive similar systems for new high technology, high risk ventures during the R and D stage of the initial venture's development cycle.

Non-recurring costs are not included in STS pricing.

Commercial ventures on space will be encouraged by making available flight opportunities at regular intervals.

NASA pays R and D and staff costs for launchers. In 1986, an agreement was signed with Space Services, Incorporated, allowing use of NASA facilities for launch of the privately developed Conestoga launch vehicle. In 1987, NASA completed an agreement with General Dynamics to privatize the NASA-developed Atlas/Centaur launch vehicle. This agreement transfers authority to General Dynamics to use NASA-controlled facilities and capabilities for commercial launchings.

Access to NASA laboratories and staff is free for projects in which NASA participates.

Centers for the Commercial Development of Space and Centers of Excellence have been set up, mainly at universities. Each has industrial participation and a Board with largely industrial members. Funding is for three to five years at an annual rate of about $750K.

Privatization of Landsat was accompanied by a subsidy to the private sector company, EOSAT. A further subsidy is under consideration.

NASA sponsors invitational workshops in specific research areas related to programs with commercial potential.

NASA has established a space data base.

Subtleties

Tendering processes favour US suppliers.

Military procurement can be used to develop competence and thus gain a head start on the competition.

3.2 ESA - CNES

Mandate

Convention of the European Space Agency & Rules of Procedure of the ESA Council, 1975

Article II (d) Elaborate and implement the industrial policy appropriate to its programme and by recommending a coherent industrial policy the Member States

Article VII(b) Improve the world-wide competitiveness of European industry by maintaining and developing space technology and by encouraging the rationalization and development of an industrial structure appropriate to market requirements.....

Interpretations

ESA is an R and D organization and does not deal with commercialization. It does not answer to a single country, and supports external R and D through contracts. There is no joint funding with industry.

If a product or process appears to have commercial applications, there is pressure from member countries for ESA to let the private sector take over.

ESA has been involved in one commercialization activity. Following commercialization of remote sensing in the US, a

lot of pressure was exerted on ESA to commercialize their data distribution service for remote sensing products. After a year and a half discussion, ESA entered into a contract with a consortium of companies in member states to distribute the remote sensing data.

Connection to, and time on Olympus will be provided free to industry and universities in Europe and Canada for a period of two years.

EURICA is paid for by ESA.

The Centre Nationale d'Etude Spaciale (CNES) in France plays a role similar to NASA in the U.S. It has its own laboratories where industry participates, and supports high risk R and D. It also acts as a contractor for proof of concept work, which it will undertake on a cost reimbursable basis.

CNES pursues a policy of stimulating the commercialization of space activities. It is doing so through the establishment of subsidiary CNES companies and by participating in Groupments d'Interet Economique (GIE) which bring together financial and industrial interests in France and other European countries. Progress in this endeavour to date is as follows.

Intespace - created in 1983 out of the French Space Testing Laboratories; it is now jointly funded by CNES and a number of private firms. firms.

Spot Image - also commercialized with CNES participation. Spot Image is subsidized by the French government, which is the largest shareholder. The only non-French support is from the Swedish Space Corporation (about 5%), and Belgium (about 1%).

SAT Control - develops and markets space vehicle control centres and associated services.

Novespace - specializes in planning and conducting the transfer of space technology to industry; formed in 1986, eight financial institutions participate.

SIMKO - provides capital funding for the establishment at Kourou.

GDTA - Groupment pour le Developpement de la Teledetection Aerospatiale deals with

training, international projects and work abroad, distribution of satellite data, and space oceanography, including the development of new on-board sensors.

Prospace - provides foreign promotion for the space-related activities and products of member manufacturing companies, carries out market surveys, and markets the products concerned.

Satel Conseil provides international consulting services in the field of satellite-aided communications.

Arianespace - launches satellites.

CLS - promotes the Argos system and handles the world-wide processing and distribution of Argos data. (Argos beacons carry atmospheric and oceanographic sensors)

A German consortium, INTOSPACE, is actively recruiting industry into Spacelab by requiring that they need only provide materials and processing requirements. The unique science hardware, support instrumentation and multiuser hardware is provided by governments.

3.3 NASDA

Mandate

NASDA was established on October 1, 1969, under the provisions of the National Space Development Agency Law, as a special corporate entity charged with the prime responsibility for implementing practical applications of space developments solely for peaceful purposes. It is the implementing arm of the Science and Technology Agency, the Ministry of Posts and Telecommunications, and the Ministry of Transport. Applications include meteorology, communications, broadcasting, earth resource surveys, maritime applications, geodesy, and space experiments. Once the government has decided to proceed with a space project, NASDA is responsible for building, launching and managing operational and developmental satellites.
The Institute of Space and Astronautical Science, an agency of the Ministry of Education, Science and Culture, is responsible for all aspects of space science, including building and launching satellites.

The Space Activities Commission, advisory to the Prime Minister, oversees all Japanese space activities. It is made up of wise elder leaders from all sectors; they are generally about 70 years old. The secretariat, which

prepares discussion papers and the agenda, resides within the Space Division of the Science and Technology Agency. The Commission has no facilities of its own. It takes direction from the Council for Science and Technology, of which the Prime Minister is chairman.

The Science and Technology agency signs formal agreements involving NASDA with foreign agencies.

Interpretations

The Science and Technology Agency established an Office of Space Utilization Promotion on May 21, 1987. This office will work out measures for encouraging space utilization and provide domestic customers with an opportunity to use outer space.

MITI established a new Space Industry Division on July 1, 1987. It will promote industrial utilization of space and strengthen the industrial bases of space-related equipment manufacturers.

A Space Technology Corporation has been formed, funded 30% by industry and 70% by The Center for Research Facilitation in Fundamental Technology. The objective is to develop the next generation of multi-compound semiconductors.

In 1987, a new tax system for promoting space development was created. This provides tax cuts to a purchaser of testing and research equipment specified in a Ministry of Finance Ordinance

Japan develops and runs its projects through a complicated series of interlocking committees. Decisions are arrived at through a protracted consensus-forming process. Because consultation is complete, decisions are implemented rapidly.

The Ministry of International Trade and Industry (MITI) is also participating in space, devoting about 7% of its budget to this field, with a plan to increase its contribution by about 50% in each of the next few years. MITI becomes involved when commercial opportunities appear.

Technical Research Associations are set up when a particular technology has been identified that is of importance to Japan. Each Association is established under the Industrial Technical Research Association Law (Law no. 81 of May 6, 1961; revised July 9,1963). These Associations operate under a set of regulations that are very specific. They must prepare annual budgets and each member must participate in the research investigations undertaken by the Association.

Associations report to MITI, unless the subject area falls directly within the purview of another Ministry. Funding comes from participating companies and other sources, including profits from betting on boat racing, horse racing, and bicycle racing! There are provisions for accelerated depreciation of capital equipment at the discretion of the Minister.

Japanese industry has set up two organizations to coordinate space activities. The Keidanren is a council composed of representatives from 94 companies. It has within it a Space Activities Promotion Council. Its space development activities date from 1961, and its responsibilities are to review the current space development system in Japan, to improve indigenous technical development capabilities, to promote domestic production, and to further international cooperation with developing countries.

The Society of Japanese Aerospace Companies has 142 members and is similar to the Air Industries Association of Canada.

NASDA has its own in-house laboratories with its own staff. There are also industrial contractors located in the laboratories, so that integration of government and industry is complete.

There is cooperation amongst industries at the R and D level, but competition once developments reach the commercialization stage.

Japan has established an operational centre, funded at the rate of 1B yen/year, to promote geological applications of remote sensing. This is core funding for R and D. The centre also sells data.

In addition, a second duplicate centre has been located at Tokai University, cost about $50M, to study archiving and reproduction of remote sensing data. This is an R and D centre only.

Subtleties

Japan uses its centres to train the developing world. The result is that Japanese technology is bought. Nairobi is an example.

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Implementation	JEA's. NASA provides free launch and free cargo space. Commercial R and D aimed at proof of concept will get full support including STS integration services. NASA will not subsidize competitive similar systems. Non-recurring costs not included in STS pricing. Commercial ventures encouraged by provision of regular flights. NASA will pay R and D and staff costs for launchers. Free access to staff and facilities for projects in which NASA participates. Centers for the Commercial Development of Space and Centers of Excellence have been established. Privatization of Landsat is subsidized. Workshops related to commercial potential are sponsored. A space data base has been established.	Supports early R and Only one commercializ sensing data. Will provide connecti participants for two ESA paying capital co CNES participates wit - Intespace - Spot Image - SAT Control - Novespace - SIMKO - GDTA - Prospace - Satel Conse - Arianespace - CLS Unique science hardwa multiuser facilities
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	Convention of the European Space Agency & Rules of Procedure of the ESA Council, 1975 Article II (d) Elaborate and implement the industrial policy appropriate to its programme and by recommending a coherent industrial policy ... Article VII (b) Improve the world-wide competitiveness of European industry by maintaining and developing space technology and by encouraging the rationalization and development of an industrial structure appropriate to market requirements ..	The National Space Development Agency Law, 1969. NASDA was designated as a special corporate entity charged with the prime responsibility for implementing practical applications of space developments solely for peaceful purposes.
	Supports early R and D through contracts only. Only one commercialization - distribution of remote sensing data. Will provide connection to and free time on Olympus to participants for two years. ESA paying capital cost of EURICA. CNES participates with 10 Affiliates and GIE's. - Intespace - Spot Image - SAT Control - Novespace - SIMKO - GDTA - Prospace - Satel Conseil - Arianespace - CLS Unique science hardware, support instrumentation and multiuser facilities are provided by governments.	The Science and Technology Agency established an Office of Space Utilization Promotion on May 21, 1987. MITI established a new Space Industry Division on July 1, 1987. A Space Technology Corporation has been formed to develop multi-compound semiconductors. A new tax system for promoting space development was created in 1987. NASDA has its own laboratories in which idustrial contractors work. NASDA supports the development of multiuser hardware. NASDA has set up a remote sensing centre to promote geological applications. Core R and D funding is provided. A duplicate remote sensing facility has been established at a university for strictly R and D purposes.
	Member states use military procurement to position firms.	Industrial facilities for defence and civil applications are the same. Remote sensing centers are used to train developing world and lock them in to Japanese suppliers.