

## LAND REMOTE SENSING COMMERCIALIZATION – A STATUS REPORT

by

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### ABSTRACT

This paper will describe the current offer by the United States Department of Commerce to transfer the U.S. land remote sensing program to the private sector. A Request for Proposals (RFP) was issued on January 3, 1984, soliciting offers from U.S. firms to provide a commercial land remote sensing satellite system. Proposals must be submitted by February 29, 1984, and must address a complete system including satellite, communications, and ground data processing systems. Offerors are encouraged, but not required, to propose to take over the Government Landsat system which consists of Landsat 4, launched in July 1982, and Landsat D' to be launched in the next few weeks. Also required in proposals are the market development procedures and plans to ensure that commercialization is feasible and the business will become self-supporting at the earliest possible time.

To carry out the Solicitation, the Secretary of Commerce has appointed a Source Evaluation Board for Civil Space Remote Sensing (SEB/CSRS). The SEB prepared the RFP and will evaluate responses and make a report of findings to the Secretary, who is the Source Selection Official for this Solicitation.

As a matter of Federal Policy, the Solicitation is designed to protect both national security and foreign policy considerations. In keeping with these concerns, an offeror must be a U.S. Firm. Requirements for data quality, quantity, distribution and delivery are met by current operational procedures. Any changes in data development and distribution proposed by an Offeror will require U.S. Government approval. Some additional requirements on how the commercial operator must comport itself to address national security concerns are addressed in a classified Appendix.

Cost to the Government will be a major factor in review of the proposals. Therefore, it is the Government's desire that the Offeror be prepared to develop and operate follow-on systems without Government subsidies. However, to facilitate rapid commercialization, an offeror may elect to include in his proposal mechanisms for short term government financial assistance.

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## INTRODUCTION

In February 1983, the President decided to offer the United States' civil operational remote sensing satellites to the private sector for commercialization. Pursuant to that Presidential decision, the Secretary of Commerce has appointed a Source Evaluation Board for Civil Space Remote Sensing (SEB/CSRS). The SEB prepared the RFP and will evaluate responses and make a report of findings to the Secretary, who is the Source Selection Official for this Solicitation.

The objective of the Solicitation is to establish a commercial U.S. civil operational land-observing satellite program. This is being done in order to maintain U.S. leadership in remote sensing from space and to foster the economic benefits of such data for the private and public good.

The law requires that contracting for the system may not occur until: (1) The Secretary of Commerce has presented Congress a comprehensive statement of recommended policies, procedures, conditions, and limitations to which any contract should be subject; and (2) Congress thereafter enacts a law which contains such policies, procedures, conditions, and limitations as it deems appropriate.

On January 3, 1984, the Government issued a Request for Proposals (RFP) for a commercial land remote sensing satellite system. The Government is willing to provide financial and/or operational support during the early years of operation of the system, but its ultimate objective is to purchase data, over the counter, from a self sustaining commercial operation. Government financial support will be limited both as to amount and duration. In return for its support, the Government requires that the system meet certain technical and procedural requirements.

There is a fundamental difference between the present situation and that envisioned for the future. Today the government owns the satellite data. In the future, a commercial operator would own the raw data produced by the commercial satellite system. The Government would buy data from the owner/operator and further process and use the data for its own specified purposes. Offerors are required to define their proposed proprietary interests in data (including copyright) and to indicate how these interests could inhibit, limit, restrict, or alter the cost of the use of data by Federal Agencies.

While the Government expects the commercial operator to maintain his own inventory of data products for sale, the Government also expects to continue to maintain an archive of data of potential historical interest. The bidders must propose arrangements to make possible both functions.

The RFP has been structured to elicit proposals for a commercial operational land remote sensing satellite system to begin operation after the present Government Landsat system. Offerors are encouraged to include in their proposals provision for taking over the Landsat system for its lifetime.

An offeror must propose a satellite system, ground control system and data preprocessing system. Also required are the market development procedures and plans to ensure that commercialization is feasible and the business will become self supporting at the earliest possible time.

The Government is interested in innovative techniques or systems which would improve service and/or reduce cost. Thus, Offerors are encouraged to propose new technology, innovative systems or innovative business approaches which would be advantageous to the Government, to the Offeror, or to both. All reasonable business arrangements between the Offeror and the Government will be considered.

As a matter of Federal policy, this Solicitation is designed to protect both national security and foreign policy considerations. In keeping with these concerns, an offeror must be a U.S. Firm as specified in the Solicitation. The requirements for quality and quantity of data, as well as the distribution and delivery of that data to meet such considerations, are met by current operational procedures. Some additional requirements on how the commercial operator must comport himself to address national security concerns are addressed in a classified Appendix to the Solicitation. The provisions of that Appendix must be met in order for a proposal to be considered acceptable.

Because the U.S. Government is no longer likely to be the most important customer for land remote sensing data, the international specifications on how a commercial operator will do business are not strictly limited to past government practices. However, the operator is encouraged to continue with policies now used by the Federal Government vis-a-vis Landsat data. Should he wish to change this mode of operation, Government approval is required.

In general, the Source Evaluation Board has identified no need for a new regulatory scheme or authority in order to enforce the stipulations of the RFP and the resultant contract. Antitrust regulations, international trade controls, national defense reviews, communications frequency allocations and launch approvals can all be handled within present Government regulatory apparatus. Most other stipulations of the contract can be handled through normal contractual arrangements. The possible exception is that the Government may need additional authority to impose civil penalties, should a successful bidder fail to meet the national security or some of the international stipulations outlined in the RFP.

Nothing in the Solicitation is intended to limit an Offeror from pursuing other related business opportunities which are not within the scope of the Solicitation (e.g. providing specialized or "value-added" services to customers other than the Government), but no direct Government support of "value-added" services will be acceptable. Furthermore, the Government does not intend to limit itself to buying data and/or services from only the successful Offeror.

Cost to the Government over the term of the contract will be an important factor in the selection. As a baseline for a cost assessment, the Government has prepared an accounting of its assets and operating costs. This accounting is summarized in the solicitation.

## **BACKGROUND**

The Landsat satellite system provides information about the condition of the Earth's surface by a process of sensing radiation from objects on the earth. Landsat 4, launched July 16, 1982, carries a new sensor, the Thematic Mapper (TM) which, for the first time, provides 30 m data in a seven band format. To provide continuity of data with previous Landsats, the Multi-Spectral Scanner (MSS) which provides 80 m resolution in four bands was also deployed on Landsat 4. Both TM and MSS will be deployed on Landsat D'.

On November 16, 1979, the President assigned to the National Oceanic and Atmospheric Administration (NOAA) the management responsibility for civil operational land remote sensing. NOAA assumed operational control of the MSS on January 31, 1983. However, due to the experimental nature of the TM, operational status for this sensor is not planned until early 1985. The current Landsat system includes no satellites after Landsat D'.

As part of the current Administration's policy of reducing Government size and entrusting to the private sector as much of current Government functions as possible, President Reagan decided, on February 28, 1983, to offer to the U.S. private sector the opportunity to propose a commercial land remote sensing satellite system. The President's original proposal included the commercialization of the U.S. civil meteorological satellites as well as the land remote sensing spacecraft. However, as part of the fiscal year 1984 appropriations process, the Congress added language to the Department of Commerce appropriations law which had the effect of excluding the meteorological satellites from the commercialization activity.

### **CURRENT SYSTEM DESCRIPTION**

There have been four Landsat satellites launched to date. Landsat 1, 2 and 3 have ceased to function. Landsat 4 has experienced several failures including a serious reduction in available solar array power and a complete loss of the X-band direct downlink for Thematic Mapper image data. As of December 1983, sufficient power was available to operate the MSS image data mission providing direct readout at S-band to U.S. and foreign ground stations and to provide one pass of Thematic Mapper data per day when TDRSS is operational. Hardware changes have been made to Landsat D' to correct the failure modes observed in Landsat 4. Landsat D' is in test in preparation for its anticipated launch on or about March 1, 1984.

Landsat 4 and Landsat D' consist of NASA's standard Multimission Modular Spacecraft and a mission-unique instrument module. The satellite configuration is designed for a three-year mission life and can accommodate retrieval by the Space Shuttle in a near polar orbit. The spacecraft bus includes the attitude control, propulsion, communications, data handling and power subsystems. The instrument module includes the MSS, TM, a wideband communications subsystem, high-gain and other antennas, and a solar array capable of generating two kilowatts of power.

Landsat tracking, command transmission, telemetry and image data acquisition are currently performed by a NASA worldwide network of ground stations and the Transportable Ground Station at NASA's GSFC in Greenbelt, Maryland.

The current Landsat Ground Segment consists of a Control and Simulation Facility (CSF), a Mission Management Facility (MMF), an Image Generation Facility (IGF), and Direct Reception Ground Stations, including the Transportable Ground Station (TGS). The Landsat-4/D' Ground Segment and its associated "Products" are depicted pictorially in Figure 1.

The Landsat-4/D' Ground Segment operations and equipment resides in Building 28 at Goddard Space Flight Center. The Operational System completely occupies one wing of this building. Preprocessing of data is performed at GSFC to radiometrically correct all raw data and append auxiliary data from which geometrical corrections can be made at a later step of the process.

The Department of the Interior's Earth Resources Observation Systems (EROS) Data Center (EDC) in Sioux Falls, South Dakota processes and distributes Landsat data

under reimbursable arrangements with NOAA. The Center provides access to Landsat data as well as to aerial photographs acquired by the U.S. Department of the Interior, NASA and other Federal agencies. EDC's primary functions are data storage, reproduction and dissemination in response to user requests; user assistance and training; and research in techniques for manipulation of digital spatial data in cooperation with DOI and other agencies.

### **INTERNATIONAL AND FOREIGN POLICY CONSIDERATIONS.**

Establishment of a commercial Landsat program will require the private operator to address three areas: (1) conformity of private operation with applicable laws (i.e., international treaty obligations and export control legislation); (2) availability of data for international use; and (3) relations with foreign Landsat ground station operators.

In reviewing and responding to the international and foreign policy areas, bidders will need to bear in mind that specific issues and the international climate will be unknown variables during the lifetime of the contract. It is, therefore, not possible to state in advance the precise factors which the Government would deem critical in any particular request by a future private operator for approval/concurrence. In general, the Government would have to balance foreign policy considerations of the time--including maintenance of U.S. technical leadership and impact of a suggested private operator initiative upon relations with specific countries--against the objective of promoting reasonable commercial return for the private operator.

The U.S. Government presently has or is negotiating agreement with a number of foreign Landsat ground receiving stations around the world. The specific provisions of these agreements are set forth in a Memorandum of Understanding between NOAA and each foreign Landsat ground station operator. The current international Landsat ground station network has provided the U.S. and foreign station operators with measurable benefits and has enhanced U.S. prestige and foreign policy objectives in outer space, while providing U.S. agencies (NASA, NOAA) with revenues in the form of yearly access fees from the foreign ground station operators.

During the lifetime of Landsat 4/D', the commercial operator must obtain the concurrence of the U.S. Government before terminating or initiating agreements with an existing or prospective foreign ground station operator. Operators of follow-on land remote sensing systems are not required to maintain or develop foreign ground receiving stations. However, relations developed between a U.S. commercial operator of land satellites and any current or future foreign land satellite ground station operators shall be subject to appropriate supervision or oversight by the U.S. Government.

Each proposal shall include the plans and procedures to address foreign policy issues and international obligations. As a minimum, the proposal shall address when and how the proposer will provide the required notifications or requests for approval/disapproval, as well as the approach and organization for interface with foreign entities, the U.S. Government and other satellite operators. The proposal must also address plans and policies for international data sale and distribution. Offerors may, at their option, suggest ways and means by which the present international network of foreign Landsat ground receiving stations may be continued throughout the life of the contract.

## TECHNICAL PROPOSAL REQUIREMENTS

A successful Offeror will be required to design, develop and operate a land remote sensing satellite system and develop a commercially viable system for acquiring data meeting domestic, foreign and Government data needs.

Each Offeror must structure the Technical Proposal to respond to each of the requirements listed below. These requirements address the follow-on commercial system. In addition, takeover of the present Landsat 4 and D' system may be proposed. This paper provides a brief summary of the requirements for the follow-on commercial system.

### Government Data Needs

The proposal shall address the proposer's understanding of the data needs for Federal agencies and in particular:

- (a) Means of providing the required global data for both mission responsibilities and research.
- (b) Procedures for tasking of data requirements and relationships to commercial market requirements.
- (c) Methods and procedures to improve data throughput and timeliness.
- (d) Pricing procedures and ordering schedules for data delivery.
- (e) System improvements to enhance data coverage, times and areas for Federal data needs.
- (f) Plans to interface with, and utilize the results of Federal agency programs in remote sensing R&D.
- (g) Implications of proprietary interests, if any, in use and transfer of data within and among Federal agencies.
- (h) Methods and procedures to ensure that standards for data quality necessary to meet standard data processing of data disseminated to users will not be less than that maintained by the Federal operator at time of contract.

### Communications

The Offeror has the option of designing the system to use any reasonable communications system. The design must show, as a minimum, the advantages and disadvantages with attention to data coverage, effects on foreign and domestic markets, system reliability and lifetimes, cost comparisons between the selected communication system and TDRSS usage and the effect on Government land remote sensing data needs.

Offerors must discuss their requirements and procedures for obtaining access to and utilizing the frequency spectrum. As a minimum, the proposal shall provide the offerors' understanding of the issues involved, the approach, and the management organization to be utilized to assure effective coordination of frequency spectrum utilization. The proposal shall separately address these issues with regard to take-over of satellites/systems currently operated by the Government (Landsat 4 & D') and those designed and constructed by the private sector owner/operator.

### **Launch**

The proposal shall address the plans and procedures, with associated schedules, for launching land remote sensing satellite systems. The Government currently plans to discontinue Delta launches from WTR after the launch of Landsat D'. In the contemplated contract, the Government does not guarantee the availability of launch support services in the form of boosters (ELV or STS), launch pad support, tracking aircraft support, command and control support, test range support or other specialized support. However, the Government is prepared to negotiate the provision of such services on a cost reimbursement or other basis.

### **Data Base**

Proposals shall address arrangements, plans and procedures for maintaining an active commercial inventory of data products to be sold. Many options are possible pertaining to existing Landsat data archives and those yet to be acquired by the Government from Landsat 4 and D'. The Offeror must propose specific plans for establishing a commercial data inventory plus the interface to an historical archive that satisfies the Government's data needs.

The proposal shall address the Government's requirement to maintain an historical archive of remotely sensed data for research purposes and the public good. As a minimum, the proposal shall define the terms and conditions under which the owner/operator would make his commercial inventory available to the Government when found to have no further value to the owner/operator.

### **Research & Development**

The proposal shall address the needs and purpose of remote sensing data for R&D and the approach to provision of commercial data for research. Explicit reference should be made to (a) Provision of both commercial and experimental data in support of R&D activities, (b) The fact that U.S. Government will use remote sensing data from foreign satellites for R&D purposes, (c) Methods to maintain cognizance of R&D results for purposes of system or product improvements for commercial use, and (d) Interface procedures with Federal agencies having primary responsibility for aerospace R&D, including R&D related to applications of aerospace remotely sensed data.

## **U.S. GOVERNMENT OVERSIGHT AUTHORITY**

Successful operation of the follow-on commercial land observing system is a matter of great importance to the U.S. Accordingly, it is necessary that the U.S. Government have sufficient rights and authorities to ensure that the operating capabilities of this system are not compromised by error or inadvertance. Any proposal submitted in response to this RFP must address this issue in depth, including U.S. Government oversight of Contractor operations, U.S. Government authorities to prevent or correct deficiencies either technical or financial that would threaten the operational

capability of the system, and procedures to ensure the prompt and effective implementation of these authorities.

Offerors are required to propose a program for periodic Government review during that portion of system development which is supported by the Government. Proposals will contain a description of and schedule for a program to provide such visibility.

Since authorizing legislation is required before the Secretary of Commerce may make an award under this RFP, offerors will need to keep abreast of current Congressional views on commercial civil space remote sensing. For example, a draft bill on this subject was recently prepared by staff of the Committee on Science and Technology of the U.S. House of Representatives. Proposals should indicate a sensitivity to Congressional concerns by indentifying and defending procedures/requirements involving matters on which Congressional views have been expressed. Most importantly, proposals must indicate where they would require special authorizing legislation, and explain why such actions are considered necessary.

### **CONCLUSION**

The process described in this paper is unique in U.S. Federal Government history. It is the first attempt to spin-off to the private sector an entire Federal program. The SEB has attempted to strike an appropriate compromise between the Government oversight required to safeguard national interests and Federal investment, on the one hand, and a laissez faire approach to encourage private sector innovation, on the other. The next three months will bear watching to see how successful that attempt has been.



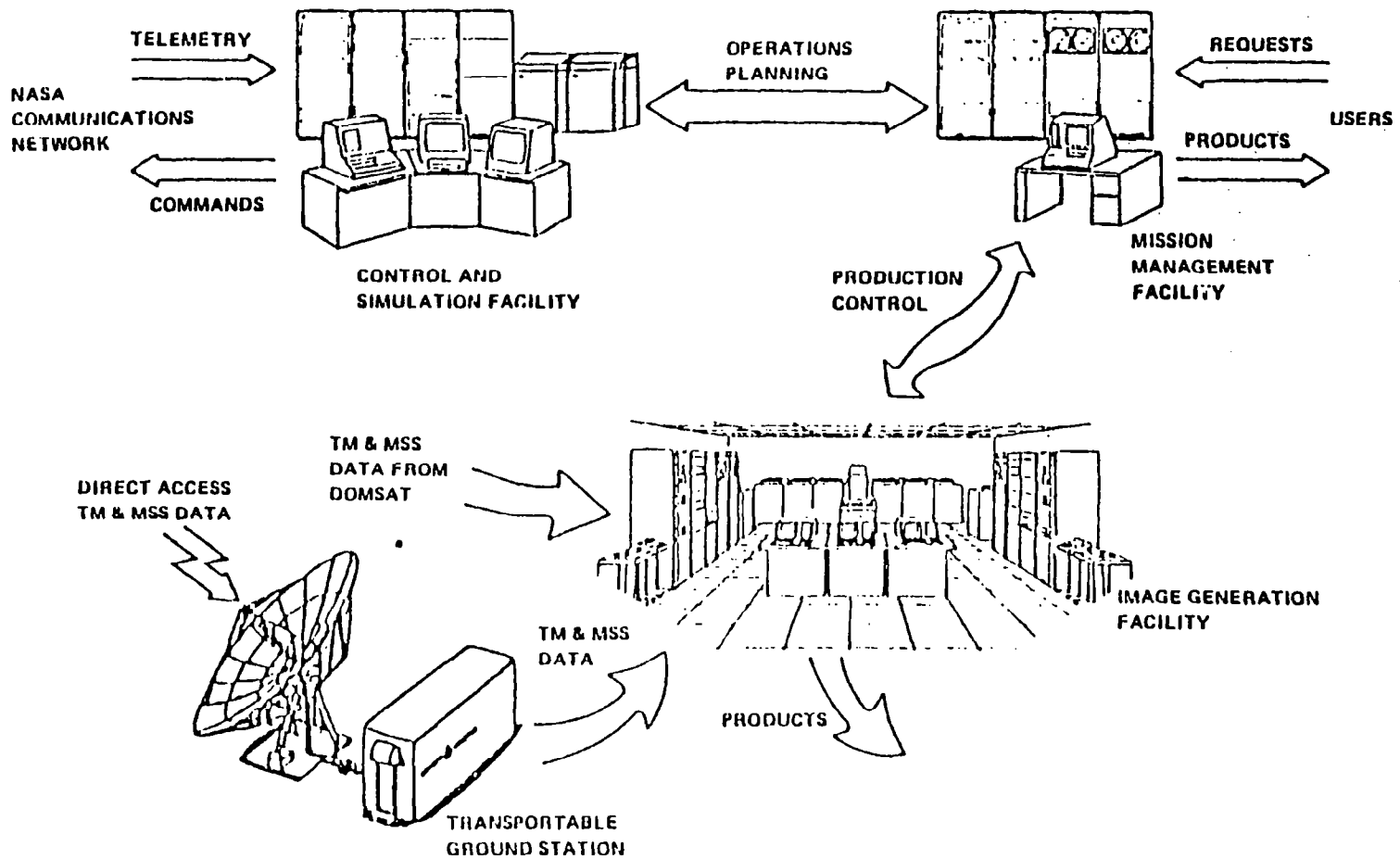


Figure 1 Landsat - 4/D' Ground Segment