

SPOT

TO: Larry Pettiger  
OFFICE: ERO  
PAGES: HEADER PLUS 14 SHEETS

FROM: A. Watkins  
OFFICE: Chief, EDC  
DATE: 8-24-83

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Thanks,  
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## Reception and Processing of French SPOT Satellite Data

The French, through the Centre National d'Etudes Spatiales (CNES), together with Belgium and Sweden, will place a high-resolution, pointable, multiple linear array (MLA) sensor in orbit aboard the Systeme Probatoire d'Observation de la Terre (SPOT) satellite in 1985. Three attributes of this system will offer significant advantages to Earth observations: increased ground resolution (10 meters), pointable off-nadir viewing providing frequent revisit capabilities (13 times per 26-day period at 40° North or South latitude), and the opportunity for stereo coverage.

## The Case for a U.S. Ground Receiving and Processing Station

To receive full benefit from land remote sensing satellites, the data must be available in a timely fashion and in suitable format to allow effective application. The higher resolution SPOT data, available every few days in near real-time, as could be supplied by a receiving station located in the U.S., opens new applications possibilities previously only hypothesized, for civil satellite data. The U.S. needs assured access to the SPOT data that minimizes foreign intervention and guards against foreign ground data processing and distribution impracticalities and failures. U.S. ground data reception and processing competence and experience are needed if U.S. benefits from application of the data are to be realized. Some of these important new applications possibilities include: 1) disaster assessment, including surveys of damage caused by floods, fire, wind, volcanic eruptions, and explosions; 2) renewable resources management such as pest and disease abatement programs, water management in irrigated agricultural regions, and crop and rangeland management activities to optimize yields; 3) crop and timber assessment

including crop production estimation programs, drought assessment programs, and fire fuels estimation for fire management purposes; and 4) environmental analysis for flood forecasting, surface mine reclamation, and undesirable plant production.

Other important national interests could be served by direct access to these data. United States' interest in critical domestic and foreign energy and minerals assessment, location, and claims/lease activities and agricultural resources import-export policy would be supported through the availability of these data. The prospect of SPOT data not being readily available to both U.S. Government and commercial users, in a timely manner and in suitable formats, could result in these national interests being placed in a position of competitive disadvantage internationally. The United States should assure that it has access to 10-meter satellite data that is at least equal to the access of other foreign governments and organizations. A U.S. station would also allow appropriate agencies of the Government to continually monitor and better assess the value to foreign governments and interests of 10-meter data of the U.S.

Although the French and other foreign satellite system operators will undoubtedly impose certain limitations and controls on reception of their data, timely access to high-quality data products over the U.S. would be assured by operation of a U.S. Government receiving and processing station. A U.S. receiving station would acquire real-time data over North America, and the ground processing equipment at the station would allow raw data obtained from France or other countries to be processed using U.S. ground processing technology. The Government operator would maintain technological awareness of the SPOT program by participating in the international technical working groups which the French plan to organize. These working groups will be similar to those implemented by the U.S. through NASA for Landsat.

The existence of a SPOT ground receiving and processing system should not be viewed as a replacement or alternative for a U.S. satellite system because of coverage restrictions and lack of control over data and sensor characteristics. However, it would serve to fill gaps and voids in the flow of U.S. data, whether created by design or by premature satellite failures, and the data would be complimentary to Landsat data. Since SPOT data are downlinked in the same X-band frequency range as is used for Landsat, a U.S. SPOT receiving station could be augmented to serve as a backup to the planned Landsat 4 and 5 TDRSS downlink for data over North America.

The implementation of a ground receiving and processing system by the U.S. Government is consistent with past U.S. foreign policy that supported internationalization of remote sensing by encouraging other Governments to install ground stations for the U.S. Landsat program. An unwillingness by the U.S. Government to participate in the SPOT program could have a negative impact on international relations between the U.S. and other countries involved.

### Concerns

The most frequently expressed concern related to U.S. implementation of a ground receiving station for SPOT data is that such a Federally funded and operated ground station is inconsistent with the Administration's policy for commercialization of civil remote sensing activities. U.S. industry interested in operating all or part of the civil land remote sensing satellite system could view a Government-created SPOT data receiving and processing system as competitive with the private sector; this could further discourage private sector interest. At present, there is no commitment for operation of Government satellites after Landsat D', which is scheduled for launch in early 1984. The

implemenation of a SPOT ground station should not constrain commercialization because many alternatives exist for restricting its use to satisfying critical Federal data needs and/or ultimate transfer of responsibility for such a system to the private sector. If, because of a variety of National security issues, a case can be made for a captive internal Government capability, then commercialization is not an issue. In any case, no commercial entity has come forward with a proposal for receiving and processing SPOT data in the U.S.

An additional concern is that the benefits of having near-real-time access to SPOT data and the ability to process raw satellite information into specific formats do not warrant the capital investment of \$10-13 million which would be required for a U.S. ground station. Both U.S. Government and private users will presumably be able to purchase data received by other countries such as France or Canada through SPOT Image, USA, a French-owned company incorporated in the U.S.

Less tangible concerns are related to national pride (maintenance of U.S. leadership in space technology) and economic interest (the paying of an "access fee" to the French which could be viewed as a form of subsidy). Concern has been expressed that U.S. involvement in a ground reception and processing station for SPOT data would serve to increase the "leakage" of U.S.-developed ground data processing technology, thereby diminishing U.S. technological leadership.

In summary, a French land remote sensing satellite system will be launched in 1985, and will introduce worldwide coverage with 10 meter data. The data are of unique character and will receive a high level of interest within the U.S. No U.S. organization is planning to receive, process, and distribute the data. Due

to the uncertainty of the future of the Landsat program, voids will probably occur in the flow of data to users during the 1980's, and U.S. users may have to depend upon foreign data sources. A U.S. ground data receiving and processing station would assure access to and availability of this data with a minimum of foreign intervention and dependence on foreign data handling and processing technology.

## CHARACTERISTICS

	<u>LANDSAT</u>		<u>SPOT</u>
	<u>MSS</u>	<u>TM</u>	
LAUNCH DATE	-1982/1984-		1985 WITH FOLLOW-ON
GROUND RESOLUTION (IFOV)	80 METERS	30 METERS	20 METERS - MULTISPECTRAL 10 METERS - PANCHROMATIC
GROUND SWATH	-185 KM-		60 KM x 2 = 120 KM
SPECTRAL COVERAGE	0.5 TO 1.1mm 4 BANDS	0.45 TO 12.5mm 7 BANDS	0.5 TO 0.9 mm 3 BANDS
TELEMETRY FREQUENCY	X OR S BAND	X BAND	X BAND
REPEAT CYCLE	-16 DAYS-		26 DAYS - 1 TO 3 DAY REVISIT - POINTABLE-
STEREO	-NO-		YES - SIDE POINTABLE 0.5 TO 0.75 BASE/HEIGHT
ACQUISITION QUANTITY	130/DAY	1/DAY 1983 12/DAY 1984 50/DAY 1985	GROUND STATION DEPENDENT
REMOTE ACCESS	-TDRSS-		TAPE RECORDERS
GROUND STATIONS	-U.S. PLUS 10 OTHER COUNTRIES-		FRANCE PLUS 5-10 OTHER COUNTRIES



## CONCERNS

- o POSSIBLE IMPACT ON ADMINISTRATION'S COMMERCIALIZATION POLICY.
- o DO BENEFITS WARRANT COST?
- o "LEAKAGE" OF U.S. GROUND DATA PROCESSING TECHNOLOGY.
- o DATA DISTRIBUTION AND CONTROL RESTRICTIONS.

## FRENCH PLANS

- o SPOT SATELLITE BEING DEVELOPED BY CNES FOR ARIANE LAUNCH IN 1985.
- o SPOT IMAGE FORMED TO HANDLE WORLDWIDE DISTRIBUTION OF DATA.
- o DATA PROCESSING AND CENTRAL DATA ARCHIVES IN TOULOUSE.
- o SPOT IMAGE-USA, INCORPORATED WILL MANAGE DATA DISTRIBUTION IN USA.
- o GROUND STATIONS BEING EQUIPPED FOR SPOT DATA IN FRANCE, SWEDEN (ESA), BRAZIL, CANADA, AND JAPAN. DISCUSSIONS UNDERWAY WITH INDIA, ARGENTINA, SOUTH AFRICA, AUSTRALIA, INDONESIA, ETC.
- o SPOT IMAGE, USA HAVE INDICATED DESIRE FOR USE OF CANADIAN STATION AND SOUTHWESTERN U.S. STATION TO PROVIDE DATA OF NORTH AMERICA .
- o SPOT IMAGE PLANS ON "EXCLUSIVE DISTRIBUTION ZONE" RIGHT FOR "FRANCHISED" GROUND STATIONS.
- o GROUND STATIONS WILL PAY A FIXED ACCESS FEE PLUS A VARIABLE FEE BASED ON DATA REQUESTED.
- o SPOT IMAGE HAS DISCUSSED FEES AND PRICES "SIMILAR" TO LANDSAT (NOAA).
- o ALL DATA TO BE COPYRIGHTED BY SPOT IMAGE.
- o SPOT IMAGE PLANS FOR U.S. GROUND STATION NOT ANNOUNCED.

## ISSUES

- o SHOULD NOT BE VIEWED AS A REPLACEMENT OR ALTERNATIVE FOR A U.S. SATELLITE SYSTEM.
- o GROUND STATION COULD BE USED TO SATISFY FEDERAL REQUIREMENTS ONLY OR PLAN TO TRANSFER RESPONSIBILITY TO THE PRIVATE SECTOR.
- o SERIOUS DISCUSSIONS WITH FRENCH NEEDED TO RESOLVE DATA DISTRIBUTION CONTROL CONCERNS.

## RATIONALE FOR A U.S. GROUND STATION

- o WOULD ASSURE TIMELY ACCESS (NEAR REAL-TIME) TO DATA OF CONTERMINOUS U.S. IN PROPER FORMAT AND DATA PROCESSING CAPABILITY FOR TAPE RECORDED RAW DATA
- o IMPROVED RESOLUTION, NEAR REAL-TIME DATA FLOW, AND MORE FREQUENT REVISIT OPPORTUNITIES OPEN MAJOR NEW APPLICATIONS POSSIBILITIES:
  - o DISASTER ASSESSMENT AND RELIEF PLANNING
  - o VEGETATION PEST AND DISEASE ABATEMENT PROBLEMS
  - o WATER RESOURCES MANAGEMENT
  - o DROUGHT ASSESSMENT
  - o FOREST AND BRUSH FIRE MANAGEMENT
  - o FLOOD FORECASTING
  - o UNDESIRABLE PLANT PRODUCTION MONITORING
  - o SURFACE MINE RECLAMATION
- o OPTIMIZED ACCESS TO DATA IMPORTANT FOR:
  - o CRITICAL DOMESTIC AND FOREIGN ENERGY AND MINERALS INTERESTS
  - o AGRICULTURAL RESOURCES IMPORT-EXPORT POLICY

- o WOULD PROVIDE HIGH RESOLUTION MULTISPECTRAL DATA DURING POSSIBLE GAPS IN THE FLOW OF DATA FROM A U.S. SYSTEM FOR SUPPORT OF RESEARCH, DEVELOPMENTAL, AND APPLICATIONS.
- o MAINTAINS TECHNOLOGICAL AWARENESS OF FOREIGN SATELLITE ACTIVITIES.
- o WOULD ALLOW CONTINUOUS ASSESSMENT OF VALUE TO FOREIGN GOVERNMENTS OF 10 METER DATA OF U.S.
- o PROVIDES EASIER ACCESS AND ORDERING OF DATA FROM FOREIGN SATELLITES.
- o CONSISTENT WITH PAST U.S. FOREIGN POLICY.....AND WITH INTERNATIONALIZATION.
- o COULD SERVE AS A BACKUP TO TDRSS SYSTEM FOR LANDSAT 4 DATA OF THE U.S. WITH SOME MODIFICATIONS.

## COST AND SCHEDULE

- o FOR 43 IMAGE (MULTISPECTRAL OR PANCHROMATIC) AND 5 CCT PRODUCTS EACH DAY
  - o 32 LEVEL I (SYSTEM CORRECTION)
  - o 8 LEVEL II (GROUND CONTROL POINTS)
  - o 3 LEVEL III (TERRAIN RELIEF CORRECTION)
  
- o 20 - 24 MONTH DESIGN, DEVELOPMENT, IMPLEMENTATION
  
- o \$10 - 13 MILLION NON-RECURRING COST
  
- o \$2 MILLION RECURRING COST PLUS STATION ACCESS FEE

COST ESTIMATE

RECEIVING SUBSYSTEM (ANTENNA, RECEIVER,  
DEMOC, BIT SYNC, BORESIGHT TOWER AND  
ANTENNA, TEST EQUIP.) \$ 1,733.0

RECORD SUBSYSTEM ( 28 TRK HDTR,  
CONTROLLER, FRAME SYNC.) 479.0

PROCESSING SUBSYSTEM (28 TRACK HDTR,  
FRAME SYNC, 6250 BPI DRIVES, CPU,  
DISPLAY, DISK DRIVES AND CONTROLLERS,  
ARRAY PROCESSORS, FILM RECORDER, ETC.) 1,788.0

SOFTWARE (RADIOMETRIC AND GEOMETRIC  
CORRECTION, RESAMPLING, AND SYSTEM  
OPERATIONS) 6,340.0

PROJECT MGMT, OTHER, AND ESTIMATED FEE 2,000.0

TOTAL ESTIMATE \$12,340.0