

No. 30290

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**UNITED STATES OF AMERICA  
and  
THAILAND**

**Memorandum of understanding relating to the establishment  
and operation of a Landsat system. Signed at Washing-  
ton on 9 May 1979**

*Authentic text: English.*

*Registered by the United States of America on 28 September 1993.*

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**ÉTATS-UNIS D'AMÉRIQUE  
et  
THAÏLANDE**

**Mémoire d'accord relatif à l'établissement et au fonc-  
tionnement du système Landsat. Signé à Washington le  
9 mai 1979**

*Texte authentique : anglais.*

*Enregistré par les États-Unis d'Amérique le 28 septembre 1993.*

## MEMORANDUM OF UNDERSTANDING<sup>1</sup> BETWEEN THE NATIONAL RESEARCH COUNCIL OF THAILAND AND THE UNITED STATES NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

The United States National Aeronautics and Space Administration (NASA), which conducts an experimental Landsat program and, under certain conditions, provides for direct reception of data from these satellites by stations operated outside the United States, and the National Research Council Of Thailand (NRCT) which plans to establish a station to receive, process, archive and disseminate Landsat data, have decided to enter into this Memorandum of Understanding which, subject to the following terms and conditions, provides for (a) direct reception of data from NASA's currently operating and potential future experimental Landsat satellites by the NRCT's ground station and (b) availability to NASA and others of Landsat data acquired by this NRCT station.

1. For its part, the NRCT will use its best efforts to:
  - (a) set up and operate a ground station near Bangkok for the reception and facilities for processing, archiving and dissemination of Landsat data at its own cost including the cost of the necessary communication links with the NASA Landsat Operations Control Center at the Goddard Space Flight Center, Greenbelt, Maryland;
  - (b) produce Landsat computer compatible tapes and image products;
  - (c) ensure, in conformance with US Landsat data dissemination practices, unrestricted public availability of all Landsat data received within range of the Bangkok ground station at a fair and reasonable charge, and in a non-discriminatory manner;
  - (d) ensure the provision of processed Landsat data (imagery and digital products) to NASA-selected Principal Investigators whose test sites are within range of the Bangkok station, for the period of coverage envisaged and under the same conditions as NASA applies to them;
  - (e) provide to NASA reasonable support requested by NASA during a spacecraft emergency condition, such as the provision of duplicate station tapes or high density digital tapes should NASA have problems with data transmission;

<sup>1</sup> Came into force on 9 May 1979 by signature, in accordance with section 6.

- (f) provide at no charge to NASA and the US EROS Data Center monthly catalog listings of all the Landsat data acquired by the Bangkok ground station. These catalog listings will also be made publicly available;
  - (g) make available to NASA on request, for US Agencies' experimental purposes, on a cost-free basis and in reasonable quantities, copies of processed or unprocessed Landsat data acquired by the NRCT.
2. For its part, NASA will use its best efforts to:
- (a) program the Landsat Multispectral Scanner, Return Beam Vidicon and Thematic Mapper instruments for coverage of the area within the acquisition radius of the Bangkok ground station and transmit the data acquired directly to this station. Programming details will be arranged by mutual agreement of the Project Managers;
  - (b) provide the Bangkok ground station with orbital elements for calculating the antenna pointing angles necessary to acquire the Landsat transmitted signal, and for processing the data acquired;
  - (c) process, on a time-available basis and as agreed by the designated technical representatives, a limited number of NRCT data tapes for initial evaluation and calibration of the Bangkok station's performance. The NRCT will ensure that such data tapes are fully compatible with NASA's data processing equipment and related software;
  - (d) make available to the NRCT for comparison purposes, a limited amount of NASA-acquired Landsat data covering selected portions of the Bangkok station's coverage zone.
3. The NRCT and NASA will each designate technical representatives to be responsible for coordinating the agreed functions and responsibilities of each party with the other. The technical representatives, or their deputies and advisors by mutual agreement, will participate in meetings of the Landsat Ground Station Operations Working Group. This Working Group, established by NASA, meets every six months and serves as a forum for exchange of technical information among station operators. Supplemental meetings between the NRCT and NASA will be held by mutual agreement.
4. The following additional understandings are confirmed:
- (a) The NRCT, in conjunction with other Thailand agencies, will use its best efforts to ensure that any radio frequency problem occurring in relation to Landsat data reception by the Bangkok station is resolved to the satisfaction of the parties to this Memorandum of Understanding. Questions concerning radio

frequency interference by the Landsat spacecraft raised by parties in third countries will be referred to the US Government and NASA for reply. It is also noted that provisions of the International Telecommunications Union's Radio Regulations<sup>1</sup> require that radio frequencies for future operational Landsat type satellites will differ from those currently used for experimental satellites. In this connection, NASA plans to use the following frequencies for sensor data transmissions from the Landsat-D spacecraft:

Multispectral Scanner -- S-Band (2200-2300 MHz) and X-Band (8025-8400 MHz).  
Thematic Mapper -- X-Band (8025-8400 MHz).

- (b) It is understood that the NASA Landsat program is experimental in character and, therefore, subject to change in accordance with modifications in technical requirements and opportunities, and that at the date of this Memorandum of Understanding, NASA cannot make a firm commitment regarding the space flight of future Landsat instruments. NASA, however, undertakes to keep NRCT informed in good time of any modifications to the satellite design or to its plans for the Landsat instruments which may affect the implementation of this Memorandum of Understanding.
- (c) NASA and the NRCT will exchange, upon request, such technical information as may be necessary for the implementation of this Memorandum of Understanding, as is mutually agreed, and is consistent with the export regulations of the two countries.
- (d) NASA and the NRCT may each release public information regarding their own activities under this Memorandum of Understanding and, insofar as the participation of the other party is concerned, after suitable consultation.
- (e) It is understood that construction on the Bangkok ground station will be underway within fifteen months of the signing of this agreement. In the event that construction of the Bangkok station is not underway within fifteen months of the signing of this agreement, NASA, after consultation with the NRCT, shall have the option to terminate its activities under this agreement.

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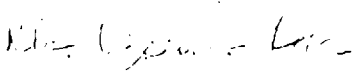
<sup>1</sup> International Telecommunication Union, *Radio Regulations*, Edition of 1982, as amended.

- (f) The responsibility for spacecraft control, health and status will remain with NASA throughout the execution of this Memorandum of Understanding.
- (g) When the expected coverage of a prospective Landsat ground station overlaps with that of the Bangkok station, NASA will inform the NRCT and will advise the prospective station operator of this NRCT/NASA Memorandum of Understanding which provides for the unrestricted public availability of data acquired of areas within range of the Bangkok station at a fair and reasonable charge. Should the prospective station operator choose to pursue plans for a station with substantially overlapping coverage, NASA will encourage the prospective station operator and the NRCT to consult with a view toward reaching a mutually satisfactory understanding on responding to requests for data of the overlapping coverage area.
- (h) The US EROS Data Center will include with all responses to requests for Landsat data acquired in the Bangkok station's coverage zone, a statement noting that the Bangkok station should have available more recent and/or more complete data. In the event that the EROS Data Center receives requests for specific Landsat scenes, products or for specific information on their holdings, EROS will, in accordance with US Freedom of Information laws, provide the data and/or information requested.
- (i) The ability of the NRCT and NASA to carry out their responsibilities under this Memorandum of Understanding is subject to the availability of appropriated funds.
- (j) Copies of any agreements signed by the NRCT concerning the sale of Landsat data from the Bangkok ground station shall be made available to NASA upon request and shall be consistent with the provisions of paragraph 1 (c) above.

5. In consideration of the costs NASA is bearing for the Landsat space segment, the NRCT will pay to NASA the sum of \$200,000 per annum beginning six months after the date the Bangkok station begins to acquire Landsat data. The NRCT will pay this sum in quarterly installments at the end of each quarter. After January 1, 1980 NASA may, after consultation with operating agencies, revise the rate and arrangements for cost sharing. Such revised cost sharing arrangements will be applied to all non-US Landsat stations on an equitable basis.

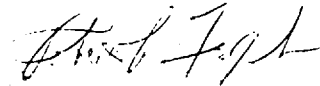
6. This Memorandum of Understanding shall enter into force after signature by both parties and confirmation<sup>1</sup> by the Government of Thailand and the Government of the United States through an exchange of diplomatic notes. This Memorandum of Understanding shall continue in force for a period of five years, subject to extension as may be agreed by the parties and their respective governments.

For the National Research Council  
of Thailand:

 <sup>2</sup>

Date: May 9, 1979

For the National Aeronautics  
and Space Administration:

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Date: May 9, 1979

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<sup>1</sup> Signature constitutes confirmation (Information supplied by the Government of the United States of America).

<sup>2</sup> Kios Visessurakarn.

<sup>3</sup> Robert Frosch.