

MEMORANDUM OF UNDERSTANDING
BETWEEN
THE DEPARTMENT OF SPACE AND
THE DEPARTMENT OF SCIENCE AND TECHNOLOGY
OF THE GOVERNMENT OF THE REPUBLIC OF INDIA
AND
THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AND
THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
OF THE UNITED STATES OF AMERICA
FOR SCIENTIFIC COOPERATION
IN THE AREAS OF EARTH AND ATMOSPHERIC SCIENCES

The Department of Space (hereinafter referred to as "DOS") and the Department of Science and Technology (hereinafter referred to as "DST"), both of the Government of the Republic of India (hereinafter referred to as the "Indian Party"),

and

The National Aeronautics and Space Administration (hereinafter referred to as "NASA") and the National Oceanic and Atmospheric Administration (hereinafter referred to as "NOAA"), both of the Government of the United States of America (hereinafter referred to as the "U.S. Party"),

the U.S. and Indian Parties constituting the Parties to this Memorandum of Understanding (hereinafter referred to as "the Parties"),

RECOGNIZING that Earth observation from outer space represents a critical element in the worldwide investigation of global environmental issues;

DESIRING to observe, monitor, and study aspects of the Earth's surface and atmosphere from outer space;

RECALLING that the United States and India have enjoyed fruitful cooperation in the field of Earth observation for meteorological purposes, witnessed by their cooperation in the development and operation of geostationary meteorological satellites;

RECALLING that India has been receiving U.S. operational meteorological and environmental satellite data provided by NOAA globally;

RECALLING that NASA has been entrusted to carry out Earth observation activities under the Mission to Planet Earth program, including the Tropical Rainfall Measuring Mission (hereinafter referred to as "TRMM");

RECALLING that DOS and DST have been entrusted to carry out the meteorological segment of the Indian National Satellite System Programme (hereinafter referred to as "INSAT"), established in 1983 with the launch of INSAT-1B;

NOTING that major opportunities for joint scientific activities and exchange of data are possible because of the coincidence of Indian and U.S. Earth observation missions;

RECOGNIZING the essential role meteorological and environmental satellite data have in operational meteorological applications, including global weather forecasting, and in research;

NOTING that DOS has unique and appropriate facilities and resources for calibration and validation for the TRMM and NOAA polar-orbiting missions;

NOTING that the U.S. Party has expressed interest in receiving near-real time access to digital visible and infrared data and derived products from the INSAT satellites; and

RECOGNIZING the benefits to the scientific and applications communities, working with atmospheric, ocean, ice, and land surface information, in having rapid access to data from the above missions;

HAVE AGREED AS FOLLOWS:

**Article 1
PURPOSE**

The purpose of this Memorandum of Understanding (MOU) is to define the terms and conditions of scientific and technical collaboration among the Parties, which shall include cooperation in the areas of Earth and atmospheric sciences and the associated needs for the exchange of data.

**Article 2
SCIENTIFIC COOPERATION**

The Parties shall be responsible for cooperating generally in those areas of science and technology that include, but are not limited to, the following:

- research and development projects, including the exchange of their results, as well as visits of scientists, specialists, and researchers;
- scientific conferences, symposia, courses and workshops;
- project development activities;
- exchange or sharing of scientific and technological information and documentation in the context of cooperative activities;
- exchange or sharing of communications and networking equipment or materials; and
- other forms of scientific and technical cooperation as may be mutually agreed.

Specific areas of cooperation include, but are not limited to, the following:

1. Weather Analysis and Forecasting Techniques (Short-range to Seasonal)
2. Evaluation of DMSP SSM-I Data for Use in Flood Forecasting, Drought Monitoring, and Snow Melt Runoff Modeling
3. TRMM
4. Satellite Product Development and Improvement
5. Surface and Precipitation Parameters (Ocean and Land)
6. Calibration of 1 Kilometer Resolution AVHRR Data Set (from India) with Global Land 1-KM AVHRR Data Set and 4 Kilometer GAC Data Set (from the U.S.)
7. Inter-comparison studies of SSM-I Pathfinder Data for Use in Land Surface Studies (Classification, Temperature, Vegetation)
8. Atmospheric sciences/Geosphere-Biosphere Program (GBP)

Details of implementation will be worked out by mutual agreement.

Article 3 DATA ACCESS AND TRANSMISSION

The U.S. Party shall:

- make available to the Indian Party the agreed Earth and atmospheric data, produced by the research and operational systems of the U.S. Party, as well as the retrospective data from such systems contained in their respective archives, as agreed;
- install two communication circuits (each full duplex lines with capacity of at least 64 kilobits per second) to allow Earth observation data from the United States to be accessed by the India Party and to transfer INSAT data from a pick-up point designated by the India Meteorological Department, New Delhi, to the United States;
- provide training and full support for the maintenance of the communication links;

- provide the capability for the U.S. Party to receive all data from INSAT and other auxiliary data on a near-real time basis; and
- work with the Indian Party to determine the feasibility of acquiring INSAT data at hourly intervals and fund any augmentation in ground capacity necessary to accomplish this end, if determined desirable by the U.S. Party.

The Indian Party shall:

- make available to the U.S. Party the agreed Earth and atmospheric science data, including that data produced by the INSAT system, as well as retrospective Indian Party data, as agreed;
- provide an interface to two communication circuits (each full duplex lines with capacity of at least 64 kilobits per second) to allow Earth observation data from the U.S. Party to be accessed by India and to transfer INSAT data from a pick-up point designated by the India Meteorological Department, New Delhi, to the United States;
- provide necessary technical and auxiliary information to permit the U.S. Party to install and enable the maintenance of the communication circuits for the reception of the Indian Earth and atmospheric data;
- use its best efforts to maintain the communication links for timely and efficient data transfer;
- cooperate with and assist the U.S. Party to transmit all full-resolution, full disk, digital data from INSAT (currently 4096 x 4096 pixel visible, 1024 x 1024 pixel infrared) at three-hourly intervals for imagery and a sequence of three half-hourly images centered on synoptic times 00Z and 12Z, along with any other auxiliary data that can be made available, on a near-real time basis;
- work with the U.S. Party to study the feasibility of providing imagery at one-hourly intervals; and
- assist the U.S. Party in the installation of any augmentation to INSAT ground processing systems, if provided by the U.S. Party, and also assist the U.S. Party with their operation.

Article 4
DATA UTILIZATION AND DISTRIBUTION

All Earth and atmospheric observation data, including GOES data, exchanged by the Parties under this MOU shall be available without fee or at no more than the marginal cost of filling a specific user request and without restriction, except for near-real-time INSAT data, which are made available for use only as described in paragraph 1 below.

1(i). Near-real-time INSAT data shall be available without fee to all U.S. Government agencies for Governmental use worldwide and to their affiliated users within the United States for their use. The U.S. Party shall use its best efforts to protect such data from disclosure to other parties, unless approved by the Indian Party. These restrictions do not apply to derivative data and products resulting from U.S.-sponsored scientific and application activities.

1(ii). Earth and atmospheric science data, including near-real-time GOES data, shall be available without fee to all Indian Government agencies for Governmental use worldwide and to their affiliated users within India for their use.

2. The U.S. Party shall inform its distributees of any restrictions on the use and/or redistribution of near-real-time INSAT data.

3. Definitions:

a(i). "INSAT data" means full resolution data and derived products from the INSAT VHRR instruments, including visible and infrared data and derived products.

a(ii) "GOES data" means full resolution data and derived products from the GOES instruments, including visible, middle and thermal infrared data and derived products.

b (i). "Near-real-time INSAT data" means data derived from the INSAT data processing stream in New Delhi and transmitted by point to point communication link without the introduction of any delays or storage times. The only distinction between this and "real-time" is the elapsed time to read the files from the storage system in the INSAT ground processing facility and transmit the data over communications links to a data server computer in the U.S. Depending upon the capacity of the transmission lines implemented, "near-real-time" data could be available in the U.S. as soon as one hour after data reception in New Delhi.

b (ii) "Near-real-time GOES data" means data derived from the GOES data processing stream in NESDIS (National Environmental Satellite, Data, and Information Service) and made available on the internet without the introduction of any delays or storage times.

The only distinction between this and "real-time" is the elapsed time to read the files from the storage system in the GOES ground processing facility and to put it onto the GOES web site. Depending upon the capacity of the transmission lines implemented, "near-real time" data could be available in India as soon as one hour after data reception in the U.S.

c. "Affiliated user" means any U.S. or Indian state or local governmental agency or organization formally associated with these government units in carrying out their programs, including researchers and contractors.

d. "Use" means reception, processing, transformation, or dissemination in recognizable form of data covered by this MOU.

Article 5 FUNDING

There shall be no exchange of funds under this MOU between the U.S. and Indian Parties unless otherwise agreed.

Any financial obligations of the Parties under this MOU are subject to their funding procedures and to the availability of appropriated funds. Should either Party encounter budgetary problems in the course of its respective internal procedures, which may affect the activities carried out under this MOU, that Party shall notify and consult with the other Party in a timely manner.

Article 6 CUSTOMS ARRANGEMENTS

Each Party shall be responsible for the customs clearance, at no cost to the other Party, of items received at its customs points of entry for the fulfillment of the Parties' responsibilities for scientific cooperation under this MOU. Such arrangements shall be reciprocal.

Article 7 EXCHANGE OF TECHNICAL DATA AND GOODS

Each Party is obligated to transfer to the other Party only those technical data and goods necessary to fulfill the responsibilities of the furnishing Party under this MOU. Earth and atmospheric observation data shall be exchanged and distributed as set forth in Article 4, Data Utilization and Distribution. With respect to technical data, other than earth and atmospheric observation data, and goods, it is the intent of the Parties to effect such transfer without restrictions as to use or disclosure, subject to the following:

1. In the event a Party finds it necessary to transfer technical data in carrying out its responsibilities under this MOU that are proprietary, and for which protection is to be maintained, such technical data will only be transferred with the furnishing Party's authorization. Such data will be marked with a notice indicating that they shall be used and disclosed by the receiving Party and its contractors and subcontractors only for the purposes of fulfilling the receiving Party's responsibilities under this MOU and that the technical data shall not be disclosed or retransferred to any other entity without prior written permission of the furnishing Party. The receiving Party agrees to abide by the terms of the notice and to protect any such marked technical data from unauthorized use and disclosure.
2. In the event a Party finds it necessary to transfer technical data and goods in carrying out its responsibilities under this MOU that are export-controlled, the furnishing Party shall mark such technical data with a notice and identify such goods. The notice or identification shall indicate that such technical data and goods shall be used, and such technical data shall be disclosed, by the receiving Party and its contractors and subcontractors only for the purposes of fulfilling the receiving Party's responsibilities under this MOU. The notice or identification shall also provide that such technical data shall not be disclosed, and such technical data and goods shall not be retransferred, to any other entity without prior written permission of the furnishing Party. The Parties agree to abide by the terms of the notice or identification and to protect any such marked technical data and identified goods. Nothing in this Article requires the Parties to transfer technical data and goods contrary to national laws or regulations relating to export control or control of classified data.
3. The Parties are under no obligation to protect any unmarked technical data or unidentified goods. However, all goods and technical data exchanges under this MOU shall be used exclusively for the purpose of fulfilling the Parties' responsibilities under this MOU.

**Article 8
INVENTION AND PATENT RIGHTS**

Nothing in this MOU shall be construed as granting or implying any rights to, or interest in, patents or inventions of the Parties or their contractors or subcontractors.

**Article 9
LIABILITY**

No Party shall make any claim against the another, its employees, a related entity of the other (e.g., contractors, subcontractors, investigators, other participating entities), or

employees of the other's related entities for injury to or death of its own employees or employees of its related entities, or for damage of any kind to or loss of its own property or that of its related entities arising out of activities under this MOU whether such injury, death, damage or loss arises through negligence or otherwise, except in the case of willful misconduct. In addition, each Party shall extend the cross-waiver of liability as set forth above to its own related entities by requiring them, by contract or otherwise, to agree to waive all claims against the entities or persons identified above.

**Article 10
PUBLIC INFORMATION**

The Parties retain the right to release public information regarding their own activities under this MOU. In cases where the activities of the other Party are concerned, prior consultation shall be sought.

**Article 11
SETTLEMENT OF DISPUTES**

Each Party shall consult with the other as soon as possible on any matter that may affect the proper implementation of the MOU. Any dispute as to the interpretation or implementation of the terms of this MOU shall be referred to the Associate Administrator for Mission to Planet Earth of NASA, Assistant Administrator for Satellite and Information Services of NOAA, Scientific Secretary of ISRO for DOS, and Advisor International Affairs for DST.

**Article 12
ENTRY INTO FORCE, AMENDMENTS, TERMINATION**

This MOU shall enter into force upon signature by the Parties and shall remain in force for an initial period of 5 years.

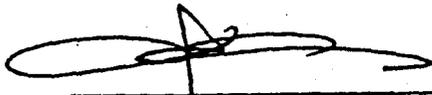
This MOU may be extended or amended at any time by written agreement of the Parties.

This MOU may be terminated upon 90 days written notice by either Party. Neither Party shall have the right to any claim whatsoever for compensation or damage as a consequence of termination of this MOU.

IN WITNESS THEREOF, the undersigned being duly authorized, have signed this Memorandum of Understanding.

Done in duplicate in the English language.

FOR THE DEPARTMENT OF SPACE
OF THE REPUBLIC OF INDIA



K. Kasturirangan
Secretary

Date: 16th Dec 1997
Place: Washington DC.

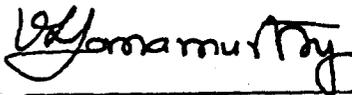
FOR THE NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION OF
THE UNITED STATES OF AMERICA



Daniel S. Goldin
Administrator

Date: Dec 16, 1997
Place: Washington DC

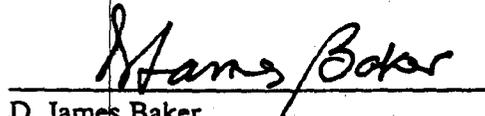
FOR THE DEPARTMENT OF SCIENCE
AND TECHNOLOGY OF THE
REPUBLIC OF INDIA



V. S. Ramamurthy
Secretary

Date: Dec. 16, 1997
Place: Washington DC

FOR THE NATIONAL OCEANIC AND
ATMOSPHERIC ADMINISTRATION
OF THE UNITED STATES OF
AMERICA



D. James Baker
Administrator

Date: 16 December 1997
Place: Washington DC

APPENDIX

ACRONYM LIST

| | |
|--------|---|
| AVHRR | Advanced Very High Resolution Radiometer (NOAA) |
| DMSP | Defense Meteorological Satellite Program (U.S.) |
| DOS | Department of Space, Government of India |
| DST | Department of Science and Technology, Government of India |
| GAC | Global Area Coverage |
| GBP | Geosphere - Biosphere Program |
| GOES | Geostationary Operational Environmental Satellite (NOAA) |
| INSAT | Indian National Satellite System |
| MOU | Memorandum of Understanding |
| NASA | National Aeronautics and Space Administration, Government of the United States of America |
| NESDIS | National Environmental Satellite, Data, and Information Service (NOAA) |
| NOAA | National Oceanic and Atmospheric Administration, Government of the United States of America |
| SSM-I | Special Sensor Microwave-Imager (U.S.) |
| TRMM | Tropical Rainfall Measuring Mission (NASA/NASDA of Japan) |
| VHRR | Very High Resolution Radiometer (India) |