SPACE COOPERATION

Moon Mineralogy Mapper Instrument

Memorandum of Understanding between the UNITED STATES OF AMERICA and INDIA

Signed at Bangalore May 9, 2006

NOTE BY THE DEPARTMENT OF STATE

Pursuant to Public Law 89—497, approved July 8, 1966 (80 Stat. 271; 1 U.S.C. 113)—

". . .the Treaties and Other International Acts Series issued under the authority of the Secretary of State shall be competent evidence . . . of the treaties, international agreements other than treaties, and proclamations by the President of such treaties and international agreements other than treaties, as the case may be, therein contained, in all the courts of law and equity and of maritime jurisdiction, and in all the tribunals and public offices of the United States, and of the several States, without any further proof or authentication thereof."

INDIA

Space Cooperation: Moon Mineralogy Mapper Instrument

Memorandum of understanding signed at Bangalore May 9, 2006; Entered into force May 9, 2006.

Memorandum of Understanding

between the United States

National Aeronautics and Space Administration (NASA)

and the

Indian Space Research Organisation (ISRO)

on Cooperation Concerning

NASA's Moon Mineralogy Mapper (M3) Instrument

on

ISRO's Chandrayaan-1 Mission

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Preamble

The United States National Aeronautics and Space Administration (hereinafter referred to as NASA), and the Indian Space Research Organisation (hereinafter referred to as ISRO);

As the Parties to this Memorandum of Understanding (MOU) (hereinafter the Parties);

CONSIDERING that the United States and India have agreed upon a major initiative to enhance joint activities in space cooperation;

CONSIDERING ISRO's plan to fly a mission, Chandrayaan-1, designed to explore the Moon from polar lunar orbit in 2007;

CONSIDERING the release of the Announcement of Opportunity by ISRO, calling for proposals from interested foreign investigators to fly instruments on Chandrayaan-1;

CONSIDERING the selection by ISRO of the Moon Mineralogy Mapper (M3) proposal to use a visible-near infrared imaging spectrometer to map the mineralogy of the Moon;

RECOGNIZING the need for a mission to collect these data to characterize and map the lunar surface composition in the context of its geologic evolution and to assess Moon mineral resources at high spatial resolution; and

CONSIDERING that cooperation on such a mission would be beneficial to both nations and to future human activities on the Moon;

Have agreed as follows:

Article 1 - Purpose

This MOU sets forth the terms and conditions under which the Parties shall cooperate in the Chandrayaan-1 Mission with regard to the M3 instrument.

Article 2 – Definitions

As used in this MOU, the following terms shall have the specified meanings:

2.1 "ISRO Chandrayaan-1 Science Working Team" consists of scientists from ISRO and other Indian research institutions, as well as the Principal Investigators (PIs) responsible for the non-Indian instruments on the Chandrayaan-1 Mission.

2.2 "M3 Science Team" consists of only those scientists selected by the M3 PI to carry out specific tasks to meet M3 science objectives, and a Co-Investigator selected by ISRO.

2.3 "M3 Instrument Data" are data received from the payload, including sensor and

housekeeping data.

2.4 "Science Data Products" are data products resulting from the processing of the M3 instrument data.

Article 3 - Mission Description and Participation

3.1 The primary objective of the Chandrayaan-1 Mission is to map key properties of the Moon from polar orbit to better understand its history, evolution, and current state. These objectives include mapping the mineral resources of the Moon. To accomplish these science objectives, the Chandrayaan-1 Mission is to carry several ISRO remote sensing instruments and an impact probe, as well as a number of contributed instruments from foreign countries including the M3 sponsored by NASA.

3.2 The M3, selected by ISRO for flight on Chandrayaan-1 after an international solicitation and competition and after a NASA peer-reviewed selection, is a collaboration between NASA, which developed and fabricated the M3 instrument, and ISRO, which included the M3 instrument on its flight. The M3 Project is to be led by a PI of Brown University who is to have overall responsibility for project resources and mission success. The M3 instrument will be designed and developed at the Jet Propulsion Laboratory (JPL).

3.3 The Chandrayaan-1 Mission is conceived, designed, built, and flown by ISRO. The Chandrayaan-1 spacecraft, integrated and tested under ISRO responsibility, is to carry the M3 instrument designed and provided by JPL.

3.4 The requirements for the M3 instrument were developed by the M3 Science Team and the instrument team at JPL. These requirements define the spatial coverage, spectral resolution, and signal-to-noise value of the observations necessary to map the minerals of the Moon.

3.5 The Chandrayaan-1 Mission is to collect science data and products for the entire lunar surface.

3.6 ISRO plans for the Chandrayaan-1 spacecraft to operate for a nominal period of two years. ISRO is to operate the spacecraft throughout the life of the mission. NASA is to provide ISRO with a plan and procedure for commanding the M3 instrument from the ISRO satellite control center. NASA is to process M3 instrument data and science products, as defined in Article 5 – NASA Responsibilities and Article 16 – Science Data Policy, below. The Indian Space Science Data Center (ISSDC) is also to have an M3 Data Processing Subsystem (a replica of the Payload Operating Center (POC) workstation, to be delivered by NASA) to process collected raw scientific and resource related flight data.

3.7 M3 instrument data and science data products are to be made available to the

Chandrayaan-1 Science Team and the broader international user community according to Article 16 – Science Data Policy.

Article 4 - ISRO Responsibilities

To implement this cooperative project, ISRO shall use reasonable efforts to:

4.1 Provide overall systems engineering function for the Chandrayaan-1 Mission, including in developing overall system specifications and developing jointly with JPL an Interface Control Document (ICD) which shall define the NASA/ISRO interfaces.

4.2 Provide spacecraft engineering, develop a spacecraft specification document and establish requirements for overall spacecraft-level testing, plan and conduct spacecraft-level tests, evaluate test results, certify flight readiness and provide a Payload Design Interface Specification (PDIS) between the platform and the payload.

4.3 Integrate the M3 instrument onto the Chandrayaan-1 platform, perform functional and environmental testing, and launch the spacecraft from the Indian launch facility.

4.4 Carry out end-to-end, system-level testing by performing functional tests of the satellite, including providing assistance with testing of the M3 instrument data telemetry with NASA-provided ground control and data archival centers.

4.5 Provide ground support equipment and qualified personnel at appropriate sites to support instrument and system integration, testing, launch, and operations.

4.6 Perform checkout of the Chandrayaan-1 spacecraft during the launch campaign.

4.7 Operate the spacecraft throughout the life of the mission.

4.8 Design, fabricate, test, and operate the Chandrayaan-1 Mission Control Center (MCC).

4.9 Receive, process, archive, and provide to JPL raw and processed M3 instrument data and related spacecraft data upon receipt as specified in the Chandrayaan-1 /M3 Implementation Plan.

4.10 Perform system-level testing between the spacecraft and the MCC including joint testing with the NASA-provided M3 POC workstation located at JPL.

4.11 Perform evaluation and calibration activities, as agreed, after launch and according to a schedule defined in the Chandrayaan-1 M3 Implementation Plan, to verify the performance achieved in lunar orbit.

4.12 Perform analysis and validation of M3 telemetry data during the overall mission.

4.13 Arrange with the appropriate Indian research organizations to support and prepare the Indian members of the science teams, Indian scientists, and Indian users to analyze and validate the M3 instrument data and science data products and publish their findings in accordance with Article 7 – Science Team, Article 16 – Science Data Policy, and Article 17 - Publication of Public Information and Results; in particular, in archiving and/or making available, as appropriate, Chandrayaan-1 science data products to the scientific community.

4.14 Inform NASA promptly of any technical or programmatic problems which may affect overall Chandrayaan-1 Mission schedules or performance.

Article 5 - NASA Responsibilities

To implement this cooperative project, NASA shall use reasonable efforts to:

5.1 Provide system engineering and overall system specifications for M3 and develop, with the support of ISRO, the M3 instrument/platform ICD which shall define the NASA/ISRO interfaces that demonstrate compliance to mission requirements.

5.2 Provide requirements for overall M3 instrument-level testing, the planning and conduct of M3 instrument system-level tests, evaluation of test results, and certification of flight readiness.

5.3 Design, fabricate, assemble, and test the M3 instrument.

5.4 Provide information on interfaces of the M3 instrument to the Chandrayaan-1 spacecraft.

5.5 Assemble, integrate, and test the M3 instrument on Chandrayaan-1 spacecraft.

5.6 Design, fabricate, and test the NASA POC and install a replica at the ISSDC.

5.7 Perform end-to-end, system-level testing, including system-level testing between the M3 instrument data telemetry system and the NASA-provided ground system.

5.8 Transport the M3 instrument to the ISRO-designated site, in preparation for satellite integration.

5.9 Provide ground support equipment, including an M3 instrument engineering model and qualified personnel at appropriate sites, to support satellite and system integration, testing, launch, and operations.

5.10 Provide the necessary plan and procedure to ISRO for carrying out M3 instrument operations management.

5.11 Perform M3 evaluation and calibration activities, as agreed, after launch and according to a schedule defined in the Chandrayaan-1 M3 Implementation Plan, to verify the performance achieved on-orbit by the M3 instrument and provide results to ISRO.

5.12 Process and archive M3 instrument data and make the instrument data and science data products available to ISRO via the POC, as required, in a timely manner and in accordance with Article 16 - Science Data Policy.

5.13 Support the U.S. science team members in analyzing and validating M3 science data and science data products and in publishing their findings, in accordance with Article 7 – Science Team, Article 16 – Science Data Policy and Article 17 - Publication of Public Information and Results.

5.14 Inform ISRO promptly of any technical or programmatic problems which may affect the overall Chandrayaan-1 schedules or performance.

Article 6 - Project and Program Management

6.1 A Chandrayaan-1/M3 Joint Steering Group (JSG) shall be established to provide implementation oversight for the M3 instrument. The Chandrayaan-1/M3 JSG shall be composed of the M3 Program Executive and the M3 Program Scientist at NASA Headquarters, the Discovery Program Director, and ISRO representatives involved in the development of the Chandrayaan-1 Mission. The JSG shall review M3 implementation status and resolve implementation conflicts to facilitate timely delivery of the M3 instrument.

6.2 The NASA M3 PI has assigned mission implementation responsibility to the M3 Mission Management Team (MMT). The M3 Project is part of the Discovery Program which has designated a Mission Manager to oversee the M3 Project. The M3 MMT shall provide end-to-end mission planning and day-to-day management. The MMT shall be located at JPL and shall be led by the NASA/JPL M3 Project Manager who shall serve as interface to the JSG and the Discovery Program.

Article 7 - Science Team

7.1 The M3 Science Team, formed by the NASA M3 PI, shall be responsible for the science management of the M3 experiment on the Chandrayaan-1 Mission. The M3 Science Team shall be the principal scientific forum for instrument oversight, algorithm development, validation of science data, and initial science data evaluation studies. ISRO will select a Co-Investigator on the M3 Science Team, as described in Article 2.2 above.

7.2 Additionally, the Science Team may invite scientists with an expertise in the area to perform science data evaluation. The Parties reserve the right to establish guest investigator programs for science activities related to their respective payloads.

7.3 The M3 PI shall be a member of the ISRO Chandrayaan-1 Science Working Team and shall be responsible for oversight of the M3 Science Team in Chandrayaan-1 science analyses and for coordinating science requirements and plans with other organizations.

7.4 The M3 PI, supported by the Science Team, shall be responsible for the development of the scientific aspects of the experiment and for assuring that the science data products are effectively used and that the results are expeditiously produced and made available, according to Article 16 – Science Data Policy, below.

Article 8 – Chandrayaan-1 M3 Implementation Plan

8.1 The NASA M3 Project Manager shall prepare, in close coordination with the ISRO Chandrayaan-1 Project Director, the Chandrayaan-1 M3 Implementation Plan, which shall then be subject to approval by the Parties. In case of conflict between this Chandrayaan-1 M3 Implementation Plan and the MOU, the MOU shall prevail. This plan shall detail how the M3 contribution to the Chandrayaan-1 Mission will be accomplished, including mission planning, instrument development and delivery, rough description of the interfaces (to be more specifically defined in an Interface Control Document), data flow and downlink options, conduct of mission operations, and data delivery. The delivery process and timeline for M3 data from ISRO shall be defined.

8.2 To ensure mission success, NASA and ISRO shall provide mutual insight into the elements under their respective responsibility, consistent with Article 14 – Transfer of Goods and Technical Data.

8.3 Meetings and reviews required to carry out the responsibilities set forth in this MOU shall also be included in the Chandrayaan-1 M3 Implementation Plan and shall be held periodically in the United States, India, or at other sites as mutually agreed. The Parties agree to invite each other to these meetings and reviews. The reviews shall be chaired by NASA or ISRO, as agreed.

8.4 The Parties shall act in accordance with the schedules to be defined in the M3 Chandrayaan-1 M3 Implementation Plan and to avoid changes that will have a negative effect on the other Party with regard to scientific return, implementation approach, cost, and/or schedule, and where they cannot be avoided, to minimize these negative effects. To the extent that changes made by NASA or ISRO to the Chandrayaan-1 M3 Implementation Plan cause schedule or other problems that go beyond either Party's program constraints, the NASA Instrument Project Manager

and ISRO Chandrayaan-1 Project Director shall discuss potential options to address such problems and submit their proposal to NASA and ISRO Management.

Article 9 – Mission Reviews, Integration, and Flight Readiness

9.1 To implement the M3 experiment, there shall be a series of reviews to evaluate the readiness of the flight and ground segments to proceed to implementation, integration, test, and final launch preparation. Representatives from both Parties shall serve on the boards of these reviews, in particular, the Readiness and Pre-Ship Review boards. Both Parties shall furnish engineering and programmatic data and shall participate in these mission reviews, as mutually agreed.

9.2 NASA and ISRO shall jointly make a final determination of the overall readiness to proceed with integration of the payload to the spacecraft.

Article 10 - Exchange of Personnel

Each of the Parties shall facilitate the movement of persons necessary to implement this MOU into and out of its country subject to its laws and regulations. To facilitate coordination related to the Chandrayaan-1 Mission, the Parties may exchange a limited number of liaison visits from each Party, at times and under conditions as mutually agreed by the NASA M3 Project Manager and ISRO Chandrayaan-1 Project Director pursuant to necessary administrative authorizations. In the event of such an exchange, the Parties each shall provide necessary office space and administrative support at the host location, including such additional support services as may be agreed by the Parties. Salary and all other personnel expenses and living and travel expenses shall be borne by the employing Party of the liaison(s) throughout the duration of their assignment.

Article 11 - Funding

Each Party shall bear the costs of discharging its respective responsibilities under this MOU, including travel and subsistence of each Party's personnel and transportation of its own equipment and associated documentation. The obligations of the Parties under this MOU are subject to their respective funding procedures and the availability of appropriated funds.

Article 12 - Customs and Taxes

Each Party shall facilitate the arrangement of free customs clearance and waiver of applicable duties and taxes for equipment and related goods necessary for the implementation of this MOU. Such facilitation of arrangements shall be fully reciprocal. In the event that any customs fees and/or taxes of any kind are still levied on the equipment and related goods for implementation of this MOU, after seeking to develop the necessary free customs clearance and waiver of applicable duties and taxes, such customs fees and/or taxes shall be borne by the Party of the country levying the fees

and/or taxes.

Article 13 - Ownership of Elements and Equipment

For the purposes of this MOU, each Party shall retain ownership of elements and equipment it furnishes to the other Party. Any equipment not launched into space shall be returned to the furnishing Party expeditiously, as mutually agreed. Each Party shall transport its equipment to the designated delivery points, as specified in the Chandrayaan-1 M3 Implementation Plan, and, where appropriate, from such delivery points, when the equipment is to be returned to the furnishing Party.

Article 14 - Transfer of Goods and Technical Data

The Parties are obligated to transfer only those technical data (including software) and goods necessary to fulfill their respective responsibilities under this MOU, in accordance with the following provisions, notwithstanding any other provision of this MOU:

14.1 All activities of the Parties shall be carried out in accordance with their national laws and regulations, including those pertaining to export control and the control of classified information.

14.2 The transfer of technical data for the purpose of discharging the Parties' responsibilities with regard to interface, integration, and safety shall normally be made without restriction, except as provided in paragraph 14.1 above.

14.3 All transfers of goods and proprietary or export-controlled technical data are subject to the following provisions. In the event a Party or its related entity (e.g., contractor, subcontractor, grantee, cooperating entity) finds it necessary to transfer goods or to transfer proprietary or export-controlled technical data, for which protection is to be maintained, such goods shall be specifically identified and such proprietary or export-controlled technical data shall be marked. The identification for goods and the marking on proprietary or export- controlled technical data shall indicate that the goods and proprietary or export-controlled technical data shall be used by the receiving Party or related entities only for the purposes of fulfilling the receiving Party's or related entity's responsibilities under this MOU, and that the identified goods and marked proprietary technical data or marked export-controlled technical data shall not be disclosed or retransferred to any other entity without the prior written permission of the furnishing Party or its related entity. The receiving Party or related entity shall abide by the terms of the notice and protect any such identified goods and marked proprietary technical data or marked export-controlled technical data from unauthorized use and disclosure. The Parties to this MOU shall cause their related entities to be bound by the provisions of this Article related to use, disclosure, and retransfer of goods and marked technical data through contractual mechanisms or equivalent measures.

14.4 All goods exchanged in the performance of this MOU shall be used by the receiving Party or related entity exclusively for the purposes of the MOU. Upon completion of the activities under the MOU, the receiving Party or related entity shall return or, at the request of the furnishing Party or its related entity, otherwise dispose of all goods and marked proprietary technical data or marked export-controlled technical data provided under this MOU, as directed by the furnishing Party or related entity.

Article 15 - Intellectual Property

15.1 For the purposes of this Article, "Related Entity" includes but is not limited to contractors, subcontractors, grantees, or cooperating entities (or any lower tier contractor, subcontractor, grantee, or cooperating entities) of a Party.

15.2 PATENTS

15.2.1 Nothing in this Agreement shall be construed as granting, either expressly or by implication, to the other Party any rights to, or interest in, any inventions of a Party or its related entities made prior to the entry into force of, or outside the scope of, this Agreement, including any patents or other forms of protection (in any country) corresponding to such inventions.

15.2.2 Any rights to, or interest in, any invention made in the performance of this Agreement solely by one Party or any of its related entities, including any patents or other forms of protection (in any country) corresponding to such invention, shall be owned by such Party or, subject to paragraph 15.2.4 of this Article, such related entity.

15.2.3 It is not anticipated that there will be any joint inventions made in the performance of this Agreement. Nevertheless, in the event that an invention is jointly made by the Parties in the performance of this Agreement, the Parties shall, in good faith, consult and agree as to: a) the allocation of rights to, or interest in, such joint invention, including any patents or other forms of protection (in any country) corresponding to such joint invention; b) the responsibilities, costs, and actions to be taken to establish and maintain patents or other forms of protection (in any country) for each such joint invention; and c) the terms and conditions of any license or other rights to be exchanged between the Parties or granted by one Party to the other Party.

15.2.4 With respect to any invention created in the performance of this Agreement and involving a related entity, allocation of rights between a Party and its related entity to such invention, including any patents or other forms of protection (in any country) corresponding to such invention, shall be determined by such Party's laws, regulations, and applicable contractual obligations.

15.3 COPYRIGHTS

15.3.1 Nothing in this Agreement shall be construed as granting, either expressly or by implication, to the other Party any rights to, or interest in, any copyrights of a Party or its related entities created prior to the entry into force of, or outside the

scope of, this Agreement.

15.3.2 Any copyrights in works created solely by one Party or any of its related entities, as a result of activities undertaken in performance of this Agreement, shall be owned by such Party or related entity. Allocation of rights between such Party and its related entities to such copyrights shall be determined by such Party's laws, regulations, and applicable contractual obligations.

15.3.3 For any jointly authored work, should the Parties decide to register the copyright in such work, they shall, in good faith, consult and agree as to the responsibilities, costs, and actions to be taken to register copyrights and maintain copyright protection (in any country).

15.3.4 Subject to the provisions of Articles 14 and 17, each Party shall have an irrevocable, royalty free right to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, and authorize others to do so on its behalf, any copyrighted work resulting from activities undertaken in the performance of this Agreement for its own purposes, regardless of whether the work was created solely by, or on behalf of, that Party or jointly with the other Party, and without consulting with or accounting to the other Party.

Article 16 – Science Data Policy

Access to Chandrayaan-1 and M3 science data shall be as follows:

16.1 The Parties shall release scientific data from the M3 to the international scientific community after a period of no longer than 12 months. The 12-month data validation and verification period begins with the receipt, by either Party, of the data from the spacecraft.

16.2 In all cases, the Parties shall provide immediate access to all M3 instrument data and science data products, free of charge, for members of the M3 science team, as well as designated representatives of M3 science team members, including associates, staff, and coworkers. The Parties shall also provide, free of charge, M3 instrument data and science data products to NASA or ISRO-selected participating scientists. The Parties shall have the right to use the data (processed and unprocessed) at any time for support of their respective responsibilities but shall not prejudice the M3 PI and Co-I's first publication rights, which are established in accordance with paragraph 16.1 above.

16.3 After the 12 month validation and verification period, the Parties shall make the data from the M3 instrument, including required calibration and spacecraft data, available to the international scientific community in a form suitable for analysis.

16.4 NASA shall make science data products available to the public and the science community in standard Planetary Data System (PDS) format after the appropriate science calibration and validation. In order to promote rapid access to science data products, some preliminary science data products shall be archived after initial

verification, but prior to full validation, and made available to all users at no more than the cost of fulfilling the user request.

16.5 All M3 instrument data and science data products shall be archived in appropriate NASA data centers and the ISSDC, as defined in the Chandrayaan-1 M3 Implementation Plan. Copies of the M3 science data products shall be exchanged between the Parties.

16.6 The M3 Science Team members (including designated representatives) must provide a report to the Parties on the results of their analysis and validation investigations and the results of their investigations on validated M3 science data.

16.7 Notwithstanding the termination of this MOU, any M3 instrument data and science data products obtained from the M3 experiment (as defined in the Chandrayaan-1 M3 Implementation Plan) shall be archived by NASA for at least 10 years after completion of the Chandrayaan-1 Mission, unless otherwise agreed by the Parties.

16.8 If deemed of interest for scientific analysis of M3 instrument data, the Parties may agree to provide mutual access to correlative data products from other instruments or missions.

16.9 To enhance scientific analysis of Chandrayaan-1 M3 instrument data, research announcements may be issued by the Parties.

16.10 Complementary data from ISRO-provided instruments on the Chandrayaan-1 Mission shall be made available, free of charge, to NASA M3 PI, upon request, for the purpose of collaboration with ISRO.

16.11 Scientific data obtained by Chandrayaan-1 Mission are to be released to the international scientific community in a form suitable for analysis after a period that shall not exceed 1 year. This one year period shall begin with the receipt by the PIs/Co-Is of usable scientific data from the spacecraft in a form suitable for analysis. The period for producing usable scientific data should not nominally exceed 6 months following receipt of data from the spacecraft.

Article 17 - Publication of Public Information and Results

17.1 The Parties retain the right to release public information regarding their own activities under this Agreement. The Parties shall coordinate with each other in advance concerning releasing to the public information that relates to the other Party's responsibilities or performance under this Agreement.

17.2

17.2.1 The Parties shall make the final results obtained from the Chandrayaan-1 Mission available to the general scientific community through publication in appropriate journals or by presentations at scientific conferences as

soon as possible and in a manner consistent with good scientific practices.

17.2.2 Each Party shall have an irrevocable, royalty free right to reproduce, prepare derivative works from, distribute to the public copies of, present publicly, and authorize others to do so on its behalf, the scientific information included in each such publication or presentation for its own purposes. The royalty free right shall exist irrespective of any copyright protection applicable to each such publication or presentation.

17.2.3 Raw data, analyzed data and final results primarily obtained from the Chandrayaan-1 M3 science data, or other scientific information regarding results obtained from the implementation of this Agreement, shall be disclosed by the Party, or its investigators that collected the data, analyzed the data or generated the results, to the other Party prior to any publication or presentation. The first presentation/publication will be done jointly by designated scientists of the Parties.

17.3 The Parties acknowledge that the following data or information does not constitute public information and that such data or information shall not be included in any publication or presentation by a Party under this article without the other Party's prior written permission: 1) data furnished by the other Party in accordance with Article 14 of this Agreement which is export-controlled, classified or proprietary; or 2) information about an invention of the other Party before a patent application has been filed covering the same, or a decision not to file has been made.

Article 18 – Liability

18.1 The purpose of this Article is to establish a cross-waiver of liability between the Parties and their related entities in the interest of encouraging participation in the exploration, exploitation, and use of outer space. This cross-waiver of liability shall be broadly construed to achieve this objective.

18.2 As used in this cross-waiver,

18.2.1 the term "Related Entity" means:

(i) a contractor or subcontractor of a Party at any tier;
(ii) a user or customer of a Party at any tier; or
(iii) a contractor or subcontractor of a user or customer of a Party at any tier.
"Contractors" and "subcontractors" include suppliers of any kind.

18.2.2 the term "damage" means:

(i) bodily injury to, or other impairment of health of, or death of, any person;
(ii) damage to, loss of, or loss of use of any property;

(iii) loss of revenue or profits; or
(iv) other direct, indirect, or consequential damage.

18.2.3 The term "payload" means any property to be flown or used on or in the launch vehicle.

18.2.4 The term "launch vehicle" means an object or any part thereof intended for launch, launched from Earth, or returning to Earth which carries payloads or persons, or both.

18.2.5 The term "Protected Space Operations" means all launch vehicle and payload activities on Earth, in outer space, or in transit between Earth and outer space done in implementation of this MOU. Protected Space Operations begins upon entry into force of this MOU and ends when all activities done in implementation of this MOU are completed. It includes, but is not limited to:

(i) research, design, development, test, manufacture, assembly, integration, operation, disposal, or use of launch or transfer vehicles, payloads, or instruments, as well as related support equipment and facilities and services;
(ii) all activities related to ground support, test, training, simulation, or guidance and control equipment and related facilities or services. "Protected Space Operations" excludes activities on Earth which are conducted on return from space to develop further a payload's product or process for use other than for launch vehicle-related activities necessary to complete implementation of this MOU.

18.3

18.3.1 Each Party agrees to a cross-waiver of liability pursuant to which each Party waives all claims against any of the entities or persons listed in sub-paragraphs 18.3.1 (i) through 18.3.1 (iii) of this section based on damage arising out of Protected Space Operations. This cross-waiver shall apply only if the person, entity, or property causing the damage is involved in Protected Space Operations and the person, entity, or property damaged is damaged by virtue of its involvement in Protected Space Operations. The cross-waiver shall apply to any claims for damage, whatever the legal basis for such claims, against:

(i) the other Party;
(ii) a related entity of the other Party;
(iii) the employees of any of the entities identified in sub-paragraphs (i) and (ii) above.

18.3.2 In addition, each Party shall extend the cross-waiver of liability as set forth in paragraph 18.3.1 of this section to its own related entities by

requiring them, by contract or otherwise, to agree to waive all claims against the entities or persons identified in sub-paragraphs 18.3.1 (i) through 18.3.1 (iii).

18.3.3 For avoidance of doubt, this cross-waiver of liability includes a cross-waiver of liability arising from the Convention on International Liability for Damage Caused by Space Objects of March 29, 1972, where the person, entity, or property causing the damage is involved in Protected Space Operations and the person, entity, or property damaged is damaged by virtue of its involvement in Protected Space Operations.

18.3.4 Notwithstanding the other provisions of this Article, this cross-waiver of liability shall not be applicable to the following:

(i) claims between a Party and its own related entity or between its own related entities;
(ii) claims made by a natural person, his/her estate, survivors, or subrogees for bodily injury, other impairment of health or death of such natural person, except where the subrogee is a Party to this MOU or has otherwise agreed to be bound by the promises of this cross-waiver;
(iii) claims for damage caused by willful misconduct;
(iv) intellectual property claims;
(v) contract claims between the Parties based on the express contractual provisions of this MOU; or
(vi) claims for damage based on a failure of the Parties or their related entities to flow down the cross-waiver.

18.3.5 Nothing in this Article shall be construed to create the basis for a claim or suit where none would otherwise exist.

Article 19 - Registration of Space Objects

ISRO shall request that the Government of India register the Chandrayaan-1 spacecraft as a space object in accordance with the Convention on Registration of Space Objects Launched into Outer Space of January 14, 1975. Registration pursuant to this section shall not affect the rights or obligations of either Party or its Government under the 1972 Convention on International Liability for Damage Caused by Space Objects.

Article 20 – Settlement of Disputes

Any disputes not settled through the mechanisms provided in Article 6 – Project and Program Management, or any other issue concerning the interpretation or implementation of the terms of the MOU that cannot be resolved otherwise, shall be referred to the appropriate level of management of the Parties for consideration and joint amicable resolution.

Article 21 – Entry into Force, Duration, Amendment, and Termination

21.1 This MOU shall enter into force upon signature and remain in force until ten years after the Chandrayaan-1 spacecraft has been launched. This MOU may be amended and extended by written agreement of the Parties. Either Party may terminate this MOU at any time upon at least twelve months written notice to the other Party. In that event, the Parties shall endeavor to minimize negative impacts of such termination on other Parties.

21.2 Termination of the MOU shall not affect a Party's continuing obligations under Articles 6 (Project and Program Management), 13 (Ownership of Elements and Equipment), 14 (Transfer of Goods and Technical Data), 15 (Intellectual Property), 16 (Science Data Policy), 17 (Publication of Public Information and Results), and 18 (Liability), unless otherwise agreed to by the Parties.

FOR THE UNITED STATES NATIONAL AERONAUTICS AND SPACE ADMINISTRATION:

Michael D. Griffin
Administrator

Date: 9 May 2006

Place: Bangalore, India

FOR THE INDIAN SPACE RESEARCH ORGANISATION:

G. Madhavan Nair
Chairman

Date: 9 May 2006

Place: Bangalore, India