

MEMORANDUM OF UNDERSTANDING
BETWEEN THE
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
OF THE
UNITED STATES OF AMERICA
AND THE
JAPAN AEROSPACE EXPLORATION AGENCY
CONCERNING ACTIVITIES RELATED TO THE
SOLAR PHYSICS SATELLITE (SOLAR-B) PROJECT

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PREAMBLE

The National Aeronautics and Space Administration (NASA) of the United States of America and the Japan Aerospace Exploration Agency (JAXA), hereinafter, jointly referred to as "the Parties";

Desiring to extend their cooperation developed in exploration and use of outer space for peaceful purposes;

Recognizing that the Parties initiated cooperation on the SOLAR-B Project under the auspices of the NASA/Institute of Space Science and Astronautical Science of Japan SOLAR-B Interim Agreement concluded on February 3, 2000;

Recalling the Agreement Between the Government of the United States of America and the Government of Japan Concerning the Cross-Waiver of Liability for Cooperation in the Exploration and Use of Space for Peaceful Purposes of April 24, 1995 (the "Cross-Waiver Agreement"), the Exchange of Notes of the same date between the Government of the United States of America and the Government of Japan concerning subrogated claims, and the Agreed Minutes of December 8, 2000, concerning the Cross-Waiver Agreement;

Considering that cooperation on the SOLAR-B Project will enhance the scientific value of the mission and provide mutual benefits; and

Pursuant to the agreement effected by the Exchange of Notes between the Government of the United States of America and the Government of Japan dated June 10, 2005, concerning cooperative activities related to SOLAR-B, hereinafter referred to as the "Exchange of Notes,"

Have agreed to the provisions of this Memorandum of Understanding, hereinafter referred to as the "MOU," as follows:

ARTICLE 1 - PURPOSE

This MOU establishes the terms and conditions under which the Parties shall cooperate on SOLAR-B, a mission with instruments placed into a Sun-synchronous orbit about the Earth to advance understanding of the outer solar atmosphere. This MOU applies to mission development, launch, in-flight and mission operations, data return, and data analysis. The Parties shall cooperate according to Exchange of Notes and this MOU. This MOU shall supersede, in its entirety, the NASA/Institute of Space and Astronautical Science of Japan SOLAR-B Interim Agreement established on February 3, 2000.

ARTICLE 2 - MISSION DESCRIPTION

SOLAR-B is a JAXA mission that follows the highly successful Yohkoh (SOLAR-A) international collaboration. The SOLAR-B International Partnership includes Japan (JAXA), the United States (NASA), the United Kingdom (Particle Physics and Astronomy Research Council, or PPARC), and the European Space Agency (ESA). The primary goal of the mission is to advance understanding of the origin of the outer solar atmosphere, the corona, through study of the coupling between the fine magnetic structure observed at the photosphere and the dynamic processes occurring in the corona. This goal is achieved through the development of a satellite with advanced instrumentation that will be placed into a Sun-synchronous orbit about the Earth where it can make continuous measurements of the Sun's magnetic field and atmospheric dynamics.

The SOLAR-B satellite will be launched on a JAXA M-V launch vehicle from the Kagoshima Space Center in Japan into a Sun-synchronous orbit, currently scheduled to occur in CY2006. The SOLAR-B satellite will carry three telescopes designed to observe the solar atmosphere in the optical, x-ray, and extreme ultraviolet (EUV) spectral regions. The satellite is planned to commence science observations within 2 months after launch. Science observations will be coordinated and supported by science and engineering representatives from members of the SOLAR-B International Partnership. During the planned 3-year primary mission phase, in-depth studies to probe the physics of the solar photosphere, corona, and transition region will be undertaken. Scientific data returned from the satellite will enable generation of high-resolution images in the X-ray, optical waveband, and spatially resolved EUV spectra. Combinations of the images will be used to create filtergrams, magnetograms, and spectroheliograms.

JAXA is to provide the overall mission management. JAXA is also to provide the SOLAR-B satellite, various satellite bus and telescope hardware elements as indicated in Article 3 of this MOU, the SOLAR-B mission operations center in Sagami-hara, Japan, scientific and engineering manpower and facilities to conduct SOLAR-B systems-level integration support, mission operations development, science operations support, and science data analysis support. JAXA is also to provide the resources for primary satellite tracking, command, navigation, and telemetry support for the mission. Through a

separate arrangement between JAXA and ESA, ESA is expected to provide the majority of science telemetry support. NASA will provide launch and early post-launch operations support, including satellite tracking support.

NASA is to provide the instruments and components associated with the three telescopes, as indicated in Article 4 of this MOU, and sufficient scientific and engineering manpower to participate in systems-level integration support, mission operations development, science operations support, and science data analysis support.

In addition, NASA may provide limited science telemetry support for the primary mission phase utilizing NASA ground network facilities.

The NASA-PPARC arrangement was concluded on March 24, 2000, for collaboration on the EUV Imaging Spectrometer (EIS) that will be integrated into the SOLAR-B satellite. JAXA concluded an arrangement on August 11, 2004, with Mullard Space Science Laboratory, which is funded by PPARC, to undertake the development and construction of the EIS instrument.

ARTICLE 3 - JAXA RESPONSIBILITIES

To carry out its responsibilities under this MOU, JAXA shall use reasonable efforts to:

1. Provide overall program management for the Solar-B mission.
2. Design, build, and test the SOLAR-B satellite.
3. Design and build the 0.5-meter diameter Solar Optical Telescope (SOT), which supplies light to a NASA-provided Focal Plane Package (FPP).
4. Design, build, and deliver to NASA the X-Ray Telescope Sensor (XRT-S) and associated XRT-Electronics (XRT-E). These hardware elements will be provided to the Smithsonian Astrophysical Observatory (SAO) in the U.S. for integration into the NASA provided X-Ray Telescope (XRT).
5. Design, build, and install the tip-tilt mirror mechanism that forms the mechanical component of the Correlation Tracker Mechanism (CTM).
6. Design, build, and test the Mission Data Processor (MDP) that controls the operation of the FPP, XRT, and EIS, and that collects and formats the data for transmission to the ground.
7. Launch the SOLAR-B satellite.
8. Provide the SOLAR-B Mission Control Center at the JAXA Sagami-hara facility, including hardware elements to perform the Level 0 mission data processing and archiving functions.

9. Manage flight operations and provide mission operations support.
10. Provide primary tracking, command, satellite navigation, and telemetry support utilizing the JAXA Kagoshima Communications Network.
11. Provide science operations support and science data analysis support for all mission phases.
12. Provide a Visiting Scientist, at no cost, the following support:
 - Work space;
 - Office furniture;
 - Office supplies;
 - Personal computer for work space use, with access to the public Internet and e-mail;
 - Access to local and long distance, including international, telephone and facsimile services to the extent necessary to support the Visiting Scientist's assignment;
 - Normal work space security;
 - Expenses for travel when conducted at the request of JAXA.

ARTICLE 4 - NASA RESPONSIBILITIES

To carry out its responsibilities under this MOU, NASA shall use reasonable efforts to:

1. Design, build, and deliver to JAXA a complete Focal Plane Package (FPP), consisting of the FPP-Sensor (FPP-S), FPP-Electronics (FPP-E), FPP-Power (FPP-PWR), Polarization Modulator Unit (PMU), and the detector and control software for the CTM, to be integrated with the JAXA-provided Optical Telescope Assembly (OTA).
2. Design, build, and deliver to JAXA the stand-alone X-Ray Telescope (XRT), integrating into it the JAXA-provided XRT-Sensor (XRT-S) and XRT-Electronics (XRT-E).
3. Provide major optical components to the EIS to be delivered to PPARC in the United Kingdom, including the Primary Mirror Subassembly, the diffraction grating, the grating slit subassembly, and the extreme ultraviolet filters.
4. Support instrument integration and provide technical assistance as needed to support satellite integration and testing activities.
5. Support mission operations development including preliminary mission design and instrument-level planning and command generation software.

6. Support mission operations, including provision of satellite tracking, during the initial launch phase operations.
7. If funding is available, may provide for an average of two passes per day of science telemetry activities during the primary mission phase using NASA's ground network facilities.
8. Participate in operations for science planning and instrument command generation activities.
9. Provide for the archiving and distribution of mission science data and provide for the limited archiving of instrument science data at the U.S. Principal Investigator's institution to support science investigations.
10. Provide science operations support and science data analysis support for all mission phases.
11. Bear standard costs and expenses associated with a Visiting Scientist's assignment, including salary, living and transportation expenses while working with JAXA in Japan under this MOU.
12. Ensure that the Visiting Scientist understands and has agreed to comply with the terms and conditions of the MOU.

ARTICLE 5 - PROGRAM AND SCIENCE MANAGEMENT

The JAXA SOLAR-B Project Manager shall be responsible for overall management of the SOLAR-B mission. Within the United States, the NASA Marshall Space Flight Center (MSFC) has established the SOLAR-B Project Office headed by a Project Manager. Under the direction of the NASA SOLAR-B Program Executive at NASA Headquarters and the Goddard Space Flight Center (GSFC) Solar Terrestrial Probes (STP) Program Office, and with concurrence from the NASA Solar-B Program Scientist at NASA Headquarters, the MSFC SOLAR-B Project Manager shall be responsible for the overall management and implementation of the NASA portion of the Solar-B collaboration. Under the direction of the NASA SOLAR-B Program Scientist, a designated MSFC SOLAR-B Project Scientist shall be responsible to ensure that the science data acquired by the mission is analyzed, interpreted, and made available to the science community.

The principal points of contact for each Party in the performance of this MOU are designated below:

For NASA: Ms. Victoria Elsbernd
SOLAR-B Program Executive

Science Mission Directorate
NASA Headquarters
300 E Street, SW
Suite 3Q39
Washington, DC 20546
USA
Phone: (202) 358-2499
Fax: (202) 358-3987
E-mail: victoria.elsbernd@nasa.gov

For JAXA: Professor Takeo Kosugi
SOLAR-B Project Manager
Institute of Space and Astronautical Science, JAXA
3-1-1, Yoshinodai, Sagamihara
Kanagawa, 229-8510
Japan
Phone: 81 42 759 8175
Fax: 81 42 759 8526
E-mail: kosugi@solar.isas.jaxa.jp

ARTICLE 6 - SCIENTIFIC DATA VALIDATION AND RIGHTS

Results of the scientific investigations shall be made available to the scientific community in general through publication in appropriate journals or other established channels, as mutually agreed. Within 2 weeks of receipt, JAXA shall archive and make available to NASA and its sponsored science investigators all Level-0 scientific data. Within 6 months of receipt, JAXA shall permit the open distribution of all Level-1 scientific data from the NASA-sponsored data site(s). NASA shall be responsible for providing for the long-term archiving and distribution of all available scientific data. In the event that the results of the joint scientific investigations are copyrighted, the Parties shall have a royalty-free right under the copyright to reproduce, distribute, and use such copyrighted work for their own purposes.

ARTICLE 7 - EXCHANGE OF TECHNICAL DATA AND GOODS

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:

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

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 1 above.
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 will indicate that the goods and proprietary or export-controlled technical data shall be used by the receiving Party or its related entities only for the purposes of fulfilling the receiving Party's or its 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 its 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 will 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.
4. All goods exchanged in the performance of this MOU shall be used by the receiving Party or its related entity exclusively for the purposes of the MOU. Upon completion of the activities under the MOU, the receiving Party or its 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 its related entity.

ARTICLE 8 - INVENTIONS AND PATENT RIGHTS

1. 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 for activities conducted under this MOU.
2. In the event that an invention is jointly made by employees of the Parties, their contractors, or subcontractors during the implementation of this MOU, the Parties shall consult and agree as to the responsibilities and costs of actions to be taken to establish and maintain patent protection (in any country) for such invention and on the terms and conditions of any license or other rights to be exchanged or granted by or between the Parties.

ARTICLE 9 - FINANCIAL ARRANGEMENTS

The Parties shall be responsible for funding their respective activities under this MOU, including travel and subsistence of their own personnel and transportation of all equipment for which it is responsible. Obligations under this MOU shall be subject to its funding procedures and the availability of appropriated funds. Should either Party encounter budgetary problems that may affect the activities to be carried out under this MOU, the Party encountering the problems will notify and consult with the other Party as soon as possible.

ARTICLE 10 - ALLOCATION OF RISKS

1. The Agreement Between the Government of the United States of America and the Government of Japan Concerning Cross-Waiver of Liability for Cooperation in the Exploration and Use of Space for Peaceful Purposes of April 24, 1995 (hereinafter referred to as "Cross-Waiver Agreement"), the Exchange of Notes of the same date between the Governments of the United States of America and Japan concerning subrogated claims and the Agreed Minutes of December 8, 2000, concerning the Cross-Waiver Agreement shall apply to activities under this MOU.
2. JAXA shall purchase insurance coverage to hold harmless the Government of the United States of America, NASA, and its related entities against liability arising from subrogated claims of the Government of Japan against the Government of the United States of America, NASA, and its related entities based on damage arising from activities undertaken pursuant to this MOU. In any event, JAXA shall ensure that the Government of the United States of America, NASA, and its related entities are reimbursed for any costs incurred by them relating to any such claims. NASA waives all claims, including subrogated claims, of the Government of the United States of America against the Government of Japan, JAXA, and its related entities based on damage arising from activities undertaken pursuant to this MOU.

ARTICLE 11 - MISHAP INVESTIGATION

In the case of a mishap or mission failure, the Parties shall provide assistance to each other in the conduct of any investigation, bearing in mind, in particular, the provisions of Article 7.1. In the case of activities which might result in the death of, or serious injury to, persons or substantial loss of, or damage to, property as a result of activities under this MOU, the Parties shall agree to establish a process for investigating each such mishap.

ARTICLE 12 - PERSONNEL EXCHANGES

Each Party shall, as appropriate, assist with the provision of entry and residence documentation for the other Party's personnel who enter, exit, or temporarily reside within its country's territory for the purpose of carrying out the activities covered by this MOU.

ARTICLE 13 - CUSTOMS CLEARANCE AND TAXES

Subject to the laws and regulations of the Parties' respective countries, each Party will seek to arrange free customs clearance and waiver of applicable duties and taxes for equipment and related goods necessary for the implementation of this MOU. In the event that any customs duty, fees, and/or taxes of any kind are levied on the equipment and related goods for the implementation of this MOU, after seeking the necessary free customs clearance and waiver of applicable duties and taxes, such customs duty, fees and/or taxes will be borne by the Party of the country levying the duty, fee, and/or taxes. Such arrangements will be reciprocal and will be implemented in accordance with the respective laws and regulations in each country.

ARTICLE 14 - RELEASE OF GENERAL INFORMATION TO THE PUBLIC

Releases of general information to the public regarding this Project may be made by the appropriate Party for its own portion of the Project as desired. Insofar as participation of the other Party is involved, the Parties will seek to consult with each other prior to any releases, consistent with relevant laws and policies.

ARTICLE 15 - OWNERSHIP OF EQUIPMENT

Any equipment provided by NASA pursuant to this MOU shall remain the property of NASA. Any equipment provided by JAXA pursuant to this MOU shall remain the property of JAXA.

ARTICLE 16 - SETTLEMENT OF DISPUTES

Pursuant to paragraph 4 of the Exchange of Notes, the Parties will consult promptly with each other on all issues involving the interpretation or implementation of this MOU.

Any matter that has not been settled in accordance with the above paragraph shall be referred to the appropriate JAXA SOLAR-B Project Manager and the NASA, MSFC SOLAR-B Project Manager. They will attempt to resolve all issues arising from the implementation of this MOU. If they are unable to come to an agreement on any issue,

then the dispute will be referred to the NASA Administrator and the JAXA President, or their designated representatives, for joint resolution.

ARTICLE 17 - REGISTRATION OF SPACE OBJECTS

JAXA shall request the Government of Japan to register the SOLAR-B satellite as a space object in accordance with the Convention on the Registration of Objects Launched into Outer Space of January 14, 1975 (the Registration Convention). Registration pursuant to this Article 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 18 - AMENDMENTS

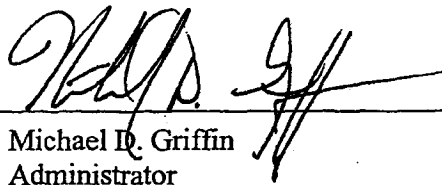
This MOU may be amended by written agreement of the Parties.

ARTICLE 19 - ENTRY INTO FORCE, DURATION, AND TERMINATION

1. This MOU shall enter into force upon signature by the Parties and shall remain in force for 8 years, unless extended by mutual written agreement and provided that the Exchange of Notes remains in force.
2. Either Party may terminate this MOU at any time upon giving at least 12 months prior written notice to the other Party of its intent to terminate. In that event, the Parties will endeavor to reach agreement on terms and conditions to minimize negative impacts on the other Party. Termination of this MOU shall not affect a Party's continuing obligations under the following Articles of this MOU: Scientific Data Validation and Rights, Exchange of Technical Data and Goods, Inventions and Patent Rights, Allocation of Risks, and Customs Clearance and Taxes, unless otherwise agreed by the Parties.

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

FOR THE JAPAN AEROSPACE
EXPLORATION AGENCY:



Michael D. Griffin
Administrator

Date: June 21, 2005

Place: Washington, DC



Keiji Tachikawa
President

Date: June 23, 2005

Place: Tokyo, Japan

I CERTIFY THIS TO BE A TRUE COPY OF THE SIGNED
ORIGINAL.

