[1] Office of the Administrator APR 6, 1984

Mr. Kenneth Baker, MP
Minister of State for Industry with Special Responsibility
for Space and Information Technology
Department of Industry
Ashdown House
123 Victoria Street
London SWIE 6RB
UNITED KINGDOM

Dear Mr. Minister:

Having recently returned from my visit to Europe, Japan and Canada, I wish to take this opportunity to summarize my impressions of the trip and to express my appreciation for your generous hospitality. Overall, I was extremely pleased by the reactions I received to President Reagan's Space Station initiative. Government and industry leaders at each of my stops exhibited great interest in the possibilities for an international Space Station. I believe this reflects the successful legacy of cooperation already established among us in the space age, as well as the groundwork we have laid together over the past two years for embracing this challenge. I hope you feel as I do that our discussions were quite useful for getting the dialogue started for our next step in the planning process. I am quite optimistic about the prospects for international cooperation on the Space Station project, and will soon be sharing these views with the President.

As we discussed, the President believes that international participation in the manned Space Station program can provide a highly positive centerpiece for demonstrating Free World unity, goodwill and technological progress. He has proposed that the international Space Station be discussed at the London Economic Summit with an eye towards agreement in principle that Summit partners will participate in the development of the station. A Summit declaration will serve us all well by establishing the political underpinnings for this joint technological venture. With this firm basis for our collaboration, we will be able to arrange mechanisms that will allow us to interact more closely during the planning phase of the Space Station project.

I believe that our working closely together over the next year is extremely important. This will ensure that our respective planning activities and definition studies are [2] complementary. During the next two years, NASA will conduct an extended definition phase study of the Space Station in order to design the Station best capable of meeting requirements, facilitating management and providing flexibility for growth. As time goes on, there will be less and less flexibility in the Space Station design to accommodate the interests and needs of potential partners. Early participation in the planning process, either directly or through ESA, is therefore essential. I believe insight into this planning process will allow participants to hone their ideas for participation; it will also allow them to speak directly to their proposals so that the final Space Station design can accommodate them.

As I mentioned, NASA will hold frequent international workshops over the next two years to permit this cross-fertilization to occur. We will hold the first such workshop in June at which time we can all review our activities. For our part, we will brief you on our preparation of the domestic U.S. "Request for Proposals" for Phase B. These RFP's will cover the $8B fully functional Space Station that the U.S. will provide. As I described to you, President Reagan has committed the U.S. to building an $8B fully functional Space Station to be operational by the early 1990's, but has also set the stage for working togeth-

er to develop a more expansive international Space Station with even greater benefits and capabilities for us all to use. Thus, we are inviting your Government to take a close look at our plans and concepts and then, based on your long-term interests and goals, share with us your ideas for cooperation that will expand the capabilities of the Space Station.

Also during the June meeting, we will discuss additional mechanisms for working together over the next two years. In the course of my trip, I heard many proposals for such mechanisms which we are currently evaluating. Mr. Kenneth Pedersen, NASA Director of International Affairs, will be contacting you in the near future with the necessary details on the June meeting.

During the past 18 months, we have worked hard to make sure that our Space Station concepts are compatible with and responsive to user communities. We will continue this emphasis in the next two years of planning as well as throughout the lifetime of the Space Station program. As I mentioned, the U.S. is committed to maintaining a strong space science and applications program. I have received a commitment from the President that the NASA budget will grow 1% per year in real terms in order to maintain a balanced space program. Indeed, this year, the President requested Congress to authorize two new starts in space science along with the Space Station.

Because I understand that the relationship between scientific objectives and the Space Station program is [3] important to you, I would be pleased for you to designate an observer to our Space Station Science Advisory Committee, chaired by Professor Peter Banks, which was recently established to assist NASA in scientific planning for the Space Station. As you know, ESA has already designated two observers, so you may wish to work through them. The first meeting of the Banks Committee will take place at NASA Headquarters on April 25 and 26. A second meeting is planned in June. There will also be a week-long workshop held later this summer. One of the key early objectives of the Committee is to influence the Space Station Phase B RFP so that the Space Station is designed to optimize space science and application uses. In addition, an Industrial Committee similar to the Peter Banks Committee will be established to ensure that the Space Station maximizes the commercial opportunities of space, another important objective that we all share. We will welcome observers on that Committee, as well. Once we agree more formally on our respective activities during the planning phase, then we would look forward to having our partners as permanent members on both Committees.

Another topic which we discussed is the importance of protecting against the unwarranted transfer of technology. Technology transfer has been an increasing concern on all our parts in the past few years, and we will need to work together to make sure we are protecting our respective technology bases in this partnership. Major international partners in the Space Station will receive assured access to the Station. Therefore, protection of intellectual property is a prime requirement if we are to stimulate private sector investment and involvement in this program over the long term.

During my trip I was also asked frequently about the extent of U.S. military involvement in the U.S. Space Station. The U.S. Space Station program is a civil program which will be funded entirely out of NASA's budget, with no national security funds to be used. While the Defense Department worked with NASA in the early planning for [the] Space Station by reviewing their near- and long-term requirements for space, they concluded they had no requirements for a manned Space Station. NASA, therefore, constructed its proposal to the President on the basis of civil and commercial requirements. The Space Station that the President directed NASA to build is a civil Space Station. Of course, like the Shuttle, the Space Station will be available for users. If there are any national security users, like national and international users, they will be able to pay to use the facility. As provided in the Outer Space Treaty, however, all activity on the Space Station will be limited to peaceful, non-aggressive functions.

Finally, on behalf of the U.S. Delegation, I would like to thank you for your gracious hospitality during our visit. I especially appreciated your giving me the opportunity to meet [4] numerous U.K. Government and industrial representatives at the fine luncheon you hosted. It was a pleasure seeing you, and I am looking forward to seeing you again soon in the near future.

With warm personal regards.

Sincerely,

James M. Beggs
Administrator

Document I-35

Document title: Dale D. Myers, NASA, and Reimar Leust, European Space Agency (ESA), "Memorandum of Understanding Between the United States National Aeronautics and Space Administration and the European Space Agency on Cooperation in the Detailed Design, Development, Operation and Utilization of the Permanently Manned Civil Space Station," September 29, 1988.

Source: NASA Historical Reference Collection, NASA History Office, NASA Headquarters, Washington, D.C.

This NASA-ESA memorandum of understanding (MOU) and two similar documents—one between NASA and the Science and Technology Agency of Japan and the other between NASA and the Canadian Ministry of State for Science and Technology—contained the detailed agreements that would guide the international partners during the lifetime of the space station program. The MOUs were the end product of lengthy and contentious negotiations between NASA and its potential station partners. These MOUs operated within a policy and legal framework established by a multilateral intergovernmental agreement signed at the same time by representatives of the governments (rather than of the respective space agencies). The intergovernmental agreement and the three MOUs established the most ambitious experiment in international technological cooperation ever undertaken.

Memorandum of Understanding Between the United States National Aeronautics and Space Administration and the European Space Agency on Cooperation in the Detailed Design, Development, Operation and Utilization of the Permanently Manned Civil Space Station

[1] The National Aeronautics and Space Administration (hereinafter "NASA") and the European Space Agency (hereinafter "ESA"),

Recalling that in his State of the Union Address of January 25, 1984, the President of the United States directed NASA to develop and place into orbit within a decade a permanently manned Space Station and invited friends and allies of the United States to participate in its development and use and to share in the benefits thereof, in order to promote peace, prosperity and freedom,

Recalling the terms of Resolution Number 2 adopted on 31 January 1985 by the ESA Council meeting at ministerial level on participation in the Space Station program,

Recalling the terms of Resolution Number 2 adopted on 10 November 1987 by the ESA Council meeting at ministerial level on participation in the Space Station program,

Recalling the NASA Administrator's letter of April 6, 1984, to the ESA Director General,

Having successfully implemented the Memorandum of Understanding between NASA and ESA for the Conduct of Parallel Detailed Definition and Preliminary Design Studies (Phase B) Leading toward Further Cooperation in the Development, Operation and Utilization of a Permanently Manned Space Station, which entered into force on June 3, 1985,

Considering the Agreement among the Government of the United States of America, Governments of Member States of the European Space Agency, the Government of Japan and the Government of Canada on Cooperation in the Detailed Design, Development, Operation and Utilization of the Permanently Manned Civil Space Station (hereinafter "the Intergovernmental Agreement") and particularly Article 4 thereof,

[2] Considering the Memorandum of Understanding between NASA and the Science and Technology Agency of Japan (STA) for the Cooperative Program Concerning Detailed Definition and Preliminary Design Activities of a Permanently Manned Space Station, which entered into force on May 9, 1985, and the Memorandum of Understanding between NASA and the Ministry of State for Science and Technology of Canada (MOSST), for a Cooperative Program Concerning Detailed Definition and Preliminary Design (Phase B) of a Permanently Manned Space Station, which entered into force on April 16, 1985,

Considering the Memorandum of Understanding between NASA and the Government of Japan (the GOJ) on Cooperation in the Detailed Design, Development, Operation and Utilization of the Permanently Manned Civil Space Station and recognizing that the GOJ has designated STA in that Memorandum of Understanding as its Cooperating Agency, as provided for in Article 4 of the Intergovernmental Agreement,

Considering also the Memorandum of Understanding between NASA and MOSST on Cooperation in the Detailed Design, Development, Operation and Utilization of the Permanently Manned Civil Space Station,

Convinced that this cooperation among NASA, ESA, STA and MOSST implementing the provisions established in the Intergovernmental Agreement will further expand cooperation through the establishment of a long-term and mutually beneficial relationship and will further promote cooperation in the exploration and peaceful use of outer space,

Have agreed as follows:

Article 1 - Purpose and Objectives

1.1. The purpose of this Memorandum of Understanding (MOU) is, pursuant to Article 4 of the Intergovernmental Agreement and on the basis of genuine partnership, to establish arrangements between NASA and ESA (hereinafter "the Parties") implementing the provisions of the Intergovernmental Agreement concerning the detailed design, development, operation and utilization of the permanently manned civil Space Station for peaceful purposes, in accordance with international law. In drafting this MOU, the Parties intended it to be consistent with the provisions of the Intergovernmental Agreement. This MOU will be subject to the provisions of the Intergovernmental Agreement. It defines [3] the nature of the genuine partnership, including the respective rights and obligations of the Parties to this MOU.

1.2. The specific objectives of this MOU are:

– to detail the roles and responsibilities of NASA, ESA, STA and MOSST (hereinafter the "partners") in the detailed design, development, operation and utilization of the Space Station and also to record the commitments of NASA and ESA to each other and to STA and MOSST;

– to establish the management structure and interfaces necessary to ensure effective planning and coordination in the conduct of the detailed design, development, operation and utilization of the Space Station;

– to provide a framework that maximizes the total capability of the Space Station to accommodate user needs and that ensures that the Space Station is operated in a manner that is safe, efficient and effective for both Space Station users and Space Station operators; and

– to provide a general description of the Space Station and the elements comprising it.

1.3. Relevant definitions and explanations are to be found in Article 22.

Article 2 - General Description of the Space Station

2.1. NASA has a Space Station program which will produce a core U.S. Space Station. ESA has a Columbus program, and STA and MOSST also have space programs to produce significant elements which, together with the core U.S. Space Station, will create an international Space Station complex with greater capabilities that will enhance the use of space for the benefit of all participating nations and humanity. MOSST's contribution will be an essential part of the infrastructure of the permanently manned civil international Space Station complex (hereinafter "the Space Station").

2.2. The Space Station will be a unique, multi-use facility in low-Earth orbit, comprising both manned and unmanned elements: a permanently manned base comprising elements provided by all the partners; unmanned platforms in near-polar orbit; a man-tended free-flying laboratory to be serviced at the manned base; and Space Station-unique ground elements to support the operation and utilization of the elements on orbit.

[4] 2.3. The Space Station will enable its users to take advantage of human ingenuity in connection with its low-gravity environment, the near-perfect vacuum of space and the vantage point for observing the Earth and the rest of the Universe. Specifically, the Space Station and its evolutionary additions could provide for a variety of capabilities, for example:

– a laboratory in space, for the conduct of science and applications and the development of new technologies;

– a permanent observatory, with elements in low inclination and near-polar orbits, from which to observe Earth, the Solar System and the rest of the Universe;

– a transportation node where payloads and vehicles are stationed, assembled, processed and deployed to their destination;

– a servicing capability from which payloads and vehicles are maintained, repaired, replenished and refurbished;

– an assembly capability from which large space structures and systems are assembled and verified;

– a research and manufacturing capability in space, where the unique space environment enhances commercial opportunities;

– an infrastructure to encourage commercial investment in space;

– a storage depot for consumables, payloads and spares; and

– a staging base for possible future missions, such as a permanent lunar base, a manned mission to Mars, unmanned planetary probes, a manned survey of the asteroids, and a manned scientific and communications facility in geosynchronous orbit.

Article 3 - Space Station Elements

3.1. The Space Station will consist of elements comprising both flight elements and Space Station-unique ground elements. The elements are summarized in the Annex to the Intergovernmental Agreement and are further elaborated in this Article. Their requirements are defined and controlled in appropriate program documentation as provided for in Article 7.

[5] 3.2. NASA Space Station Flight Elements: NASA will design, develop and provide the following flight elements including subsystems, the Extra Vehicular Activity (EVA) system, the Space Station Information System, flight software and spares as required:

– one permanently attached Habitation Module with complete basic functional outfitting to support habitation for a crew of up to eight, including primary storage of crew provisions

– one permanently attached multipurpose Laboratory Module, located so as to contain the center of gravity of the manned base, with complete basic functional outfitting and including provisions for storage of NASA spares, secondary storage of crew provisions, and storage for safe haven capability

– two sets of Attached Payload Accommodation Equipment for accommodation of payloads externally attached to the Space Station Truss Assembly

– four Resource Nodes which provide pressurized volume for crew and equipment, connections between manned base pressurized elements and support of pressurized attached payloads

– Truss Assembly which is the manned base structural framework

– Solar Photovoltaic Power Modules which serve as the manned base electrical power source, providing 75kw of total power

– Propulsion Assembly

– at least three sets of Logistics Elements (pressurized and unpressurized Integrated Logistics System carriers) which provide systems operation support and user ground-to-orbit and return logistics and on-orbit supply for extended periods

– Airlock/Hyperbaric Airlock for purposes of crew and equipment transfer

– one Flight Telerobotic System (FTS)

– one Mobile Transporter which will serve to provide translation capability for the Mobile Servicing Center

– one Polar Platform to work together with the ESA-provided Polar Platform

[6] 3.3. ESA Space Station Flight Elements: ESA will design, develop and provide the following flight elements including subsystems, flight software and spares as required:

– one Attached Pressurized Module (APM), with volume equivalent to that of four Spacelab segments, permanently attached to the manned base, with complete basic functional outfitting and including provisions for storage of ESA spares, secondary storage of crew provisions, and storage for safe haven capability

– one Polar Platform to work together with the NASA-provided Polar Platform

– one Man-Tended Free Flyer (MTFF), including a pressurized module, with volume equivalent to that of two Spacelab segments, capable of autonomous operational periods of six months or longer

3.4. STA and MOSST Space Station Flight Elements: As reflected in the MOU between NASA and the GOJ and in the MOU between NASA and MOSST:

3.4.a. STA Space Station Flight Elements: STA will design, develop and provide the following flight elements including subsystems, flight software and spares as required:

– one Japanese Experiment Module (JEM), a permanently attached multipurpose research and development laboratory, consisting of a pressurized module and an Exposed Facility, at least two Experiment Logistic Modules, and including a scientific equipment airlock, the JEM remote manipulator and IVA control/monitoring of the JEM Remote Manipulator System (JEM-RMS), with complete basic functional outfitting, including provisions for storage of STA spares, secondary storage of crew provisions, and storage for safe haven capability

3.4.b. MOSST Space Station Flight Elements: Canadian elements will be developed to play the predominant role in satisfying the following functions for the Space Station:

– attached payload servicing (external)
– Space Station assembly
– Space Station maintenance (external)
– transportation on Space Station
– deployment and retrieval functions
– EVA support

3.4.b.1. MOSST will design, develop and provide the following flight elements, including subsystems, flight software and spares as required:

[7] – one Mobile Servicing Center (MSC) which comprises a Mobile Remote Servicer (MRS) and the NASA-provided Mobile Transporter

– one MSC Maintenance Depot (MMD), primarily for maintenance of the MSC, including external storage of MOSST element spares. (Necessary internal storage of MOSST element spares will be provided in the NASA-provided elements.)

– one Special Purpose Dexterous Manipulator (SPDM)

3.5. Space Station-unique ground elements will be provided by NASA, ESA and the other partners. These elements will be adequate to support the design and development (including assembly and verification), the continuing operation and the full international utilization of each partner's flight elements listed above. The requirements for these elements will be defined and controlled in appropriate program documentation as provided for in Article 7.

3.5.a. NASA will provide the following Space Station-unique ground elements to support the flight elements listed in Article 3.2: equipment required for specialized or unique integration or launch; ground support equipment (GSE) and flight support equipment (FSE) including necessary logistics; engineering support centers and user support centers; a polar platform control center; and test equipment, mock-ups, simulators, crew training equipment, software and any facilities necessary to house these items. To support the Space Station as a whole, NASA will provide Space Station-unique ground elements including the Space Station Control Center (SSCC), the Payload Operations Integration Center (POIC), subsystem testbeds and elements related to logistics support and to software development including the Software Support Environment.

3.5.b. As will be agreed and documented in the program documentation as provided for in Article 7, ESA will provide, at defined locations, a defined capacity of the following Space Station-unique ground elements to support the ESA flight elements listed in Article 3.3: equipment required for specialized or unique integration or, as the case may be, for launch or return to Earth; GSE and FSE including necessary logistics; operations control centers, engineering support centers and user support centers; and test equipment, mock-ups, simulators, crew training equipment, software and any facilities necessary to house these items.

3.5.c. As reflected in the MOU between NASA end the GOJ and in the MOU between NASA and MOSST, STA and MOSST will provide, at defined locations, a defined capacity of the following Space [8] Station-unique ground elements to support their flight elements listed in Article 3.4: equipment required for specialized or unique integration or, as the case may be, for Launch or return to Earth; GSE and FSE including necessary logistics; engineering support centers and user support centers; and test equipment, mockups, simulators, crew training equipment, software and any facilities necessary to house these items.

Article 4 - Access to and Use of the Space Station

4.1. NASA and ESA will each assure access to and use of their Space Station flight elements listed in Article 3, in accordance with allocation commitments detailed in Articles 8.3.a, 8.3.b, and 8.3.c. Beyond these allocation commitments, the capabilities of the Space Station will be made available to the partners subject to specific arrangement between the relevant partners.
4.2. The partners' utilization of flight elements listed in Article 3 will be equitable, as provided in the allocation commitments set forth in Article 8 of this MOU and of the corresponding MOU's between NASA and the GOJ and between NASA and MOSST.
4.3. In accordance with the procedures in Article 8, NASA and ESA will each assure access to and use of their Space Station-unique ground elements referred to in Article 3.5 by each other and the other partners in order to support fully the utilization of the flight elements in accordance with the Consolidated Operations and Utilization Plan provided for in Article 8.1.c. As provided in Article 8, NASA and ESA will each also assure access to and use of their Space Station-unique ground elements by each other and the other partners for system operations support.
4.4. As requested by ESA for its design and development activities, access to and use of the Space Station-unique ground elements provided by NASA to support the Space Station as a whole will be provided for in appropriate program documentation as provided for in Article 7. Access by ESA and NASA to each other's remaining Space Station-unique ground elements for design and development activities will be subject to specific arrangements on a space-available basis.

[9] *Article 5 - Major Program Milestones*

5.1. The Space Station program of NASA and the Columbus program of ESA each include detailed design and development. The NASA and ESA programs also include Space Station operation and utilization. Because of the extended period required to assemble the Space Station, the design and development activities will overlap the operation and utilization activities. After the completion of detailed design and development which includes assembly of the Space Station and one year of initial operational verification (Phase C/D), mature operations and utilization (Phase E) will begin.
5.2. Major target milestones for the Space Station are as follows:

– Initiation of NASA's Phase C/D	Dec 1987
– Initiation of ESA's Phase C/D	Feb 1988
– NASA-provided Polar Platform Preliminary Design Review	Jan 1989
– First Space Station Element Launch	Jan 1994
– NASA-provided Laboratory Module Launch	Jan 1995

– Permanently Manned Capability	Oct 1995
– NASA-provided Polar Platform Launch	Oct 1995
– ESA-provided APM Launch	Oct 1996
– Completion of Manned Base Assembly	Nov 1996
– ESA-provided Polar Platform Launch	Mar 1997
– Completion of NASA's Phase C/D; Initiation of Phase E	Nov 1997
– First Station Servicing of MTFF	Jun 1998

5.3. NASA and ESA will develop, maintain and exchange coordinated implementation schedules. These schedules, including the dates for the above milestones, the delivery dates for the ESA-provided elements and the assembly sequence for all elements of the Space Station, will be updated as necessary and formally controlled in appropriate program documentation as provided for in Article 7.

Article 6 - Respective Responsibilities

6.1.a. While undertaking the detailed design and development of the Space Station elements described in Articles 3.2 and 3.5.a, and within the scope of the Parties' responsibilities established elsewhere in this MOU, NASA will:

[10] 1. provide overall program coordination and direction;
2. perform overall system engineering and integration and perform system engineering and integration for NASA-provided elements consistent with these responsibilities;
3. establish, in consultation with the other partners, overall verification, safety, reliability, quality assurance and maintainability requirements and plans and develop verification, safety, reliability, quality assurance and maintainability requirements and plans for the NASA-provided elements that meet or exceed these overall requirements and plans, which address the elements in Articles 3.2 and 3.5.5;
4. confirm that the ESA verification, safety, reliability, quality assurance and maintainability requirements and plans for the APM, for the MTFF insofar as it has effects on the manned base associated with its servicing at the manned base, and for the ESA-provided Polar Platform insofar as it has effects on the NASA Space Transportation System (STS) associated with its servicing by the STS, developed by ESA in accordance with Article 6.2.a.5, meet or exceed the overall Space Station verification, safety, reliability, quality assurance and maintainability requirements and plans;
5. provide regular progress and status information on NASA Space Station program activities and plans;
6. provide, as applicable, program information, systems requirements information and technical interface information necessary for the integration of ESA-provided elements described in Article 3.3 into the Space Station and/or the coordinated operation and utilization of ESA-provided elements;
7. develop, with ESA, the agreed joint documentation described in Article 7.1;
8. perform ground integration tests as necessary to assure on-orbit compatibility and perform verification and acceptance tests for the flight elements in Article 3.2 and accommodate ESA representation at such tests as necessary for NASA and ESA to fulfill their respective responsibilities under this MOU;
9. conduct overall Space Station preliminary design reviews, critical design reviews, design certification [11] reviews, safety, reliability and quality assurance reviews, operations readiness reviews and flight readiness reviews in order for NASA to certify, following

the certifications at element level provided by NASA and the other partners, that all Space Station elements to be launched on the STS, including the ESA-provided APM, are acceptable for launch, on-orbit assembly and orbital operations; that the ESA-provided Polar Platform, to be launched on Ariane-5, is acceptable for servicing by STS; and that the ESA-provided MTFF, to be launched by Ariane-5, is acceptable for servicing at the manned base; and accommodate ESA representation as necessary for NASA and ESA to fulfill their respective responsibilities under this MOU;
10. conduct for the elements it provides preliminary design reviews, critical design reviews, design certification reviews, and safety, reliability and quality assurance reviews; and accommodate ESA representatives as necessary for NASA and ESA to fulfill their respective responsibilities under this MOU;
11. support, as appropriate, and provide information necessary for ESA to conduct the reviews identified in Article 6.2.a.11;
12. deliver on-orbit the ESA-provided APM and its initial outfitting in accordance with Article 12 and the assembly sequence controlled in appropriate program documentation as provided for in Article 7; [and] assemble on-orbit and verify interfaces of Space Station flight elements, including the flight elements that ESA will provide, with assistance from ESA, in accordance with agreed assembly, activation and verification plans;
13. assist in the on-orbit activation and performance verification of the APM provided by ESA in accordance with agreed assembly, activation and verification plans;
14. for each NASA-provided flight element, provide necessary ground and flight support equipment and initial spares; and perform qualification and acceptance tests of this equipment according to Space Station program requirements and interfaces as set forth in the documents described in Article 7.1;
15. establish in Europe and accommodate in the U.S. agreed liaison personnel as provided in Article 7.2;
[12] 16. participate with ESA and the other partners in Space Station management mechanisms as provided in Articles 7 and 8, including the development of the Operations Management Plan and the Utilization Management Plan;
17. work with ESA and the other partners to ensure that the Space Station Composite Utilization Plan described in Article 8.3.f can be accommodated by the elements provided by NASA, ESA and the other partners—in particular, work with ESA and the other partners to establish standard interfaces between the elements and user-provided hardware and software; provide standard and special user integration and user operations support as described in Articles 8.3.e, 8.3.h, and 8.3.l to users of the other partners or the other partners as users who are to use the NASA-provided flight elements; perform rack-level physical integration on the ground of NASA users of the APM; plan and conduct user operations; and make available Space Station-unique ground elements to support the Space Station Composite Utilization Plan. In addition, NASA will work with ESA in order that NASA and MOSST, respectively, may establish the capabilities to distribute data to NASA and MOSST users of the APM directly from the NASA Tracking and Data Relay Satellite System (TDRSS) space network and to process NASA and MOSST user commands to the APM through the TDRSS space network;
18. establish in consultation with ESA and the other partners, information format and communication standards for a technical and management information system, and establish and maintain a computerized technical and management information system. This system is to work in conjunction with a compatible ESA computerized information system in accordance with the documents described in Article 7.1;
19. develop a Space Station Information System (SSIS) architecture for the end-to-end data transmission between the Space Station data source and the data user; [and]

establish and maintain a Software Support Environment (SSE), including necessary hardware and Space Station software standards to be established by NASA in consultation with ESA and the other partners, to work in conjunction with an ESA software development facility, in accordance with the documents described in Article 7.1;
20. develop and maintain flight and ground software related to elements it provides in accordance with Space Station software standards described in Article 6.1.a.19;
[13] 21. develop an Integrated Logistics System for the manned base in accordance with the documents described in Article 7.1;
22. provide spares for the NASA-provided elements as required to support assembly and initial operational verification;
23. provide operations support and logistics support for the NASA-provided flight elements; and
24. develop and provide to the System Operations Panel described in Article 8 baseline operations plans and maintenance plans for the NASA-provided elements describing routine systems capabilities and defining maintenance requirements, including logistics requirements, necessary for sustaining their functional performance.

6.1.b. Beginning upon the initiation of Space Station operations and utilization, and within the scope of the Parties' responsibilities established elsewhere in this MOU, NASA will:

1. participate in Space Station management mechanisms and development of documentation as provided in Articles 7 and 8, and in the sharing of Space Station operations costs as provided in Article 9;
2. provide sustaining engineering, spares, operations support and logistics support for the Space Station elements it provides;
3. maintain overall systems engineering, integration and operations support capability for Space Station operations and utilization;
4. provide resupply and logistics management/integration support for Space Station operations;
5. work with ESA and the other partners to prepare and implement plans for the integration and operation of user activities in the Space Station Consolidated Operations and Utilization Plan described in Article 8.1.c. In order to accomplish this, provide standard and special user integration and user operations support as described in Articles 8.3.e, 8.3.h, and 8.3.l; perform rack-level physical integration on the ground of NASA users of the APM; make available its Space Station-unique ground elements to support this Consolidated Plan; support planning for future utilization activities; and, using the capabilities provided for in Article 6.1.a.17, NASA and MOSST, respectively, may distribute data to NASA and MOSST [14] users of the APM directly from the TDRSS space network and process NASA and MOSST user commands to the APM through the TDRSS space network;
6. provide logistics flights for the NASA-provided elements in accordance with Articles 9 and 12, and provide logistics flights for the ESA-provided elements in accordance with Articles 9 and 12;
7. provide the Space Station Control Center and the Payload Operations Integration Center for manned base operations control; a polar platform control center for the NASA-provided Polar Platform; and engineering support centers for the NASA-provided elements as provided in Article 8;
8. maintain the Software Support Environment including hardware and software standards for the support of Space Station operations;

9. maintain its flight and ground software in accordance with the Space Station software standards described in Article 6.1.a.19;
10. upon completion of manned base assembly plus a one-year operational verification period, provide docking, access and servicing for the MTFF at the manned base as required by ESA, however, no more frequently than once every six months; and
11. if appropriate STS capability exists, provide for STS servicing of the NASA-provided Polar Platform and, if ESA selects to use this STS capability and with details to be agreed by NASA and ESA, provide STS servicing of the ESA-provided Polar Platform in accordance with Articles 9 and 12.

6.2.a. While undertaking the detailed design and development of the Space Station elements described in Articles 3.3 and 3.5.b, and within the scope of the Parties' responsibilities established elsewhere in this MOU, ESA will:

1. perform system engineering and integration for the APM consistent with NASA's overall system engineering and integration responsibilities;
2. design the APM to be compatible with the STS and with the Space Station Information System which includes use of TDRSS;
3. design and develop the ESA-provided MTFF; insofar as the MTFF has effects on the manned base associated with its [15] servicing at the manned base, the design and development of the MTFF will comply with otherwise established manned base requirements, capabilities and interfaces, including safety; the MTFF will be capable of autonomous operational periods of six months or longer;
4. design and develop the ESA-provided Polar Platform; insofar as the ESA-provided Polar Platform has effects on the STS associated with its servicing by the STS, its design and development will comply with the operational and safety requirements of the STS;
5. develop, in consultation with NASA, verification, safety, reliability, quality assurance and maintainability requirements and plans for the APM, for the MTFF insofar as it has effects on the manned base associated with its servicing at the manned base, and for the ESA-provided Polar Platform insofar as it has effects on the STS associated with its servicing by the STS that meet or exceed the overall Space Station verification, safety, reliability, quality assurance and maintainability requirements and plans established in Article 6.1.a.3, which address the elements in Articles 3.3 and 3.5.b;
6. provide regular progress and status information on Columbus Program activities and plans;
7. provide, as applicable, program information, systems requirements information and technical interface information necessary to understand the impact of the ESA-provided flight elements on the Space Station configuration and/or on the coordinated operation and utilization of the Space Station, and necessary to integrate those flight elements into the Space Station;
8. develop, with NASA, the agreed joint documentation described in Article 7.1;
9. perform interface verification tests as necessary to assure on-orbit compatibility and perform verification and acceptance tests for the flight elements in Article 3.3, and accommodate NASA representation at such tests as necessary for NASA and ESA to fulfill their respective responsibilities under this MOU;
10. maintain, and provide to NASA on request, ground and on-orbit verification test procedures and results as necessary to assess that the ESA-provided APM complies with overall Space Station program requirements and interface requirements, and, insofar as they have effects on the STS and the manned base, that the [16] ESA-provided Polar Platform and MTFF comply with the operational and safety requirements associated with servicing

of these ESA-provided elements by the STS and at the manned base, respectively, as set forth in the documents described in Article 7.1;
11. conduct for the elements it provides preliminary design reviews, critical design reviews and other reviews as set forth in the documents described in Article 7.1 which will include review of safety, reliability and quality assurance, and accommodate NASA representation as necessary for NASA and ESA to fulfill their respective responsibilities under this MOU;
12. support as appropriate, and provide information necessary for NASA to conduct, the reviews identified in Article 6.1.a.9;
13. support, as appropriate, and provide information necessary for NASA to conduct the reviews identified in Article 6.1.a.10;
14. following design and development of the APM, arrange for the on-orbit delivery of the APM and its initial outfitting in accordance with Article 12 and in accordance with the assembly sequence controlled by appropriate program documentation as described in Article 7;
15. launch and operate the MTFF so that its first servicing at the manned base will be no earlier than the completion of the one-year manned base operational verification period, and launch and operate the ESA-provided Polar Platform;
16. assist in the on-orbit assembly and interface verification of the ESA-provided APM in accordance with agreed assembly, activation and verification plans;
17. activate on-orbit and verify performance of the ESA-provided APM, with assistance from NASA, in accordance with agreed assembly, activation and verification plans; activate on-orbit and verify performance of the ESA-provided MTFF, in accordance with the appropriate program documentation as described in Article 7 which addresses the MTFF insofar as it has effects on the manned base associated with its servicing at the manned base; and activate on-orbit and verify performance of the ESA-provided Polar Platform;
18. for each ESA-provided flight element, provide necessary ground and flight support equipment and initial spares; [17] and perform qualification and acceptance tests of this equipment according to Space Station program requirements and interfaces as set forth in the documents described in Article 7.1;
19. establish in the United States and accommodate in Europe agreed liaison personnel as provided in Article 7.2;
20. participate with NASA and the other partners in Space Station management mechanisms as provided in Articles 7 and 8, including the development of the Operations Management Plan and the Utilization Management Plan;
21. work with NASA and the other partners to ensure that the Space Station Composite Utilization Plan described in Article 8.3.f can be accommodated by the elements provided by NASA, ESA and the other partners—in particular, work with NASA and the other partners to establish standard interfaces between the elements and user-provided hardware and software; provide standard and special user integration and user operations support as described in Articles 8.3.e, 8.3.h, and 8.3.l to users of the other partners or the other partners as users who are to use the ESA-provided flight elements; support and provide information necessary for NASA and MOSST to perform rack-level physical integration on the ground of NASA and MOSST users of the APM; plan and conduct user operations; make available Space Station-unique ground elements to support the Space Station Composite Utilization Plan; and support and provide information necessary for NASA and MOSST, respectively, to establish the capabilities to distribute data to NASA and MOSST users of the APM directly from the TDRSS space network and to process NASA and MOSST user commands to the APM through the TDRSS space network;

22. establish and maintain, in accordance with the documents described in Article 7.1, a compatible computerized technical and management information system to work in conjunction with the NASA computerized information system referred to in Article 6.1.a.18; ESA will be responsible for the provision of necessary hardware and software based on information format and communication standards established by NASA, in consultation with ESA and the other partners;
23. establish and maintain the necessary hardware and software for software production to work in conjunction with the Software Support Environment;
[18] 24. develop and maintain flight and ground software related to elements it provides; for the ESA-provided APM, the development and maintenance of this software will be in accordance with Space Station software standards described in Article 6.1.a.19;
25. provide spares for the ESA-provided elements as required to support initial operational verifications, including assembly for the APM;
26. provide operations support and logistics support for the ESA-provided flight elements; and
27. develop and provide to the System Operations Panel described in Article 8 baseline operations plans and maintenance plans describing routine systems capabilities and defining maintenance requirements, including logistics requirements, necessary for sustaining the functional performance of the ESA-provided APM, for the MTFF insofar as it has effects on the manned base associated with its servicing at the manned base and for the ESA-provided Polar Platform insofar as it has effects on the STS associated with its servicing by the STS.

6.2.b. Beginning upon the initiation of Space Station operations and utilization, and within the scope of the Parties' responsibilities established elsewhere in this MOU, ESA will:

1. participate in Space Station management mechanisms and development of documentation as provided in Articles 7 and 8, and in the sharing of Space Station operations costs as provided in Article 9;
2. provide sustaining engineering, spares, operations support and logistics support for the Space Station elements it provides;
3. work with NASA and the other partners to prepare and implement plans for the integration and operation of user activities in the Space Station Consolidated Operations and Utilization Plan described in Article 8.1.c. In order to accomplish this, provide standard and special user integration and user operations support as described in Articles 8.3.e, 8.3.h, and 8.3.l; support and provide information necessary for NASA and MOSST to perform rack-level physical integration on the ground of NASA and MOSST users of the APM; make available its Space Station-unique ground elements to support this Consolidated Plan; support planning for future utilization activities; and support and provide information necessary for NASA and MOSST, respectively, to distribute data to NASA and MOSST users of the APM [19] directly from the TDRSS space network and to process NASA and MOSST user commands to the APM through the TDRSS space network;
4. arrange for logistics flights related to the ESA-provided elements in accordance with Articles 9 and 12;
5. provide operations control centers and engineering support centers for the ESA-provided APM, Polar Platform and MTFF, as provided in Article 8; and
6. maintain its flight and ground software for the elements it provides; for the ESA-provided APM, the maintenance of this software will be in accordance with Space Station software standards described in Article 6.1.a.19.

Article 7 - Management Aspects of the Space Station Program Primarily Related to Detailed Design and Development

7.1. Management/Reviews

7.1.a. NASA and ESA are each responsible for the management of their respective Space Station Phase C/D activities consistent with the provisions of this MOU. This Article establishes the management mechanisms to coordinate the respective Space Station design and development (including assembly and verification) activities of NASA and ESA, to establish applicable requirements, to assure safe operations, to establish the interfaces between the Space Station elements, to review decisions, to establish schedules, to review the status of activities, to report progress and to resolve issues and technical problems as they arise.

7.1.b. The NASA/ESA Program Coordination Committee (PCC), co-chaired by the NASA Associate Administrator for Space Station and the ESA Director of Space Station and Platforms, will meet periodically throughout the lifetime of the program or promptly at the request of either Party to review the Parties' respective design and development activities. The Co-Chairmen will together take those decisions necessary to assure implementation of the cooperative design and development activities related to Space Station flight elements and to Space Station-unique ground elements provided by the Parties, including, as appropriate, to design changes of the Parties' flight elements during Phase E. In taking decisions regarding design and development, the PCC will consider operation and utilization impacts, and will [20] also consider design and development recommendations from the Multilateral Coordination Board described in Article 8.1.b. However, decisions regarding operation and utilization activities will be taken in accordance with Article 8. The Co-Chairmen will each designate their respective members and will decide on the location of meetings. If the Co-Chairmen agree that a specific design and development issue or decision requires consideration by another partner at the PCC level, the NASA/ESA PCC may meet jointly with the NASA/STA PCC and/or the NASA/MOSST PCC.

7.1.c. Multilateral Program Reviews will be organized by NASA and will meet as necessary at the request of any partner so that the Parties to this MOU and the other partners can report progress and discuss the status of their Phase C/D program activities.

7.1.d. The manned base and NASA-provided Polar Platform requirements, configuration, housekeeping resource allocations for design purposes, and element interfaces will be controlled by the Space Station Control Board (SSCB) chaired by NASA. The SSCB will also control Space Station activities through the completion of assembly and initial operational verification, and other Space Station configuration control activities related to the manned base, related to the MTFF insofar as it has effects on the manned base associated with its servicing at the manned base, and related to the ESA-provided Polar Platform insofar as it has effects on the STS associated with its servicing by the STS. ESA will be a member of the SSCB, and of such subordinate boards thereof as may be agreed, attending and participating when these boards consider items which affect the APM, interfaces between the NASA-provided and the ESA-provided elements, interfaces between the ESA-provided elements and the STS, interfaces between the ESA-provided elements and other partner-provided elements, or the accommodation on the manned base of the Composite Utilization Plan and the Composite Operations Plan described in Article 8. Decisions by the SSCB Chairman may be appealed to the PCC, although it is the duty of the SSCB Chairman to make every effort to reach consensus with ESA rather than have issues referred to the PCC. Such appeals will be made and processed expeditiously. Pending resolution of appeals, ESA need not proceed with the implementation of an SSCB decision

as far as its provided elements are concerned; NASA may, however, proceed with an SSCB decision as far as its provided elements are concerned. NASA will be a member of the Columbus Control Board chaired by ESA, and of such subordinate boards thereof as may be agreed, attending and participating as appropriate. As far as the elements separated from the manned base are concerned, NASA will assume management responsibility for the design and development of the NASA-provided Polar Platform, including meeting requirements related to polar [21] platform user interfaces and polar platform STS servicing; ESA will assume management responsibility for the design and development of the ESA-provided Polar Platform, including meeting requirements related to polar platform user interfaces and polar platform STS servicing; [and] ESA will also assume management responsibility for the design and development of the MTFF and for meeting requirements related to its effects on the manned base associated with its servicing at the manned base.

7.1.e. NASA will develop an overall Program Plan for Space Station design and development based on information provided by all the partners detailing overall program content, implementation approach and schedules. ESA will develop a Columbus Program Plan for design and development detailing ESA program content, implementation approach and schedules. A Joint Program Plan [JPP] for design and development, signed by the NASA Associate Administrator for Space Station and the ESA Director of Space Station and Platforms, will cover the interrelationship between the ESA program and the overall program. Any modification or any addition to the JPP will be approved by the PCC.

7.1.f. NASA will develop a Program Requirements Document (PRD) based on information provided by all the partners providing the programmatic basis for the overall conduct of Phase C/D. A Joint PRD (JPRD), signed by the NASA Associate Administrator for Space Station and the ESA Director of Space Station and Platforms, will represent the top-level requirements related to the APM, the MTFF insofar as it has effects on the manned base associated with its servicing at the manned base and the ESA-provided Polar Platform insofar as it has effects on the STS associated with its servicing by the STS. The JPRD will identify the applicability to the ESA program of all paragraphs in the PRD, including any which are added or modified. Any modification or any addition to the JPRD will be approved by the PCC.

7.1.g. NASA has developed an overall Program Definition and Requirements Document (PDRD) based on information provided by all the partners which contains requirements for Space Station flight element hardware and software and provides the technical basis for the overall conduct of Phase C/D. A Joint PDRD (JPDRD), signed by the NASA Program Director and the ESA Program Manager, contains the detailed requirements related to the APM, the MTFF insofar as it has effects on the manned base associated with its servicing at the manned base and the ESA-provided Polar Platform insofar as it has effects on the STS associated with its servicing by the STS. The JPDRD identifies the applicability to the ESA program of all paragraphs in the PDRD including any which are added or modified. Any modification to the PDRD will be approved by the SSCB. Any modification or any addition to the co-signed JPDRD will be mutually agreed and [22] jointly signed by the NASA Program Director and the ESA Program Manager.

7.1.h. NASA will develop Architectural Control Documents (ACD's) which define and control the end-to-end architecture of the manned base distributed systems and control the interfaces of these systems with each other and with the flight elements. In addition, NASA will develop, in consultation with the appropriate partners, Interface Control Documents (ICD's) which control interfaces between: the flight elements comprising infrastructural elements and the flight elements comprising accommodations elements as defined in Article 8.1.d; between the flight elements comprising infrastructural elements; and, as appropriate, between any other flight elements, between flight and ground

or among ground elements. NASA will also develop a Baseline Configuration Document (BCD) based on information provided by all the partners which controls the configuration of the manned base and of the NASA-provided Polar Platform. The ACD's and the BCD will be developed by the start of NASA's Phase C/D; the ICD's will be developed early in Phase C/D. Any modification or any addition to the ACD's, the BCD and the ICD's will be approved by the SSCB. Joint interface documentation, which identifies the applicability to the ESA-provided APM of all interfaces in the ACD's, BCD and ICD's, including any which are modified, will be developed by NASA and ESA. This joint interface documentation will be mutually agreed and jointly signed by the NASA Program Director and the ESA Program Manager. Any modification or any addition to this joint interface documentation will be mutually agreed and jointly signed by the NASA Program Director and the ESA Program Manager. NASA and ESA will jointly develop an ICD which will govern the interfaces between the ESA-provided MTFF and the manned base in connection with the docking, access and servicing of the MTFF at the manned base, in accordance with Article 6.2.a.3. NASA and ESA will also jointly develop an ICD in which they will agree on standard user interfaces for the polar platforms they provide; this ICD will also govern the interfaces between the ESA-provided Polar Platform and the STS. The MTFF ICD will be developed early in Phase C/D; the Polar Platform ICD will be established no later than the Preliminary Design Review for the NASA-provided Polar Platform. The MTFF and Polar Platform ICD's will be mutually agreed and jointly signed by the NASA Program Director and the ESA Program Manager. Any modification or addition to these documents will be mutually agreed and jointly signed by the NASA Program Director and the ESA Program Manager.

7.1.i. Program Management Reviews will be held as necessary at which the NASA Program Director and the Program Managers representing ESA and the other partners will report on the status of their respective design and development activities, including schedule, element performance parameters and element [23] interface requirements. These formal Program Management Reviews will be held at least quarterly and will be chaired by NASA. Less formal status reviews will be held monthly; representatives of the partners' Program Managers will attend these reviews.

7.1.j. ESA will participate in selected NASA reviews on Space Station requirements, architecture and interfaces as defined in the JPP. Similarly, NASA will participate in selected ESA reviews as defined in the JPP; the other partners will participate as appropriate.

7.1.k. Through participation in the above management mechanisms, NASA and ESA agree to achieve commonality on the manned base as required by the overall Space Station safety requirements as defined pursuant to Article 10. NASA and ESA also agree to provide standard interfaces for Space Station users both in the permanently attached pressurized laboratories and on the polar platforms. Exceptions to these requirements for commonality may be agreed on a case-by-case basis between NASA and ESA. In addition, NASA and ESA will work through the above management mechanisms to seek agreement on a case-by-case basis regarding the use of interchangeable hardware and software in order to promote efficient and effective Space Station operations, including reducing the burden on the Space Station logistics system.

7.2. Liaison. The NASA Office of Space Station and ESA Space Station and Platforms Directorate are responsible for NASA/ESA liaison activities. ESA may provide representative(s) to NASA Headquarters in Washington, D.C., and NASA may provide representative(s) to ESA Headquarters in Paris. In order to facilitate the working relationships between the NASA Program Director and the ESA Program Manager, ESA will provide and NASA will accommodate ESA liaison to the NASA Space Station Program Office. Similarly, NASA will provide and ESA will accommodate NASA liaison to the ESA Space

Station Program Office. In addition, by mutual agreement, ESA may provide and NASA will accommodate ESA liaison to NASA Centers involved in the Space Station program, and NASA may provide and ESA will accommodate liaison to ESA Centers involved in the ESA Space Station program. Arrangements specifying all conditions relating to the liaison relationships will be agreed and co-signed by the Co-Chairmen of the PCC.

Article 8 - Management Aspects of the Space Station Program Primarily Related to Operations and Utilization

8.1. General

8.1.a. NASA and ESA each have responsibilities regarding the management of their respective operations and utilization [24] activities and the overall Space Station operations and utilization activities, in accordance with the provisions of this MOU. NASA will have the responsibility for the overall planning for and direction of the operation of the manned base (including all elements within the operational Command and Control Zone (CCZ) of the manned base as defined in the program documentation provided for in Article 7) and the NASA-provided Polar Platform. ESA will have the responsibility for the planning for and direction of the operation of the elements it provides which are separated from the manned base (specifically, the MTFF when outside the operational CCZ of the manned base and the ESA-provided Polar Platform when outside the operational CCZ of the STS, as defined in the program documentation provided for in Article 7). Operations and utilization activities will comprise long-range planning and top-level direction and coordination, which will be performed by the strategic-level organizations; detailed planning and support to the strategic-level organizations which will be performed by the tactical-level organizations; and implementation of these plans which will be performed by the execution-level organizations.

8.1.b. A Multilateral Coordination Board (MCB) will be established as soon as possible after the start of NASA's Phase C/D and will meet periodically over the lifetime of the program or promptly at the request of any partner with the task to ensure coordination of the activities of the partners related to the operation and utilization of the Space Station. The Parties to this MOU and the other partners will plan and coordinate activities affecting the safe, efficient and effective operation and utilization of the Space Station through the MCB, except as otherwise specifically provided in this MOU. The MCB will comprise the NASA Associate Administrator for Space Station; the ESA Director of Space Station and Platforms; the MOSST Deputy Secretary, Space Policy Sector; and the STA Director-General of the Research and Development Bureau. The NASA Associate Administrator for Space Station will chair he MCB. The Parties agree that all MCB decisions should be made by consensus. However, where consensus cannot be achieved on any specific issue within the purview of the MCB within the time required, the Chairman is authorized to take decisions. The Parties agree that, in order to protect the interests of all partners in the program, the operation and utilization of the Space Station will be most successful when consensus is reached and when the affected partners' interests are taken into account. MCB decisions will not modify rights of the partners specifically provided in this MOU. Decisions regarding the operation and utilization of the ESA-provided elements which are separated from the manned base and which do not have effects on the manned base associated with servicing at the manned base or have effects on the STS associated with servicing by the STS will be taken by ESA, except as otherwise specifically provided in Article 8.3.

[25] 8.1.c. The MCB will establish Panels which will be responsible for the long-range strategic coordination of the operation and utilization of the Space Station, to be called

the System Operations Panel and the User Operations Panel respectively, described in detail below. The MCB will develop a charter that will define the organizational relationships and responsibilities of these Panels, and the organizational relationships of these Panels with the tactical- and execution-level organizations described below. Any modifications to the charter will be approved by the MCB. The MCB will approve, on an annual basis, a Consolidated Operations and Utilization Plan (COUP) for the Space Station based on the annual Composite Operations Plan and the annual Composite Utilization Plan developed by the Panels and described below. In doing so, the MCB will be responsible for resolving any conflicts between the Composite Operations Plan and the Composite Utilization Plan which cannot be resolved by the Panels. The COUP will be prepared by the User Operations Panel and agreed to by the System Operations Panel. The charter for these Panels will also delineate the Panels' delegated responsibilities with respect to adjustment of the COUP. The COUP will be implemented by the appropriate tactical- and execution-level organizations.

8.1.d. Manned Base Hardware. The following is provided to explain the relationships between the different types of elements on the manned base which are allocated for use by the partners. The Space Station manned base includes:

- accommodations elements; and
- infrastructural elements.

The accommodations elements are the NASA-provided Laboratory Module, the ESA-provided APM, the STA-provided JEM including the Exposed Facility and the Experiment Logistics Modules, and the NASA-provided Attached Payload Accommodation Equipment. The infrastructural elements comprise all other manned base elements, including servicing elements and other elements that produce resources which permit all manned base elements to be operated and used.

8.1.d.1. Housekeeping. Both accommodations elements and infrastructural elements will be used for assembly, for verification and for maintenance of the manned base in an operational status, and also for the storage of element spares, crew provisions and safe haven capability, with secondary storage of crew provisions to be distributed equally among the three laboratories. In such use, they are referred to, respectively, as providing:

[26]
- housekeeping accommodations; and
- housekeeping resources.

During Phase C/D, these housekeeping accommodations and housekeeping resources will be controlled in appropriate program documentation as provided for in Article 7. During Phase E, these housekeeping accommodations and housekeeping resources will be controlled according to the mechanisms in Article 8.2.d.

8.1.d.2. Utilization. The accommodations and resources not required to maintain the manned base in an operational status will be used in connection with Space Station utilization, and are referred to, respectively, as:

- user accommodations; and
- utilization resources.

Details regarding the allocation of the Space Station user accommodations and utilization resources are provided in Article 8.3. NASA and ESA agree to seek to minimize the demands for housekeeping accommodations and housekeeping resources in order to maximize those available for utilization.

8.1.e. Platforms and MTFF. Because of the different character of the platforms and the MTFF, differentiation between accommodations and resources is not required. Mechanisms governing the operation of these elements are to be found in Article 8.2 and mechanisms governing the utilization of these elements are to be found in Article 8.3.

8.2. Operations
8.2.a. It is the goal of the Parties to this MOU to operate the Space Station in a manner that is safe, efficient and effective for both Space Station users and Space Station operators. To accomplish this, the MCB will establish, within three months of its establishment, a System Operations Panel (SOP) to coordinate strategic-level operations activities and operations planning activities as provided for in Article 8.1.c.
8.2.b. The SOP will comprise one member each from NASA, ESA and the other partners. Members may send designated alternates to SOP meetings. In addition, each partner may call upon relevant expertise as necessary to support SOP activities. The SOP will take decisions by consensus; in the event of failure to reach consensus on any issue, the issue will be forwarded to the MCB for resolution. In the interest of efficient management, NASA and ESA recognize that the SOP should take the responsibility routinely to resolve all operations issues as expeditiously as possible rather than refer such issues to the MCB.
[27] 8.2.c. The SOP will develop, approve and maintain an Operations Management Plan for the operation, maintenance and refurbishment of and logistics for the manned base, the NASA-provided Polar Platform and the ESA-provided Polar Platform insofar as these platforms have effects on the STS associated with their servicing by the STS, and the MTFF insofar as it has effects on the manned base associated with its servicing at the manned base during Phase E. This Plan will describe relationships among the strategic, tactical and execution levels of operations management, where the strategic level is coordinated by the SOP; the tactical level, by the tactical operations organization referred to in Article 8.2.e; and the execution level, by implementing organizations and field centers. Consistent with the other provisions of this Article, the Operations Management Plan will also address operational requirements for the manned base, the NASA-provided Polar Platform and the ESA-provided Polar Platform insofar as these platforms have effects on the STS associated with their servicing by the STS, [and] the MTFF insofar as it has effects on the manned base associated with its servicing at the manned base and Space Station-unique ground elements. The Operations Management Plan will provide the procedures for preparation of the baseline operations plans and maintenance plans provided for in Articles 6.1.a.24 and 6.2.a.27, annual refinements to these baseline plans, and the Composite Operations Plan described in Article 8.2.d, including procedures for adjustment of these plans as further information becomes available.
8.2.d. On an annual basis, NASA and ESA will each provide to the SOP any significant refinements to their baseline operations plans and maintenance plans five years in advance. Using the operations and maintenance plans and these refinements provided by all of the partners, including requirements for use of Space Station-unique ground elements, the SOP will develop and approve an annual Space Station Composite Operations Plan (COP) consistent with the annual Space Station Composite Utilization Plan described in Article 8.3.f. The COP will also identify the housekeeping accommodations and housekeeping resources required for maintenance of the manned base in an operational status. Compatibility of the COP and the Composite Utilization Plan must be assured through coordination between the SOP and the User Operations Panel, described in Article 8.3.d, during the preparation and approval process.
8.2.e. NASA, with the participation of all the partners, will be responsible for integrated tactical-level activities for Space Station manned base operations. To this end, NASA will establish an integrated tactical operations organization and the other partners will participate in discharging the responsibilities of this organization. ESA and the other partners will provide personnel to the integrated tactical operations organization who will bring expertise on the elements [28] each provides and will participate in overall integrated tactical operations activities. NASA and ESA will consult and agree regarding the

responsibilities to be discharged by the ESA personnel. NASA and ESA will also consult and agree regarding the number of ESA personnel and all administrative conditions related to these personnel. In conjunction with the integrated activities, NASA, ESA and the other partners will each perform distributed tactical-level activities related to the elements each provides, such as decentralized system operations support planning, user support planning, logistics planning, and the accommodations assessments described in Article 8.3.h. Tactical-level activities will include planning for system operations and for user support activities across all manned base elements. Tactical-level activities for elements separated from the manned base when outside the operational CCZ of the STS or the manned base, as defined in the program documentation provided for in Article 7, will be performed by the element provider. However, where the same services, such as transportation, logistics and communications, are required by both the manned base and elements which are operating separated from the manned base, planning for these services will be performed by the integrated tactical operations organization.

8.2.f. Tactical Operations Plans (TOP's) for the manned base and for the MTFF insofar as it has effects on the manned base associated with its servicing at the manned base will be developed by the tactical operations organization described in Article 8.2.e to implement the COUP. Each TOP will include Increment Plans (IP's) for a period of two years prior to launch of the STS to the manned base for a specific increment. (An increment is normally the interval between visits of the STS for the purpose of resupply in support of manned base operations and utilization as approved in the COUP.) Each IP will describe the detailed manifest of user payloads, systems support equipment and supplies needed to support the increment. Each IP will also describe changes to the complement of hardware and software to be flown during that increment and the payload and system support activities needed to carry out the activities approved in the COUP for that increment. The IP will identify the crew complement and define logistics requirements including STS interface requirements, changes to housekeeping resource requirements, changes to housekeeping accommodation requirements and communication requirements, including TDRSS use and requirements for distribution of data, to support the subject increment.

8.2.g. NASA, with the participation of all the partners, will be responsible for integrated execution-level planning for and execution of the day-to-day operation of the manned base. ESA and the other partners will participate in discharging the responsibilities of the Space Station Control Center (SSCC), [29] established and managed by NASA, which will conduct execution-level activities and support tactical planning. ESA and the other partners will provide personnel to the SSCC. These personnel will bring expertise on the elements that partner provides, will participate in overall SSCC-based activities, and will support real-time on-orbit activities with emphasis on the elements each provides. NASA and ESA will consult and agree regarding the responsibilities to be discharged by the ESA personnel. NASA and ESA will also consult and agree regarding the number of ESA personnel and all administrative conditions related to these personnel. In conjunction with the integrated activities, NASA, ESA and the other partners will each perform distributed execution-level activities related to the elements each provides, such as monitoring and support of real-time systems operations. NASA, ESA and the other partners will provide engineering support centers to perform detailed engineering assessments and real-time operations support to the SSCC required for the operational control of the manned base elements they provide. Execution-level activities for elements separated from the manned base when outside the operational CCZ of the STS or the manned base, as defined in the program documentation provided for in Article 7, will be the responsibility of the element provider. The partners may also participate in and provide personnel to other execution-

level activities at other sites as agreed.
8.2.h. The International Operational Concepts Working Group (IOCWG), established by the Space Station Phase B MOU's, will continue to advise the Parties to this MOU in planning for the establishment of the SOP. Once the SOP is established, the activities of the IOCWG will end.

8.3. Utilization
8.3.a. Manned Base
8.3.a.1. NASA and MOSST will provide Space Station manned base infrastructural elements to assemble, maintain, operate and service the manned base; NASA and MOSST will also provide resources derived from these infrastructural elements to the other partners as provided in Article 8.3.a.2. ESA will retain the use of 41% of the user accommodations on its APM; NASA will retain the use of 97% of the user accommodations on its accommodations elements; NASA and ESA will each provide MOSST 3% of the user accommodations on their accommodations elements; and ESA will provide NASA the remaining user accommodations on its APM. NASA, ESA and MOSST will each control the selection of users for their allocations of user accommodations; such NASA, ESA and MOSST control of the selection of users for their allocation of user accommodations will he exercised in accordance with the procedures in this MOU and in the NASA-MOSST MOU for developing the Composite Utilization Plan.
[30] 8.3.a.2. Allocation of manned base resources among the partners will be in accordance with the following approach. Housekeeping resources required by all elements, and provided as noted in Article 8.1.d.1, will be set aside. The utilization resources will be allocated as follows: 20% of utilization resources will be allocated to NASA because of its Attached Payload Accommodation Equipment; 3% of utilization resources will be allocated to MOSST; [and] the remaining utilization resources will be apportioned equally among the three laboratory modules. ESA will be allocated 50% of the utilization resources apportioned to the ESA-provided APM and STA will be allocated 50% of the utilization resources apportioned to the ESA-provided JEM. NASA will be allocated 100% of the utilization resources apportioned to the NASA-provided Laboratory Module, the remaining 50% of the utilization resources apportioned to the ESA-provided APM and the remaining 50% of the utilization resources apportioned to the ESA-provided JEM. The above allocation of utilization resources is to the partner, not to the elements, and may be used by the partner on any Space Station element consistent with the COP and the Composite Utilization Plan. More than this allocation of any utilization resource may be gained by each partner through barter or purchase from other partners.
8.3.a.3. ESA's allocation of user accommodations and utilization resources will begin once the APM is verified following assembly to the manned base.
8.3.a.4. Manned base utilization resources are power, user servicing capacity, heat rejection capacity, data handling capacity, total crew time and EVA capacity. The initial list of manned base utilization resources to be allocated is power, user servicing capacity and total crew time. All other manned base utilization resources may be used without allocation. To support the operation and full international utilization of the Space Station manned base as defined in Article 3, NASA plans to provide the number of STS flights per year baselined by the SSCB during Phase C/D. From the total Space Station user payload capacity available on STS flights actually flown to and from the manned base each year, each partner will have the right to purchase STS launch and return services for its Space Station utilization activities, up to its allocated percentage of utilization resources. (The foregoing does not apply to STS launch and return capacity provided to and from the

manned base in connection with Space Station evolutionary additions.) Similarly, the partners will have the right to purchase, up to their allocated percentage of utilization resources, TDRSS data transmission capacity available to the manned base. The User Operations Panel, defined in Article 8.3.d, will update the lists of utilization resources and allocated utilization resources as necessary as NASA and the other partners gain experience.

[31] 8.3.b. Platforms

8.3.b.1. In recognition of the fact that platforms are separate elements that do not require extensive support from the infrastructural elements of the manned base, platforms are treated separately from the manned base.

8.3.b.2. NASA and ESA will share the use of each other's polar platforms on a balanced reciprocal basis, recognizing that the two platforms may have different capabilities and that the user community may propose specific splits based on actual payloads; such proposals must be agreed to by NASA and ESA, and by MOSST with respect to its 3% utilization of the polar platforms provided for in Article 8.3.b.3, and processed by the User Operations Panel as part of the development of the Composite Utilization Plan provided in Article 8.3.f.2. NASA and ESA will also provide associated user integration and user operations support to each other and each other's users.

8.3.b.3. MOSST will be provided 3% utilization of both the NASA and ESA polar platforms together with the associated user integration and user operations support. STA may purchase, barter or enter into other arrangements for platform utilization.

8.3.c. Man-Tended Free Flyer

8.3.c.1. ESA will retain the total use of the MTFF it provides.

8.3.c.2. Notwithstanding Article 8.3.c.1, each year, NASA will have an option to use up to 25% of MTFF utilization capacity by purchase at prices ESA routinely charges comparable customers or by barter such as for an amount of utilization resources and/or user accommodations. The conditions of such purchase or barter will be agreed between NASA and ESA.

8.3.c.3. In case of total use of the MTFF by ESA, all accommodations and resources required to service the MTFF at the manned base will come out of the user accommodations and utilization resources available to ESA as provided in Article 8.3.a.

8.3.d. It is the goal of the Parties to use the Space Station in a safe, efficient and effective manner. To accomplish this, the MCB will establish, within three months of its establishment, a User Operations Panel (UOP), to assure the compatibility of utilization activities of the manned base, the polar platforms, and use by the MTFF of manned base utilization resources and user accommodations. The UOP will comprise one member each from NASA, ESA and the other partners. Members may send designated alternates to UOP meetings. In addition, each partner may call upon relevant expertise as necessary to support [32] UOP activities. The UOP will take decisions by consensus; except as noted in Article 8.3.f.2, in the event of failure to reach consensus on any issue, the issue will be forwarded to the MCB for resolution. In the interest of efficient management, NASA and ESA recognize that the UOP should take the responsibility to routinely resolve all utilization issues as expeditiously as possible rather than refer such issues to the MCB.

8.3.e. The UOP will develop, approve and maintain a Utilization Management Plan which will describe relationships among the strategic, tactical and execution levels of utilization management, where the strategic level is coordinated by the UOP; the tactical level, by the integrated tactical operations organization described in Article 8.2.e; and the execution level, by implementing organizations and field centers. The Plan will also establish processes for utilization of the Space Station elements, including the user support centers and other Space Station-unique ground elements provided by all the partners,

consistent with Article 8.3.d; define standard user integration and user operations support; and describe the approach to distributed user integration and operations. The Plan will provide procedures for preparation of the partners' Utilization Plans and Composite Utilization Plan described in Article 8.3.f, including procedures for adjustment of these Plans as further information becomes available.

8.3.f. Utilization Plan for the Manned Base and the Polar Platforms

8.3.f.1. On an annual basis, five years in advance, NASA and ESA each will develop a Utilization Plan for all proposed uses of its allocation of manned base user accommodations and utilization resources, for all proposed uses of unallocated manned base utilization resources and Space Station-unique ground elements, and for all uses of the polar platforms. Each partner will satisfy the requirements of its users for storage within the user accommodations available to that partner, with the exception of temporary on-orbit storage in the Integrated Logistics System carriers in which user equipment, including MTFF equipment, is launched or returned to Earth as specified in the applicable Increment Plan. As regards the MTFF, the ESA Utilization Plan will include all uses of manned base user accommodations and utilization resources required to service the MTFF at the manned base, information necessary to determine whether any planned utilization of the MTFF would have effects on the manned base associated with its servicing at the manned base, and information related to Article 9.8(e) of the Intergovernmental Agreement. NASA and ESA each will prioritize and propose appropriate schedules for the user activities in its Utilization Plan, including the use of user support centers and other Space Station-unique ground elements to support the [33] utilization of the flight elements. These individual Utilization Plans will take into consideration all factors necessary to assure successful implementation of the user activities, including any relevant information regarding crew skills and special requirements associated with the proposed payloads.

8.3.f.2. NASA and ESA each will forward its Utilization Plan to the UOP. Using the Utilization Plans of NASA, ESA and the other partners, the UOP will develop the Composite Utilization Plan (CUP), covering the use of both flight and Space Station-unique ground elements, based on all relevant factors, including each element-provider's recommendations regarding resolution of technical and operational incompatibilities among the users proposed for its elements. In its use of the Space Station, each partner will seek, through the mechanisms established in this MOU, to avoid causing serious adverse effects on the use of the Space Station by the other partners. In the event of failure of the UOP to reach consensus on the utilization of the manned base and/or related Space Station-unique ground elements, the issue will be forwarded to the MCB for resolution. In the event of failure of the UOP to reach consensus on the utilization of the ESA-provided Polar Platform, ESA will take the decision, and in the event of failure of the UOP to reach consensus on the utilization of the NASA-provided Polar Platform, NASA will take the decision; however, in either event, NASA and ESA will respect the utilization rights of Canada and of each other in any such decisions.

8.3.f.3. Utilization Plans proposed by NASA, ESA and the other partners which fall completely within their respective allocations and do not conflict operationally or technically with one another's Utilization Plans will be automatically approved. However, Articles 9.8(a), 9.8(b) and 9.11 of the Intergovernmental Agreement will apply.

8.3.g. Utilization Plan for the MTFF

8.3.g.1. The MTFF Utilization Plan will be developed and approved by ESA. As appropriate, MTFF utilization will be consistent with Articles 8.3.c.2 and 8.3.f.1.

8.3.h. Each partner will participate in integrated tactical-level planning of user activities. To this end, each partner will provide personnel to the operations organization described in Article 8.2.e. These personnel will participate in integrated tactical-level planning of

user activities; they will also support the strategic-level planning of user activities. NASA and ESA will consult and agree regarding the responsibilities to be discharged by the ESA personnel. NASA and ESA will also consult and agree regarding the number of ESA personnel and all administrative conditions related to these personnel. In addition, partners providing user accommodations [34] will be responsible for providing standard user integration and user operations support to users of other partners or other partners as users, including conducting assessments of the flow of payload integration activities for all payloads manifested in the user accommodations they provide. Accommodation assessments for individual payloads manifested in a laboratory module covering engineering, operations and software compatibility will also be performed by the partner providing that laboratory module in support of the preparation and execution of Tactical Operations Plans and Increment Plans. Similarly, MOSST will be responsible for providing standard user integration and user operations support for users of the other partners or other partners as users of the flight elements provided by MOSST; and NASA will be responsible for providing standard user integration and user operations support for users of the other partners or other partners as users of the manned base systems/subsystems provided by NASA.

8.3.i. Each partner will participate in discharging the responsibilities of the Payload Operations Integration Center (POIC) established and managed by NASA which will be responsible for assistance to manned base users in planning and executing user activities on the manned base, for overall direction of the execution of user activities on the manned base, and for interaction with the SSCC in order to coordinate user activities with systems operations activities. Each partner will provide personnel to the POIC. NASA and ESA will consult and agree regarding the responsibilities to be discharged by the ESA personnel. NASA and ESA will also consult and agree regarding the number of ESA personnel and all administrative conditions related to these personnel. The interaction between the POIC and SSCC will be described in the Operations Management Plan. Both NASA and ESA will provide user support centers which will function within the framework of NASA's responsibilities for the POIC. The interactions between the user support centers and the POIC will be described in the Utilization Management Plan. NASA and ESA will each be responsible, relative to the elements they provide which are separated from the manned base, for assistance to users in planning and executing user activities, for direction of the execution of user activities and for interaction with the MTFF and polar platform control centers to coordinate user and element operations activities.

8.3.j. In working out problems which may arise after the development of the COUP, in the case of a technical or operational incompatibility between users, the partner(s) providing the element(s) in which the users have accommodations, as well as other impacted partners, will provide appropriate analyses and recommendations to the appropriate strategic-, tactical- or execution-level organization for resolution of conflicts. However, if such conflict only has impacts within a single manned base element and only impacts users of the [35] provider of that element, the partner providing that manned base element will be responsible for resolving such conflicts in accordance with the content of the COUP; conflicts related to proposed polar platform utilization will be resolved as provided in Article 8.3.f.2.

8.3.k. NASA, ESA and the other partners may at any time barter for, sell to one another or enter into other arrangements for any portion of their Space Station allocations, and are free to market the use of their allocations individually or collectively, according to the procedures established in the Utilization Management Plan. The terms and conditions of any barter or sale will be determined on a case-by-case basis by the parties to the transaction. The partner providing allocations will ensure that the obligations it has undertaken under this MOU are met. NASA, ESA and the other partners each may retain the revenues they derive from such marketing.

8.3.l. NASA and ESA will make their Space Station-unique ground elements, including user support centers, available for use by each other and the other partners in order to support fully both the standard and special user integration and operations support approved in the CUP and the requirements in the COP. Any special user integration or user operations support provided by a partner to users of the other partners or other partners as users will be provided on a reimbursable basis at prices routinely charged comparable users for similar services.
8.3.m. The International Utilization Coordination Working Group (IUCWG), established by the Space Station Phase B MOU's, will continue to advise the Parties to this MOU in planning for the establishment of the UOP. Once the UOP is established, the activities of the IUCWG will end.
8.4. In order to protect the intellectual property of Space Station users, procedures covering all personnel, including Space Station crew, who have access to data will be developed by the MCB.
8.5. The partners will seek to outfit the NASA-provided Laboratory Module, the ESA-provided APM and the STA-provided JEM to equivalent levels by the end of Space Station assembly in Phase C/D.

Article 9 - Operations Costs Responsibilities

9.1. The Parties will seek to minimize operations costs for the Space Station. The Parties will also seek to minimize the exchange of funds, for example, through the performance of specific operations activities.
[36] 9.1.a. The costs associated with ESA's providing personnel to undertake integrated tactical- and execution-level activities as provided for in Articles 8.2.e, 8.2.g, 8.3.h, and 8.3.i will be agreed between NASA and ESA and will be a contribution towards the satisfaction of ESA's common system operations costs responsibilities established below.
9.2. Element operations costs
9.2.a. NASA and ESA will each have operational responsibilities for the elements it provides as detailed in Article 8. Such operational responsibilities mean that NASA and ESA will each be financially responsible for element operations costs, that is, costs attributed to operating and to sustaining the functional performance of the flight elements that it provides, such as ground-based maintenance, sustaining engineering, provision of spares, launch and return costs for spares, launch and return costs of the fraction of the Integrated Logistics System carriers provided for in Article 3.2 that is attributable to spares, and also costs attributed to the maintenance and operation of element-unique ground centers.
9.3. Common system operations costs
9.3.a. Manned Base. Other than the element operations costs covered in Article 9.2.a, NASA, ESA and the other partners will equitably share the common system operations costs; that is, the costs attributed to the operation of the manned base as a whole. The categories comprising common system operations costs are: integrated tactical planning activities performed by the integrated tactical operations organization provided for in Article 8.2.e, including user integration planning and maintenance of common documentation; space systems operations (SSCC-based operations, SSCC maintenance and common elements of the Software Support Environment); POIC-based operations and POIC maintenance; Integrated Logistics System operations, including consumables and common inventory management activities; prelaunch/post landing processing of logistics carriers; launch to orbit and return of consumables, crew and crew logistics, and launch and return of the fraction of the Integrated Logistics System carriers provided for in

Article 3.2 that is attributable to consumables and crew logistics; and transmission of housekeeping data between the manned base and the ground (SSCC, POIC and launch and landing sites). Each partner will be responsible for a percentage of common system operations costs equal to the percentage of Space Station utilization resources allocated to it in Article 8.3.a.2. ESA's responsibility for sharing common system operations costs will begin following the assembly and verification of the APM.

[37] 9.3.b. Platforms. NASA and ESA will each be responsible for the common system operations costs for the platforms which they provide.

9.3.c. Man-Tended Free Flyer. ESA will be responsible for the common system operations costs for the MTFF it provides.

9.3.d. Any changes to the list of common system operations costs in this Article will be made by agreement among the partners.

9.4. The Parties to this MOU and the other partners will work through the SOP to identify the detailed contents to be included in each common system operations cost category. The partners will also, each year, report to the SOP on their forecasts for future years for all costs included in the common system operations costs of the manned base and on their identified actual annual common system operations costs. The SOP will develop detailed procedures for implementing this Article. If possible, after the partners have gained experience in the operation of the Space Station, the SOP will endeavor to establish a fixed value for the annual common system operations costs.

9.5. Costs of user activities such as payload/experiment design, development, test and evaluation (DDT&E); payload ground processing; provision of payload/experiment spares and associated equipment; launch and return of payloads/experiments, spares and associated equipment; launch and return of the fraction of the Integrated Logistics System carriers provided for in Article 3.2 that is attributable to user payloads/experiments, spares and associated equipment; and any special user integration or user operations support, including specialized crew training, will be the responsibility of Space Station users of the partners or of individual partners as users. Such costs will not be shared among NASA, ESA and the other partners, nor will such costs contribute toward the satisfaction of common system operations costs responsibilities. In addition, the DDT&E and operations costs of the users' support centers will not be shared among NASA, ESA and the other partners.

9.6. NASA, ESA and the other partners will not recoup their DDT&E costs for their elements from one another in the operation and utilization of the Space Station.

9.7. In case of failure of any partner to perform its operations responsibilities or to provide for its share of common system operations costs, the partners will meet to discuss what action should be taken. Such action could result in, for example, an appropriate reduction of the failing partner's rights to its allocations.

[38] *Article 10 - Safety*

10.1. In order to assure safety, NASA has the responsibility, working with the other partners, to establish overall Space Station safety requirements and plans covering Phase C/D and Phase E. Such requirements and plans for Phase C/D have been established, and development of further safety requirements and plans for Phase C/D and Phase E and changes to safety requirements and plans will be processed, according to the procedures in Articles 7 and 8. As far as the elements separated from the manned base and their payloads are concerned, NASA has the responsibility to establish and implement overall safety requirements and plans governing the NASA-provided Polar Platform, and ESA has the responsibility to establish and implement overall safety requirements and plans governing

the ESA-provided Polar Platform and the MTFF. The overall Space Station safety requirements and plans will be applicable to the MTFF insofar as it has effects on the manned base associated with its servicing at the manned base. STS safety requirements will be applicable to the ESA-provided Polar Platform insofar as it has effects on the STS associated with its servicing by the STS.

10.2. Each partner will develop detailed safety requirements and plans, using its own standards where practicable, for its manned base hardware and software that meet or exceed the overall Space Station safety requirements and plans. Each partner will have the responsibility to implement applicable overall and detailed Space Station safety requirements and plans throughout the lifetime of the program, and to certify that such safety requirements and plans have been met with respect to the Space Station manned base elements and payloads it provides. ESA will have the responsibility to certify that the MTFF and ESA-provided Polar Platform and their payloads are safe. However, NASA will have the overall responsibility to certify that all Space Station manned base elements and payloads are safe, including the MTFF and its payloads insofar as they have effects on the manned base associated with their servicing at the manned base. NASA will also have the responsibility to certify that the ESA-provided Polar Platform and its payloads are safe insofar as they have effects on the STS associated with their servicing by the STS.

10.3. NASA will conduct system safety reviews which ESA will support. NASA, ESA and the other partners will also conduct safety reviews of the elements and payloads they provide; NASA will participate in and support such reviews by the other partners. MOSST will also participate in and support safety reviews by the other partners as appropriate related to the MOSST-provided elements and MOSST payloads. NASA and MOSST [39] support to such safety reviews will include provision of necessary safety-related information to enable the other partners to conduct their reviews. Furthermore, status reports on safety requirements and plans will be a standard agenda item at the Program Management Reviews provided for in Article 7.1.i. The partners will participate as appropriate in any Space Station safety review boards established by NASA.

10.4. NASA will have the responsibility for taking any decision necessary to protect the safety of the manned base, including all elements operating in conjunction with the manned base, or its crew in an emergency.

Article 11 - Space Station Crew

11.1. ESA has the right to provide personnel to serve as Space Station crew from the time that ESA begins to share common system operations costs as provided in Article 9.3.5. NASA will provide flight opportunities for ESA Space Station crew satisfying the percentage of the total crew requirement equal to the percentage of manned base utilization resources allocated to ESA in Article 8.3.a.2. Flight of ESA Space Station crew will be satisfied over time, not necessarily on each specific crew rotation cycle. The SOP will review the implementation of this paragraph on a biennial basis.

11.2. During assembly and verification, a fully trained ESA crew member will participate in the on-orbit assembly and system verification of the ESA-provided APM and other assigned flight element assembly and system verification tasks planned during that on-orbit period as provided in the verification plan described in Articles 6.1.a.4. and 6.2.a.3. Further, during the first two servicings of the MTFF at the manned base, a fully trained ESA crew member will participate in the relevant activities.

11.3. Space Station crew will meet medical standards and security and suitability requirements developed by NASA in consultation with ESA and the other partners regarding Space Station crew qualifications for long-term manned space flight. NASA and ESA

will jointly certify that these standards and requirements have been met by the ESA Space Station crew. Furthermore, the MCB may establish additional criteria for Space Station crew. Following certification, all Space Station crew will enter into an appropriate training cycle in order to acquire the skills necessary to conduct Space Station operations and utilization. Such training will be conducted in groups, subject to the requirements of different functional specializations. The training will include integrated manned systems operations training conducted primarily at NASA centers [40] and element-specific operations training conducted primarily by the partner providing the element at appropriate centers of all of the partners. In full consultation with ESA regarding the flight assignments of ESA crew members, NASA will designate, from among the certified Space Station crew, specific crew complements, which include the Space Station Commander, for specific crew rotation cycles, consistent with Article 11.1. NASA will designate specific crew complements to support payload requirements identified in the COUP. A specific crew complement will be trained as a team in preparation for a specific crew rotation cycle, subject to requirements of different functional specializations.

11.4. NASA and ESA will be financially responsible for all compensation, medical expenses, subsistence costs on Earth, and training for Space Station crew which they provide. Full training for all assigned duties will be required.

11.5. The Code of Conduct for the Space Station will be developed by NASA, with the full involvement of ESA, MOSST and the GOJ, and approved for the Space Station program in accordance with the principles for reaching decisions established in Article 8.1.b. It will, inter alia: establish a clear chain of command; set forth standards for work and activities in space, and, as appropriate, on the ground; establish responsibilities with respect to elements and equipment; set forth disciplinary regulations; establish physical and information security guidelines; and provide the Space Station Commander appropriate authority and responsibility, on behalf of all the partners, to enforce safety procedures and physical and information security procedures in or on the Space Station.

11.6. ESA crew selected for operating the MTFF outside the operational CCZ of the manned base are not considered Space Station crew, pursuant to this Article, for the purposes of that activity.

Article 12 - Transportation, Communications and Other Non-Space Station Facilities

12.1. Transportation

12.1.a. For purposes of design of Space Station elements and payloads, NASA's STS is the baseline launch and return transportation system for the Space Station manned base and for the NASA-provided Polar Platform. ESA's Space Transportation System is the baseline launch transportation system for the MTFF and the ESA-provided Polar Platform.

12.1.b. NASA will provide reimbursable STS launch services to ESA in connection with the assembly of the ESA-provided APM to the manned base and its initial outfitting in accordance with the program documentation described in Article 7.1. NASA will [41] also provide reimbursable launch and return services in connection with the logistics requirements of manned base elements. NASA will also provide reimbursable launch and return services in connection with the MTFF when it is serviced at the manned base and in connection with manned base users; availability of STS services for such purposes is as provided in Articles 8.3.a.4 and 8.3.c. NASA will also provide reimbursable launch services in connection with servicing of the ESA-provided Polar Platform, with details to be agreed by NASA and ESA, if appropriate STS capability exists and if ESA selects to use this capability. Reimbursement for such launch services may be in cash or agreed kind. All reim-

bursable STS services will be provided under launch services agreements. NASA will also provide launch and return services in connection with manned base common system operations logistics; costs for such services will be shared among the partners as provided in Article 9.3. ESA will provide the initial launch of the MTFF and the ESA-provided Polar Platform. ESA will also provide launch and return services in connection with the logistics requirements of the MTFF when it is not serviced at the manned base.

12.1.c. Other government or private sector space transportation systems of partners may be used in connection with the Space Station if they are compatible with the Space Station. Specifically, ESA will have the right of access to the Space Station manned base using the ESA Space Transportation System, including Ariane and Hermes. Recognizing that the responsibility for developing these systems and for making them technically and operationally compatible with the manned base rests with ESA, NASA will provide to ESA that information necessary for ESA to make them compatible. Technical, operational and safety requirements for access to the manned base will be controlled in appropriate program documentation as provided for in Articles 7 and 8.

12.1.d. With respect to financial conditions, NASA and ESA will provide reimbursable launch and return services to each other, to the other partners and to each other's and the other partners' users at prices they routinely charge comparable users. Launch and return services related to manned base common system operations logistics will also be made available by NASA on the same basis.

12.1.e. Both NASA and ESA will use their best efforts to accommodate additional launch and return requirements in relation to the Space Station, as well as proposed requirements and flight schedules related to the Space Station activities described above.

12.1.f. Each partner will respect the proprietary rights in and confidentiality of appropriately marked data and goods to be transported on its space transportation system.

[42] 12.2. Communications

12.2.a. Space Station communications will involve space-to-ground, ground-to-space, ground-to-ground and space-to-space data transmission. The TDRSS space network is the baseline communication system for the manned base elements and payloads, as well as for the NASA-provided Polar Platform and its payloads. ESA's Data Relay Satellite system (EDRS) is the baseline communication system for the ESA-provided Polar Platform and the MTFF and their payloads. ESA will be responsible for ensuring communications compatibility of the MTFF with the manned base for proximity operations, docking and servicing and of the ESA-provided Polar Platform with the STS for servicing as applicable. On a reimbursable basis, NASA and ESA will use their best efforts to accommodate, with their respective communication systems, specific Space Station-related requirements of each other and the other partners. With respect to financial conditions, NASA and ESA will provide such communication services at prices no higher than those they routinely charge comparable customers. Other communication systems may be used on the manned base by ESA, the other partners or Space Station users if such communication systems are compatible with the manned base and manned base use of TDRSS. Technical and operational requirements related to Space Station communications will be controlled in appropriate program documentation as provided for in Articles 7 and 8.

12.2.b. NASA and ESA will consult regarding the possible future addition of manned base capability to accommodate ESA-provided facilities permitting manned base use of EDRS, if compatible with the manned base and with manned base use of TDRSS.

12.2.c. Unless otherwise agreed by NASA and ESA, ground-to-ground transmission of polar platform data from one partner to the other partners or the other partners' users will conform to the communications transportation formats, protocols and standards agreed to by the Consultative Committee for Space Data Systems (CCSDS).

12.2.d. Partners and users of the partners may implement measures to ensure confidentiality of their utilization data passing through the Space Station Information System and other communication systems being used in connection with the Space Station. (Notwithstanding the foregoing, data which are necessary to assure safe operations will be made available according to procedures in the Utilization Management Plan and their use will be restricted to safety purposes only.) Each partner will respect the proprietary rights in, and the confidentiality of, the utilization data passing through its communication systems, including its ground network and the communication systems of its contractors, when providing communication services to another partner.

[43]12.3. Other Non-Space Station Facilities

12.3.a. Should ESA desire to use the Space Shuttle, Spacelab, or other NASA facilities on a cooperative or reimbursable basis to support the development of its Space Station Utilization Plan or to support its Space Station detailed design or development activities, NASA will use its best efforts to accommodate ESA's proposed requirements and schedules. Likewise, should NASA desire to use Ariane, Hermes or other ESA facilities on a cooperative or reimbursable basis to support the development of its Space Station Utilization Plan or to support its Space Station detailed design or development activities, ESA will use its best efforts to accommodate NASA's proposed requirements and schedules.

12.3.b. If NASA and ESA agree that it is appropriate and necessary for the conduct of the cooperative program, NASA and ESA will use their good offices in connection with attempting to arrange for the use of U.S. and European Governments' or contractors' facilities by the Parties and/or their contractors. Such use will be subject to separate arrangements between the user and the owner of the facilities.

Article 13 - Advanced Development Program

13.1. NASA and ESA each are conducting Space Station advanced development programs in support of their respective detailed design and development activities. Cooperation in such advanced development activities will be considered on a case-by-case basis and entered into where it is advantageous to both sides and where there are reciprocal opportunities.

13.2. ESA proposals to use NASA advanced development test beds or other NASA facilities in support of ESA's Space Station advanced development program will be considered on a case-by-case basis either on a cooperative or reimbursable basis. Likewise, NASA proposals to use ESA's facilities in support of NASA's Space Station advanced development program will be considered on a case-by-case basis either on a cooperative or reimbursable basis.

13.3. Should ESA desire to use the Space Shuttle or Spacelab on a cooperative or reimbursable basis to support ESA Space Station advanced development activities, NASA will use its best efforts to accommodate ESA's proposed requirements and flight schedules. Likewise, should NASA desire to use ESA launch vehicles on a cooperative or reimbursable basis to support NASA Space Station advanced development activities, ESA will use its best efforts to accommodate NASA's proposed requirements and flight schedules.

[44] *Article 14 - Space Station Evolution*

14.1. The partners intend that the Space Station will evolve through the addition of capability and will strive to maximize the likelihood that such evolution will be effected through contributions from all the partners. To this end, it will be the object of the Parties

to provide, where appropriate, the opportunity to the other partners to cooperate in their respective proposals for additions of evolutionary capability. The Space Station together with its additions of evolutionary capability will remain a civil station, and its operation and utilization will be for peaceful purposes, in accordance with international law.

14.2. This MOU sets forth rights and obligations concerning only the elements listed in Article 3, except that this Article and Article 16 of the Intergovernmental Agreement will apply to any additions of evolutionary capability. As such, this MOU does not commit either Party to participate in, or grant either Party rights in, the addition of evolutionary capability.

14.3. NASA and ESA agree to study evolution concepts for the Space Station during Phase C/D and Phase E. NASA will be responsible for development of overall manned base evolution concepts, in consultation with ESA and the other partners, and for integrating ESA's and the other partners' evolution concepts into an overall manned base evolution plan. ESA will be responsible for development and decision on subsequent implementation of evolution concepts for the ESA-provided Polar Platform and for the MTFF insofar as they have no technical or operational impacts on the STS or the manned base, in accordance with Articles 14.6 and 14.7.

14.4. NASA, ESA, and the other partners will participate in an International Evolution Working Group (IEWG) to coordinate their respective evolution studies and to consider overall Space Station evolution concepts and planning activities.

14.5. The MCB will review specific evolutionary capabilities proposed by any partner, assess the impacts of those plans on the other partners' elements and on the manned base, and review recommendation for minimizing potential impacts on Space Station activity during the addition of evolutionary capabilities.

14.6. Following the review and assessment provided for in Article 14.5, and consistent with the provisions of the Intergovernmental Agreement, cooperation between or among partners regarding the sharing of addition(s) of evolutionary capability will require either amendment of the relevant NASA-ESA, NASA-GOJ and NASA-MOSST MOU's or a separate agreement to which, to the extent that such addition is on the manned base or has a technical or operational impact on the STS or the manned base, NASA is a party to ensure that such addition is [45] consistent with NASA's overall programmatic responsibilities as detailed in this MOU.

14.7. Following the review and assessment provided for in Article 14.5, and consistent with the provisions of the Intergovernmental Agreement, the addition of evolutionary capability by one partner will require prior notification of the other partners, and, to the extent that such addition is on the manned base or has a technical or operational impact on the STS or the manned base, an agreement with NASA to ensure that such addition is consistent with NASA's overall programmatic responsibilities as detailed in this MOU.

14.8. The addition of evolutionary capability will in no event alter the rights and obligations of either Party to this MOU concerning the elements listed in Article 3, unless otherwise agreed by the affected Party.

Article 15 - Cross-Waiver of Liability: Exchange of Data and Goods; Treatment of Data and Goods in Transit; Customs and Immigration; Intellectual Property; Criminal Jurisdiction

The Parties note that, with respect to the cross-waiver of liability, exchange of data and goods, treatment of data and goods in transit, customs and immigration, intellectual property and criminal jurisdiction, the relevant provisions of the Intergovernmental Agreement apply.

Article 16 - Financial Arrangements

16.1. Each Party will bear the costs of fulfilling its responsibilities, including but not limited to costs of compensation, travel and subsistence of its own personnel and transportation of all equipment and other items for which it is responsible under this MOU. However, as provided in Article 9.3, the partners will equitably share common system operations costs.
16.2. The ability of each Party to carry out its obligations is subject to its funding procedures and the availability of appropriated funds.
16.3. In the event that funding problems are arising that may affect a partner's ability to fulfill its responsibilities under this MOU, that partner will promptly notify and consult with the other partners. Further, the Parties undertake to grant high priority to their Space Station programs in developing their budgetary plans.
[46]
16.4. The Parties will seek to minimize the exchange of funds while carrying out their respective responsibilities in this cooperative program, including, if they agree, through the use of barter, that is, the provision of goods or services.

Article 17 - Public Information

17.1. NASA and ESA will be responsible for the development of an agreed Public Affairs Plan that will specify guidelines for NASA/ESA cooperative public affairs activities during the detailed design, development, operation and utilization of the Space Station.
17.2. Within the Public Affairs Plan guidelines, both NASA and ESA will retain the right to release public information on their respective portions of the program. NASA and ESA will undertake to coordinate with each other, and, as appropriate, with the other partners, in advance concerning public information activities which relate to each other's responsibilities or performance in the Space Station program.

Article 18 - Consultation and Settlement of Disputes

18.1. The Parties agree to consult with each other and with the other partners promptly when events occur or matters arise which may occasion a question of interpretation or implementation of the terms of this MOU.
18.2. In the case of a question of interpretation or implementation of the terms of this MOU, such question will be first referred to the NASA Associate Administrator for Space Station and the ESA Director of Space Station and Platforms for settlement. The Parties recognize that in the case of a question concerning the commitments made in this MOU to STA and/or MOSST, the consultations will be broadened so as to include the STA Director General of the Research and Development Bureau and/or the MOSST Deputy Secretary, Space Policy Sector.
18.3. Any question of interpretation or implementation of the terms of this MOU which has not been settled in accordance with Article 18.2 will be referred to the NASA Administrator and the ESA Director General for settlement. The Parties recognize that in case of a question concerning the commitments made in this MOU to STA and/or MOSST, the matter will also be referred to the Minister of State for Science and Technology of Japan and/or the Secretary of MOSST.
18.4. Any issues arising out of this MOU not satisfactorily settled through consultation, pursuant to this Article may be [47] pursued in accordance with the relevant provisions of the Intergovernmental Agreement.

18.5. Unless otherwise agreed between NASA and ESA, implementation of decisions made pursuant to mechanisms provided for in this MOU will not be held in abeyance pending settlement of issues under this Article.

Article 19 - Entry into Force

19.1. Pursuant to the Arrangement Concerning Application of the Space Station Intergovernmental Agreement Pending its Entry into Force, which became effective on September 29, 1988, this MOU will enter into force after signature of both the NASA Administrator or his designee and the ESA Director General or his designee, upon written notification by each Party to the other that all procedures necessary for its entry into force have been completed.
19.2. Pending the entry into force of the Intergovernmental Agreement between the United States and the European Partner in accordance with Article 25 of that Agreement, the Parties agree to abide by the relevant terms of that Agreement.
19.3. If the United States or the European Partner withdraws from the Arrangement Concerning Application of the Space Station Intergovernmental Agreement Pending its Entry into Force, the corresponding Cooperating Agency will be deemed to have withdrawn from this MOU effective from the same date.
19.4. If, by December 31, 1992, the Intergovernmental Agreement has not yet entered into force between the United States and the European Partner in accordance with Article 25 of that Agreement, the Parties will consider what steps are necessary and appropriate to take account of that circumstance.
19.5. If the United States or the European Partner gives notice of withdrawal from the Intergovernmental Agreement in accordance with Article 21 of that Agreement, the corresponding Cooperating Agency will be deemed to have withdrawn from this MOU effective from the same date.

Article 20 - MOU Amendments

This MOU may be amended at any time by written agreement of the Parties. Any amendment must be consistent with the Intergovernmental Agreement. To the extent that a provision of this MOU creates specific rights or obligations accepted by another partner, that provision may be amended only with the written consent of that partner.

[48] *Article 21 - Review*

Upon the request of either Party, the Parties will meet for the purpose of reviewing and promoting cooperation in the Space Station. In the process of this review, the Parties may consider amendments to this MOU.

Article 22 - Definitions and Explanations

22.1. In addition to the definitions specified in the Intergovernmental Agreement, the following definitions will apply to this MOU:

"international Space Station complex," also "Space Station," means the collection of elements listed in Article 3;

"manned base" means Space Station flight elements excluding the polar platforms and the MTFF;

"Parties" means NASA and ESA;

"partners" means NASA, ESA, STA and MOSST.

22.2. Explanation of the following terms may be found in this MOU in the Articles noted:

"Accommodations" - Article 8.1.d
"Command and Control Zone (CCZ)" - Article 8.1.a
"Common system operations costs" - Article 9.3
"Composite Operations Plan (COP)" - Article 8.2.d
"Composite Utilization Plan (CUP)" - Article 8.3.f
"Consolidated Operations and Utilization Plan (COUP)" - Article 8.1.c
"Flight elements" - Article 3
"Increment Plan (IP)" - Article 8.2.f
"Infrastructure" - Article 8.1.b
"Multilateral Coordination Board (MCB)" - Article 8.1.b
"Payload Operations Integration Center (POIC)" - Article 8.3.i
"Program Coordination Committee (PCC)" - Article 7.1.b
"Resources" - Article 8.1.d and Article 8.3.a.4
"Space Station Control Board (SSCB)" - Article 7.1.d
"Space Station Control Center (SSCC)" - Article 8.2.g
"Space Station-unique ground elements" - Article 3
"System Operations Panel (SOP)" - Article 8.2.a and Article 8.2.b
"Tactical Operations Plan (TOP)" - Article 8.2.f
"User Operations Panel (UOP)" - Article 8.3.d

[49] DONE at Washington, this 29th day of September, 1988, in two originals in the English, French, German and Italian languages, each version being equally authentic.

[50] FOR THE UNITED STATES NATIONAL AERONAUTICS AND SPACE ADMINISTRATION:

POUR L'ADMINISTRATION NATIONALE DE L'AERONAUTIQUE ET DE L'ESPACE DES ETATS UNIS:

FÜR DEI NATIONALE LUFT UND RAUMFAHRTORGANISATION DER VEREINIGTEN STAATEN:

PER L'AMMINISTRAZIONE NAZIONALE PER L'AERONAUTICA STATI UNITI:

signed by Dale D. Myers

FOR THE EUROPEAN SPACE AGENCY:

POUR L'AGENCE SPATIALE EUROPEENNE:

FÜR DEI EUROPAISE WELTRAUMORGANISATION:

PER L'AGENZIA SPAZIALE EUROPEA:

signed by Reimar Leust

Document I-36

Document title: "Draft Proposals for US-USSR Space Cooperation," April 4, 1961.

Source: NASA Historical Reference Collection, NASA History Office, NASA Headquarters, Washington, D.C.

President John F. Kennedy called for U.S.-Soviet space cooperation in his January 20, 1961, inaugural address and his first State of the Union address a few days later. To examine the possibilities for such cooperation, presidential science advisor Jerome Wiesner set up both an external advisory group and an internal government study group. A number of drafts of a white paper on the topic were prepared. As the white paper was nearing completion, the Soviet Union launched Yuri Gagarin into orbit on April 12, 1961. A few days later, President Kennedy decided that he had to compete—not cooperate—in space, and the white paper was temporarily set aside.

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[1] April 4, 1961

Draft Proposals for US-USSR Space Cooperation

OBJECTIVES

The objectives are to confirm concretely the U.S. preference for a cooperative rather than competitive approach to space exploration, to contribute to reduction of cold war tensions by demonstrating the possibility of cooperative enterprise between the U.S. and the USSR in a field of major public concern, and to achieve the substantive advantages of cooperation that in major projects would impose more of a strain on economic and manpower resources if carried out unilaterally.

GUIDELINES

The proposals seek to (a) maximize acceptability by the USSR, and (b) minimize the potential for misunderstanding and obstructionism which must be recognized to exist in any joint program with the Soviet Union. The proposals therefore have, in general, the following character:

(1) Valid scientific objectives.
(2) Comparable contributions by U.S. and USSR.
(3) Technical and economic feasibility for U.S. portion.
(4) Minimal interference with on-going U.S. programs.
(5) Minimal grounds for Soviet suspicions of U.S. motives (success, surveillance, etc.)
(6) Opportunities for third-nation participation at appropriate time.

The proposals fall into three categories:

(a) The employment of existing or easily attainable ground facilities for exchange of information and services in support of orbiting experiments.
(b) The coordination of independently-launched satellite experiments so as to achieve simultaneous but complementary coverage of agreed phenomena.
[2] (c) Coordination of or cooperation in ambitious projects for the manned exploration of the moon and the unmanned exploration of the planets.

The three categories of proposals are advanced in order to offer the Soviet Union a wide range of choice and avoid the appearance of "pushing" a pre-selected objective. While the costs are estimated by NASA to range from relatively insignificant levels in Category (a) to $15-20 million in Category (b) and, very roughly, $10 billion in Category

(c), it may be assumed that the Soviet Union as well as ourselves is likely to pursue the more costly programs in any event.

Such cooperation as is discussed here should be proposed and carried out on the basis of an expanding U.S. program of space science and exploration, and without prejudice to continuing joint enterprise with and assistance to the free world.

PROCEDURE

Overtures should be made at Governmental levels, inviting the USSR to engage in cooperative enterprise such as the proposals below. Soviet counter-suggestions of areas of cooperation would also be invited. The initial discussions would seek a go-ahead for exploratory technical talks preliminary to agreements in principle. Privacy in all such discussions would appear to enhance the chances of success. Technical advice should be available at all times.

[3] *PROPOSALS*

Category (a)

These proposals for the most part call for the use of ground facilities for mutual service:

(i) The U.S. and the USSR might agree to provide ground-based support on a reciprocal basis for space experiments, e.g.,

- When either nation launches a satellite or probe carrying a magnetometer experiment, the other would collect rapid-run magnetograms at its ground observatories. (A Soviet scientist has recently promised to do this in connection with the U.S. P-14 probe, following a private request.)
- When either nation launches a meteorological satellite, the other would carry out routine and special (airborne, balloon-borne, all-sky camera) weather observations synchronized with the passes of the satellite, analyze the data from both sources, and participate in scientific exchanges of the results.
- Similar arrangements would be useful in connection with ionospheric, auroral, and other geophysical researches.

(ii) The U.S. and the USSR could agree to record telemetry from each other's satellites, exchanging the resulting tapes as requested. Each would furnish the necessary orbital information and telemetry calibrations to the other. This would be of particular value in sun-related experiments and could extend to the exchange of command signals to permit the best-situated nation to energize a given experiment under certain conditions of solar activity.

(iii) In the communications field, the USSR may wish to employ a ground facility for long-distance experimental transmission of voice or TV signals by means of communications satellites to be launched by NASA after mid-1962 (Projects Relay/Rebound). Such facilities are being prepared also by the U.K. and France. Transmissions may be effected between the latter and the USSR (by means of a U.S. satellite) as usefully as between the U.S. and the USSR. (If *supplementary* equipment peculiar to such experimental testing in this case is required by the USSR, NASA could provide it at costs ranging up to $2 million.)

[4] The exchanges proposals in (a) have been sought, almost with complete unsuccess, at government agency and scientific society levels since the beginning of the IGY. They are included because of their inherent desirability and because a somewhat greater chance of acceptance may follow if initiated at higher levels. (The programs in Categories (b) and (c) have not yet been proposed to the Soviet Union.)

The proposals made in Category (a) are for *coordinated* rather than *interdependent* efforts and thus would avoid difficulties which may be associated with the latter type of cooperation with the USSR.

[5] *Category (b)*

(i) Weather satellites promise broad near-future benefits to the peoples of the world. Equal participation by the U.S. and the USSR in coordinated launching of experimental satellites capable of providing typhoon warnings, etc., would have great impact.*

One specific proposal is that the U.S. and the USSR each place in polar orbit a meteorological satellite to record cloud-cover and radiation-balance data, such that

- The two satellites have reasonably overlapping lifetimes (at least three months).
- The satellites orbit in planes at right angles to each other, providing at least six-hour coverage of the earth.
- The data characteristics permit reception and analysis interchangeably, if possible.
- Each country may receive telemetry from the other's satellite through continuous readout if power sources permit or by command if otherwise.
- Camera resolutions are appropriate only for the objective—photographs of cloud cover.
- The results are to be made available to the scientific community (World Data Centers and WMO).

(ii) Coordinated programs including experimental or research satellite launchings in other fields than meteorology (e.g., communications) could also be of value. In the field of geophysics, for example, there are possibilities for the useful coordination of the orbits of contemporaneous satellites so as to obtain measurements under contrasting or complementary conditions.

(iii) Simultaneous and coordinated rocket launchings from a number of stations covering a wide range of latitudes and longitudes would for the first time provide a global picture of the properties of the atmosphere at a given instant of time, if conducted on a scale greater than now done during International Rocket Weeks.

[6] The first proposal in Category (b) above falls in the meteorological field, in which the U.S. appears to lead. While the USSR has not yet done anything in this field, it has on one occasion indicated at the highest scientific level that space meteorology is favorably viewed as an area for cooperation. A generous time-scale (or offer to provide instrumentation) might moderate the negative factor.

The proposals made in Category (b) are, like those in Category (a), for *coordinated* rather than *interdependent* efforts and thus would avoid difficulties which may be associated with the latter type of cooperation with the USSR.

[7] *Category (c)*

These proposals related to the exploration of celestial bodies.

(i) Mars or Venus Programs.

Planetary investigations are immensely difficult undertakings requiring protracted programs of great complexity and variety, progressing through fly-bys, orbiters, hard and soft landings, and surface prospecting. The U.S. and the USSR could coordinate their independent programs so as to provide for a useful sequencing and, perhaps, sharing of experimental missions, with scientific benefits and economics. Full data exchange, guaranteed by provision of telemetry calibrations, should be provided. If cooperation is interrupted, no less is sustained and the programs may proceed independently.

The U.S. and USSR could, alternatively, enter into a joint program that would mean more intimate involvement; such a program would include cooperative development of

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* Broader cooperation in meteorology is possible and desirable. A specific proposal for a major worldwide cooperative meteorological program, in which satellites would be a part, is being developed separately.

equipment and sharing of experimental missions, and would point toward eventual joint launching of probes.

(ii) Manned Exploration of Moon.

The presence of man will immeasurably enhance the scientific investigation of the Moon—so critical for understanding the origin of the solar system—by providing the resourcefulness, flexibility and opportunity for improvisation available only with man.

As a first step in non-limited cooperative effort, the U.S. and the USSR would each undertake to place a small party (about 3) of men on the moon for scientific purposes and return them to earth.

As in planetary programs, a more extensive cooperative program could also be envisaged in which the U.S. and USSR enter into a joint manned lunar program, including cooperative development, planning, and international exploration.

The proposals made in Category (c), in the lunar and planetary fields, suggest programs for which the USSR has demonstrably greater existing capability. Inclusion of both categories in proposals to the USSR may therefore be effective.

[8] No significant Mars probe capability now exits in the U.S. By 1964, Centaur should permit significant fly-bys only, while Saturn C-1 would put about 300 pound payloads in orbit after 1964.

The Mars/Venus program is a long-range one whose cost varies widely with numbers of launchings, nature of payloads, and extent of back-up. A balanced program (unmanned), including some 15 Venus shots and 8 Mars shots in the next decade, may cost in the order of $1 billion.

Neither country now possesses a capability for a manned lunar project. It will require boosters of the order of Saturn C-2 using orbital rendezvous and refueling techniques (still to be attempted and perfected) for the upper stages. At least six Saturn C-2's would be required for a single mission, plus appropriate back-up. The time-scale is probably a decade, during which some 70-80 Saturns would be required for developmental purposes, and the cost is roughly of the order of $10 billion. During the decade, alternative vehicle systems may conceivably become available, obviating the difficult rendezvous requirement.

In the suggestions for cooperation given above, it can be seen that the degree of involvement between the U.S. and the USSR can in principle be varied from coordination of national programs to full cooperation on joint endeavors.

It is possible to *restrict* proposals which may be made to the Soviet Union to the level of coordination of essentially independent programs. Benefits would derive from joint planning and organization of such coordinated efforts. This might have the advantages of greater acceptability in the U.S. and in the Soviet Union (where suspicions of U.S. motivations would be present in any case). It may also be more realistic in terms of the technical exchange and access which may be feasible.

On the other hand, it would be possible to indicate a *range* of possible relationships to the Soviet Union, extending to interdependent programs and leaving it to them to select the starting level.

As we contemplate programs that involve greater degrees of cooperation, we must also anticipate certain increased difficulties. These would include the risk that the whole program would be lost if one or the other participant withdrew because of political or other reasons: the fact that we would have to be prepared to admit Russians to installations such as Cape Canaveral and to show them details of our booster and payload systems (of course, the Russians [9] would have to do the same if they agreed to intimate cooperation), and the possibility that Congressional, scientific and public support might also be

more difficult because of the very high costs involved, coupled with the potential damage to our program if the Soviets became obstructive or withdraw. Positive factors must also be considered, of course, such as the impact on U.S./USSR relations growing out of intimate cooperation on large and meaningful projects, and the advantages occurring to both countries in carrying out space programs utilizing the best of what each has to offer without unnecessary time pressures.

At any level of relationships, proposals for cooperation in Category (a) have the greatest potential for matching the President's theme that "Both nations would help themselves as well as other nations by removing those endeavors from the bitter and wasteful competition of the Cold War." The United States considers exploration of the celestial bodies, particularly manned space exploration, to be perhaps the most challenging adventure of this century. This venture should be conducted on behalf of the human race and the earth as a whole, not on behalf of any single nation. The vigorous and accelerating United States space exploration program is proceeding in this spirit. If the Soviet Union shares this conception, then planning should be undertaken promptly for cooperative manned exploration of the moon and unmanned exploration of Mars and Venus. These projects should of course be open to the participation of all interested countries [and might come under the auspices of the United Nations]. They could, however, be undertaken most constructively only if the United States and the Soviet Union agree on objectives and on coordination of their efforts for the most rapid progress and the most efficient use of human and natural resources.

Document I-37

Document title: John F. Kennedy, to Soviet Union Chairman Nikita Khrushchev, March 7, 1962.

Source: NASA Historical Reference Collection, NASA History Office, NASA Headquarters, Washington, D.C.

From the day he was inaugurated, President John F. Kennedy had hoped that the Soviet Union would be willing to cooperate with the United States in space exploration and exploitation. Kennedy decided in 1961 that he had to compete with the Soviet Union in dramatic space achievements, but he still hoped that other areas of space could serve as arenas for cooperation. Nikita Khrushchev seemed to open the door to such cooperation in his February 21, 1962, message to Kennedy, which congratulated the United States on its first human orbital flight, the Freedom 7 *Mercury mission of John Glenn. Kennedy replied immediately, telling the Soviet premier that the United States would soon forward specific proposals for cooperation. After a rapid review of cooperative possibilities within the U.S. government, Kennedy forwarded this letter on March 7, proposing specific cooperative initiatives to the Soviet Union. This letter marked the beginning of substantive cooperation between the two space superpowers.*

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[1] Dear Mr. Chairman:

On February twenty-second last I wrote you that I was instructing appropriate officers of this Government to prepare concrete proposals for immediate projects of common action in the exploration of space. I now present such proposals to you.

The exploration of space is a broad and varied activity and the possibilities for cooperation are many. In suggesting the possible first steps which are set out below, I do not

intend to limit our mutual consideration of desirable cooperative activities. On the contrary, I will welcome your concrete suggestions along these or other lines.

1. Perhaps we could render no greater service to mankind through our space programs than by the joint establishment of an early operational weather satellite system. Such a system would be designed to provide global weather data for prompt use by any nation. To initiate this service, I propose that the United States and the Soviet Union each launch a satellite to photograph cloud cover and provide other agreed meteorological services for all nations. The two satellites would be placed in near-polar orbits in planes approximately perpendicular to each other, thus providing regular coverage of all areas. This immensely valuable data would then be disseminated through normal international meteorological channels and would make a significant contribution to the research and service programs now under study by the World Meteorological Organization in response to Resolution 1721 (XVI) adopted by the United Nations General Assembly on December 20, 1961.

2. It would be of great interest to those responsible for the conduct of our respective space programs if they could obtain operational tracking services from each other's territories. Accordingly, I propose that each of our countries establish and operate a radio tracking station to provide tracking services to the other, utilizing equipment which we would each provide to the other. Thus, the United States would provide the technical equipment for a tracking station to be established in the Soviet Union and to be operated by Soviet technicians. The United States would in turn establish and operate a radio tracking station utilizing Soviet equipment. Each country would train the other's technicians in the operation of its equipment, would utilize the station located on its territory to provide tracking services to the other, and would afford such access as may be necessary to accommodate modification and maintenance of equipment from time to time.

[2] 3. In the field of the earth sciences, the precise character of the earth's magnetic field is central to many scientific problems. I propose therefore that we cooperate in mapping the earth's magnetic field in space by utilizing two satellites, one in a near-earth orbit and the second in a more distant orbit. The United States would launch one of these satellites while the Soviet Union would launch the other. The data would be exchanged throughout the world scientific community, and opportunity for correlation of supporting data obtained on the ground would be arranged.

4. In the field of experimental communications by satellite, the United States has already undertaken arrangements to test and demonstrate the feasibility of intercontinental transmissions. A number of countries are constructing equipment suitable for participation in such testing. I would welcome the Soviet Union's joining in this cooperative effort which will be a step toward meeting the objective, contained in United Nations General Assembly Resolution 1721 (XVI), that communications by means of satellites should be available to the nations of the world as soon as practicable on a global and non-discriminatory basis. I note also that Secretary Rusk has broached the subject of cooperation in this field with Minister Gromyko and that Mr. Gromyko has expressed some interest. Our technical representatives might now discuss specific possibilities in this field.

5. Given our common interest in manned space flights and in insuring [sic] man's ability to survive in space and return safely, I propose that we pool our efforts and exchange our knowledge in the field of space medicine, where future research can be pursued in cooperation with scientists from various countries.

Beyond these specific projects we are prepared now to discuss broader cooperation in the still more challenging projects which must be undertaken in the exploration of outer space. The tasks are so challenging, the costs so great, and the risk to the brave men who engage in space exploration so grave, that we must in all good conscience try every possibility of sharing these tasks and costs and of minimizing these risks. Leaders of the United

States space program have developed detailed plans for an orderly sequence of manned and unmanned flights for exploration of space and the planets. Out of discussion of these plans, and of our own, for undertaking the tasks of this decade would undoubtedly emerge possibilities for substantive scientific and technical cooperation in manned and unmanned space investigation. Some possibilities are not yet precisely identifiable, but should become clear as the space programs of our two countries proceed.

[3] In the case of others it may be possible to start planning together now. For example, we might cooperate in unmanned exploration of the lunar surface, or we might commence now the mutual definition of steps to be taken in sequence for an exhaustive scientific investigation of the planet Mars or Venus, including consideration of the possible utility of manned flight in such programs. When a proper sequence for experiments has been determined, we might share responsibility for the necessary projects. All data would be made freely available.

I believe it is both appropriate and desirable that we take full cognizance of the scientific and other contributions which other states the world over might be able to make in such programs. As agreements are reached between us on any parts of these or similar programs, I propose that we report them to the United Nations Committee on the Peaceful Uses of Outer Space. The Committee offers a variety of additional opportunities for joint cooperative efforts within the framework of its mandate as sets forth in General Assembly Resolutions 1472 (XIV) and 1721 (XVI).

I am designating technical representatives who will be prepared to meet and discuss with your representatives our ideas and yours in a spirit of practical cooperation. In order to accomplish this at an early date I suggest that the representatives of our countries, who will be coming to New York to take part in the United Nations Outer Space Committee, meet privately to discuss the proposals set forth in this letter.

Sincerely,

John F. Kennedy

Document I-38

Document title: Nikita Khrushchev, to President John F. Kennedy, March 20, 1962.

Source: NASA Historical Reference Collection, NASA History Office, NASA Headquarters, Washington, D.C.

Nikita Khrushchev replied to President Kennedy's March 7 letter within two weeks. With his acceptance in principle of the concept of U.S.-U.S.S.R. space cooperation, discussions could begin between NASA and its Soviet counterparts regarding specific cooperative undertakings. While the need for progress on disarmament was mentioned in the Khrushchev letter, it was not made a precondition for cooperation.

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[1] Dear Mr. President:

Having carefully familiarized myself with your message of March 7 of this year, I note with satisfaction that my communication to you of February 21 containing the proposal that our two countries unite their efforts for the conquest of space has met with the necessary understanding on the part of the Government of the United States.

In advancing this proposal, we proceeded from the fact that all peoples and all mankind are interested in achieving the objective of exploration and peaceful use of outer space, and that the enormous scale of this task, as well as the enormous difficulties which must be overcome, urgently demand broad unification of the scientific, technical, and material capabilities and resources of nations. Now, at a time when the space age is just dawning, it is already evident how much men will be called upon to accomplish. If today the genius of man has created space ships capable of reaching the surface of the moon with great accuracy and of launching the first cosmonauts into orbit around the earth, then tomorrow manned spacecraft will be able to race to Mars and Venus, and the farther they travel the wider and more immense the prospects will become, for man's penetration into the depths of the universe.

The greater the number of countries making their contribution to this truly complicated endeavor, which involves great expense, the more swiftly will the conquest of space in the interests of all humanity proceed. And this means that equal opportunities should be made available for all countries to participate in international cooperation in this field. It is precisely this kind of international cooperation that the Soviet Union unswervingly advocates, true to its policy of developing and strengthening friendship between peoples. As far back as the beginning of 1958 the Soviet Government proposed the conclusion of a broad international agreement on cooperation in the field of the study and peaceful use of outer space and took the initiative in raising this question for examination by the United Nations. In 1961, immediately after the first space flight by man had been achieved in the Soviet Union, we reaffirmed our readiness to cooperate and unite our efforts with those of other countries, and most of all with your country, which was then making preparations for similar flights. My message to you of February 21, 1962 was dictated by these same aspirations and directed toward this same purpose.

[2] The Soviet Government considers and has always considered the successes of our country in the field of space exploration as achievements not only of the Soviet people but of all mankind. The Soviet Union is taking practical steps to the end that the fruits of the labor of Soviet scientists shall become the property of all countries. We widely publish notification of all launchings of satellites, space ships and space rockets, reporting all data pertaining to the orbit of flight, weight of space devices launched, radio frequencies, etc.

Soviet scientists have established fruitful professional contact with their foreign colleagues, including scientists of your country, in such international organizations as the Committee of Outer Space Research and the International Astronautical Federation.

It seems to me, Mr. President, that the necessity is now generally recognized for further practical steps in the noble cause of developing international cooperation in space research for peaceful purposes. Your message shows that the direction of your thoughts does not differ in essence from what we conceive to be practical measures in the field of such cooperation. What, then, should be our starting point?

In this connection I should like to name several problems of research and peaceful use of space, for whose solution it would in our opinion be important to unite the efforts of nations. Some of them, which are encompassed by the recent U.N. General Assembly resolution adopted at the initiative of our two countries, are also mentioned in your message.

1. Scientists consider that the use of artificial earth satellites for the creation of international systems of long-distance communication is entirely realistic at the present stage of space research. Realization of such projects can lead to a significant improvement in the means of communication and television all over the globe. People would be provided with a reliable means of communication and hitherto unknown opportunities for broadening contacts between nations would be opened. So let us begin by specifying the definite opportunities for cooperation in solving this problem. As I understood from your message, the U.S.A. is also prepared to do this.

2. It is difficult to overestimate the advantage that people would derive from the organization of a world-wide weather observation service using artificial earth satellites. Precise and timely weather prediction would be still another important step on the path to man's subjugation of the forces of nature; it would permit him to combat more successfully the [3] calamities of the elements and would give new prospects for advancing the well-being of mankind. Let us also cooperate in this field.

3. It seems to us that it would be expedient to agree upon organizing the observation of objects launched in the direction of the moon, Mars, Venus, and other planets of the solar system, by radio-technical and optical means, through a joint program.

As our scientists see it, undoubted advantage would be gained by uniting the efforts of nations for the purpose of hastening scientific progress in the study of the physics of interplanetary space and heaven[ly] bodies.

4. At the present stage of man's penetration into space, it would be most desirable to draw up and conclude an international agreement providing for aid in searching for and rescuing space ships, satellites and capsules that have accidentally fallen. Such an agreement appears all the more necessary, since it might involve saving the lives of cosmonauts, those courageous explorers of the far reaches of the universe.

5. Your message contains proposals for cooperation between our countries in compiling charts of the earth's magnetic field in outer space by means of satellites, and also for exchanging knowledge in the field of space medicine. I can say that Soviet scientists are prepared to cooperate in this and to exchange data regarding such questions with scientists of other countries.

6. I think, Mr. President, that the time has also come for our two countries, which have advanced further than others in space research, to try to find a common approach to the solution of the important legal problem with which life itself has confronted the nations in the space age. In this connection I find it a positive fact that at the UN General Assembly's 16th session the Soviet Union and the United States were able to agree upon a proposal on the first principles of space law which was then unanimously approved by the members of the UN: a proposal on the applicability of international law, including the UN charter, in outer space and on heavenly bodies; on the accessibility of outer space and heavenly bodies for research and use by all nations in accordance with international law; and on the fact that space is not subject to appropriation by nations.

Now, in our opinion, it is necessary to go further.

[4] Expansion of space research being carried out by nations definitely makes it necessary to agree also that in conducting experiments in outer space no one should create obstacles for space study and research for peaceful purposes by other nations. Perhaps it should be stipulated that those experiments in space that might complicate space research by other countries should be the subject of preliminary discussion and agreement on an appropriate international basis.

I have named, Mr. President, only some of the questions whose solution has, in our view, now become urgent and requires cooperation between our countries. In the future, international cooperation in the conquest of space will undoubtedly extend to ever newer fields of space exploration if we can now lay a firm foundation for it. We hope that scientists of the USSR and the U.S.A. will be able to engage in working out and realizing the many projects for the conquest of outer space hand in hand, and together with scientists of other countries.

Representatives of the USSR on the UN Space Committee will be given instructions to meet with representatives of the United States in order to discuss concrete questions of cooperation in research and peaceful use of outer space that are of interest to our countries.

Thus, Mr. President, do we conceive of—shall we say—heavenly matters. We sincerely desire that the establishment of cooperation in the field of peaceful use of outer space facilitate the improvement of relations between our countries, the easing of international tension and the creation of a favorable situation for the peaceful settlement of urgent problems here on our own earth.

At the same time it appears obvious to me that the scale of our cooperation in the peaceful conquest of space, as well as the choice of the lines along which such cooperation would seem possible is to a certain extent related to the solution of the disarmament problem. Until an agreement in general and complete disarmament is achieved, both our countries will, nevertheless, be limited in their abilities to cooperate in the field of peaceful use of outer space. It is no secret that rockets for military purposes and spacecraft launched for peaceful purposes are based on common scientific and technical achievements. It is true that there are some distinctions here; space rockets require more powerful engines, since by this means they carry greater payloads and attain a higher altitude, while military rockets in general do not require such powerful engines—engines already in existence can carry warheads of great destructive force and assure their arrival at any point, on the globe.

[5] However, both you and we know, Mr. President, that the principles for designing and producing military rockets and space rockets are the same.

I am expressing these considerations for the simple reason that it would be better if we saw all sides of the question realistically. We should try to overcome any obstacles which may arise in the path of international cooperation in the peaceful conquest of space. It is possible that we shall succeed in doing this, and that will be useful. Considerably broader prospects for cooperation and uniting our scientific-technological achievements, up to and including joint construction of spacecraft for reaching other planets—the moon, Venus, Mars—will arise when agreement on disarmament has been achieved.

We hope that agreement on general and complete disarmament will be achieved; we are exerting and will continue to exert every effort toward this end. I should like to believe that you also, Mr. President, will spare no effort in acting along these lines.

Yours respectfully,

N. Khrushchev

Moscow, March 20, 1962

Document I-39

Document title: "Record of the US-USSR Talks on Space Cooperation," March 27, 28, and 30, 1962, with attached: Arnold W. Frutkin, Director, Office of International Programs, NASA, "Topical Summary of Bilateral Discussions With Soviet Union," May 1, 1962.

Source: NASA Historical Reference Collection, NASA History Office, NASA Headquarters, Washington, D.C.

Following up on the exchange of letters between John Kennedy and Nikita Khrushchev, both the United States and the Soviet Union appointed delegations to begin discussions on space cooperation possibilities. NASA Deputy Administrator Hugh L. Dryden headed the U.S. delegation, while Professor Anatoli A. Blagonravov of the Soviet Academy of Science led the Soviet delegation. This document records their first three days of meetings, which laid the foundation for more formal negotiations a few months later.

[1]

Record of the US-USSR Talks on Space Cooperation

Held in New York City
on March 27, 28 and 30, 1962

First Meeting - March 27

Participants:	*United States*	*USSR*
	Dr. Hugh Dryden	Prof. A. A. Blagonravov
	Dr. John W. Townsend	Mr. Y. A. Barinov
	Dr. Donald F. Hornig	Mr. Roland H. Timerbaev
	Mr. Lewis Bowden	Mr. Valentin A. Zaitzev
	Mr. Peter Thacher	Mr. G. S. Strashevsky (Interpreter)

The first in a series of bilateral conversations between the US and the USSR was held March 27 at USUN [United Nations]. It was agreed at the outset by Dryden and Blagonravov that these were preliminary, informal talks designed to prepare the basis for further, formal negotiations between US and Soviet experts to discuss specific areas of practical cooperation in outer space as suggested in the exchange of correspondence between President Kennedy and Mr. Khrushchev. Blagonravov stressed the need for initial cooperation in practical fields, such as weather satellites and communication systems, which would be meaningful to the man in the street. They agreed to take up the subject of meteorological satellites at the outset.

Meteorological Satellites. Dryden suggested that the US and the USSR put up meteorological satellites in complimentary [sic] orbits. The US TIROS satellite was a relatively crude, experimental craft, and we had in mind making NIMBUS the basis of our contribution to an operational system. The first launching of NIMBUS would be within a year. It would be stabilized as to scan the earth continuously from a polar orbit, and we had in mind equipment which would permit transmittal of data direct to any nation's ground station, including pictures of overhead cloud cover. We would in addition, of course, transmit information to WMO [the World Meteorological Organization].

[2] Blagonravov made what appeared to be a general statement to the effect that cooperation must develop stage by stage; he noted that launch systems were closely related to other aspects (military); therefore the achievement of broadest cooperation will be related to progress in disarmament. Conversely, progress in cooperation will aid the development of mutual trust between nations.

Turning to the meteorological project, the USSR will transmit to the US all data they receive from NIMBUS. They expect to launch their own meteorological satellite and are prepared to come to an agreement on coordination of orbits. They will transmit all meteorological data from their own system to other countries. He noted that speedy transmittal of data is essential.

Dryden commented that he had in mind the problem of access to launch sites and therefore was proposing only coordination; in any case, we will not seek information the Soviets do not wish to give. He noted that the recent Soviet launch, which was first in a new series, was said to include devices for measurement of cloud coverage.

Blagonravov said that they intend to launch meteorological satellites on a national basis and to exchange data. He had in mind that WMO would insure [sic] the proper transmittal of information to other countries.

Dryden questioned what the next step might be. Should there be a meeting of both sides' experts at the time of the coming COSPAR [Committee on Space Research] Conference in Washington, or should the problem be left to WMO? Blagonravov said the best way would be to continue through WMO. He drew attention to an April 23 symposium scheduled for Washington. Dryden asked if there should be private meetings between US and Soviet experts at that time. Blagonravov said this particular symposium will not attract experts in the field of satellite weather forecasting, but nonetheless the experts present could explore the problem in a preliminary way.

Dryden noted that the SYG of WMO has obtained the presence of two US and Soviet meteorological experts in Geneva to help with the preparation of WMO's report on this subject. Blagonravov said he had no information about the details of their discussion and was unable to judge the results.

[3] Dr. Hornig commented that success in this field will depend in large part on the compatibility of information sought and obtained. He asked if we could discuss this aspect with a view to standardizing equipment in satellites. Blagonravov preferred to leave the job of determining technical requirements to WMO experts.

Communications Satellites. Blagonravov said they are ready to take part in studies of principles and of design plans for a system which should be organized through ITU [the International Telecommunications Union]. They are ready to take part in experimental projects, and they are ready to supply information to the US on radio signals bounced off ECHO. He thought the time had come to make a "symbolic start" in this field.

Dryden noted that ECHO has become smaller, and the surface is considerably wrinkled; it is therefore less satisfactory for radio relay purposes. We plan to launch within a year a large, 140-foot sphere which will be more rigid and therefore more suitable. Blagonravov indicated that they were agreeable to using the larger sphere.

Dryden suggested the USSR might wish to join experiments with active relays. Blagonravov said they lack experience. Dryden said we also lack experience but noted that several European states are building ground stations for this purpose and suggested that the USSR might also. Blagonravov noted that active relays require extensive equipment somewhat like the enormous receivers that the USSR is now building for deep space probes, such as to Venus. Dryden suggested it might be possible to modify some of these large dishes so that they could receive signals from active-relay satellites. Blagonravov said they would prefer to leave it up to ITU experts to organize cooperation in this field. Townsend noted this would be difficult for ITU because the problem is one essentially of equipment, a subject ITU does not normally handle.

Dryden felt the subject needed further bilateral discussions between experts. He noted that CCIR has recently been discussing the problem of the sharing of frequencies between satellite and ground-based microwave systems. He thought that both countries might cooperate in studying this possible source of interference, a subject also suitable for [4] bilateral discussion. Blagonravov noted the problem is already under review by ITU. Dryden said we do not presently have any active communications satellites; they are at present only in a research and development phase which will include one low-altitude launch later this year. Blagonravov commented this first experiment may help to clarify the situation.

Geomagnetic Research. Dryden noted the desirability of coordinating data gathering in this field. Blagonravov said he could not yet say when the USSR will be prepared to launch

research vehicles to measure the earth's magnetic field. Their first interest will be the measurement of field components; later they will seek to measure the dimension of the total field. Nonetheless, the time is now right to organize an exchange of data on geomagnetic measurements. Dryden thought this was already on the agenda of COSPAR and wondered if Soviet experts would be present at the COSPAR meeting. It was agreed that Dryden and Blagonravov would meet with their experts during COSPAR. Townsend asked if the USSR had decided which orbit, high or low, they would undertake. Blagonravov replied that it does not make much difference; they could do it at any altitude. He noted that at a previous COSPAR meeting US experts had suggested that the Soviet Union take the high orbits but no decision had been reached. Dryden commented that this suggestion had been in recognition of greater Soviet thrust capabilities. Although not exciting for the man in the street, Dryden felt this is a field of great interest to scientists.

Space Medicine. Dryden announced that the US will publish on April 6 a detailed report containing all medical information resulting from the Glenn flight. He said Blagonravov and other Soviet scientists would be welcome at the time. On the US side many ideas for cooperation in this field are being discussed, such as the establishment of an international laboratory, and possible coordination in manned-flight experiments, but he suspected that the Soviets might prefer an exchange of information. Blagonravov expressed preference for a broad exchange of information. Dr. Hornig noted that much background other than from manned-flight space is available; he hoped that the exchange would include ground laboratory and animal data. Blagonravov agreed. Dryden asked if Blagonravov had considered visits to laboratory facilities. Blagonravov said he had not discussed this subject with appropriate Soviet experts before leaving Moscow and, therefore, could not answer.

[5] *Salvage and Rescue.* Blagonravov raised the problem of insuring [sic] the return of astronauts and vehicles from other states. Dryden noted this was largely a legal and political problem, but worth exploring here. Blagonravov said their ideas had not advanced beyond general terms. Dryden said it was no question but that the US would use its facilities to aid a Soviet astronaut in difficulty and he hoped the same would be true for Americans. Blagonravov stated this would, of course, be so. Dryden asked if the Soviets favor some form of international agreement or treaty, of the sort, for example, which govern civil aircraft. Blagonravov felt some means should be found to assure that all UN members agree to the return of capsules. Dryden called on Thacher who suggested that it might be appropriate for the UN Outer Space Committee to recommend an appropriate resolution for adoption at the next session of the General Assembly. Timerbaev felt he and Thacher should discuss this bilaterally in the context of the committee.

It was agreed that there should be no announcement made to the press concerning these talks and that the next meeting would take place on March 28 at the Soviet Mission.

Second Meeting - March 28

Participants:	*United States*	*USSR*
	Dr. Dryden	Prof. Blagonravov
	Dr. Townsend	Mr. Barinov
	Dr. Hornig	Mr. Timerbaev
	Mr. Frutkin	Mr. Zaitzev
	Mr. Bowden	Mr. Aldoshin
	Dr. Porter	Mr. Strashevsky
	Mr. Thacher	(Interpreter)

The second in a series of US-Soviet bilateral discussions about possible cooperation in outer space matters was held at the Soviet Mission to the UN during the morning of March 28.

[6] *Contamination of Space.* Blagonravov believed the problem of pollution deserves studying. He had in mind radioactive contamination, bacteriological contamination, interference with radio transmission from the earth to satellites and from satellites to the earth, and possible physical interference of the sort many feared would result from Project WESTFORD. He commented that there were grounds for fear of interference by the needles on two counts: radio astronomy, and physical damage to other satellites, particularly optical equipment. He did not feel it necessary to exclude this type of experiment, rather he felt there should be some procedure for preliminary discussion which would analyze all possible harmful effects and thereby dispel the fears of interested scientists. Dryden noted that in his letter, Khrushchev had placed the subjects of radioactive and bacteriological contaminations primarily in a legal context. He noted that there is broad consultation by the US with interested scientists and, on the international level, through COSPAR which is a useful means of bringing about understanding of the scientific aspects of experiments. Blagonravov and Dryden agreed that nuclear engines would be needed for long distance probes and presented a number of technical problems. Dryden commented these were primarily problems relating to contamination of the surface of the moon and planets, not of intervening space. Porter noted that in Florence he and Blagonravov had agreed on three principles: (1) radioactive components should be so packaged as to prevent dispersal in case of impact; (2) radioactive materials should be chosen with short half-life times; and (3) radioactive materials should be chosen which did not occur in nature. Dryden felt there was not much left to discuss about radioactive and bacteriological contamination and asked if we should consider the problem of frequency allocation. Thacher noted that the UN Committee would probably consider the problem of contamination in its technical subcommittee. Porter suggested it might be wise to delegate to COSPAR the task of studying this problem. Dryden felt that the ultimate decision must rest with launching states. As to the problem of terminating satellite transmissions, he found it hard to make a general rule where so much depends on the precise nature of the experiment. For example, it did not seem desirable arbitrarily to exclude experiments from which continual transmission could be expected. Blagonravov agreed and said the Soviet idea is mainly to stress the importance of preliminary [7] exchanges which can dispel apprehensions whenever they seem likely. Although thankful for information given him by Porter about the problem of physical interference by WESTFORD, apprehension nonetheless arose and Blagonravov felt it might be necessary to have meetings between scientists. Porter invited Blagonravov to express these apprehensions as soon as they arise to the National Academy of Sciences.

Tracking for Deep Space Probes. After Blagonravov appeared to have completed his remarks, Dryden noted that in the course of conversation all but one of the general topics suggested in the letters of President Kennedy and Chairman Khrushchev had been touched upon. The one remaining was Khrushchev's suggestion which appeared to relate to tracking facilities for deep space probes. He turned to Blagonravov.

Blagonravov said he would prefer to hear Dryden first. Dryden said that President Kennedy had suggested an exchange of "tracking stations" but that our interest was more in the field of telemetry data rather than in observation of satellite orbits. This is particularly true with regard to those scientific satellites, such as Van Allen's which broadcast continuously and do not store data. He noted that emphasis was placed in Khrushchev's

letter on the need for observation and contact with deep space shots. It seemed logical that useful exchange could be found. Dryden commented that to a large extent the technical problem in following a deep space probe relates to the transmitter. Our stations in Southern California, Australia and South Africa, for example, are equipped to handle only certain frequencies which cannot easily be altered. Therefore, if our receivers were to be of help, the satellite transmitter should be at appropriate frequencies. He wondered if this presented any technical problems for the Soviets.

Blagonravov replied there is no problem in tracking US satellites over the USSR, and if the US supplied frequencies the USSR will devote the necessary facilities to track them and receive them, and will supply resulting data. Conversely, when the Soviets are interested in receiving data from us they will supply the frequencies and the codes to us.
[8] Dryden commented this could be done in two ways, either by recording telemetry signals on tape and sending the tape to the launchers, or by supplying the code, in which case the recipient could reduce the data for the launchers. Blagonravov asked which Dryden preferred.

Dryden commented we found our own scientists prefer to work out their own results. He cited as an example the case of Van Allen and the Japanese scientist who had been given the code but whose results were out of line because he had not realized that one of the channels was malfunctioning. Blagonravov felt that both ways were possible and that the decision would depend on the specifics in each case. Townsend suggested this would be a good area for progress.

Next Steps. Dryden asked where we were to go from here. Blagonravov replied our approach may vary from problem to problem. Some, as had been suggested, may be appropriate for COSPAR; the general subject of frequency allocation is appropriate for ITU; others are appropriate for WMO experts.

Dryden agreed that discussions ultimately should take place with other states in an appropriate international forum. But we felt it more useful to start bilateral talks at the time of the COSPAR meeting. For example, it might then be useful to start discussions on meteorological satellites and geomagnetic research. So far as the meteorological satellite is concerned, he felt it would be wise to distinguish between the research and development phase, and the operational system. He thought talk should start without delay about the experimental stage; as a result the two sides could come to an agreement on the type of information to be sought. Continuing with the general outline, Dryden suggested there might be later discussion in Moscow about such matters as coordination of planetary exploration. In the meantime, he thought it would be helpful if we could follow up the general discussion of the past days with specific discussions on certain subjects. He asked if it would be possible to agree to try to arrange discussions at the time of the COSPAR meeting on meteorological satellites and geomagnetic research.
[9] Blagonravov drew attention to his inability to consult with appropriate experts but said he would be prepared to get in touch with Dryden. It would be helpful if Dryden could list his ideas as to the priority of subjects which he could take with him to Moscow, and later he, Blagonravov, could respond with proposals. Dryden suggested that he could prepare plans and meet with Blagonravov again next week. Blagonravov said he would be leaving for Moscow this weekend, and it would be desirable to receive a list before that time. Dryden suggested we could select a few steps, although we are to respond to all, and suggested meeting again on March 30.

Blagonravov made an evasive reply. Dryden said we therefore would prepare and give to Blagonravov on Friday specific proposals for later discussion by the experts during the COSPAR meeting in Washington. These proposals would involve meteorological satellites,

geomagnetic research and the general area of telemetry. At the same time, we would be prepared for later discussions, perhaps in Moscow, regarding communication satellites, space medicine, and inter-planetary exploration.

It was agreed that the next meeting would take on "neutral ground" (at the Soviet's insistence), i.e. at the UN. It was agreed that Thacher and Timerbaev should prepare a joint press release for issuance after the following meeting which would respond to the desires of both countries for forward movement in the area of US-Soviet cooperation.

Military Reconnaissance. During the course of general conversation which followed, Blagonravov commented that the climate for cooperation would be greatly improved if both sides would issue a declaration to the effect that neither would use satellites for the purpose of military reconnaissance. Blagonravov expressed himself as certain that Dryden was not in a position to comment on this aspect of outer space. Nonetheless, Blagonravov hoped that the US Government was as attentive to the opinion of its scientists as was his, the Soviet, Government. Before coming to New York, his colleagues had asked him to urge his American colleagues to persuade the US Government to issue such a declaration. (The translator failed to make clear, as had Blagonravov in Russian, that he had been instructed by his Government to raise this matter.)

[10] *Third Meeting - March 30*

Participants:	*United States*	*USSR*
	Dr. Dryden	Prof. Blagonravov
	Dr. Townsend	Mr. Barinov
	Dr. Hornig	Mr. Timerbaev
	Mr. Frutkin	Mr. Zaitzev
	Mr. Bowden	Mr. Strashevsky
	Dr. Porter	(Interpreter)
	Mr. Thacher	

The third in a series of US-Soviet bilateral discussions about possible cooperation in outer space matters was held at the United Nations Headquarters during the afternoon of March 30.

Dryden presented to Blagonravov the three tentative proposals worked out by the American side on collaboration in the fields of weather satellites, geomagnetic survey, and telemetry. Dryden pointed out that these proposals were being handed to the Soviets in order that they might study them and be prepared to discuss them in a concrete fashion at the April COSPAR meeting and in other forums. Blagonravov, with the aid of his interpreter, scanned the tentative proposals quickly and said that he would take them back to Moscow and discuss them with the relevant Soviet specialists.

While Blagonravov was reading our proposals, Thacher of USUN and Timerbaev of the Soviet UN Mission attempted to come to agreement on the wording of the joint statement to be made upon the conclusion of the talks that day. The US draft had proposed listing the three topics mentioned above since these were the fields in which further concrete talks were planned. Timerbaev insisted that if topics touched on in the three days of talks were listed they would necessarily have to include mention of military intelligence reconnaissance satellites. Thacher and Timerbaev did not reach an accord on the matter, and it was placed before Dryden and Blagonravov. The latter reiterated Timerbaev's stand and Dryden demurred, pointing out that the subject of military reconnaissance satellites did not fall within the frame of reference agreed to for the talks. Agreement was finally

reached that the statement issued would simply say that the items mentioned in the Kennedy and Khrushchev letters respectively had been discussed, as well as additional topics. The problem of listing the specific items touched on was, therefore, obviated.

Dryden and Blagonravov then met with the press and released their statement.*

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[Attachment page 1]

Topical Summary of Bilateral Discussions With Soviet Union

(Note: For negotiations of March 27, 28, 30, 1962)

1. Meteorological Satellites

Blagonravov indicated that a series of scientific satellites which had just begun with the launching of COSMOS I would seek meteorological data, although this was not necessarily true of the first launching in the series. The Soviet Union intends to launch meteorological satellites to photograph cloud cover and would be agreeable to coordinating their orbits and other details with the US and to exchange the data. Like the US, the USSR would wish to relate any such program to WMO activities and sponsorship. Blagonravov said that meteorological satellites should be launched on a national basis with data coordination through WMO. (Subsequent private discussions suggest that the USSR nevertheless recognizes the fundamental necessity of bilateral coordination in flight programs.) Dr. Dryden suggested the possibility of using Nimbus as a basis for the joint program in about a year.

2. Communications Satellites

Khrushchev had given priority to cooperation in the field of communications satellites, and Blagonravov indicated that the Soviet Union would desire to take part in experimental projects. Nevertheless, he was not yet ready to identify suitable modes of cooperation in this field. He said that (Soviet) experience was lacking on active repeaters and seemed to feel that a position must be worked out on communications systems in the ITU before such could be done. The Soviet interest in communications satellites cooperation actually appeared directed primarily toward operational matters rather than experimental. As a "symbolic" gesture, however, Blagonravov made a point of expressing readiness to utilize the US ECHO satellite for a communication demonstration between the US and the Soviet Union. (It should be noted that Blagonravov later stated that he did not mean, by the use of the word symbolic, that the cooperative use of ECHO would not have real value.) The US delegation considered that ECHO had deteriorated too much to permit a satisfactory demonstration, and the two sides agreed to look toward the ECHO follow-on program for such a demonstration. There was some indication that the Russians would wish to utilize a new deep space probe dish, or dishes, which they are now constructing for communications experiments.

[2] 3. Magnetic Field Survey

The Soviets would be willing to coordinate with the US in an effort in which each country placed a satellite in orbit to measure the Earth's field. Blagonravov said that the Soviets could place a satellite at either of the higher or lower altitudes required for this project and could measure the field components as well as strength. It is still undecided whether the USSR would devote a special satellite for the program or join the experiment

* See "Preliminary Summary Report" of these conversations prepared by Dr. Dryden.

with others in a multi-purpose satellite. There vas some indication that the Soviets would measure the field components as early as, or earlier than, the scalar values. When it was suggested that the standards established for the World Magnetic Survey for measurement of vectors were quite stringent, Blagonravov said he was not personally familiar with them but would make sure that they were brought to the attention of the proper scientists of the USSR.

4. Data Acquisition

Blagonravov made clear that the Soviet Union was not ready to exchange tracking and data acquisition station equipment. Instead, he said that the Soviet Union would make available on its own territory equipment to American specifications to provide desired services. Blagonravov did not exclude the possibility of equipment exchange at a later stage. Soviet interests were clearly directed more toward deep space tracking and data acquisition than toward the acquisition of telemetry for scientific satellites as desired by the US. There was some appearance of the possibility of an agreement for appropriate trade-offs here. The question of exchanging telemetry codes along with the exchange of telemetry tapes was discussed, and it was agreed that such exchanges would have to be worked cut on a case-by-case basis. Dr. Dryden pointed out that there was some difficulty in providing calibrations for telemetry, both because of the sensitivities of prime experimenters and the empirical requirements for calibration adjustment in the period after satellite launch. Dr. Dryden pointed out, in addition, that public errors had been made, as by the Japanese, in using calibrations not fully understood by them. With regard to deep space probe tracking and telemetry, it appeared that some activity is going on in the Soviet Union to strengthen its capabilities. It was also understood that both sides would be launching deep space probes at approximately the same periods due to the "window" situation and that therefore each country might be limited in providing services to the other.

[3] 5. Deep Space Activities

With regard to cooperation in lunar and planetary activities per se, Blagonravov stated that current programs were too far along to permit coordination at this date. The coordination of future progress with respect to physical quantities measured by the probes launched by the US and USSR seemed possible.

6. Space Medicine

There was relatively little discussion of space medicine. Dr. Dryden suggested this might be an appropriate area for broad exchanges. He indicated that some people in this country feel it may be useful to exchange laboratory visits. Blagonravov appeared to believe that laboratory visits would not be easy to arrange at this stage but rested on a lack of information as to the situation in his own country. The matter was left for further definition.

7. "Pollution" of Space

Blagonravov expressed concern about several types of possible interference in the space activities of one country by reason of the activities of another. In this category, he included biological contamination, radio nuisances and interference, and the dispersion of particles as in Project WESTFORD. It is not clear whether he had in mind legal prohibitions. Specifically, with regard to Project WESTFORD, Blagonravov indicated fear of damage or interference with optical experiments in satellites. It was clear that he did not argue to prohibit WESTFORD but rather to provide for preliminary discussion to avoid harmful effects. Dr. Dryden reviewed the procedures followed in the US to assure that the scientific community has no substantial concerns regarding any proposed experiment, referred to the descriptions by a [Jet Propulsion Laboratory] representative of our contamination procedures at a recent meeting in the Soviet Union, to continuing consideration by COSPAR of this subject, and to the coordination of radio frequency uses by the

ITU. The US delegation indicated its belief that the technical aspects were largely for the Technical Subcommittee. Dr. Dryden concluded with the observation that each launching country would undoubtedly expect to retain the final judgment over action to be taken in any given case of possible or alleged pollution. Blagonravov seemed to be in complete agreement. Dr. Dryden explored Soviet attitude toward the use of nuclear power or propulsion sources. Blagonravov agreed that there was no objection to these per se, assuming general safeguards. His response to this was so prompt as to reflect current Soviet consideration of nuclear propulsion or power sources.

[4] 8. Spy Satellites

During the session held at the Soviet UN Mission, Blagonravov brought up, almost apologetically, a proposal which he stated he had been "instructed" to raise. He said that it would be desirable if the scientists of the US would join with those of the Soviet Union in a pledge to reserve space for peaceful purpose and to prohibit the use of satellites for surveillance purposes. Blagonravov suggested that Dr. Dryden might not be prepared to comment on this. Dr. Dryden replied that the subject was outside the scope of the present technical discussions. There was some further discussion in a rather bantering vein about this subject with Blagonravov expressing the belief that scientists in his country could not devote themselves to non-peaceful purposes in space research. Dr. Dryden observed that this was an interesting remark to come from an old artillery observer. The subject was raised again by Blagonravov at the end of a subsequent session as an item to be included in the joint press release at the end of the first round of discussions. It was offered as a counterproposal to the US desire to specify the three subjects of greatest [discussion, with plans for future talks,] identified in the negotiations. The Soviets wished then to include all other subjects, plus the spy-in-the-sky pledge, or, in the alternative, remove the specific references to subjects discussed. The US side held to the position that the press release should not go beyond those matters discussed in the letters. The implication left in the press release was that the current, as well as future, discussions would be based upon the matters identified in the Kennedy-Khrushchev correspondence.

9. Balloons

When the question relating to balloon-borne experiments arose, Blagonravov made clear the Soviet dislike for the use of balloons.

10. Procedures

It was agreed that the first round of discussions constituted informal exploratory talks prior to formal negotiations. Dr. Dryden's official summary of the opening sessions and the text of the press release which terminated them are attached. These indicate that formal negotiations will begin either at the time of the COSPAR meeting in Washington at the end of April or at the time of the meeting of the Technical and Legal Subcommittees of the UN Outer Space Committee in Geneva at the end of May. Continuity between the two separate sessions was assured by (1) leading the Soviet delegation to agree privately to the identification of three subjects as most promising for early and [5] more detailed investigation, and (2) providing to the USSR somewhat expanded papers on each of these three subjects for their study and future comments. It was agreed that Soviet scientists would consider these papers and Blagonravov indicated that his side would provide similar papers. It was agreed that the working papers would not be published. It should be noted, however, that none of the subjects indicated in the Kennedy-Khrushchev correspondence is excluded from further investigation, although Dr. Dryden indicated that certain aspects might be more appropriate for the Legal Subcommittee of the UN or other forms.

Dr. Dryden specifically asked Blagonravov whether the Soviet view would permit agreement on individual cooperative projects as agreement could be reached upon them

or whether the Soviets felt it was necessary to achieve a total package before any agreement could be reached. Blagonravov strongly indicated his belief that the first procedure should be followed. This may be interpreted as a hopeful sign, particularly in view of the fact that this discussion followed immediately upon the heels of Blagonravov's efforts to write a spy-in-the-sky pledge into a final joint press release. The sequence would suggest that the Soviets do not at this time mean to impose political preconditions upon cooperative projects of the character discussed in the Kennedy-Khrushchev correspondence.

With regard to locations of meetings, Dr. Dryden indicated readiness to hold a future meeting in Moscow, after the Washington or Geneva meeting. The Soviets welcomed this since they appear to attach some value to rotating meetings at among western, neutral and Soviet sites.

11. General

While political considerations were trotted out by Blagonravov at various times during the course of the discussions, they did not appear ever to be raised with the purpose of obstructing conversation. Blagonravov repeated Khrushchev's statement that more ambitious cooperative efforts would have to wait upon disarmament. The spy-in-the-sky pledge discussed above was raised with good humor and appeared to have been fitted in outside the central framework of the negotiations. In the formulation of the press release, the Soviet political offices did ask to reverse the priority of the references to Kennedy and Khrushchev, presumably on the basis of Khrushchev's initiation of their correspondence. [6] On several occasions, the junior member of the Soviet delegation Barinov indicated he was considerably impressed by the scope and size of the NASA program as reflected in the briefings given during the week for the Outer Space Committee at the US Mission.

At one point, Dr. Dryden described in detail the US working relations with the UK on their joint satellite program. Blagonravov stated that he hoped for similar relationships between the US and the USSR.

Arnold W. Frutkin, Director
Office of International Programs
National Aeronautics and Space Administration May 1, 1962

Document I-40

Document title: McGeorge Bundy, Memorandum for the President, July 13, 1962, with attached: George Ball, Under Secretary of State, Memorandum for the President, "Bilateral Talks Concerning US-USSR Cooperation in Outer Space Activities," July 5, 1962.

Source: NASA Historical Reference Collection, NASA History Office, NASA Headquarters, Washington, D.C.

The White House monitored closely the initial U.S.-U.S.S.R. talks on space cooperation to make sure that any agreements reached did not go beyond the bounds of political feasibility in the United States. McGeorge Bundy was President John F. Kennedy's Assistant for National Security Affairs. With this memorandum, he forwarded to Kennedy the Department of State's report on the initial talks and agreements between NASA's Deputy Administrator Hugh L. Dryden and Soviet representative Anatoli Blagonravov.

[1] July 13, 1962

Memorandum for the President

Here for your approval is a memorandum from George Ball on the results of the Dryden and Blagonravov outer space negotiations. At pages three and four it gives recommended procedure from here on out.

I know you have been concerned lest Dryden make agreements that might come under political attack. I believe these three specific projects are quite safe. They have been reviewed with a beady eye by CIA and Defense, and they have been reported in detail to determined and watchful Congressmen like Tiger Teague, with no criticism. In essence they provide for the kind of cooperation in which we get as much as we give, and in which neither our advanced techniques nor our cognate reconnaissance capabilities will he compromised.

McG. B.

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[Attachment page 1] July 5, 1962

Memorandum for the President

Subject: Bilateral Talks Concerning US-USSR Cooperation in Outer Space Activities

On May 15 the Secretary wrote to you describing the developments in this matter prior to the recent talks in Geneva between Dr. Dryden and Professor Blagonravov. These talks commenced on May 29 and continued concurrently with meetings of the subcommittees of the UN Outer Space Committee. As a result, technical arrangements for three specific cooperative projects were agreed ad referendum to the US and Soviet Governments in a joint memorandum signed by Dr. Dryden and Professor Blagonravov on June 8. (See Enclosure 1.) On the same day, Dr. Dryden and Professor Blagonravov issued a joint Press Communique summarizing briefly the results of these discussions. (See Enclosure 2.)

The three projects involve (1) exchange of weather data from satellites and the eventual coordinated launching of meteorological satellites, (2) a joint effort to map the magnetic field of the earth by means of coordinated launchings of geomagnetic satellites and related ground observations, and (3) cooperation in the experimental relay of communications via the ECHO satellite. It was also agreed that there should be further discussion of the possibility of broader cooperation in experiments using active communications satellites to be launched in the future. These arrangements are quite limited in [2] scope and have been drawn carefully to assure reciprocal benefit. They have been developed in the context of multilateral programs (e.g., the program of the World Meteorological Organization for the acquisition and world-wide distribution of weather data, and the program being planned by the International Union of Geodesy and Geophysics for a world geomagnetic survey). The Soviets appeared quite anxious to achieve these agreements.

The arrangements proposed in the joint Dryden-Blagonravov memorandum represent a sound way of proceeding so long as they are adhered to by the Soviet Government and are developed in such a way as not to foster an impression abroad that they represent

a more significant step toward US-Soviet cooperation than they actually do or that US-USSR cooperation will in any way preempt the cooperation already being developed with other countries.

There remain three other specific projects which were suggested in your exchange of correspondence with Chairman Khrushchev last March, but on which no specific conclusions or proposals have been reached during the technical discussions so far, i.e.: (1) the acquisition of data obtained through tracking facilities located in each other's countries but operated by the host governments, (2) joint observation of solar and interplanetary probes, and (3) space medicine. Although it seems clear that the Soviets are not interested in cooperating in tracking and it appears doubtful that they are really interested in joint observation of space probes, it would be well to afford them the opportunity to discuss all these projects further.

Upon Dr. Dryden's return from Geneva, Under Secretary McGhee, who is coordinating this matter for the Department, [3] convened a meeting of the interested agencies of government in which Dr. Dryden, Dr. Welsh, Dr. Reichelderfer, and representatives of Dr. Wiesner, Mr. Bundy, the Defense Department, the Air Force and CIA participated. A review of the recent discussions in Geneva and of the specific proposals contained in the joint Dryden-Blagonravov memorandum resulted in agreement to proceed as follows:

1. After a reasonable interval and if no serious objections have been raised by any of the interested agencies, Dr. Dryden will inform Professor Blagonravov that we have no changes to suggest in their joint memorandum. (The memorandum provided for a two-month waiting period during which either party could propose changes.)

2. Upon notification from Professor Blagonravov that the Soviets do not desire changes which would be unacceptable to us (or at the conclusion of the two-month waiting period), we will, assuming the Soviets still wish to proceed, exchange notes with the Soviet Government to confirm government-level agreement to these proposals.

3. It was suggested that when that agreement has been obtained, you may wish to write to Chairman Khrushchev noting both the agreement to proceed with the specific arrangements at hand and the prospects of further technical discussions on additional topics. A draft of such a letter will be submitted for your approval.

4. Meanwhile, Under Secretary McGhee and Dr. Dryden will report these developments to members of Congress who have a specific interest and responsibility in this field, and the Department will prepare a report to be sent to the Secretary General of the United Nations when formal agreement has been reached with the Soviets.

5. Dr. Dryden will, in cooperation with the interested agencies, proceed now to arrange nominations for US membership in the joint US-Soviet working groups which are to [4] develop the detailed implementation of the meteorological and geomagnetic proposals. These working groups will not, however, be activated until formal agreement has been reached with the Soviet Government.

6. The joint Dryden-Blagonravov memorandum will be treated as CONFIDENTIAL, pending government-level agreement by the Soviets or earlier Soviet public release.

7. After formal agreement has been obtained, Dr. Dryden will arrange directly with Professor Blagonravov for further technical discussions, possibly in Moscow this fall, concerning broader cooperation in communication via satellites and the possibility of cooperation in such of the remaining topics dealt with in your exchange of letters with Chairman Khrushchev as may seem worthwhile to pursue further.

It is our feeling that the present low key, step-by-step approach through informal talks by scientific representatives continues to be the preferable means of moving toward further cooperation and that we should plan to proceed on this basis after government-level agreement has been reached on the specific arrangements already proposed.

George Ball

Document I-41

Document title: McGeorge Bundy, Memorandum for the President, "Your 11 a.m. appointment with Jim Webb," September 18, 1963.

Source: NASA Historical Reference Collection, NASA History Office, NASA Headquarters, Washington, D.C.

The possibility of turning Project Apollo into a cooperative undertaking with the Soviet Union was under active consideration in NASA and the White House as President John F. Kennedy met with NASA Administrator James E. Webb on September 15, 1963. The political climate was much different than it had been in 1961, when the President had decided to race the Soviet Union to the Moon; the high levels of spending for Apollo were coming under criticism in the United States. Kennedy's National Security Advisor McGeorge Bundy suggested to the President that a cooperative mission was desirable, if technically, institutionally, and politically feasible. Two days later, in an address to the United Nations General Assembly, Kennedy suggested that the United States and the Soviet Union take the lead in making the first human voyages to the Moon an undertaking of all countries.

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[1] September 18, 1963

Memorandum for the President

SUBJECT: *Your 11 a.m. appointment with Jim Webb*

Webb called me yesterday to comment on three interconnected aspects of the space problem that he thinks may be of importance in his talk with you:

1. *Money.* The space authorization is passed at $5.350 billion, and he expects the appropriation to come out at about $5.150 billion. While the estimates are not complete, his current guess is that in early '64 he will require a supplemental of $400 million ($200 million requiring authorization and $200 million appropriation only) in order to keep our commitment to a lunar landing in the 1960's.

2. *The Soviets.* He reports more forthcoming noises about cooperation from Blagonravov in the UN, and I am trying to run down a report in today's *Times* (attached) that we have rebuffed the Soviets on this. Webb himself is quite open to an exploration of possible cooperation with the Soviets and thinks that they might wish to use our big rocket, and offer in exchange the advanced technology which they are likely to get in the immediate future. (For example, Webb expects a Soviet landing of instruments on the moon to establish moon-earth communications almost any time.)

The obvious choice is whether to press for cooperation or to continue to use the Soviet space effort as a spur to our own. The *Times* story suggests that there is already low-level disagreement on exactly this point.

3. *The Military Role.* Webb reports that the discontent of the military with their limited role in space damaged the bill on the Hill this year, with no corresponding advantage to the military. He thinks this point can and should be made to the Air Force, and he believes that the thing to do is to offer the military an increased role somehow. He has already had private exploratory talks with Ros Gilpatric for this purpose.

[2] Webb thinks the best place for a military effort in space would be in the design and manning of a space craft in which gravity could be simulated, in preparation for later explorations. He thinks such a space craft may be the next logical step after Gemini. On

the other hand, he is quite cool about the use of Titan III and Dinosoar [sic] and would be glad to see them both cancelled. You will recall that McNamara has just come out on the other side on Titan III.

My own hasty judgment is that the central question here is whether to compete or to cooperate with the Soviets in a manned lunar landing:

1. *If we compete,* we should do everything we can to unify all agencies of the United States Government in a combined space program which comes as near to our existing pledges as possible.
2. *If we cooperate,* the pressure comes off, and we can easily argue that it was our crash effort on '61 and '62 which made the Soviets ready to cooperate.

I am for cooperation if it is possible, and I think we need to make a really major effort inside and outside the government to find out whether in fact it can be done. Conceivably this is a better job for Harriman than East-West trade, which might almost as well be given to George Ball.

McG. B.

Document I-42

Document title: National Security Action Memorandum No. 271, "Cooperation with the USSR on Outer Space Matters," November 12, 1963, with attached: Charles E. Johnson, Memorandum for Mr. Bundy, December 16, 1963.

Source: NASA Historical Reference Collection, NASA History Office, NASA Headquarters, Washington, D.C.

Ten days before he was assassinated, President John F. Kennedy signed this memorandum giving the NASA Administrator the lead within the Executive Branch in developing substantive proposals for enhanced U.S.-U.S.S.R. space cooperation. This action was a followup to Kennedy's September 20 speech before the United Nations. Note that the attached memorandum from Charles Johnson to McGeorge Bundy has Anatoli Blagonravov's last name misspelled twice.

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[1] November 12, 1963

National Security Action Memorandum No. 271

Memorandum for the Administrator, National Aeronautics and Space Administration

SUBJECT: Cooperation with the USSR on Outer Space Matters

I would like you to assume personally the initiative and central responsibility within the Government for the development of a program of substantive cooperation with the Soviet Union in the field of outer space, including the development of specific technical proposals. I assume that you will work closely with the Department of State and other agencies as appropriate.

These proposals should be developed with a view to their possible discussion with the Soviet Union as a direct outcome of my September 20 proposal for broader cooperation between the United States and the USSR in outer space, including cooperation in lunar landing programs. All proposals or suggestions originating within the Government relating to this general subject will be referred to you for your consideration and evaluation.

In addition to developing substantive proposals, I expect that you will assist the Secretary of State in exploring problems of procedure and timing connected with holding discussions with the Soviet Union and in proposing for my consideration the channels which would be most desirable from our point of view. In this connection the channel of contact developed [2] by Dr. Dryden between NASA and the Soviet Academy of Sciences has been quite effective, and I believe that we should continue to utilize it as appropriate as a means of continuing the dialogue between the scientists of both countries.

I would like an interim report on the progress of our planning by December 15.

Information copies to:

Chairman, National Aeronautics and Space Council
Secretary of State
Secretary of Defense
Director of Central Intelligence
Chairman, Atomic Energy Commission
Director, National Science Foundation
Special Assistant to the President
for Science and Technology
Director, Bureau of the Budget
Director, U.S. Information Agency

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[Attachment page 1] December 16, 1963

Memorandum for Mr. Bundy

Mac—

The attached interim report to the President from NASA in response to NSAM 271 follows the line I suggested to NASA. It is intended to show that work is actively progressing on the development of a concrete approach to the Soviets following on the Kennedy-Johnson initiatives. I am following the progress of this project and will try to ensure that it stays on the timetable described by Dryden.

There has been an additional development since the preparation of the interim report. Our Embassy Moscow reports the receipt of a letter from Blaganravov to Dryden, the cable is attached. This is the first communication from Blaganravov in eight months. NASA still has its institutional fingers crossed as to whether this represents a substantive response on the part of the Soviets. They are awaiting the final text (being pouched) before reacting to the letter.

Charles E. Johnson [initialed]