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AUDIT REPORT

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NASA CAN IMPROVE ITS MITIGATION OF RISKS ASSOCIATED WITH INTERNATIONAL AGREEMENTS WITH JAPAN FOR SCIENCE PROJECTS

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National Aeronautics and
Space Administration

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Final report released by:

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Acronyms

AMSR-E	Advanced Microwave Scanning Radiometer-E
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
DoD	Department of Defense
GAO	Government Accountability Office
GPM	Global Precipitation Measurement
NPD	NASA Policy Directive
NPR	NASA Procedural Requirements
OCE	Office of the Chief Engineer
OER	Office of External Relations
SMD	Science Mission Directorate

IN BRIEF

NASA CAN IMPROVE ITS MITIGATION OF RISKS ASSOCIATED WITH INTERNATIONAL AGREEMENTS WITH JAPAN FOR SCIENCE PROJECTS

The Issue

To ensure a robust space science program, NASA undertakes many projects with foreign partners. International partnering in science projects provides NASA an opportunity to fulfill its mission to advance and communicate scientific knowledge and understanding about the universe and solar system. Science partnerships with Japan remain robust and beneficial to NASA. The Astro-E2 mission was a joint collaboration between NASA and its Japanese partner. In August 2005, a NASA science instrument failed on the Astro-E2 mission 3 weeks after launch.

We performed this audit to evaluate the adequacy of NASA's risk management of science projects undertaken with Japan through international agreements. Specifically, we determined whether (1) NASA managers of these projects complied with NASA procedural requirements by taking appropriate action to identify and mitigate risks and (2) international agreements with Japan adequately addressed risk management requirements and standards between the parties. We identified 17 science projects that had international agreements with Japan as of January 27, 2006, and reviewed 5 of those projects. Details on the audit's scope and methodology are in Appendix A.

NASA policy requires that science project managers use the risk management process to identify and mitigate risks to increase the likelihood of achieving project goals and to identify and mitigate risks associated with foreign partner participation. The international agreements for the projects we reviewed delineated which portions of the project were to be accomplished by NASA (NASA responsibilities) and which portions were to be accomplished by the Japanese partner.

Results

We found that for NASA's responsibilities in the five projects we reviewed, the science project managers had complied with NASA procedural requirements by taking appropriate action to identify and mitigate risks. However, for the Japanese partners' responsibilities, science project managers identified information-sharing risks stemming from export control laws and regulations (export control risks) and mission assurance risks but did not take appropriate action to mitigate those risks. During the planning

phase of the project's life cycle, NASA science project managers and export administrators did not work collaboratively and prepare a technology transfer control plan to assess the export-controlled technical data to be shared with their Japanese partners, which could have mitigated export control risks. NASA science project managers could have mitigated mission assurance risks by participating with their Japanese partners in joint reviews, integration, and testing. Appropriate action was not taken because NASA's policy was unclear about early collaboration to identify data to be shared with a foreign partner and the international agreements we reviewed did not require joint participation in reviews, integration, and testing related to mission success.

We also found that the international agreements that we reviewed did not address NASA's and the Japanese partners' risk management requirements and standards to be used on the projects. NASA's policy requires project managers to implement a risk management process, but that policy does not describe risk management requirements and standards that should be addressed in international agreements.

The failure to take necessary appropriate actions to mitigate export control and mission assurance risks adversely impacted NASA because NASA science projects lacked adequate assurance that sufficient information was available to properly integrate instrument components or an instrument with the spacecraft. Improper integration can lead to a malfunction of an instrument or spacecraft-level system and can ultimately result in the loss of scientific data or mission failure.

Management Action

We recommended that NASA revise its guidance and establish procedures to

- require that export administrators and project managers collaborate early in a project's life cycle to identify and assess export-controlled technical data that will be provided to foreign partners and approval requirements (NASA Procedural Requirements [NPR] 2190.1, "NASA Export Control Program," April 10, 2003, and NPR 7120.5C, "NASA Program and Project Management Processes and Requirements," March 22, 2005);

- address technology transfer control plan requirements (the "Science Mission Directorate Management Handbook");

- describe risk management requirements and standards that should be addressed in international agreements (NPR 7120.5C); and

- require that project managers assess the need for joint participation in project reviews, integration, and testing related to mission success in international agreements (NPR 7120.5C).

In response to a draft of this report, management concurred with the intent of the recommendations and proposed corrective actions that we consider to be responsive to all of the recommendations. See the finding section for a discussion of the comments and Appendix C for the full text of the comments. All of the recommendations are resolved, but they will remain open until all actions have been completed and verified. No additional comments are required.

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INTRODUCTION

Background

NASA Policy Directive (NPD) 1050.1G, "Authority to Enter into Space Act Agreements," November 21, 2003, implements the Space Act, which provides NASA broad authority to enter into international agreements. The Space Act allows NASA to establish an international agreement with a foreign government, agency, or university. NASA policy[1] defines an international agreement as a set of legally enforceable promises between NASA and a foreign partner to accomplish the objectives of the agreement. An international agreement establishes project responsibilities of each partner, which includes hardware development and provision for the spacecraft and launch vehicle. Hardware development involves building an instrument or instrument components, either separately or jointly. The spacecraft may be launched from the United States or from the foreign partner's country. The Assistant Administrator for External Relations is responsible for negotiating NASA's international agreements with foreign partners.

NASA Procedural Requirements (NPR) 7120.5C, "NASA Program and Project Management Processes and Requirements," March 22, 2005, defines risk management as an organized, systematic decision-making process. The NPR requires project managers to identify, analyze, plan, track, control, communicate, and document risks to increase the likelihood of achieving project goals. NPR 7120.5C also requires that NASA project managers use the risk management process to identify and mitigate risks associated with foreign partner participation. Previous versions of NPR 7120.5 contained similar requirements.

NPR 8000.4, "Risk Management Procedural Requirements w/Change 1 (4/13/04)," requires NASA project managers to analyze risks. In analyzing the impact of a risk, managers are to assess the likelihood that an identified risk will occur and its consequence to the project. Managers are to use the assessment to decide whether to take actions aimed at reducing the likelihood of a risk occurring, mitigating the consequence of the risk, or both, and defining the timeframe in which those actions must be taken to avoid harm.

NASA science projects with Japan are managed by the Science Mission Directorate (SMD). SMD designates the NASA Center that will lead the project and concurs on the Center's selection of a project manager. As of January 27, 2006, NASA had 17 science projects that had international agreements with Japan (see Appendix B). We limited our

[1] NASA Advisory Implementation Instructions 1050-1, "Space Act Agreements Manual (Revalidated w/o Changes 11/21/03)."

review to 5 of the 17 science projects for which the Japanese partner participated in hardware development:

- Advanced Microwave Scanning Radiometer-E (AMSR-E)
- Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER)
- Astro-E2
- Global Precipitation Measurement (GPM)
- Solar-B

The international agreements for the projects delineated which portions of the project were to be accomplished by NASA (NASA responsibilities) and which portions were to be accomplished by the Japanese partner.

Objectives

The overall objective of this audit was to evaluate the adequacy of NASA's risk management of science projects undertaken with Japan through international agreements. Specifically, we determined whether

- NASA managers of these projects complied with NASA procedural requirements by taking appropriate action to identify and mitigate risks and

- international agreements with Japan adequately addressed risk management requirements and standards between the parties.

We also reviewed internal controls as they related to the overall objective. See Appendix A for details on the audit's scope and methodology, our review of internal controls, and prior coverage.

ACTIONS NEEDED TO MITIGATE EXPORT CONTROL AND MISSION ASSURANCE RISKS

For NASA's responsibilities on the five projects that we reviewed, the science project managers had established a risk management process that met NASA requirements. For the Japanese partners' responsibilities, NASA science project managers followed NASA policy in identifying information-sharing risks stemming from export control laws and regulations (export control risks) and mission assurance risks. However, they did not take actions necessary to reduce the likelihood of identified risks occurring and to mitigate the consequences of those risks as required by NPR 8000.4. Such actions were not taken because NASA policy does not clearly require

- NASA science project managers and export administrators to work collaboratively during the planning phase of the project's life cycle to identify and assess export-controlled data and

- project managers to prepare a technology transfer control plan.

In addition, NASA policy does not describe risk management and mission assurance requirements and standards that should be addressed in international agreements.

Without adequate mitigation of export control and mission assurance risks, NASA projects lack adequate assurance that sufficient information is available to properly integrate instrument components or an instrument with the spacecraft. Improper integration can lead to a malfunction of an instrument or spacecraft-level system and can ultimately result in the loss of scientific data or mission failure.

Risks Associated with NASA Science Projects with International Partners

We determined that the primary risks associated with joint NASA–Japan science projects are export control risks and mission assurance risks. Although we reviewed only science projects with Japanese partners, the identified risks could be applicable to other space flight projects and projects with other foreign partners.

Export Control Risks. A project with a foreign partner has information-sharing risks stemming from export control laws and regulations.[2] NASA's export control policies and procedures are addressed in NPR 2190.1, "NASA Export Control Program," April 10, 2003, which defines an export as the transfer of anything to a foreign entity by any means, regardless of whether that transfer occurs in the United States, overseas, or in space. NPR 2190.1 implements export control laws and regulations that require export control of technical data and technology for the design, development, and operation of launch vehicles, spacecraft, and satellites. Unless an exemption or exception exists, NASA must obtain approval from either the Department of State or Department of Commerce to share those types of technical data with a foreign partner.

Mission Assurance Risks. A project with a foreign partner has heightened risks of mission assurance. NPR 7120.5C defines mission assurance as those activities necessary to achieve mission success. Those activities include risk assessments, system safety engineering, reliability analysis, and quality assurance. NASA policy requires project managers to be fully involved in mission assurance activities, but NASA project managers may not have access to the work performed by a foreign partner or to the overall system when that access is not specifically addressed in the international agreement.

Actions Not Taken to Mitigate Risks

For NASA's responsibilities on the five projects that we reviewed, the science project managers had established a risk management process that included steps to identify and analyze risks and develop actions to reduce the likelihood of the identified risks occurring and to mitigate the consequences of those risks. However, for their Japanese partners' responsibilities on the projects, the NASA science project managers did not take actions necessary to mitigate export control and mission assurance risks as required by NPR 8000.4. The science project managers did not collaborate with export administrators when planning the project to identify export-controlled technical data that could be shared with their Japanese partners. Additionally, the science project managers were not aware of their partners' risk management processes and did not participate in joint project reviews, integration, and testing related to mission success, as shown in the following table.

[2] Export control laws and regulations refer to the Arms Export Control Act (Public Law 90-629), as amended, implemented by the International Traffic in Arms Regulations, Department of State, and the Export Administration Act of 1979 (Public Law 96-72), as amended, implemented by the Export Administration Regulations, Department of Commerce.

Actions to Address Export Control and Mission Assurance Risks for Science Projects with Japan					
	NASA Science Project				
	AMSR-E	ASTER	Astro-E2	GPM	Solar-B
Export Control Risks	Action Taken				
NASA project and export control officials collaborated early to assess the sharing of technical data.	No	No	No	Yes	No
Technology transfer control plans were prepared.	No	No	No	Yes	No
Mission Assurance Risks	Action Taken				
International agreement defined risk management requirements and standards.	No	No	No	No	No
International agreement required joint project reviews, integration, and testing.	Yes	Yes	No	Yes	No

Early Collaboration within NASA on Export Controls. NASA's policy is to transfer only technical data required to fulfill obligations as defined in an international agreement. The five international agreements that we reviewed included language that enabled implementation of NASA's policy regarding exports of technical data. The agreements stated that transfers of technical data to define and establish interfaces, to facilitate integration, and to ensure safe and successful operations could be made without restriction. Language in the agreements also authorized the transfer of other technical data subject to export control, such as detailed engineering design, when the parties determined that exchange of technical data to be necessary in carrying out the partners' responsibilities.

However, NASA export administrators and science project management officials did not work collaboratively during the planning phase of a project's life cycle to assess the export-controlled technical data to be shared with their Japanese partners and document the assessment. Of the five projects, only GPM had documentation showing that its project officials had collaborated before the partners signed the agreement. Collaboration should occur before the partners sign the agreement to ensure that the agreement addresses the sharing of export-controlled technical data.

Export administrators stated that project management officials did not always communicate with them early in a project's life cycle to assess technical data that could be shared, which resulted in insufficient time to obtain approvals for sharing technical data. NASA science project managers stated that the export control process could be made more responsive by assisting them to obtain required approvals. They also stated

that export control training emphasized restrictions and penalties under export laws and regulations. The training did not discuss situations where projects were permitted to share export-controlled technical data or steps to obtain required approvals. As a result, project officials were reluctant to discuss a need to share technical data with their Japanese partners. For example, Astro-E2 project management officials stated they received export control training early in the project's life cycle, but that the training did not include methods of receiving approval to share technical data beyond hardware interfaces, which project managers stated may have given them the means to mitigate export control risks.

Project management officials from the Department of Defense (DoD) stated that DoD allowed missile projects to share technical data with their Japanese partners. In DoD Directive 5530.3, "International Agreements," June 11, 1987 (certified current as of November 21, 2003), DoD requires project officials to identify and assess the technical data that will be transferred under the proposed international agreement. The DoD directive requires projects to conduct the assessment when the project is in the concept stage. The officials stated that the missile project managers identified and assessed technical data during the early phase of a project's life cycle. This assessment involved a joint effort among DoD program management, security, intelligence, and foreign disclosure officials to determine the data that would be shared.

NPR 2190.1 and NPR 7120.5C do not clearly establish the requirement that export administrators and project management officials work collaboratively early in a project's life cycle. The collaboration should begin during project formulation so that the assessment is completed prior to the agreement being signed. Neither NPR requires export administrators and project management officials to assess and determine what export-controlled technical data can be shared with a foreign partner. In addition to identifying data that can be shared, early collaboration will also accelerate the approval process, which can require a long lead time.

Technology Transfer Control Plans Not Prepared. NPR 2190.1 describes a technology transfer control plan as a document that discusses technologies or technical data that require export control protection. However, the NPR does not provide criteria for determining whether a project requires a technology transfer control plan. We discussed the lack of clear criteria in our report, "Final Memorandum on NASA's Policies for Protecting Technology Exported to Foreign Entities" (IG-06-006, March 14, 2006). The report recommended that the Associate Administrator for External Relations revise NPR 2190.1 to state clearly the requirement to prepare a technology transfer control plan, and the Associate Administrator agreed to revise the NPR.

Four of the five projects that we reviewed did not have technology transfer control plans. The GPM project had a plan that included an assessment of the data that could potentially be shared and was equivalent to a technology transfer control plan.

DoD project management officials stated that they successfully used technology control plans as part of their early assessment of technical data to be shared with the foreign partner. The plan, required by DoD Directive 5530.3, documents the assessment of technical data that will be transferred to the foreign partner and critical information or technology that must be protected. DoD officials also stated that they used the plans to define timelines for obtaining approvals for sharing technical data with foreign partners.

To supplement NPR 2190.1, SMD issued a management handbook for project managers to use as guidance for managing their projects. As of May 2006, that handbook does not discuss the requirement for a technology transfer control plan, state what information the plan should include, or establish a procedure to ensure it is prepared. Once NPR 2190.1 has been updated to clarify when a technology transfer control plan is needed, SMD should revise its "Science Mission Directorate Management Handbook" to reflect the technology transfer control plan requirements and state what information should be included in that plan.

International Agreements Did Not Address Risk Management. NASA science project managers were responsible for managing risks on their projects, but international agreements we reviewed did not address NASA's and the Japanese partners' risk management requirements and standards. The agreements also did not specify the risk management procedures to be used on the projects.

Officials from the Office of External Relations (OER), SMD, and science projects stated that the international agreements did not define risk management requirements and standards because they were defined in project implementation plans. However, implementation plans were used by only the AMSR-E, ASTER, and Astro-E2 projects, and none of those three implementation plans defined partners' risk management requirements and standards.

NPR 7120.5C requires NASA science project managers to implement a risk management process and to manage risks according to standards in NPR 8000.4. However, neither NPR requires that international agreements clearly define responsibilities of the partners in managing risks or that the foreign partner establish a risk management process. To ensure mission success, both partners need to be aware of the risk management process each will use on the project, and the processes need to be binding on the partners. The lack of a NASA requirement was the underlying reason that the international agreements did not define risk management requirements and standards. NASA needs to revise NPR 7120.5C to describe risk management requirements and standards that should be addressed in international agreements.

Joint Reviews, Integration, and Testing. NPD 8700.1C, "NASA Policy for Safety and Mission Success (Revalidated 3/22/06)," and NPD 8700.3A, "Safety and Mission Assurance (SMA) Policy for NASA Spacecraft, Instruments, and Launch Services," April 28, 2004, provide mission assurance policy for NASA projects. NPD 8700.1C makes NASA project managers responsible for meeting mission success criteria, and it

describes open communication of mission assurance activities and formal project reviews as ways to accomplish those criteria. NPD 8700.3A requires mission assurance of NASA instruments, including instrument integration with the launch vehicle, when NASA uses foreign services to launch a NASA instrument or spacecraft. NASA projects must (1) establish mission assurance requirements, including integration of the instrument with the launch vehicle, and (2) verify and validate mission assurance through an integrated mission assurance review.

The five NASA science projects we reviewed had insight into mission assurance activities for the work done by NASA. Three projects had insight into the work performed by the Japanese. However, on the Astro-E2 and Solar-B projects, NASA did not have sufficient insight into mission assurance activities regarding the work done by the Japanese partner because those activities were not required in the agreement. Insight into overall mission assurance activities would have been provided by joint participation in project reviews, integration, and testing beyond each partner's interface.[3] NASA managers on the Astro-E2 and Solar-B projects did not participate in their Japanese partners' reviews. NASA managers for those two projects also did not participate in integration and testing for the entire system. NASA managers for the projects we reviewed stated that joint participation in project reviews of the overall system and integration and testing is necessary to make both partners aware of mission assurance activities beyond their respective interfaces.

To mitigate mission assurance risks, project management officials at DoD stated that, in some cases, they structure projects to retain responsibility for integrating and testing foreign components. On the Astro-E2 and Solar-B projects, NASA did not retain responsibility for project reviews of the overall system or for integration and testing of the instrument with the spacecraft. The Japanese partners for those two projects had those responsibilities because they had provided a significantly larger share of the funding than NASA, as well as the spacecraft and launch vehicle.

NASA managers and their Japanese partners did not participate in joint reviews, integration, and testing because the international agreements did not establish a requirement to do so. To meet the objectives of NPR 8700.1C and NPD 8700.3A, NASA project managers and their foreign partners should be jointly involved in appropriate project reviews for shared hardware development, integration of instruments with the spacecraft, and overall system integration. Those reviews and integration and testing are critical to meeting the project's mission success criteria. The need for joint involvement should be addressed in international agreements.

[3] The interface is the area where the portion of work performed by one partner is combined, or integrated, with the portion of work performed by another partner.

Adverse Impact to NASA Projects with Foreign Partners

Managers need to take actions necessary to reduce the likelihood of identified risks occurring and to mitigate their consequences. The Astro-E2 project illustrates that need. The project had an instrument that was built by both partners but was integrated with the spacecraft by the Japanese partner. The Japanese partner provided the spacecraft and launch vehicle. The project was launched in July 2005, and the instrument failed 3 weeks after launch, resulting in the loss of science data. NASA convened a mishap investigation board to evaluate the cause of the instrument failure, which occurred in August 2005. The board will report its findings at the conclusion of the investigation. As of June 1, 2006, the board did not have an estimated date for presenting its findings.

Export control risks can be mitigated by early collaboration and preparation of technology transfer control plans. Mission assurance risks can be mitigated by ensuring that international agreements define risk management requirements and standards. International agreements should also require joint participation in reviews, integration, and testing related to mission success.

Mitigation actions identified in this report require policy and procedural improvements by SMD and OER senior management and the Chief Engineer, as described in our recommendations. The recommendations are based on a sample of five science projects with Japanese partners that participated in hardware development. When revising its policy, NASA needs to also consider the impact on other projects and on projects with countries other than Japan.

The failure to take necessary appropriate actions to mitigate export control and mission assurance risks adversely impacted NASA because NASA projects lacked adequate assurance that sufficient information was available to properly integrate instrument components or an instrument with the spacecraft. Improper integration can lead to a malfunction of an instrument or spacecraft-level system and can ultimately result in the loss of scientific data or mission failure.

Recommendations, Management's Response, and Evaluation of Management's Response

Recommendation 1. The Assistant Administrator for External Relations should revise NPR 2190.1 to require that export administrators and project managers collaborate early in a project's life cycle to identify and assess export-controlled technical data that will be provided to foreign partners and approval requirements.

Management's Response. Management concurred. OER will revise the NPR and circulate it for Agency review in the NASA Online Directives Information System by January 31, 2007.

Evaluation of Management's Response. Management's actions are responsive. The recommendation is resolved but will remain open until corrective actions have been completed, and we have reviewed the supporting documentation.

Recommendation 2. The Associate Administrator for SMD should revise the "Science Mission Directorate Management Handbook" to address technology transfer control plan requirements consistent with the revised NPR 2190.1.

Management's Response. Management concurred. SMD will incorporate appropriate changes into the SMD Management Handbook upon OER's revision of NPR 2190.1. This action will be completed by July 31, 2007.

Evaluation of Management's Response. Management's actions are responsive. The recommendation is resolved but will remain open until corrective actions have been completed, and we have reviewed the supporting documentation.

Recommendation 3.a. The Chief Engineer should revise NPR 7120.5C to require that export administrators and project managers collaborate early in a project's life cycle to identify and assess export-controlled technical data that will be provided to foreign partners and approval requirements.

Management's Response. Management concurred. The Office of the Chief Engineer (OCE) is revising NPR 7120.5C to address this topic. OCE anticipates the new NPR will be effective by January 31, 2007.

Evaluation of Management's Response. Management's actions are responsive. The recommendation is resolved but will remain open until corrective actions have been completed, and we have reviewed the supporting documentation.

Recommendation 3.b. The Chief Engineer should revise NPR 7120.5C to describe risk management requirements and standards that should be addressed in international agreements.

Management's Response. Management did not concur because of the breadth of the recommendation. However, OCE stated it would work with OER to develop guidance for project managers to address risk management requirements and standards with international partners in applicable joint activities, including agreement formulation, as appropriate, and include the guidance in NPR 7120.5C. OCE anticipates the revised NPR will be effective by January 31, 2007.

Evaluation of Management's Response. We discussed management's response with OER and SMD officials, who stated that the nonconcurrence was based on their concern that project managers may interpret the recommendation as applying to all projects. The officials stated that risk management requirements would be addressed for those projects where the scope and risk warrant such action.

We concur with management's concerns. In making our recommendation, we intended risk management requirements to be addressed in international agreements only for projects in which those requirements were appropriate to the scope and risk.

Management's planned action is responsive to the intent of the recommendation. As a result, we consider the recommendation to be resolved. It will remain open until the corrective action has been completed, and we have reviewed the supporting documentation.

Recommendation 3.c. The Chief Engineer should revise NPR 7120.5C to require that project managers assess the need for joint participation in project reviews, integration, and testing related to mission success in international agreements.

Management's Response. Management generally concurred, stating the assessment should be performed on a case-by-case basis. OCE will revise NPR 7120.5C taking these considerations into account and anticipates that the new NPR will be effective by January 31, 2007.

Evaluation of Management's Response. Management's actions are responsive to the intent of the recommendation. In making the recommendation, our intent was to ensure that international agreements, when appropriate, require joint participation in reviews, integration, and testing related to mission success. Management's proposal to determine the need for joint participation on a case-by-case basis, considering the relative contributions of the parties, the achievement of mission objectives, and export control laws and policies, should ensure appropriate joint participation.

The recommendation is resolved but will remain open until corrective actions have been completed, and we have reviewed the supporting documentation.

Recommendation 4. The Associate Administrator for SMD and the Assistant Administrator for External Relations should establish a procedure that defines risk management requirements and standards in international agreements.

Management's Response. Management did not concur because of the breadth of the recommendation. However, the response stated that SMD will work with OER to establish procedures to ensure that project managers address risk management requirements and standards with international partners in applicable joint activities, including agreement formulation, as appropriate. This action will be completed by September 1, 2007.

Evaluation of Management's Response. We discussed management's response with OER and SMD officials. Again, the nonconcurrence was based on their concern that project managers may interpret the recommendation as applying to all projects. The officials stated that risk management requirements would be defined for those projects where the scope and risk warrant such action.

As discussed in our response to Recommendation 3.b, we concur with management's concerns. In making our recommendation, we intended risk management requirements to be defined in international agreements only for projects in which those requirements were appropriate to the scope and risk.

Management's planned action is responsive to the intent of the recommendation. As a result, we consider the recommendation to be resolved. It will remain open until the corrective action has been completed, and we have reviewed the supporting documentation.

APPENDIX A

Scope and Methodology

We identified that NASA had 17 science projects with Japan as of January 27, 2006. We selected a sample of five of those projects for which the Japanese partner participated in hardware development.

We interviewed SMD program executives, the NASA Headquarters export administrator and other officials from OER, and project management officials for the five NASA science projects. We also interviewed the export administrators at Goddard Space Flight Center and Marshall Space Flight Center. We interviewed project officials from other agencies regarding best practices on projects with Japan. The agencies were the Office of the Under Secretary of Defense (Acquisition, Technology, and Logistics), Missile Defense Agency, Naval Sea Systems Command, Department of Energy, and National Science Foundation. We also discussed the audit's objective and scope with the chairman of the NASA mishap investigation board because the board was investigating the failure of the Astro-E instrument. In addition, we briefed the Japanese Project Manager and Principal Investigator for the Astro-E2 project on the audit's objective and scope.

We reviewed the following documents:

- International Traffic in Arms Regulations, Code of Federal Regulations, Title 22, Parts 120, 121, 125, 126, and 127, revised April 1, 2005
- NPD 1050.1G, "Authority to Enter into Space Act Agreements," November 21, 2003
- NASA Advisory Implementation Instructions 1050-1, "Space Act Agreements Manual (Revalidated w/o Changes 11/21/03)"
- NPD 1360.2A, "Initiation and Development of International Cooperation in Space and Aeronautics Programs (Revalidated 3/29/04)"
- NPD 2190.1, "NASA Export Control Program," May 24, 2001
- NPR 2190.1, "NASA Export Control Program," April 10, 2003
- NPD 7120.4C, "Program/Project Management (Revalidated for 1 year 03/02/2006)"
- NPR 7120.5C, "NASA Program and Project Management Processes and Requirements," March 22, 2005
- NPR 7120.6, "Lessons Learned Process," March 22, 2005
- NPR 8000.4, "Risk Management Procedural Requirements w/Change 1 (4/13/04)"

- NPR 8621.1A, "NASA Procedural Requirements for Mishap Reporting, Investigating, and Recordkeeping," February 11, 2004
- NPD 8700.1C, "NASA Policy for Safety and Mission Success (Revalidated 3/22/06)"
- NPD 8700.3A, "Safety and Mission Assurance (SMA) Policy for NASA Spacecraft, Instruments, and Launch Services," April 28, 2004
- Memorandums of understanding and letters of agreement for science projects with Japanese partners
- Project risk management plans, project implementation plans, technology transfer control plans, and other project documents
- DoD Directive 2040.2, "International Transfers of Technology, Goods, Services, and Munitions," January 17, 1984 (Incorporating Change 1, July 5, 1985)
- DoD 5200.1-M, "Acquisition Systems Protection Program," March 1994
- DoD Directive 5530.3, "International Agreements," June 11, 1987 (certified current as of November 21, 2003)

We evaluated international agreements against risk management criteria in NPR 7120.5C. We also determined whether practices at other agencies were included in NASA's international agreements. We compared project risk management plans and documents with requirements in NPR 7120.5C and NPR 8000.4.

We performed this audit from November 2005 through June 2006 in accordance with generally accepted government auditing standards.

Use of Computer-Processed Data. We used a computer-processed spreadsheet maintained by OER that listed NASA's international agreements to select projects for review. To evaluate the reliability of the computer-processed data, we compared that spreadsheet to an SMD spreadsheet and to the file of international agreements. The comparison identified minor discrepancies. We verified our list of 17 agreements through discussions with OER and SMD. We consider the list of 17 agreements in Appendix B as reliable for our audit objectives.

Review of Internal Controls

We evaluated the adequacy of controls used by NASA science projects with Japan to manage risk. The evaluation used criteria in the

- Office of Management and Budget Circular A-123, "Management's Responsibility for Internal Control," December 21, 2004

- Government Accountability Office (GAO), "Standards for Internal Control in the Federal Government," GAO/AIMD-00-21.3.1, November 1999

- GAO, "Internal Control Management and Evaluation Tool," GAO-01-1008G, August 2001

For the five projects that we reviewed, we evaluated the control environment for managing risk, risk assessment procedures, risk control activities, risk management information and communications, and risk monitoring procedures.

Overall, we found that NASA science projects with Japan had adequate risk management controls in place for the NASA portion of work. Projects established an environment that supported risk assessment, prepared risk management plans, followed NASA policy requirements in managing risks of NASA technical responsibilities, regularly communicated risks to senior management, and monitored risks throughout the project. For risks associated with NASA's Japanese partners, NASA science project managers had identified and evaluated export control and mission assurance risks but had not taken actions to mitigate those risks. Actions were not taken because policy and procedural improvements are needed that are beyond the authority of the NASA science project managers. The recommendations in this report, if implemented, will correct the identified weaknesses.

Prior Coverage

In the past 5 years, the NASA Office of Inspector General has issued one report of particular relevance to the subject of this report: "Final Memorandum on NASA's Policies for Protecting Technology Exported to Foreign Entities" (IG-06-006, March 14, 2006). The memorandum can be accessed over the Internet at http://www.hq.nasa.gov/office/oig/hq/audits/reports/FY06/index.html.

NASA–JAPAN JOINT SCIENCE PROJECTS

- Advanced Microwave Scanning Radiometer-E, Aqua
- Advanced Spaceborne Thermal Emission and Reflection Radiometer, Terra
- Aerosol Robotic Network
- Astro-E2
- Astro-F
- Balloon-Borne Superconducting Magnet Spectrometer
- Gamma Ray Large Area Space Telescope
- Global Precipitation Measurement Program
- Gravity Recovery and Climate Experiment
- High-Energy Solar Spectroscopic Image
- High-Energy Transient Explorer-2
- International Focusing Objects Collaboration for μCrab Sensitivity
- Mu Space Engineering Spacecraft-C
- Portable Airborne Laser System
- Solar-B
- Southern Hemisphere Additional Ozonesondes
- Tropical Rainfall Measuring Mission

Projects Selected for Review

- Advanced Microwave Scanning Radiometer-E, Aqua
- Advanced Spaceborne Thermal Emission and Reflection Radiometer, Terra
- Astro-E2
- Global Precipitation Measurement Program
- Solar-B

MANAGEMENT COMMENTS

National Aeronautics and
Space Administration
Headquarters
Washington, DC 20546-0001

Reply to Attn of: SMD/Management and Policy Division

AUG 30 2006

TO: Assistant Inspector General for Auditing

FROM: Associate Administrator for Science

SUBJECT: Response to Draft Audit Report, "NASA Can Improve Its Mitigation of Risks Associated with International Agreements with Japan for Science Projects" (Assignment No. A-05-029-00)

In response to your memorandum of June 28, 2006, regarding Draft Audit Report A-05-029-00, entitled "NASA Can Improve Its Mitigation of Risks Associated with International Agreements with Japan for Science Projects," the Science Mission Directorate (SMD), the Office of External Relations (OER), and the Office of the Chief Engineer (OCE) have reviewed the recommendation and comments. We appreciate your efforts to help NASA improve its program management activities.

While the draft report provides helpful analysis and guidance with regard to improving communication and collaboration on mission-related requirements in order to minimize program risk, NASA Management is concerned that the draft report draws broad conclusions based upon a small sampling of just five international agreements, only one of which – ASTRO-E2 – involved a project mishap. Management responses to the specific recommendations of the draft report are provided below.

OIG Recommendation

1. The Assistant Administrator for External Relations should revise NPR 2190.1 to require that export administrators and project managers collaborate early in a project's life cycle to identify and assess export-controlled technical data that will be provided to foreign partners and approval requirements.

NASA Management Response

1. NASA Management concurs in the recommendation, and will provide appropriate guidance in NPR 2190.1. OER will draft and circulate the requested revisions for agency review and implementation in the NASA Online Directives Information System (NODIS) by January 31, 2007.

2

OIG Recommendation

2. The Associate Administrator for SMD should revise the "Science Mission Directorate Management Handbook" to address technology transfer control plan requirements consistent with the revised NPR 2190.1.

NASA Management Response

2. NASA Management concurs in the recommendation. Upon OER's revision of NPR 2190.1, SMD will incorporate appropriate changes into the Science Mission Directorate Management Handbook. We anticipate the revision to be effective by July 31, 2007.

OIG Recommendation

3. The Chief Engineer should revise NPR 7120.5C to:
   a. require that export administrators and project managers collaborate early in a project's life cycle to identify and assess export-controlled technical data that will be provided to foreign partners and approval requirements,

NASA Management Response

3a. NASA Management concurs in the recommendation, and NPR 7120.5C is currently being revised to address this topic. OCE expects to put the revised NPR 7120.5D into the NODIS system in August 2006. We anticipate the revision to be effective by January 31, 2007.

OIG Recommendation

3. The Chief Engineer should revise NPR 7120.5C to:
   b. describe risk management requirements and standards that should be addressed in international agreements, and

NASA Management Response

3b. NASA Management does not concur in this recommendation as written, due to its breadth. However, as discussed with the auditors, OCE will work with OER to develop guidance for project managers to address risk management requirements and standards with international partners in applicable joint activities, including agreement formulation, as appropriate. OCE will seek to include such guidance in a revision to NPR 7120.5D, which we expect to be effective by January 31, 2007.

OIG Recommendation

3. The Chief Engineer should revise NPR 7120.5C to:
   c. require that project managers assess the need for joint participation in project reviews, integration, and testing related to mission success in international agreements.

NASA Management Response

3c. NASA Management generally concurs in the recommendation, recognizing that the recommended assessment is properly effected on a case-by-case basis. NPR 7120.5C is currently being revised to address this topic. OCE expects to submit the revised NPR 7120.5D to the NODIS system by August 31, 2006. We anticipate the revision to be effective by January 31, 2007.

OIG Recommendation

4. The Associate Administrator for SMD and the Assistant Administrator for External Relations should establish a procedure that defines risk management requirements and standards in international agreements.

NASA Management Response

4. NASA Management does not concur in this recommendation as written, due to its breadth. However, as discussed with the auditors, SMD will work with OER to establish procedures to ensure that project managers address risk management requirements and standards with international partners in applicable joint activities, including agreement formulation, as appropriate. We anticipate that these procedures will be effective by September 1, 2007.

Thank you again for your assistance and this opportunity to respond to the findings and conclusions of the draft audit report. If you have any questions or require additional information, please contact T. Jens Feeley at 202-358-1714.

Mary L. Cleave

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