W

TO: M/Associate Administrator for Space Flight

FROM: W/Assistant Inspector General for Inspections, Administrative Investigations, and Assessments

SUBJECT: Review of International Space Station Phase I Lessons Learned Activity

The objective of this review is to determine whether NASA is implementing the lessons learned and experience gained by the International Space Station (ISS) Phase I Shuttle/Mir Program (Phase I).

We conducted this review concurrent with the assessment performed by NASA's ISS Independent Assessment Office (IA).[1] We agree with the IA team's final findings and recommendations (See Appendix A) and therefore, do not address them in our review. Instead, we focused our review on those areas that we believe require additional attention. This memorandum conveys our findings and recommendations regarding the lessons learned process. We thank the members of the IA study team for their cooperation in this effort.

BACKGROUND

The initial activities of the Phase I Program involved Space Shuttle rendezvous and docking mission to the Russian Space Station Mir (Mir). Follow-on activities, as precursors for the ISS, included long-duration astronauts living aboard Mir. The lessons learned and experiences gained during Phase I are to be transferred to the remaining phases of the ISS Program.

The Space Station Program Office (SSPO) has identified approximately 473 lessons learned from Phase I. The ISS lessons learned process attempts to incorporate all of the lessons from the various organizations supporting Phase I into a comprehensive database. Some of those organizations are the Phase I working groups, the Astronaut Office, the Mission Operations Directorate, and the Extravehicular Project Office.

[1] Special Assessment – Evaluation of Shuttle-Mir "Lessons Learned" Being Applied to the ISS Management Interfaces, Design, Assembly, and Operation, JSC-98-098.

These organizations, as well as others, actively documented and implemented lessons learned as the experiences were gained. The transfer of some lessons learned occurred even though no formal activity to address each documented lesson was undertaken by the SSPO until late in the Phase I Program (as addressed in Finding 1 of the IA report).

PERSONNEL TRANSITION

Various factors may affect whether lessons learned are applied. For example, personnel turnover and the time between identification of the lesson learned and its application to a program can have an impact. As an example, the following was a lesson learned from Skylab:

> Lesson 12-1. Stowage Nomenclature Standardization. Hardware nomenclature should be standardized throughout a program. On Skylab, many names existed for a single item, and this nonstandardization resulted in confusion, ambiguity, and lost time during communications among various user groups. On Skylab, the nomenclature of a given item varied relative to drawings, stowage lists, flightcrew titles, nameplates and decals, and weight reports.[2]

Note the similarity of the above lesson learned to a more recent Phase I lesson learned.

> Lesson 2-12. Too many nomenclature schemes were used to identify the same piece of hardware on different manifests. Drawing names, label names, crew names and Principal Investigator (PI) names were all used based on the needs/preferences of the user.[3]

Even though this lesson was learned on a previous program, and was obviously applicable to Phase I, the same problem reoccurred during the Phase I mission. Databases contain useful records, but some of the best lessons learned and useful experiences are exchanged first hand.

Many of the Phase I Program Office civil service personnel are now effectively working in the ISS Program. For example, the Phase I Program Manager and Deputy Program Manager are assigned significant roles in Phase II. To a large extent, others from the Phase I Program Office and personnel from the working groups have been assigned to positions that effectively use their Phase I experience. We found that lessons learned were incorporated best into those organizations where personnel were transitioned from Phase I to Phase II.

We identified one area where Phase I personnel were not effectively transferred to the Phase II Program. None of the civil service personnel from the Mir Operational and Integration Working Group (WG-6) have been transitioned to the SSPO. During Phase I, WG-6 provided crew and payload support in the areas of mission management, integration, training, and

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[2] Lesson Learned on the Skylab Program. Prepared by Lyndon B. Johnson Space Center. NASA TM X-72920. 1974.

[3] Lessons Learned Database, Space Station Program Website. This website can be found at http://iss-www.jsc.nasa.gov/ss/issapt/lldb_data/phase1.html.

operations. Since WG-6 submitted the majority of the lessons learned (approximately 73 percent), we believe there is a potential for misapplication of lessons. Those lessons deal with functions such as real time operations and training and should be addressed as quickly as possible while the experienced personnel are available to help.

The importance of the transition of contractor knowledge should not be overlooked. Again, the transition of contractor knowledge was most effective in organizations that maintained the same personnel across Phase I and Phase II. For example, Flight Operations and Systems Integration Working Group (WG-3) contractors providing flight operations support for Shuttle/Mir are now providing the same support for ISS. However, some key contractors may not have transitioned from Phase I to Phase II as anticipated because different companies were awarded the support contracts for Phase II. Lockheed-Martin contractors working on WG-6 activities did not readily transition to Phase II since United Space Alliance (USA) is providing prime support to Phase II activities.[4]

Given those concerns, either the Phase I Program Office or the SSPO should identify, where possible, the original point of contact that identified each lesson learned. We noted in our review that while some lessons learned included the author's name, some did not.[5] We believe that each lesson learned should be associated with the individual or submitting organization to ensure that, when needed, further information can be obtained. This should facilitate the exchange of information and overcome the effects of personnel not transitioning from Phase I to Phase II.

NEED FOR CONTINUING REVIEW PROCESS

The accurate, thorough, and ongoing implementation of lessons learned is important. The SSPO identified several key lessons still open pending formal closure. Also, lessons from STS-91/Increment 7 are still in the process of being compiled. Recommendations contained in the lessons learned database should be implemented in such a way as to capture all knowledge gained by the process. This would allow the database to evolve as the program changes.

Moreover, external reviews conducted by the IA office and the Office of Inspector General should also be considered part of the lessons learned review process. The implementation of findings and recommendations from those reviews will continue to strengthen the usefulness of the lessons learned. Without a continuing review process, however, these and other

[4] In some instances, Lockheed-Martin contractors did transition to the USA contract but these moves were arranged by the contract employees themselves rather than through a planned transition. Other Lockheed-Martin contractors picked up secondary ISS activities dealing with the Human Research Facility (HRF) under their contact. However, these HRF activities are not directly related to the previous work the Lockheed-Martin contractors were conducting under Phase I.

[5] An example of a lesson with the associated author's name is Lesson 1-3 in the Station Program Management Plan area dealing with Russian financial shortfalls. An example without the author's name is Lesson 1-6, which deals with conflicting program documentation issues.

important lessons may not be effectively implemented during the ISS life-cycle. There is currently no ongoing review process.

The importance of a continued review process was emphasized by the ISS Program Manager when he initially reviewed the Phase I lessons learned matrix and resulted in some improvements in the process. Many of the lessons learned were considered closed if an action item was assigned. The closure rationale was redefined to include greater detail and paths to implementation. In addition, department heads now approve the closure of lessons learned relating to their disciplines, thereby making them responsible for the implementation of the lesson.

NEED TO REPORT LESSONS LEARNED FROM FOREIGN AND LONG-DURATION MISSIONS

Efforts that are not strictly part of the Phase I Program, such as EuroMir 95; DARA Mir; Skylab, and the Payload Engineering, Mission Management and Processing Study (PES)[6] should be considered for inclusion in the lessons learned database. These missions also contain experiences gained in long-duration space flight as well as working with the Russians.[7] Examples of relevant issues from PES include the following finding:

> Finding 2.1.0 The support and interface requirements for the individual PIs or new users are not clear to the user communities. Lacking an overview document or other roadmap, on overwhelming amount of in-depth knowledge about ISS documents, user boards and interfaces appears to be required for the users to successfully implement a flight project in the ISS system.

The PES issues are not included in the current lessons learned database. No follow up processes is in place for findings and recommendations from the PES report.

The IA recommendation, however, does not consider foreign and long-duration missions. A comprehensive database should draw on all relevant experiences and lessons learned.[8]

RECOMMENDATIONS

1. The SSPO or the Phase I Program Office should identify a point of contact from the submitting organization for each current lesson to aid in future problem solving.

2. The SSPO should ensure that lessons learned activities are an ongoing process. Although some lessons learned in this activity have already been implemented, many of the lessons are still open and actual implementation of the lesson may occur well into the Phase II

[6] The Phase B PES report dated July 24, 1998, addresses issues concerning the payload processes in the ISS Program.

[7] This finding is an extension of Recommendation 4 from the IA report: "Ensure all organizations, associated with Phase I, are contacted for incorporation of lessons learned into the Phase 1matrix."

[8] An example of a comprehensive database that spans multiple missions is the Astronaut Office's database on crew comments.

Program. This process should include program reviews of Phase I lessons and continuing incorporation of ISS lessons learned.

3. The SSPO should review other historical sources for applicable lessons to further enhance the effectiveness of the database as well as providing a valuable resource for future human exploration of space.

SUMMARY & EVALUATION OF NASA MANAGEMENT'S RESPONSES

We received the Office of Space Flight's (OSF) response on December 18, 1998 (See Appendix B). OSF concurred with Recommendations 1 and 2. However, they only agreed with the "spirit" of Recommendation 3 stating that OSF "will need to assess the implementation issues before reaching a conclusion." We will evaluate OSF's response to Recommendation 3, as well as their compliance with Recommendations 1 and 2, in 120 days.

We also received a letter from the Office of Safety and Mission Assurance (OSMA) on December 11, 1998, stating their concurrence with all three recommendations (See Appendix C). OSMA stated that pursuant to NASA Policy Guidance 7120.5A, "the ISS Program should transition all the identified lessons to the NASA Lessons Learned Information System (LLIS)."

OSF should coordinate with OSMA in developing their response to Recommendation 3.

CONCLUSION

The implementation of lessons learned from Phase I, as well as other related space missions, will aid in the effectiveness of the ISS Program. We will continue to monitor this activity to determine how lessons learned are implemented in ISS Phases II and III and to see whether other lessons learned are added based on related missions prior and subsequent to Phase I.

David M. Cushing

4 Enclosures
Appendix A: Independent Assessment Report
Appendix B: Office of Space Flight Response to Draft Report
Appendix C: Office of Safety and Mission Assurance Response to Draft Report
Appendix D: Report Distribution

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APPENDIX A

Independent Assessment Report

INDEPENDENT ASSESSMENT REPORT

Special Assessment - Evaluation of Shuttle-Mir “Lessons Learned” Being Applied to the ISS Management Interfaces, Design, Assembly, and Operation

Prepared by:
Gary Renfro, Patrick Brown, Cliff Kraus, and Steven Fuqua

Approved by:

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M. M. York, Manager
SAIC, Space Station Independent Assessment

Abstract: ***Special Assessment - Evaluation of Shuttle-Mir "Lessons Learned" Being Applied to the ISS Management Interfaces, Design, Assembly, and Operation***

Submitted by: *Gary Renfro, Patrick Brown, Cliff Kraus, and Steven Fuqua*

This assessment evaluated the application of the Shuttle-Mir "lessons learned" to the ISS management interfaces, design, assembly, and operation. Adequacy of Phase 1 lessons learned were evaluated by reviewing the lesson for proper interpretation, applicability, and overall implementation to the Phase 2 Program. IA found the Phase 1 lessons learned database to be inadequate, with lessons lacking a Phase 2 implementation plan. As a result, this contributed to the latency of the Phase 2 Program incorporating and implementation of the Phase 1 lessons.

IA discovered some lessons were misinterpreted by the Phase 2 Program because the lessons learned process was lacking initiator concurrence. In addition, the initial review of the lessons identified an inadequate closure criteria for implementing the lessons to phase 2. Lastly, IA noted that all organizations have not submitted their lessons.

During the coordination with the Program, IA recommended improvement of the process flow by including the initiator, thereby forming a closed loop process. In addition, IA has recommended that all organizations provide lessons that apply to their department.

IA concluded the Phase 2 Program is now adequately applying Phase 1 lessons learned based on several positive changes from the initial lessons learned review. These changes included 1) additional review of the lessons to obtain proper interpretation; 2) Program management involvement; 3) the modification of the closure criteria to include "Open" and expected closure dates for all open actions and 4) the Program recognizing not all lessons have been submitted and implemented.

Report: ***Special Assessment - Evaluation of Shuttle-Mir "Lessons Learned" Being Applied to the ISS Management Interfaces, Design, Assembly, and Operation***

Submitted by: Gary Renfro, Patrick Brown, Cliff Kraus, and Steven Fuqua

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1.0 INTRODUCTION

1.1 Purpose. This assessment evaluated how the Shuttle-Mir "lessons learned" were being applied to the ISS management interfaces, design, assembly, and operation.

1.2 Relevance to ISS. The Shuttle-Mir Program (Phase 1), implemented between the Russian Space Agency (RSA) and NASA, has given the ISS Program a unique opportunity to learn about the Russian philosophies and approaches to implementing large, human space exploration programs and in particular, long duration, continuous, human presence to live and work in space. Many of these lessons should be adapted and applied to Phase 2 ISS and subsequent phases. The results of this assessment provide assurance that valuable knowledge gained by Phase 1 will be used to benefit the follow-on phases of the Program.

1.3 Relevance to IA. This assessment is being conducted as a response to an action assigned at Meeting 15 of the ISS Independent Assessment Panel (IIAP), May 18-20, 1998.

1.4 Background. Unique knowledge and experience was gained from dealing with the Russian organizations as well as understanding their philosophies and approaches to managing large space programs, systems, hardware, materials, and operational and procedural data. Lessons for accommodating crew members for long duration periods on orbit were also gained. Although each of the Phase 1 increment lessons learned have been debriefed postflight, it is not certain whether these lessons were implemented by the Program into Phase 2 and subsequent phases.

2.0 METHOD

2.1 Groundrules and Assumptions. IA assessed lessons learned generated by the Phase 1 Program Office. In addition, IA attempted to obtain Russian lessons for applicability.

2.2 Assessment Criteria. Adequacy of Phase 1 lessons learned implementation by Phase 2 and subsequent phases were evaluated by reviewing lessons and determining how it was implemented. IA considered the intent, rather than the letter, of the lesson in assessing how well the lesson was captured and implemented.

2.3 Approach. To complete this assessment, the following steps were performed.

1. Identified if Phase I lessons learned data has been captured and made available in a usable format.

2. Worked with the ISS Program Phase 1 lessons learned team and others to determine the applicability of a given lesson, and determined what the Program was either already doing, or planning, to implement all applicable lessons.

3. Assessed the implementation against the intent of the lesson.

4. Provided recommendations to generate a lessons learned vehicle for distribution of Phase 1 data, or enhanced the current process by applying additional recommendations.

2.4 Resources.

JSC-27206, NASA/MIR Program Phase I Payload Operations Handbook (POH) Revision A, May, 1997.

SSP-50200, Station Program Implementation Plan, Volumes 1-8.

SSP-50361, Handbook for Processing Non-Integrated Hardware for Launch, Return, and On-Orbit Use on the International Space Station, July, 1998.

SSP-50260, International Space Station Medical Operations Requirements Document (ISS MORD), January, 1998.

JSC-27050, Postflight Rehabilitation Plan, July, 1997.

MP1P 60004, Phase 1 Program Shipping Implementation Plan, January 11, 1996.

2.5 Contacts. The interpretations of the data and conclusions in this report are solely those of the authors. The listing of the following individuals, who were contacted in the course of performing this assessment, does not imply their concurrence.

ISS Primary Program Point of Contact: Jim Nise (NASA/OH)

ISS: Mike Foale (NASA/CB), Dave Lengyel (NASA/SM311), Nathan Vassberg (NASA/OE), Jeffery Cardenas (NASA/SM2), Tim Baum (NASA/DO13), Mark Theissen (LM/NS43), William C. Brown (NASA/YA), Tom Marshburn (NASA/SD), Darren Lajaunie (LM/SM2), Chris Swiader (SD/KI), Mike Horkachuck (NASA, OZ)

3.0 ANALYSIS

3.1 Initial Review of Phase 1 Lessons Learned.

The Phase I Program compiled the lessons learned into seventeen categories that parallel ISS departments. In early June, IA met with the Phase 1 lessons learned team composed of representatives from each ISS department. The representatives reviewed each of their department lessons to determine their applicability and appropriate implementation plan for the ISS Program. As a result, a lessons learned matrix, sorted by category, was developed. The matrix contained the available Phase 1 lesson description, ISS applicability, if it was implemented, traceability reference, action plan, closure rationale, and closure status. This matrix was transferred to the Phase 2 community for utilization.

3.1.1 Phase 1 Lessons Learned Integration into Phase 2

During the Phase 1 Program lessons learned were generated and stored in a database located on the World Wide Web. The advertisement and subsequent use of this database was found to be inadequate. The information provided in the database did not include plans for implementation of Phase 2. The lesson description and the root cause were the main data fields provided. As the lessons were identified, the Phase 2 Program should have begun defining closure rationale and implementation. This activity did not occur until late in the Phase 1 Program.

3.1.2 Lessons Learned Interpretation

IA reviewed the available lessons learned matrix for applicability, interpretation, and implementation rationale. Misinterpretations associated with the applicability and closure criteria for some lessons were identified. A subsequent meeting with the initiators of the lessons was conducted to obtain the “true” intention of the lesson.

An example of a misinterpreted lesson was seen in the Phase 1 Research category. The lesson description stated:

> "In order to meet Russian schedules, facility-type hardware with multi-purpose capabilities was designed and developed with no identified experiment requirements (MIPS-3C rack-mounted telemetry interface system, GASMAP-a mass spectrometer). While it was beneficial to have the hardware available, the potential for difficulties in modifying hardware, software interfaces and experiment requirements to meet hardware specifications existed."

The closure rationale, "Management relationships preclude such inadequate program development," was discussed with the Lockheed Martin Phase 1 Increment 5 initiator. IA and the initiator mutually disagreed with this closure rationale.

Another example of a misinterpreted lesson was noted in the Logistic and Maintenance category. The lesson description stated:

> "Shipping/logistics personnel took the initiative to stay abreast of all pertinent domestic and international import/export regulations. Contractor personnel recognized the need for such training independently and identified seminars and classes that would be beneficial. JSC/JB7 identified similar needs at the same time."

Although the initiator stated this description was positive, the intent was to ensure adequate training for ISS personnel in shipping and logistics areas. The initial matrix showed traceability to the NASA/RSA/ISS Phase 2 Shipping and Receiving Plan, Rev. A. At the time of the review, this document had not been baselined. The initial matrix also lacked information for closure rationale and therefore did not emphasize training.

The Phase 2 ISS Program utilized a lessons learned implementation process that did not allow the initiator to review the closure rationale until after it was already implemented. IA determined that a closed loop process, including the author/initiator, would ensure the intent of the lesson was properly captured and the closure plan was adequate. IA developed a recommended process that would allow the initiator to be a part of the review process prior to the lesson being implemented. The IA recommended flow process, as described in Appendix A, details two internal loops that allow for initiator concurrence prior to being implemented and closed. This process would assist the proper interpretation of each lesson.

As a result, coordination with the lesson author and the category representative took place for intention clarification. An interim finding which stated a lack of understanding of the lesson intent was coordinated with the Program. An additional interim finding was discussed with the Program which stated a lack of

a formal closed-loop process for defining and closing the Phase 1 lessons learned. The Program response is discussed in Section 4.2.

3.1.3 Lessons Learned Closure Criteria.

The early version of the Phase 1 lessons learned matrix contained inadequately defined rationale for lesson closures. At IA's initial involvement, the Phase 2 coordinator stated the lessons were approximately 90 percent closed. These lessons were considered closed if implemented or traceable to an ISS process or requirement. However, on verification of the closure rationale for some lessons, the document referenced had not been generated/baselined, or the process referenced to close the lesson was in the planning stages. Lessons were also closed when actions were assigned to Configuration Board/Panels to resolve the issues. This response lead the reader to perceive the lesson as closed when in fact, it remains open. IA found examples of inadequate closure rationale for both methods.

An interim finding regarding the poorly defined closure criteria was coordinated with the Program. The Program response is discussed in Section 3.2.

3.1.4 Submission of Phase 1 Lessons Learned

The initial review of the lessons learned matrix showed that some organizations had not submitted their lessons. These organizations include the Phase 1 Increment 7/STS 91, crew lessons, and additional medical operations lessons.

IA coordinated an interim finding which stated that not all Phase I organizations had submitted lessons learned to the Phase 2 Program. The Program response is discussed in Section 4.4.

3.2 Program Coordination and Involvement.

During the course of this assessment the ISS Program was actively working the lessons learned issues. However, in late July, Mr. Randy Brinkley, the ISS Program Manager, reviewed the Phase 1 lessons learned matrix. He was not satisfied with the closure rationale provided for some of the lessons. He asked each of the category/department leads to review the matrix closure rationale and provide more detailed information. At this point, Mr. Brinkley also asked for each of the department heads to sign off on each lesson which applied to their department. This step solicited the active involvement of each department in the implementation of the lessons learned from Phase 1.

A second major step the Program took involved redefining the closure criteria for the lessons. The new criteria was to track a lesson as open until all actions have been closed for that lesson, even if the action is tracked in another forum.

IA agreed with this philosophy. This action showed implementation of IA's interim finding regarding closure criteria.

A third activity was the transition of the Phase 1 Program Manager to the Phase 2 Program office. This step reinforced the implementation of Phase 1 lessons into Phase 2 and facilitated proper closure of all the lessons.

3.3 Post Review of Phase 1 Lessons Learned.

Upon IA's review of the August 28th, revised lessons learned matrix and conversations with lesson initiators and category leads, it was determined that better interpretation and closure of the lessons occurred. It is clear that initiator involvement has helped in capturing the proper intent of the lessons as well as proper closure rationale.

IA also observed the re-opening of many issues, approximately 100 lessons. The matrix now reflects a more realistic amount of open work the Program needs to address.

Initially, the closure rationale was the responsibility of the category/department representative. After completion of the revised matrix, the department heads were responsible for determining if the closure rationale was adequate. The addition of the department heads into the approval process has transferred accountability to proper management level. IA concurs with this management philosophy. The Program also implemented a new closure criteria which utilized a status of "Open" until all actions are closed.

IA's review helped facilitate adequate closure rationale for some of the lessons. An example of IA's impact is shown in the revised closure rationale for lesson R-1. Initially, as stated in Section 3.1.1, the closure rationale was

> "Management relationships preclude such inadequate program development"

This same lesson, in the revised matrix has the following closure rationale:

> "This ISS Payload hardware is being built to the requirements developed using the following process: Science Working Groups or Discipline Working Groups review and approve research requirements for Facility-class payloads through science requirements reviews or Requirements Definition Reviews. The requirements are developed to envelop requirements for each discipline. The Payloads Control Board is the forum for implementing requirements for multi-discilpine hardware; requirements are reviewed by all board members. End-to-end Technical Interchange Meetings ensure cross integration issues are addressed at Payloads Office level."

The revised lessons learned matrix reflects improved applicability, interpretation, implementation, and closure rationale for the ISS Program.

4.0 FINDINGS & RECOMMENDATIONS

4.1 Finding 1. The formalized process for documenting implementation of Phase 1 lessons learned by the ISS Program did not occur until the last year of the Phase 1 Program.

Although some lessons were captured from the Phase 1A and 1B Program, the initial effort to obtain, interpret, and implement the lessons occurred during the last year of the Phase 1 Program.

Recommendation 1. Lessons learned need to be captured and incorporated as discovered. Processes need to already be developed and in place for Phase 2 lessons learned incorporation.

Program Response 1. The Phase 2 ISS Program concurs with IA on the need to have a real-time lessons learned implementation plan, process, and related database already in place.

4.2 Finding 2. Examples of Phase 2 responses to the Phase 1 lessons demonstrated misinterpretation.

By example, SPIP Vol. 4, e.g., Item 4-19, “A system which returns payload data to the investigation team needs to provide original data/samples quickly” was misinterpreted and therefore contained an improper closure rational.

Recommendation 2. The database and process should have a formal closed loop definition that includes the initiator for incorporating and tracking Phase 1 lessons learned.

Program Response 2. The current database has added a screening process to allow any disapproved lesson to be clarified and resubmitted by the initiator. However, the process does not include the initiator’s review of the closure rationale.

4.3 Finding 3. Closure criteria for identified lessons was poorly defined.

The early version of the Phase 1 lessons learned matrix contained inadequately closed lessons. These lessons were considered closed if an action plan was in place. Furthermore, examples of action plans had not yet been generated even though the lesson was closed.

Recommendation 3. Program management needs to identify a uniform closure criteria for Phase I lessons learned to all directorates. An additional status of "Open With Plan," should be added to the tracking of lesson learned items.

Program Response 3. The ISS agreed and modified the closure criteria to "Open" until all actions are closed, and added expected closure dates for all open actions during the revision of the matrix.

4.4 Finding 4. Not all of Phase 1 organizations have submitted lessons learned to Phase 2.

The initial and subsequent secondary review of the lessons has shown some organizations have not submitted their lessons. These organizations include Phase 1 Increment 7/STS 91, crew lessons, and additional medical operations lessons.

Recommendation 4. Ensure all organizations, associated with Phase I, are contacted for incorporation of lessons learned into the Phase 1 matrix.

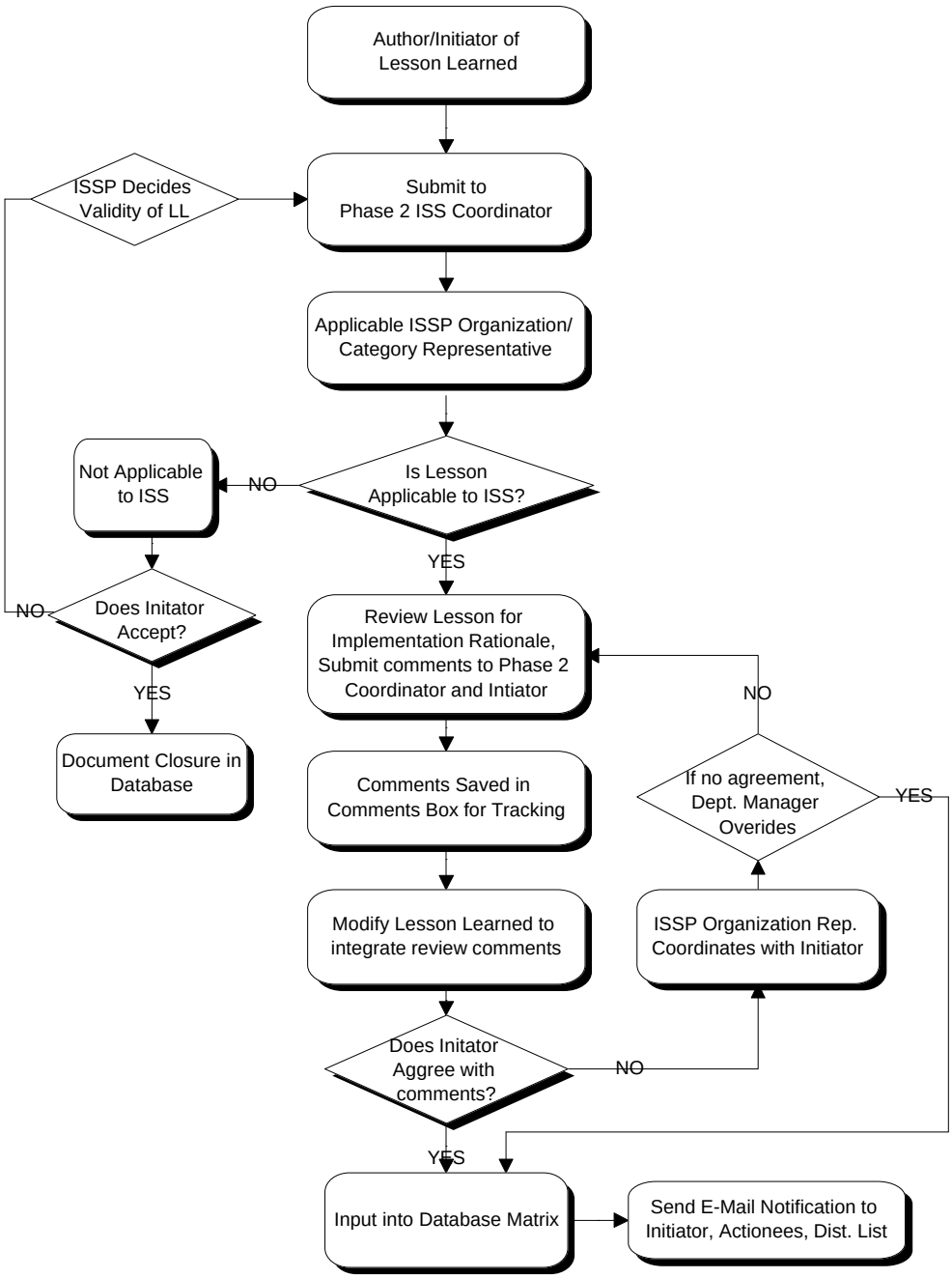
Program Response 4. The Phase 2 ISS Program concurs with the IA finding that there are additional Phase 1 lessons that have not been incorporated. These additional lessons will be reviewed by ISS when they are available. The mechanism used to review and implement the additional lessons will be the modified screening process.

5.0 CONCLUSIONS

Overall, Phase 2 Program is now adequately applying Phase 1 lessons learned. This evaluation was based on several positive changes from the initial lessons learned matrix. These changes included 1) additional review of the lessons to obtain proper interpretation; 2) Program management involvement; 3) the modification of the closure criteria to include "Open" and expected closure dates for all open actions.

IA plans to continue to monitor the interpretation and implementation of additional Phase 1 lessons as they become available. IA will also coordinate with the Phase 2 ISS Program.

Appendix A Recommended Process Flow for Lessons Learned Implementation



APPENDIX B

Office of Space Flight Response to Draft Report

APPENDIX C

Office of Safety and Mission Assurance
Response to Draft Report

APPENDIX D

Report Distribution

National Aeronautics and Space Administration (NASA) Officials-In-Charge:

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Senate Subcommittee on Science, Technology and Space
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