National Aeronautics and Space Administration

NASA Advisory Council Task Force
on
International Space Station Operational Readiness

June 16, 1998
NASA Headquarters
Washington, D.C.

MEETING REPORT

[Original signed by]
Dennis McSweeney
Executive Secretary

[Original signed by]
Thomas P. Stafford
Chairman

NASA ADVISORY COUNCIL TASK FORCE ON INTERNATIONAL SPACE STATION OPERATIONAL READINESS

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Welcome and Opening Remarks

Major General Ralph Jacobson, USAF (Ret.), welcomed the participants to the open meeting on behalf of Task Force Chairman Lieutenant General Thomas P. Stafford, USAF (Ret.). General Jacobson explained that the purpose of today's meeting is for the full Task Force to evaluate the various issues and assessments being followed and conducted by subsets of the Task Force. All of the issues addressed at today's meeting were discussed at a joint meeting of the Stafford Task Force and Utkin Advisory Expert Council at the Kennedy Space Center in the first week of June and were included in a protocol from that meeting. After evaluating these issues and assessments, the Task Force will present the results of today's meeting to the NASA Advisory Council during its meetings at NASA Headquarters, June 17-18, 1998.

ISS Test and Verification Working Group

General Jacobson, who served as the Chairman of the Task Force Working Group on ISS Test and Verification (IT&V), presented the Working Group's findings and recommendations. The IT&V Working Group was established in response to a request from NASA Administrator Daniel Goldin that the Task Force, with participation from the Aerospace Safety Advisory Panel (ASAP), conduct an assessment of ISS Test and Verification programs and provide appropriate advice and recommendations to the NASA Advisory Council (NAC).

The IT&V Working Group met with NASA and contractor personnel in March and April of 1998. In the course of these briefings, the Working Group reviewed the Independent Assessment Review (IAR) team's concern that the Program is not conducting element vibration, vibroacoustic and thermal vacuum integrated testing. Additionally, the Working Group assessed the IAR team's concern that Multi Element Integration Testing (MEIT) may be lessened due to late delivery and schedule requirements for regression testing.

As a result of the Working Group's meetings on these issues, it was found that:

- The ISS Program is following a thorough test and verification protocol.

- While there are risks without thermal vacuum and vibro-acoustics testing at the system level, redundancy or repair capabilities mitigate that risk

- The integrated testing program plan has been completed and appears to be well thought out.
  - The Program's reinstatement of the once deleted MEIT was a correct choice.
- The Program's planned vacuum testing for the upcoming elements is adequate.
- The software verification process is sound, but potential software delays are the Working Group's greatest concern.

A detailed account of the Working Group's assessment of IT&V can be found in Attachment D.

Software Schedule

Dr. Charles Daniel, Chief Engineer Space Station Integration Office, reviewed the software schedule associated with the Russian and U.S. elements. He stated that the ISS program has encountered developmental and verification problems associated with software for both the U.S. and Russian elements and there has been some erosion of the schedule during the past several years. Dr. Daniel emphasized that verified flight software releases are critical to element acceptance and MEIT testing as well as the development of comprehensive flight and ground test programs.

The Task Force recommends the following:
- The Stafford Task Force/Utkin Advisory Expert Council should jointly endorse the development and maintenance by the ISS program of a comprehensive set of software and software product schedules.
- These schedules should include products developed by the U.S and all international partners.
- The schedule should highlight software availability relative to the launch manifest, training demands, element and multi-element testing.

Dr. Daniel and Dr. Heimerdinger will follow the development of the integrated software schedule and report on its status to the full Task Force.

FGB status

Dr. Daniel also reviewed the status of the FGB, which he characterized as one of the highlights of the Program. All tests on the FGB have been completed and the vehicle is currently mothballed at the Baikonur Cosmodrome in Kazakhstan. During the testing of the FGB, a generic fault was identified in the ISS Multiplexor/Demultiplexors (MDMs) which impacts the FGB flight MDMs. The FGB flight MDMs have been removed and shipped to Moscow for incorporation of the required software modifications. These MDMs will be returned to Baikonur in August 1998 and a potential retest of the FGB is under evaluation. This potential retest is dependent on the degree of regression testing that Khrunichev Space Center (KhSC) determines is necessary, but Dr. Daniel stated that this is a minimal problem.

The Task Force will continue to monitor this issue.

Service Module Status

Dr. Daniel explained that the Service Module (SM) was shipped from KhSC to RSC-Energia on June 1, 1998 and is scheduled to be shipped to Baikonur in November of 1998 for launch in April of 1999.

Regarding the funding situation of the SM and its components, Dr. Daniel expressed his concern that this situation causes a significant threat to the development and completion of the SM. While the Russian government secured the 1997 debts, the 1988 shortfall has resulted in critical hardware delays, parts shortages and other phases of SM manufacturing, testing and training support.

U.S. ISS Element Status

General Jacobson reviewed the status of the ISS Node-1 and Laboratory. The status of the progress on these elements is satisfactory. Node-1 is essentially complete and the U.S. Lab's final acceptance is scheduled for April 12, 1999, and launch in December 1999.

Leak Rate Standards

General Jacobson stated that the leak rate specifications for the ISS pressurized elements vary among the ISS partners, with Russia having the lowest leak rate specification and Japan and Europe having the highest. There is some concern that the relatively high leak rates specified could result in a logistics problem because if the elements leak at the high end of the allowable rates, additional logistics flights would be required to deliver breathing air to the station. Russia would like the leak rate specifications to be standardized at the more stringent levels. However, NASA is concerned that doing so could necessitate changes in existing contracts, thereby driving up costs. NASA will propose a process for resolving this issue by September 1998, when the Task Force and Advisory Expert Council are scheduled to meet in Moscow. General Jacobson explained that despite the Russians' concern, planned testing of the elements will likely demonstrate significantly lower leak rates than specified for non-Russian elements. The Task Force will continue to monitor this issue.

ISS Habitability

Dr. Craig Fischer, M.D., reported on the differences in the Russian and U.S. atmosphere standards for the ISS elements. The Russians believe that the NASA Shuttle Maximum Acceptable Concentration (SMAC) levels are not stringent enough and may affect the operation of the contaminant removal system. However, the NASA tests on the contaminant removal system indicate that the system will work significantly better than the specification requires. NASA and RSA specialists are currently scheduled to meet in July to:

- Develop a joint plan for verification, operation and maintenance of the U.S./Russian systems.
- Develop agreed to specifications for the Environmental Control and Life Support System (ECLSS).
- Confirm agreements on crew health limits for contaminants.

The Task Force will review this issue after the July meeting.

MMOD Shielding

Dr. Daniel Heimerdinger, Ph.D., described the current status of the Micrometeoroid Orbital Debris (MMOD) shielding for the SM. The process appears on schedule for the shielding of the SM, however there is some concern regarding the shielding's potential impact on reboost logistics and EVA paths, i.e. accessibility to the external components of the SM. The Task Force and AEC will continue to monitor the plans for shielding in this regard.

Treadmill Project Overview

Major General Joe Engle, USAF (Ret.), described the issues associated with loads transferred to the ISS structure during the use of the treadmill on the ISS. The Russian and U.S. analysis of the loads found that the loads transferred to the structure were higher than acceptable. The Russians could not remedy the situation under the current schedule and budget. NASA agreed to build the device that would attenuate transfer of the loads onto the structure.

The Treadmill Vibration Isolation and Stabilization (TVIS) system flew on STS-81. There was a complaint from the STS-81 crew that while running on the treadmill, the loads varied excessively with associated vertical motion. The device has been reworked with a cam assembly that enables the harness to exert a constant force with vertical motion.

In addition to the treadmill, a resistance exercise device is being designed. This device will provide isometric exercise, in addition to the cardiovascular exercise provided by the treadmill. The Russians are concerned that, when six crewmembers are onboard, and with only one exercise device onboard, there will not be enough time to meet the 2 hours of exercise each crewmember is required to perform each day. Separating the two devices is being considered.

Mir Decommissioning Plan

General Engle reviewed the current plan for the decommissioning of the Mir. Members of the Task Force attended the General Designer's Review and the Joint Program Review in Moscow in April 1998. During those meetings a plan was agreed upon which provided flexibility of the date to decommission the Mir, with the baseline deorbit date of December 1999. This plan was reviewed during the Joint TF/AEC meetings held at Kennedy Space Center in June 1998.

Borris Sotnikov, Deputy General Designer, and Keith Reiley, Manager, Mission Integration (ISS), signed an agreement by which:

- The Mir Deorbit Plan (MDP), to be released June 1, 1998, will be reviewed and updated every three months.
- The MDP will consider RSA funding, Progress and Soyuz status, launch vehicle status, SM status, ISS Status, ISS and Mir operational support, ISS and Mir spares status, and overall funding and schedule status for the Mir and ISS programs.

- The plan will be designed so that Mir can be deorbited at an earlier date, if required, to avoid conflict of resources with ISS.

The Task Force concurs with the MDP and commends the Russian and U.S. teams for their product.

2A and 2A.1 Ingress Status

General Engle explained that Mr. Koptev wrote to Mr. Goldin requesting that the TF/AEC review the risk associated with the planned 2A and 2A.1 ingress of the FGB. Working Groups consisting of RSC-E, KhSC, GCTC, TsNIIMASH, NASA and Boeing presented their findings to the TF/AEC in June. The following activities are planned for the flights:

Flight 2A:

- Opening of the FGB hatch
- Installation of ventilation ducting from the Shuttle to provide air flow to the FGB
- Partial activation of some FGB systems (e.g. fans, comm., etc.)
- Transfer of cargo from the Shuttle to the FGB
- Photo survey of the FGB's internal volume
- Removal of the EVA handrail and installation on the FGB
- Closing of the FGB hatch

Flight 2A.1

- Opening of the FGB and SM hatches
- Installation of required air ducts
- Partial activation of some FGB and SM systems
- Transfers of cargo from Shuttle and Progress to SM and FGB (General Engle pointed out that the amount of cargo being transferred is significantly larger than the transfer planned for 2A)
- Installation of some SM equipment
- Closing of the FGB and SM hatches

The findings of the Working Group (RSC-E, KhSC, GCTC, TsNIIMASH, NASA and Boeing representatives) were:

Flight 2A

- All planned activities are within the vehicle requirements.
- The required Flight Procedures and Flight Rules are being jointly developed according to plan.
- KhSC has identified some technical data required from NASA to complete their certification of the FGB ingress. NASA is currently addressing these issues.

During the June TF/AEC meeting, Dr. Fischer discussed with Dr. Pestov the Russians' concern regarding the FGB atmosphere on Flight 2A. These concerns focused on possible sequestered air pockets and toxic off-gassing products. NASA is revisiting the analysis of the expected air quality at the time of hatch opening. Environmental standards, in particular air quality and

testing protocols, will be reviewed during the July TIM 23 meeting in Moscow. The TF will follow these issues as they develop.

Flight 2A.1

The training community is concerned about the short time remaining to train Shuttle crews for the ingress activities. Both U.S and Russian training experts are working to optimize the remaining training time for these crews. If adopted, the upcoming Rev. D assembly sequence change will relieve these concerns. All the parties agree that no significant flight safety issues exist.

The TF will continue to monitor the safety and readiness issues associated with ingress of the FGB on 2A and 2A.1 assembly missions.

ISS Training

Colonel James C. Adamson, USA (Ret.), Chairman of the TF Working Group on ISS Training, reported on the status of the Working Group's assessment. The Working Group conducted fact-finding meetings in the United States and Russia, including joint meetings with the AEC in January, April and June 1998.

Some of the Working Group's initial findings and observations include:

- Late software and training deliverables precluded completion of planned training for the initial ISS mission to meet the Revision C Assembly Schedule.
- The Revision D Assembly Schedule will allow recovery if the original Revision C software and other deliverable schedules are maintained.

The Working Group has agreed with the AEC to maintain a database of the status of the crew training issues being assessed by the Working Group and the AEC.

Action Items

Mr. Dennis McSweeney, Executive Secretary of the Task Force reviewed the action item discussed during the open meeting:

- Dr. Daniel and Dr. Heimerdinger will follow the development of the integrated software schedule and report its progress to the TF.

Mr. McSweeney added that all of the issues discussed today are ongoing and will continue to be reviewed and assessed at future TF meetings.

Closing Remarks

General Jacobson, on behalf of General Thomas Stafford, thanked the Task Force for their input and adjourned the meeting.

Attachment A

NASA Advisory Council
Task Force on International Space Station Operational Readiness
Open Meeting
NASA Headquarters, Room 7W31
Washington, DC
June 16, 1998
AGENDA
All times are Eastern Daylight Time

1.	Introduction	Gen. Ralph Jacobson	2:00 p.m.
2.	General Remarks	Mr. Dennis McSweeney	2:05 p.m.
3.	IT&V	Gen. Ralph Jacobson	2:10 p.m.
4.	Software Schedule	Mr. Charles Daniel	2:30 p.m.
5.	FGB Status	Mr. Charles Daniel	2:45 p.m.
6.	Service Module Status	Mr. Charles Daniel	2:55 p.m.
7.	Node 1 and U.S. Lab Status	Gen. Ralph Jacobson	3:00 p.m.
8.	Leak Rate Standards	Gen. Ralph Jacobson	3:05 p.m.
9.	ISS Habitability Standards	Dr. Craig Fischer	3:15 p.m.
10.	MMOD Shielding	Dr. Daniel Heimerdinger	3:25 p.m.
11.	Treadmill Status	Gen. Joe Engle	3:35 p.m.
12.	Mir Decommission Plans	Gen. Joe Engle	3:45 p.m.
13.	2A and 2A.1 Ingress	Gen. Joe Engle	4:00 p.m.
14.	2A Atmosphere	Dr. Craig Fischer	4:15 p.m.
15.	ISS Crew Training	Col. Jim Adamson	4:20 p.m.
16.	Wrap-up Discussion	Task Force	4:30 p.m.
17.	Review of Actions	Mr. Dennis McSweeney	4:40 p.m.
18.	Adjourn		4:45 p.m.

Attachment B

NASA ADVISORY COUNCIL TASK FORCE ON INTERNATIONAL SPACE STATION OPERATIONAL READINESS

MEMBERSHIP

Chairman

Lt. Gen. Thomas P. Stafford, USAF (Ret.)

Members

Col. James C. Adamson, USA (Ret.)
Mr. Benjamin Cosgrove
Mr. Joseph Cuzzupoli
Dr. Charles C. Daniel
Dr. John Fabian
Dr. Craig L. Fischer, MD
Dr. Michael A. Greenfield
Mr. James Heflin
Dr. Daniel J. Heimerdinger
Maj. Gen. Ralph Jacobson, USAF (Ret.)
Cdr. Michael Lopez-Alegria, USN
Dr. Ronald C. Merrell, MD
Capt. John Young, USN (Ret.)

Technical Advisors

Maj. Gen. Joe H. Engle, USAF (Ret.)
Mr. James C. Snowden

Executive Secretary

Mr. Dennis McSweeney

Asst. Executive Secretary

Ms. Holly Stevens

Attachment C

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NASA Headquarters
Washington, D.C.

MEETING ATTENDEES

Task Force Members

Col. James C. Adamson, USA (Ret.) (via teleconference)
Dr. Charles Daniel
Maj. General Joe Engle, USAF (Ret.), Technical Advisor
Dr. John Fabian (via teleconference)
Dr. Craig Fischer (via teleconference)
Dr. Michael Greenfield
Mr. Milt Heflin (via teleconference)
Dr. Daniel Heimerdinger
Maj. General Ralph Jacobson, USAF (Ret.)
Cdr. Mike Lopez-Alegria, USN
Mr. Dennis McSweeney, Executive Secretary
Ms. Holly Stevens, Asst. Executive Secretary (via teleconference)
Capt. John Young (via teleconference)

NASA Headquarters

Mr. Dan Hedin
Mr. Dana Mellerio
Ms. Susan Minor
Ms. Angela Phillips-Diaz
Mr. Arthur Whitnah

Others

Mr. Peter Cocolis, Boeing
Mr. Liam Connolly, Smith, Bucklin and Associates
Ms. Jane Mellors, European Space Agency
Mr. Charlie Walker, Boeing