

**National Aeronautics and Space Administration**

**NASA Advisory Council Task Force  
on  
International Space Station Operational Readiness**

November 4, 1998  
Johnson Space Center  
Houston, Texas

**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

November 4, 1998  
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MEETING REPORT  
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# NASA ADVISORY COUNCIL TASK FORCE ON INTERNATIONAL SPACE STATION OPERATIONAL READINESS

November 4, 1998  
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## **Welcome and Opening Remarks**

Lieutenant General Thomas P. Stafford, USAF (Ret.), welcomed the participants to the open meeting and introduced Johnson Space Center Director George Abbey. Mr. Abbey expressed his appreciation to the Task Force for the work the team has done in preparation for the upcoming International Space Station (ISS) element launches. He stated that November and December will be momentous months for the Phase 2 Program due to the November 20, 1998, launch date of the FGB (Zarya) from the Baikonur Cosmodrome in Kazakhstan and the Node (Unity) launch from Kennedy Space Center on December 3, 1998. He added that the November 3, 1998, Flight Readiness Review for the November 20, 1998, launch went well, although there are still software issues that need to be resolved. Teams from the ISS Program Office are working these issues.

Mr. Abbey added that the Task Force's work with Russia's Utkin Advisory Expert Council (AEC) has provided excellent insight and counsel on many issues leading up to Phase 2. He looks forward to continued assistance from the Task Force in working with the Russians and other International Partners (IPs) as the ISS Program progresses.

Dr. Michael Greenfield, NASA Deputy Associate Administrator for the Office of Quality and Safety Assurance, asked if the Task Force would continue to prepare readiness letters prior to each ISS launch. General Stafford replied that NASA Administrator Daniel Goldin indicated to him that he expected the Task Force to continue to prepare these letters.

## **ISS Overview**

Mr. Randy Brinkley, Program Manager of the ISS, gave an overview of the recent Program Readiness Reviews (PRR) for the ISS element launches. Mr. Brinkley stated that both NASA managers and the IPs agree that the ISS Program is ready to move into the assembly phase.

The Program recommendations that came out of the Program Readiness Reviews are:

- RSA contingency funding has been approved
  - The first milestones have been met on time
- Continue with current plans
  - Launch 1 A/R and 2A on schedule
  - Baseline plans for flights throughout 7A at the Space Station Control Board (SSCB) in conjunction with 2A launch
  - Baseline complete revision of Rev D at 2A.1 launch in May
- Proceed with implementing contingency plans

- Initiate Reboost and Control Module development
- Work with RSA to develop hardware for ICM to FGB docking
- Decide ICM Launch Package Integration (March 1999)

Mr. Brinkley said that the plans are in place, both nominal and contingency. The hardware and software are on track and the people are trained and ready for Phase 2.

Mr. Cuzzupoli asked how much contingency is in the \$60 million for the Service Module (SM). Mr. Brinkley stated that there is no contingency and that it is all allocated to the SM, the modified/upgraded Soyuz Crew Return Module, and the Propulsion Module. He added that the Russians will probably need another \$40 million this year to launch the SM. It has not yet been determined whether that funding will come from NASA or from the Russian government.

Commander Michael Lopez-Alegria, USN, asked how much of the available science time would be allotted to the Russian segment. Mr. Brinkley stated that the United States would be using 75 percent of the time for scientific research. General Stafford pointed out that that is a bone of contention with the Russian Academy of Science, who argues that since they will have less science time on ISS, they should be able to keep Mir up longer. Mr. Brinkley said that he believes this is actually a benefit for both sides because it will force the Russians into cooperative research. Previously, the Russians had resisted this type of collaboration, but if they want to do research, they will have to do it cooperatively. He believes this may help with crew integration as well.

General Stafford stated that lessons learned from Phase 1 have made Phase 2 possible and complimented both Randy Brinkley and Frank Culbertson on insisting that lessons learned be included in Phase 2. Mr. Brinkley stated that that database of 400 lessons learned is available and has been incorporated into the larger ISS database.

Mr. Brinkley described the assembly sequence modification that was released on October 2, 1998:

- Maintained 1A/R, 2A and 2A.1 launches.
- 1R launch moved to July 1999 - that shifted subsequent flights 3 or more months.
- Number of Progress vehicles launched prior to 5A reduced from 3 to 2 vehicles.
- The first Soyuz and crew will launch in January 2000
- First crew will arrive approximately 4 weeks prior to 5A
- Added a Shuttle logistics flight after 1R
- Adds a Shuttle assembly/logistics flight prior to 6A.

This new assembly sequence reduces the number of ISS Progress vehicles to ISS prior to 5A, reduces the risk to successfully accomplishing all mission objectives for Flight 6A, and provides a redundant propellant supply system prior to ATV. General Stafford pointed out that this new sequence gives the crew more time to resolve training and software issues as well. (A detailed account of the current program status is included in Attachment D, ISS Overview for the Stafford Task Panel).

Dr. Daniel Heimerdinger asked if the new assembly sequence's reduction in flights has had an impact on critical sparing. Mr. Brinkley stated that it has balanced it out because some interim flights have been added to allow the Program to work through the critical spares.

Major General Ralph Jacobson, USAF (Ret.), asked what Mr. Brinkley sees as the top concerns. Mr. Brinkley said that the issues of robotic capability and partial failures are among his top concerns. Another concern is the issue with the Gyroscope Meter of Angular Velocity Vector (GIVUS). It is zero fault tolerant, but there is a back up in the Telerobotically Operated Rendezvous System (TORU) and Compar system to maintain attitude control so that docking is still possible. In addition, Mr. Culbertson said that it is critical that the mating between the FGB and the Node works correctly.

General Jacobson asked if there is anything the committee can do to help with any outstanding issues. Mr. Brinkley stated that the Y2K issue is a concern with the Russians and that Mr. Goldin wants this issue addressed at the Heads of Agency meeting. Academician Utkin has been tasked by Mr. Koptev to conduct an in-depth review of the Y2K problem. Mr. Brinkley stated that having a copy of that review would be helpful.

General Stafford thanked Mr. Brinkley and praised his office for the job they have done to get to this point.

## **2A.1 and 2A.2**

Ms. Sharon Castle, Launch Package Manager for 2A and 2A.1, briefed the Task Force on issues related to missions 2A.1 and 2A.2:

When it was determined that 2A.1 would fly before the Service Module (SM) the manifest was split and some items were moved to 2A.2. Changes include:

- Some hardware, Russian and U.S. Crew Health Care Systems (CheCS), was moved to 2A.2
- Some FGB unique hardware was added to 2A.1
- Crew provisions were divided between 2A.1 (clothing) and 2A.2 (office supplies and personal hygiene aids)
- Critical spares were moved from 3A to 2A.1 and 2A.2
- Stowage outfitting hardware was added to 2A.1

Mr. Joe Cuzzupoli questioned how the critical spares were identified and determined for placement on either 2A.1 or 2A.2. Ms. Castle explained that there is a logistics and maintenance group that has published a document on all the critical spares, showing what they are, when they are needed, and their priority. This group meets weekly to determine certification, hardware availability and criticality. 2A.1 contains critical spares required for 3A, 4A and 5A.

2A.1 now contains:

- Pre-positioning hardware for 2R/3A/4A/5A (including computers, bar code equipment, printers, photo equipment, and both internal and external EVA hardware)
- Critical Spares
- Non-limited life crew supplies

- Some Russian hardware

2A.2 now contains:

- CheCS
- Food and hygiene aids
- SM outfitting hardware

Dr. Charles Daniel asked if the hardware would be activated on this flight. Ms. Castle responded that if time is available, the hardware would be activated.

Ms. Castle then reviewed the plans for stowage and transfer scenarios associated with 2A.1 and 2A.2:

#### 2A.1

- Khrunichev requested data on the stowage and transfer timelines, and it was determined that both planned and worst case stowage plans stay within the cg box for the FGB/Node.
- Crew transfer (generic) training began on September 11, 1998, and will continue periodically until launch.
- Preliminary stowage plan, the precursor to the On-orbit Configuration and Transfer Document (OCTD), is scheduled to be ready November 18, 1998.
- A timeline has been marked-up to incorporate modifications to the flights and will be released December 15, 1998, for the Flight Operations Review (FOR) on January 26, 1999.
- Cue cards (crew transfer instructions) are in development now and are scheduled to be released December 15, 1999.
- It is anticipated that the Russian manifest will change, based on SM and Progress planning. A series of teleconferences with the Russians will begin Monday, November 9, 1998, to review that issue, and unless the changes are massive, they will be folded into the FOR Review.

Major General Joe Engle, USAF (Ret.), asked if the volume of the transfer items will leave enough room for the crew to work in and if any air/vent ducts would be covered. Ms. Castle stated that a Technical Interchange Meeting (TIM) was conducted in April, where the schematics of the FGB were reviewed in order to assure that ducts were clear. There is a set specification in place that determines the amount of space that must be made available for the crew. Those specifications have been met. Another team also reviewed this plan in September using the actual FGB. Using both the Node and a three-dimensional mock up, another team has verified that the stowage plan is acceptable.

#### 2A.2

- The Russian modified input is expected on November 10, 1998.
- The Russian task/installation agreement is expected November 13, 1998.
- Russian input on task times expected November 13, 1998,
- The preliminary timeline is the 2A.1 timeline with minor modifications.
- Launch layout is expected December 15, 1998.
- A first look at the on-orbit stowage situation is expected January 18, 1999.

- Russian procedure inputs expected February 1, 1999.
- Official OCTD is planned for publication February 5, 1999.
- A final timeline is scheduled for publication June 24, 1999.
- Final cue cards are scheduled for publication July 29, 1999.

General Engle thanked Ms. Castle for her briefing and pointed out that despite all the anticipated changes, the people and the processes appear to be in place to adapt to these scenarios. Ms. Castle said that they have taken advantage of the Phase 1 lessons learned, and the fact that many of the people involved in Phase 1 on both sides are the same as in Phase 2. (2A.1 and 2A.2 Mission overviews and timelines are included in Attachment D, Presentation materials).

General Stafford was called away from the meeting and requested that General Jacobson continue the meeting as Chairman.

General Engle introduced Ms. Linda Uljon, the PCS Project Manager, who reviewed the readiness of the Portable Computer System (PCS) for flight on STS-88.

### **ISS Portable Computer System (PCS)**

Ms. Uljon began by explaining the requirements and delivery of the PCS:

- The MOD Systems Division and the Astronaut Office defined the requirements and participated in the development testing.
- The Astronaut Office conducted reviews, provided consensus reports and prioritized problem reports (PRs) for fixes.
- The project verified that every command and every telemetry value matched that defined in the Program database.
- 2A PCS passed the Functional Configuration Audit/Physical Configuration Audit (FCA/PCA) and the 2A Acceptance Review Board, and was accepted by the Program.
- The 2A PCS was delivered to Boeing on June 8, 1998, and they, in turn, delivered it as part of the Station Management and Control to NASA.

She continued by outlining the operability:

- PCS Load was used to satisfactorily accomplish the Cargo Element Test and delta test.
- The 2A crew used PCS with flight hardware to verify flight procedures in Mission Sequence Test.
- Operability is being demonstrated during flight-specific integrated simulations.
- All 2A Station Program Notes have been reviewed approved and incorporated into operations.
- Special training sessions to review PCS procedures and operation has been held with the 2A crew. It was well reviewed and plans are being made to have sessions with ground tested and future crews.
- 2A PCS is ready for flight.

Ms. Uljon explained that PCS currently exists in 5 formats (2A, 3A, 4A, 5A, 6A), and that each has its own characteristics. Dr. Greenfield asked if each flight has a different version. Ms. Uljon said that starting with 4A, the PCSs will be upgraded on each flight.

Colonel James Adamson, USA (Ret.), stated that he believes that the crew has made compromises in accepting software that has moved from graphical interfaces to more tabular data interfaces. Dr. John Grunsfeld (JSC/CB) agreed that the crew is not pleased with the current tabular displays but that it is critical that the programs get onboard. He added that once the station is in orbit, then the crew will work to develop more modern displays. In addition to the displays, there are a number of subtleties that the crew must be aware of in order to correctly use the system. Dr. Grunsfeld also stated that even though PCS was flying on 2A, there was no requirement for FCS to perform flight tasks. STS-88 is an opportunity to fly PCS and gather data in a flight environment prior to use of PCS.

Dr. Charles Daniel asked if there is a dynamic system that tracks PCS code changes for the interface boxes. Dr. Grunsfeld said that they are concerned about making sure that the training includes software changes, but added that the crew has developed a good relationship with the PCS teams and they are working to solve problems with the process.

General Jacobson suggested that the Task Force receive a briefing on software issues prior to each launch.

### **Report from Task Force Working Group on ISS Software**

Dr. Charles Daniel presented the results of the Task Force Software Working Group's fact-finding meetings, including meetings with Russian software managers in Moscow to discuss concerns with the integration of software and software products, software schedules, and other concerns.

#### Schedules

Dr. Daniel explained that the ISS software schedules were initially developed using a dependence network, but that the schedule shifts do not reflect the dependencies. Also, the maintenance is not included and the training product status was not maintained. The Russians indicated that although they contribute information to the schedule, they do not utilize the ISS schedules and do not believe it accurately reflects their activities.

#### Software Simulations

The Working Group stressed that software simulations of hardware systems are critical to the initial Formal Qualification Test (FQT) of software and its downstream maintenance. Dr. Daniel explained that:

- The ISS Program utilizes an approach of "certification by use".
- Recent element-level tests have pointed up significant differences between the operations of the simulations and those of the hardware.
- A comprehensive program to address the simulations and certification by comparison to the hardware performance has not been identified.
- Fixes are based on a point-incident approach rather than a systems approach.

#### Integrated Stage Level Hardware/Software Integration (HSI) Testing

- Limited HSI testing is being performed at the Software Verification Facility (SVF) on flight type processors and code – not flight hardware.

- Initial Flight Element testing is being performed with early release of code that has not completed FQT.
- Element Level Acceptance tests are conducted with Flight Processor/Flight Code and Flight Hardware.
- Multi Element Integrated Testing (MEIT) is not structured as a Stage Test Environment
  - Test configurations do not represent orbital flight configurations.
  - Stage testing is limited to Software Test Facility with simulations and Flight Type Processor/Flight Code.

### Russian Issues and Concerns

The representative of the Russian software community indicated to the members of the Working Group that:

- The Russians do not utilize the ISS integrated software schedule and do not accept ownership of the data associated with their development.
- The timing of the Software Control Board's weekly meeting prohibited their participation.
- The current integrated software test program was not comprehensive, based on Russian development history and recommend that the program be modified to provide for more downstream testing.

### Recommendations

Dr. Daniel's team recommended that:

- Representatives of the U.S. and Russian software communities should meet to address the Russian issues associated with software schedules, control boards and integrated software testing.
- The ISS verification community should evaluate the current MEIT testing approach to evaluate the potential for providing a test configuration with is both progressive and reflective of the orbital flight configuration.
- The ISS software community should evaluate the potential for utilizing element level and MEIT testing as a mechanism for certification of software simulation by direct comparison to hardware performance.

The Task Force concurred with the Software Working Group's assessments. General Jacobson thanked Dr. Daniel and requested that the Working Group continue to track these issues and report back to the full Task Force.

### **Report from the Task Force Working Group on ISS Training**

The Task Force Working Group on ISS Training reported on its recent fact-finding meetings. The Training Working Group noted that since January 1998, it had conducted four joint meetings with the Utkin Advisory Expert Council. These meetings, which had been reported on in earlier Task Force open meetings, resulted in four separate protocols signed by General Stafford and Academician Utkin.

Commander Lopez-Alegria explained that the Training Working Group and Advisory Expert Council fused all of the training issues from the four separate protocols into a single matrix of issues (see Attachment D, STF ISS Training Update). This matrix of training issues was

included as an annex to the September 25, 1998, Task Force-Advisory Expert Council protocol.

The Training Working Group will continue to work with the Advisory Expert Council to monitor and investigate issues that have not yet been “closed”.

The Task Force concurred with the Training Working Group’s assessments. General Jacobson thanked the Working Group and requested that it continue to report back to the full Task Force.

### **Action Items**

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

- General Stafford will send a letter to Academician Utkin requesting support for Frank Buzzard’s review of the status of the Russians’ preparedness for the Y2K problem.
- The Task Force will continue to monitor the PCS issues and fold them into the overall software assessment.
- Recommend to the AEC that some items on the Training matrix be moved from the Training Working Group to the Software Working Group.

### **Closing Remarks**

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

**NASA Advisory Council  
Task Force on International Space Station Operational Readiness  
Open Meeting  
Johnson Space Center  
Houston, Texas  
November 4, 1998**

**AGENDA**

**All times are Central Standard Time**

1. Welcome	G. Abbey	0:10	0900
2. Opening remarks	Gen. Stafford	0:10	0910
3. ISS Program Overview	R. Brinkley	1:00	0920
• FGB			
• 2A			
• Service Module			
• Assembly Sequence			
4. PCS STS-88 Readiness	DA	0:10	1020
5. Stafford Task Working Group Force Reports			
• ISS Software Assessment	Dr. C. Daniels	0:20	1030
• ISS Training Assessment	Cdr. M. Lopez-Alegria	0:20	1050
6. Summary/Action Items	D. McSweeney	0:10	1110
7. Closing	Gen. Stafford	0:05	1120

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, U.S. Army (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. Mark Thiessen

Executive Secretary

Mr. Dennis McSweeney

Asst. Executive Secretary

Ms. Holly Stevens

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MEETING ATTENDEES

**Task Force Members**

Lt. General Thomas P. Stafford, USAF (Ret.), Chairman  
Col. James C. Adamson, USA (Ret.)  
Mr. Ben Cosgrove  
Mr. Joe Cuzzupoli  
Dr. Charles Daniel  
Maj. General Joe Engle, USAF (Ret.), Technical Advisor  
Dr. Michael Greenfield  
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  
Mr. Mark Thiessen, Technical Advisor

**NASA Personnel**

Mr. Bill Arceneaux, JSC/OB6  
Mr. William Bates, JSC/OA  
Mr. Frank Buzzard, JSC/OA  
Ms. Sharon Castle, JSC/OM  
Mr. Frank Culbertson, JSC/OA  
Mr. Bob Dunn, JSC/CB  
Mr. Mark Ferring, JSC/ DA8  
Dr. John Grunsfeld, JSC/CB  
Mr. Bruce Luna, JSC/OA  
Ms. Linda Shirley, JSC/OA  
Ms. Linda Uljon, JSC/DA4

**Others**

Mr. Sam Boyd, SAIC  
Mr. Steve Boyles, GAO

**Attachment D**

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PRESENTATION MATERIALS

- |    |  |                    |
|----|--|--------------------|
| 1. | “ISS Overview for the Stafford Task Panel”                 | Randy. Brinkley    |
| 2. | “2A.1 and 2A.2”  | Sharon Castle      |
| 3. | “Portable Computer System (PCS) STS-88 Readiness”          | Linda Uljon        |
| 4. | “Presentation to the ISS Operational Readiness Task Force” | Charles Daniel     |
| 5. | “STF ISS Training Update”                                  | Mike Lopez-Alegria |