

National Aeronautics and Space Administration

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

**November 7, 2001
NASA Headquarters
Washington, DC**

MEETING REPORT



Original signed by

Philip J. Cleary
Executive Secretary

Original signed by

Thomas P. Stafford
Chairman

**NASA ADVISORY COUNCIL TASK FORCE ON INTERNATIONAL
SPACE STATION OPERATIONAL READINESS**

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Mr. Philip Cleary, Executive Secretary of the NASA Advisory Council (NAC) International Space Station Operational Readiness (IOR) Task Force, welcomed the participants to the open meeting. He explained that this meeting was being held to review the results of the fact-finding sessions conducted by the NAC IOR Task Force Working Group-Anfimov Advisory Expert Council (TF-AEC) Joint Commission. Fact-finding meetings were held in Russia from November 5 – 9, 2001, with experts from Rocket Space Corporation (RSC)-Energia, Khrunichev State Research and Production Center, the Gagarin Cosmonaut Training Center (GCTC), TsNIIMash, TsUP (MCC-Moscow), and the Institute for BioMedical Problems (IBMP). These meetings also included a teleconference briefing from NASA's experts on November 5, 2001. Task Force Chairman Lt. General Thomas P. Stafford, USAF (Ret.), presided and made the following introductory remarks:

Background

General Stafford stated that the NAC IOR Task Force, at the request of NASA Administrator Daniel Goldin and Rosaviakosmos General Director Yuri Koptev, worked with the Anfimov AEC to assess the safety and operational readiness of the International Space Station's Expedition 4 mission. Specifically, the Joint Commission met with NASA and Russian experts to review the safety and operational readiness of the International Space Station, the flight readiness of the Expedition 4 crew, and the American and Russian flight control team's (Mission Control Center-Houston/Mission Control Center-Moscow) preparedness to accomplish the mission. He then asked Major General Ralph Jacobson, USAF (Ret.), to present the results of the Task Force's assessment.

Joint Commission Findings & Recommendations

General Jacobson stated that the Task Force Expedition 4 Working Group found no impediments to the scheduled November 29, 2001, launch of the Expedition 4 crew.

The topics the team reviewed included:

Treadmill with Vibration Isolation System (TVIS)

Functional Cargo Block (FGB) Methanol levels

Solid Fuel Oxygen Generator (SFOG) Certification

Crew Training

Crew Medical Certification

Space Station Remote Manipulator System (SSRMS)

ISS Launch Schedule

Mission Control Center (MCC) Readiness

ISS EVA Hatch Configuration

Cargo Certification

Command & Control (C&C) Multiplexer DeMultiplexer (MDM)

TVIS

Major General Joe Engle, USAF (Ret.), reviewed the ongoing issues related to the TVIS. TVIS was designed for 11,000 hours of lifetime; however, various components have failed approximately every 300 to 400 hours. To date, there have been failures of the motor, control panel, plastic tread slats, passive isolation device, subject load device, and the subject-positioning device. The repair and maintenance of TVIS has taken up valuable crew time and its failures have become a potential medical concern due to inadequate crew antigravity conditioning.

These concerns will be addressed at the Moscow Technical Interchange Meeting (TIM) scheduled for the week of November 12, 2001. The TF will closely monitor the TIM findings and make recommendations after those results are assessed.

Chuck Daniel, Ph.D., asked if the Program Office has put together an Anomaly Resolution Team to study the TVIS failures. General Engle explained that there is currently a Johnson Space Center (JSC) team looking at it and they are coordinating their investigations with their IBMP counterparts, but communication between the two groups is lacking. Better communication will take place during the scheduled TIM when they will have face-to-face working time. Milt Heflin, Deputy Chief Flight Director, added that this issue has garnered a great deal of attention from the Program Office and that progress is being made to rectify the situation.

Arnauld Nicogossian, M.D., stated his concern that the crew spends too much time on maintenance that takes time away from on-orbit research. Dr. Nicogossian added that the loss in crew physical fitness is not acceptable from a medical standpoint. Ronald Merrell, M.D., asked what countermeasures are being taken to assure crew health in the absence of the TVIS.

General Engle reviewed the countermeasures that are in place:

- The broken plastic tread slats have been replaced with metal slats.
- The motor has been replaced.
- An alternative to the subject load and subject position devices has been developed using bungee cords, but this method of creating loads is unwieldy and difficult for the crewmembers to use.
- The TVIS can be used in a “passive mode” whereby the crewmember can move the treadmill in the event the motor is not working.
- A Teflon plate can be attached to the TVIS in place of the slats to provide a running surface.

The failure of the control panel does not allow the medical teams to capture physiological data. Dr. Nicogossian suggested that this anomaly might be the result of a faulty microchip. He expressed his concern that the loss of bone and muscle mass over a six-month mission could be a serious medical risk and suggested that continuing anomalies with the TVIS may necessitate holding the crew mission lengths to three months.

General Engle stated that the TVIS failures are a concern to both the U.S. and Russian medical communities, assured the team that this issue is being given a great amount of scrutiny, and stated that the Task Force would continue to monitor it closely.

FGB Methanol Levels

Technical Advisor Mark Thiessen reviewed the unexpected methanol detection in the FGB. On August 6, 2001, ISS atmospheric samples were returned to Earth for evaluation. The FGB samples indicated methanol levels ten times higher than the rest of the ISS. The source of the methanol has not been located and the Russian/U.S. experts both claim they have no items that contain methanol onboard. While there is no medical concern with the methanol, it is curious that the levels were only elevated in the FGB. The grab samples were taken with NASA hardware that was cleaned prior to launch, and no internal cleaning agents were used which would have contaminated the sample. Additional samples taken by the returning Soyuz crew will be analyzed after November 24, 2001, and it is believed those samples may yield additional insight into the cause.

SFOG

General Engle reviewed issues related to the SFOG candles. During Expedition 3, the Russians requested that the crew burn three of the 160 oxygen-generating candles onboard to test their longevity. Eighty of the 160 candles will run out of certification lifetime at the end December but their lifetime can be extended by determining their moisture absorption level. Russian experts stated that this could be done by burning a representative sample on orbit. ISS Commander Frank Culbertson, USN (Ret.) questioned the rationale for performing the test on-orbit, but it was later decided to delay the test until the Expedition 4 crew is onboard and has more available work time. The other 80 candles do not exceed their lifetime until the middle of 2002.

SSRMS

Three SSRMS anomalies were reported during the previous Expedition mission: 1) wrist roll, 2) Brake voltage fault and 3) shoulder pitch communication error. Mr. Thiessen stated that the Russians originally believed the anomalies were the result of a hardware failure, but it has since been determined that they were caused by characteristics endemic to the 1553 bus chipset. These characteristics are being evaluated and a software patch was instituted to correct the defect. The Russians had previously pressed to have the hardware returned, but since the institution of the corrective patch, the SSRMS has operated nominally.

Camera Lens Contamination

The SSRMS camera lens has experienced contamination and some degradation, but not enough to warrant an EVA to fix the lens. Should it continue to degrade beyond acceptable limits, the crew will return the camera for evaluation. The TF-AEC Joint Commission is satisfied with that resolution.

Crew Training and Certification

The training cycle and template have become stable and all of the simulations are operating fine. The backup crew has not received as complete training as the prime crew, but the U.S. side is not concerned with that issue. The Russians, on the other hand, prefer that the back up crew receive equal training as the prime crew, should a last minute crew change out become necessary. The Expedition 4 crew has been certified by JSC and GCTC and the crew will be declared ready to fly during the Flight Readiness Review for STS-108 scheduled for the week of November 12, 2001.

EVA Hatch Configuration

Prior to the Expedition 3 flight, Commander Culbertson expressed concern about closing multiple hatches during EVA. He believes that the Service Module (SM) should be accessible in the event of a control system failure to allow the crew to enter the SM and regain control of the ISS. Mr. Thiessen explained that this is more of a philosophical difference between the Russian and U.S. flight teams, i.e. whether it is more important for the crew to be able to regain control themselves (preferred by the U.S. side), or whether MCC-H/MCC-M should be relied upon to regain control from the ground (preferred by the Russian side). Historically the Russians have relied heavily on the ground controllers to regain control of the Station in the event of a control system failure. While they understand the U.S. team's desire to allow the crew the ability to regain control, they believe that one crewmember would not be able to complete this task and would still need consultation from MCC-H/MCC-M. The U.S. side does not ascribe to that philosophy and says that the crew would be able to regain control because of the training they have received in this area. Mr. Thiessen stated that it is essentially a "risk trade-off issue" and currently the crew office has agreed to adopt the Russian's philosophy of keeping the hatches closed.

Launch Schedule

General Engle reviewed the upcoming launch schedule:

The next Russian cargo supply vehicle, 6P, is currently scheduled for November 26, 2001, three days prior to the Expedition 4 launch (currently scheduled for November 29, 2001). The aggressive crew workload during this time has caused some concern. The existing plan is to delay Progress (6P) unstowing until the Shuttle has docked.

General Engle stated that there are questions concerning the potential impact of a Shuttle launch slip, i.e., how the undocking of the Progress, docking of the Shuttle, and crew workload would be effected. Mr. Heflin explained that this issue is being watched very closely by both the U.S. and Russian teams and will be analyzed as the launch dates near. General Engle stated that the prime concern is keeping crew workload manageable. Mr. Heflin concurred and added that both sides have improved their management of crew workload timelines. Dr. Nicogossian said that the medical teams suggest greater cooperation between the human factor team and the planning team in order to assure a feasible crew workload schedule.

Cargo Certification

Mr. Thiessen reviewed the ongoing deliberations between the Russians and the U.S. regarding cargo certification. There is frustration on the Russian side because of the organizational structure governing the overall certification of cargo and safety. The Russian organization is not complimented directly by the NASA organization. Rosaviakosmos suggested areas for improvement, which includes the Russian participation on NASA safety panels, processing of urgent cargo, hygiene evaluation of cargo, and cargo interface certification. Although there was not a request for action by Rosaviakosmos, the presentation indicated that there remains work in integrating the two agencies' philosophies regarding certification processes. The ISS program, through the Chief Engineer, is actively engaging appropriate personnel in Life Sciences and Engineering to resolve these issues and implement a cargo certification process that is consistent and efficient. Currently, the TF maintains that this is an issue best handled by the Program Office and will not make any recommendations.

MCC-M and MCC-H

General Engle stated that the two Control Centers are working together very well, as demonstrated by the transparent handover of control to MCC-M during the terrorist activity of September 11, 2001. Both sides have full confidence in the system that has been implemented.

Command and Control MDM failure

During 6A, multiple MDMs went off line. The failure was isolated to the mass storage device (MSD) (hard disk) of the MDM. The investigative team determined from the data and failure analysis submitted, that the MSD failure was due to the heads recontacting the spinning media (platter) as a result of improper commanding to park the heads. Commanding of the MSD required the use of the 'STOP' command to have the MSD park the heads in an orderly fashion thereby protecting the heads and the spinning platters. The ISS program implemented short-term measures to control the head recontacts by ensuring that all applications utilized the 'STOP' command and that power downs took place only after the heads were parked. Long-term plans call for the implementation of the Solid State Mass Memory Unit (SSMMU) taking the place of the MSD.

Dr. Daniel represented the TF during the investigations led by Mr. Jay Greene. Mr. Greene reported the results and the team's recommendations to both the U.S. and Russian program offices. The Joint Commission will continue to follow this matter as the SSMMU's are fully integrated into the ISS MDMs.

Conclusion

The Task Force concurred with the Expedition 4 Working Group's assessment that there are no issues that would preclude the launch of the Expedition 4 Crew to the ISS. General Stafford and General Jacobson expressed their gratitude for the TF's efforts to fully understand and evaluate all the issues listed above.

On a final note, General Jacobson expressed his belief that, above all, the ISS was built to conduct microgravity research. He stated that NASA Headquarters and the Program Office should concentrate on examining the status of the onboard instruments and whether they are sufficient to deliver the scientific data that the researchers require. Mr. Cleary concurred with General Jacobson and added that, in accordance with the recent report by Tom Young, the NAC is focusing on this issue to assure that "science drives engineering and not the other way around."

The meeting concluded at 1:00 p.m. Eastern Standard Time.

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Task Force Membership

Chairman

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

Members

Col. James Adamson, U.S. Army (Ret.)
Mr. Percy Baynes
Mr. Benjamin Cosgrove
Mr. Joseph Cuzzupoli
Dr. Charles Daniel
Dr. Craig Fischer
Dr. Michael Greenfield
Mr. J. Milt Heflin
Dr. Daniel Heimerdinger
Maj. Gen. Ralph Jacobson, USAF (Ret.)
Capt. Michael Lopez-Alegria, USN
Dr. Ronald Merrell
Mr. David Mobley
Dr. Arnauld Nicogossian
Dr. Shawn Rahmani
Capt. John Young, USN (Ret.)

Technical Advisors

Maj. Gen. Joe Engle, USAF (Ret.)
Mr. Mark Thiessen

Executive Secretary

Mr. Philip Cleary

Asst. Executive Secretary

Ms. Holly Stevens

Attachment B

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Meeting Attendees

Stafford Task Force Representatives

Chairman, Lt. Gen. Tom Stafford, USAF (Ret.), via teleconference
Colonel Jim Adamson, USA (Ret.), via teleconference
Mr. Ben Cosgrove – via teleconference
Mr. Joe Cuzzupoli – via teleconference
Dr. Chuck Daniel – via teleconference
Mr. J. Milt Heflin - via teleconference
Dr. Daniel Heimerdinger – via teleconference
Maj. Gen. Ralph Jacobson, USAF (Ret.) – via teleconference
Capt. Michael Lopez-Alegria, USN – via teleconference
Dr. Ronald Merrell – via teleconference
Mr. David Mobley – via teleconference
Dr. Arnauld Nicogossian – via teleconference
Dr. Shawn Rahmani – via teleconference
Capt. John Young, USN (Ret.) – via teleconference

Stafford Task Force Technical Advisors

Maj. Gen. Joe Engle, USAF (Ret.) – via teleconference
Mr. Mark Thiessen – via teleconference

Task Force Executive Secretary

Mr. Philip Cleary

Task Force Asst. Executive Secretary

Ms. Holly Stevens – via teleconference