

NASA ADVISORY COUNCIL
TASK FORCE ON THE SHUTTLE-MIR RENDEZVOUS AND DOCKING MISSIONS
September 4, 1996
NASA Headquarters
Washington, D C.

SUMMARY

The NASA Advisory Council Task Force on the Shuttle-Mir Rendezvous and Docking Missions met on September 4, 1996, from 3:30 p.m. to 5:00 p.m. in Room 7H46 at NASA Headquarters. Attachment A contains the agenda. Attachment B lists the Task Force members, NASA employees, and members of the public in attendance. Attachment C contains the Task Force's issues for future consideration. The presentation material is on file.

Introductory Remarks

Lieutenant General Tom Stafford, USAF (Ret.), opened the session by thanking the Task Force members for their contributions to The First Joint Report of the Stafford Task Force and the Utkin Advisory Expert Council (AEC). He reviewed the topics to be addressed during the meeting.

Schedule Slip Impacts

Colonel Charles J. Precourt (USAF) opened his comments by stating that he was tasked by Frank Culbertson to lead a review team to assess the impact of the STS-79 launch delay. Colonel Precourt said that there had been little or no impact on medical operations, science, training, systems integration and science interface with the CNES/Euro-Mir mission. Colonel Precourt was able to talk directly with Mission Specialist Shannon Lucid to ensure her comfort with the extended stay aboard Mir and also to determine what additional supplies she would need. The additional supplies were sent up via Progress-232 on August 1, 1996, which included reading material, food supplies, etc.

Additionally, Colonel Precourt explained that the delay was sufficient enough to rework the thermal, water production and transfer analyses. He added that in some instances the slip was actually beneficial, as it left more time to complete various science operations, allowed Dr. Lucid to prepare her equipment to bring home, enabled STS-79 Mission Specialist John Blaha more preparation time with the crew of STS-79, and helped with the crews' sleep synchronization.

Colonel Precourt informed the Task Force that STS-81 and STS-84 will launch approximately two weeks later than scheduled. STS-89's launch is yet to be determined.

At the conclusion of Colonel Precourt's remarks, Major General Joe Engle, USAF (Ret.) praised Colonel Precourt and the team's efforts on the assessment of the Solid Rocket Booster (SRB) problem, and pointed out that Colonel Precourt was able to keep everyone focused as they reached the methodical conclusion that there were no real issues which would impact the mission or warrant bringing down Dr. Lucid early.

General Stafford asked if Colonel Precourt had an update on the hurricane's current impact on the STS-79 launch. Colonel Precourt said that the earliest launch date is still September 16. General Stafford mentioned the potential conflict with the Air Force, but Precourt said that the conflict had been resolved.

Major General Ralph Jacobson, USAF (Ret.), asked if there was a limit on how much schedule delay the system would tolerate -- either human or mechanical. Colonel Precourt replied that there do not seem to be any physical consequences for Dr. Lucid. Mr. Gib Kirkham, Executive Secretary of the Task Force, asked Dr. Arnauld Nicogossian to elaborate on Dr. Lucid's health.

Dr. Nicogossian explained that Dr. Lucid is doing her exercises, not having any problems, and should be able to go for several more months before there would be any concerns about calcium loss. He added that the environment on board the Mir is good, and if there were a problem, the Soyuz is equipped with an escape module which could return her with the Russian crew.

N₂ Logistics Transfer

Mr. Miles Whitnah, Office of Quality and Safety Assurance, discussed the problems with the prime and backup Elektron oxygen generation systems on Mir. In August, the Mir had a problem with the CO₂ systems which required the use of the NASA O₂ candles to offset the problem. He explained that during the systems check, a faulty vacuum valve was discovered. That valve has been replaced and now the CO₂ system is working properly.

Another problem he addressed was the Elektron oxygen generation systems failure. There are two systems located in the Kvant-1 and Kvant-2 modules. The Kvant-1 system showed a failure, so the crew members requested the start up the Kvant- 2 system. He explained that in order to start that system, they had to purge the hydrogen manifold with nitrogen and then restart the system. The Kvant-2 system did not start. They repurged the line and ended up using a faulty N₂ system. They were given permission for a one-time-only venting of air in the line. The system started and is now operating.

While the system was down, oxygen was provided by the O₂ candles. Each crew member requires one candle per 24 hours. Six crew members were on board at the time, but Mr. Whitnah said there was no concern, as Mir had 250 candles.

Subsequently, the Russian Space Agency (RSA) requested that STS-79 transport a Russian-provided N₂ servicing system. That unit is now being checked out at Kennedy Space Center (KSC). For transport to Mir, the unit will be stored in the Spacehab module.

STS-79 Overview

Mr. Kirkham gave an overview of the STS-79 mission. The STS-79/Mir-22 docking will be tail forward with a velocity vector of minus X.

Goals

The goals of STS-79 are to dock with the Mir, deliver John Blaha for his mission, return Shannon Lucid, deliver logistics, return scientific experiments, perform secondary experiments, Developmental Test Objectives (DTOs) and Developmental Science Objectives (DSOs). Mr. Kirkham pointed out that this would be the fourth Shuttle-Mir docking mission and the first flight of the Spacehab double module.

Payloads

Payloads include the double Spacehab module, new tunnel segment and several experiments. Experiments to be delivered are the Mir Electric Fields Characterization Experiment (MEFC); the Active Rack Isolation System (ARIS), a downlink system; and the Inventory Management System (IMS), a bar coding system. STS-79 will be flying the IMAX camera for the fourth time, to perform in-cabin filming.

STS-79/Mir-22 Crew Profile

The crew for the STS-79 mission will be Commander Bill Readdy, Pilot Terry Wilcutt, Mission Specialist Jay Apt, Mission Specialist Tom Akers, Mission Specialist Carl Waltz and Mission Specialist John Blaha.

On August 12, one week before its scheduled launch, Mir-22 had a crew change. Commander Gennadi Manakov suffered a slight heart failure and was replaced by Commander Valeriy Korzun. Additionally, Flight Engineer Pavel Vinogradov was replaced by Flight Engineer Aleksandr Kaleriy. The CNES Cosmonaut Researcher Claudie Andre-Deshays was not replaced and returned to Earth on Sunday, September 2 with the Mir-21 crew.

Mission Profile

STS-79 is currently scheduled to launch on September 16. Rendezvous will be tail forward, with an R-bar approach. The Mir configuration is complete and the landing is scheduled for September 25 at Kennedy Space Center.

Decision to Destack STS-79 Solid Rocket Boosters (SRBs)

General Engle explained the decision to destack RSRM-54. When the STS-78 SRBs were taken apart for post-flight cleaning and assembly, sooting and heat effects were noted in all six field joints. An investigation team was immediately formed. The sooting was noticed most heavily in the center field joint, with less sooting in the aft section, and minimal sooting in the fore sections. General Engle said that the significance of the center sooting is that it extends into the J-joint farther than seen before. The reason for the sooting has not been conclusively identified. The most probable cause was the change in the insulation cleaning agent, surface abrader and Pressure Sensitive Adhesive (PSA). General Engle pointed out that in order to make Shuttle launches more environmentally friendly, the Trichloroethane-based (TCA) cleaner, abrader, and PSA, used to join the J-joint insulation at each field joint, was replaced with water-based components.

General Engle stated that at no time was there any concern with the design of the field joint. He added that he believes the redesigned joint to be very robust. However, because there would be no significant impact to the logistics transfers, Phase One science or Dr. Lucid's health, the assessment team determined that there was no reason to fly STS-79 with the current boosters. The decision was made to destack and use the STS-81 boosters.

General Stafford commented that it was interesting that the problem was mainly with the center joints and asked if the assessment team had determined why the center showed more sooting. General Engle explained that while there has not been a definitive determination, it is believed that the dynamics of the twang during main engine ignition may be a contributing factor.

General Jacobson asked if the dynamics of this flight were any different than the other flights. General Engle replied that while the dynamics are the same, the major cause seems to be the changing of the PSA. General Jacobson asked if the main engines were tested after the adhesive change, and General Engle said he did not know of any full-scale ground test firing and referred the question to Dr. Greenfield.

Dr. Greenfield explained that originally when the changes from Ozone Depleting Chemicals (ODCs) were implemented, they conducted a flight service motor (FSM) firing at Thiokol in the horizontal position. The new PSA was used with the old cleaner. The test was successful and no sooting was detected. However, when STS-78 boosters were stacked at KSC, the joints were joined with the new adhesive and the new cleaner/abrader. It was determined that the surfaces were equally as clean as when the TCA was used, and was then certified by similarity.

General Jacobson suggested that a process should be worked out to test new agents. Dr. Greenfield explained that changing the cleaner, abrader and PSA was a Class One change and that similarity is often used as a form of certification.

General Jacobson asked if there was a chemical change. Dr. Greenfield explained that TCA has the ability to soften the NBR rubber as a chemical attack agent, but that did not happen. Tests were also done using the water cleaner and everything was fine.

General Stafford questioned the adequacy of Thiokol testing. Dr. Greenfield stated that the whole RSRM was certified through horizontal ground tests.

Mr. Joe Cuzzupoli asked if a waiver was granted which would exempt NASA from the Montreal Protocol ban on Class I substances and allow the use of the TCA cleaner. Dr. Greenfield stated that a process is in place to review all ODCs and request waivers. He went on to say that he believes there is enough of the original cleaner/abrader and adhesive to last the life of the program. General Engle added that there are 100 gallons in inventory and the Shuttle uses three gallons per flight -- enough for 33 more flights.

General Jacobson asked if the cleaner is still manufactured. Dr. Greenfield said he believes that the chemical is still made.

General Engle closed his remarks by saying that since there were no definitive answers to the sooting problem and Dr. Lucid health was not a concern, the decision was made to destack and use the STS 81 boosters. Dr. Greenfield added that although the sooting in O-ring does not violate the Component End Item (CEI) specification, it was decided that it was best to protect the safety margin.

Mr. Cuzzupoli suggested that the Task Force explore the changes made in compliance with the Montreal Protocol.

Soyuz U Booster Failure

Dr. Greenfield began his remarks by explaining that the U boosters used to launch the Progress capsules are not the same as the Soyuz U2 boosters which carry the crew to the Mir.

Dr. Greenfield pointed out some concerns with the manufacturing quality of the U booster. He stated that there were two U booster failures which both occurred in the nose fairing at 49 seconds. In these instances, military spacecraft were being launched. One had a failure in the fairing material, which seemed to be the result of a manufacturing defect. The second one appeared to have a manufacturing defect in the fairing latches. These problems have been fixed and the Progress-232 did not suffer any fairing problems. General Stafford asked if the Soyuz fairing and the military fairings are the same. Dr. Greenfield said they are not and there have not been any problems with the U2 fairing.

Dr. Greenfield explained that there was also a problem with the fuel pressure sensor prior to the Progress-232 launch. The RSA determined that it was easier to roll out another Soyuz launch vehicle rather than recalibrate the fuel pressure sensor. He commended the Russians for the flexibility of their program.

Dr. Greenfield also stated that the U booster has had 630 successful launches out of 650 and that the U2 has had only one or two failures in the entire program. The U2, which was the greatest concern, still looks good. Dr. Greenfield closed his remarks by suggesting that we discuss the overall quality control used in the Russian program.

Status of Upcoming Missions

Mr. Kirkham reviewed the status of upcoming missions. STS-81 is scheduled to launch on January 16, 1997; STS-84, in May of 1997; STS-86 in September of 1997; STS-89 in January of 1998; and STS 91 in May of 1998. There may be a joint extra vehicular activity (EVA) with the Russians on STS-86 to prepare for the Space Station EVA tasks.

Joint Report Status

The Stafford/Utkin Joint Report was finalized on June 27. Academician Vladimir F. Utkin and General Stafford signed the report during a ceremony at Johnson Space Center. General Stafford will personally present a copy of the report to NASA Administrator Daniel Goldin.

Task Force Schedule

The STS-81 mission will be reviewed by the Task Force on January 7. A closed meeting may be held on September 23 to discuss the charter for the Task Force, as Mr. Goldin has asked that the Task Force continue to review Space Station activities through the next phases.

Action Items

In his concluding remarks, Mr. Kirkham gave a brief overview of action items that have been closed. There is now a plan in place to get NASA equipment back from the Russians in the event of an emergency. Also, at the recent GCC summit, Prime Minister Chernomydin and Vice President Gore specifically referenced the work that the Stafford/Utkin commissions have been doing. Copies of those remarks have been provided to the Task Force Members.

Questions

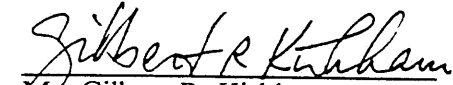
Mr. Cuzzupoli asked if a lessons learned study has been implemented. Mr. Kirkham explained that NASA is considering a contract proposal to integrate the two that are being developed at this time. Mr. Cuzzupoli emphasized that he believes that establishing and transferring lessons learned is a very important endeavor and that the Task Force should continue to monitor the effective transfer of lessons learned from Phase One to Phase Two and Three. General Stafford agreed that it is a very important tool for avoiding mistakes. Dr. Greenfield interjected that NASA is considering a proposal.

Bion Launch


Kitty Havens, from the Office of Life and Microgravity Sciences and Applications at NASA Headquarters, gave a brief overview of the Bion launch and fairing problems. A discussion was held with the RSA concerning the fairing problems they were having on Soyuz launches. The fairing has been modified for the Bion mission and that may have remedied the problem. They are continuing to use the same Ukrainian manufacturer.

Closing Remarks

General Stafford thanked the Task Force members for their assistance and adjourned the meeting at 5:00 p.m.



Mr. Gilbert R. Kirkham
Executive Secretary
Task Force on the Shuttle-Mir Rendezvous
and Docking Missions



Lt. General Thomas P. Stafford, USAF (Ret.)
Chairman
Task Force on the Shuttle-Mir Rendezvous
and Docking Missions

ATTACHMENT A

NASA Advisory Council
Task Force on the Shuttle-Mir Rendezvous and Docking Missions
Room 7H46
NASA Headquarters
Washington, DC

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AGENDA

1530-1540	Welcome	Lt. General Thomas P. Stafford, USAF (Ret.)
1540-1610	STS-79 Overview	Mr. Gilbert R. Kirkham, Executive Secretary
1610-1645	STS-79 Challenges	Maj. General Joe Engle, USAF (Ret.)
1645-1655	Status of Joint Report Status of Upcoming Missions Task Force Schedule Task Force Update	Mr. Gilbert R. Kirkham, Executive Secretary
1655-1700	Closing Remarks	Lt. General Thomas P. Stafford
1700	Adjourn	

ATTACHMENT B

NASA Advisory Council
Task Force on the Shuttle-Mir Rendezvous and Docking Missions
NASA Headquarters
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ATTENDANCE

Task Force Members

Thomas P. Stafford, Chair
James C. Adamson (via teleconference)
Joe Cuzzupoli (via teleconference)
John Fabian
Craig Fischer (via teleconference)
Michael Greenfield
James M. Heflin (via teleconference)
Ralph Jacobson (via teleconference)
Ronald Merrell (via teleconference)
Arnauld Nicogossian
Charles Precourt (via teleconference)

Executive Secretary

Gilbert Kirkham
Holly Stevens, Assistant

Technical Advisors

Joe Engle
Glynn Lunney (via teleconference)
Jim Snowden

NASA Personnel

Mark Uhran, NASA Headquarters, Code U
Miles Whitnah, NASA Headquarters, Code Q

Visitors

Frank Moring, Aerospace Daily

ATTACHMENT C

NASA Advisory Council
Task Force on the Shuttle-Mir Rendezvous and Docking Missions
NASA Headquarters
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September 4, 1996

ISSUES FOR FUTURE CONSIDERATION

1. Review adequacy of Thiokol testing.
2. Explore changes made in compliance with the Montreal Protocol ban on Ozone Depleting Chemicals (ODCs).
3. Monitor effective transfer of lessons learned from Phase One to Phase Two