National Aeronautics and Space Administration

International Space Station Advisory Committee

August 28, 2012
NASA Headquarters
Washington, DC

OPEN MEETING REPORT

J. Donald Miller
Executive Secretary

Thomas P. Stafford
Chairman

NASA INTERNATIONAL SPACE STATION ADVISORY COMMITTEE

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MEETING REPORT

Dr. J. Donald Miller, Executive Secretary of the NASA International Space Station (ISS) Advisory Committee (AC), welcomed the participants and called roll. Chairman Thomas Stafford presented the following findings:

BACKGROUND

Good afternoon and thank you for participating in this open meeting of the NASA International Space Station Advisory Committee. Thanks to all of you who engaged in the recent fact-finding meetings we held in June.

To review the areas that were covered in our latest assessment, I'm going to read from the report from the Committee's meetings in Moscow, where we met with the Russian Advisory Expert Council.

MEETING SUMMARY

At the direction of NASA and Roscosmos management, outlined in letters of February 14, 2008, March 12, 2008, and December 14, 2010 / April 22, 2011, the NASA International Space Station (ISS) Advisory Committee (AC) – Roscosmos Advisory Expert Council (AEC) Joint Commission (JC) met at Korolev, Russia, June 4-8, 2012, to continue to evaluate the viability of the ISS with specific focus on crew safety and the challenges to ISS operations, and, to assess the possibilities for using the ISS for future space exploration.

After opening comments by the Co-Chairs, the meeting was initiated with a comprehensive ISS Program Overview presentation prepared by the ISS Program Office at Johnson Space Center and presented by the Deputy Director, Human Space Flight Program - Russia Office, and, by the Flight Director of the Russian Segment of the ISS. The scope of subjects presented for review included current ISS utilization, commercial cargo vehicle status, ISS Life Extension Certification status, Soyuz vehicle status, long duration mission activities, Medical Operations on the ISS, anomalies experienced since the last JC meeting, and current ISS systems and procedures that might be candidates for improvement. Much of the discussion focused on how best to use safely the ISS for research and development, as well as support of long duration beyond Low Earth Orbit (LEO) mission planning, systems and development beyond 2020.

Utilization:

The ISS is a unique facility for performing research and testing to prepare for long duration exploration missions. Now that ISS United States Operating Segment (USOS) assembly is complete and the Russian Segment (RS) is near completion, it is important to make the most advantageous use of this laboratory. It is encouraging and instructive to see the actual usage

hours and margin of usage within the USOS requirement of 35 hours per week (RS is forty percent of total crew time). This increased utilization is critical to capitalizing on the potential of the ISS for advanced research and technology development. It is also encouraging that there are continuing actions to reduce further the time taken for procedures on ISS and that utilization hardware will get priority. Beyond these metrics, it is important to ensure accomplishment of important research and test objectives on a strategic and prioritized basis.

The ISS needs an international master plan for research with exploration as the top priority: an overall plan for prioritized research and testing objectives and identification of minimal thresholds of data necessary to initiate long duration missions. It is recognized that the NASA Human Research Program and the Russian Long Term ISS Research Program have already established their own list of priorities of objectives for exploration, and have prioritized their lists of research on the ISS to address these priorities. Due to the limited lifetime in which the ISS is operational, with a productive research environment, time is of the essence. Efforts need to be focused on coordinating, developing and implementing these plans, including joint investigations, and developing equipment to support exploration research and testing.

The JC expects that the ISS program will provide this overall international research and test master plan, including potential long duration mission simulations similar to Mars 500 and NASA Extreme Environment Mission Operations (NEEMO). The crew time available for utilization should be focused on this highest priority research. The high priorities for Exploration utilization include, but are not limited to: (1) long duration on orbit crew stays of at least nine months (comparable with anticipated duration of Martian and asteroid missions) combined with ground operation demonstrations; (2) closed loop life support testing to establish reliable systems processes, particularly testing and proving reliable closed loop air and water processes;3) radiation experiments with inflatable habitats using water for shielding, compared with measurements inside and outside current ISS modules; (4) establishment of accepted realistic standards for design and operations among partners, including implementation of those standards; (5) cryogenic fuel storage and transfer; (6) testing of zero g-sensitive processes; and (7) technologies for assurance of safe crew activities.

The ISS test capability may diminish over time as degrading systems or atmosphere demand increased time for ISS maintenance. This is a potential threat to success of the ISS. It is essential to capture correctly the utilization rate (the crew's time spent performing science), especially in contrast with the maintenance rate (the crew's time spent performing maintenance, housekeeping, and other operational activities). The trends associated with these two rates become important as we monitor the performance and demand for housekeeping and maintenance of aging systems, address evolving concerns, and increase operational efficiency and life of equipment, all the while ensuring that we avoid degradation of utilization activities. Essential to obtaining these rates is to have a clear definition among the International Partners of what activities are included within the determination of each rate.

The JC believes that to achieve maximum effectiveness of the ISS utilization as a test bed for future space exploration, a multilateral exploration plan would be timely. As noted at the last meeting of the JC in November 2011, the ISS Expert Working Group (IEWG) is considering the question: do the partners have a joint interest in using a near-Earth manned (man-tended) platform after 2020? Based on the IEWG's results and proposed solutions, the JC will assess the options for using the ISS for future exploration.

ISS Life Extension/Certification:

Both the U.S. and Russia are assessing vehicle systems and hardware to extend the life of ISS to 2020 and potentially beyond. These assessments are at various stages of completion, but are not complete. It is apparent from the material presented, that there are potential upcoming impacts to maintenance crew time, additional sparing, building of new spares, and redesign of obsolete hardware. These impacts could threaten budgets, ISS utilization and safe operation of the ISS. Therefore, these impacts need to be well understood and minimized to the degree possible, especially for the modules whose certification expires very soon, such as the Service Module (SM) and the Functional Cargo Module (FGB). It is the view of the JC that critical spares for life extension must be available prior to 2016 or safe operations cannot be assured. Efforts should be made to ensure that data needed for, and resulting from, these assessments is made available among the International Partners (IPs). This includes environmental models, such as for Micro-Meteorite and Orbital Debris (MMOD).

Contamination:

There should be clear, agreed to realistic standards on out-gassing and contamination requirements and mitigation, along with accepted implementation and procedural approaches to make sure they are achieved, especially with respect to storage and cleanliness. This is of particular importance for establishing confidence in non-IP visiting vehicles. If mitigation is required, it should be accomplished in ground processing to protect crew health and to conserve on-orbit crew time, hardware duty cycles and resources.

The ISS Program should continue to apply existing toxicological and microbiological requirements to all docking vehicles and new modules. With regard to these standards, preparation of payloads, prevention and mitigation of off-nominal conditions, and pre-flight and in-flight analyses are the shared responsibility of the international partners.

Medical Considerations:

The JC notes that the medical organizations of Roscosmos, NASA and other ISS partners effectively cooperate and ensure the health of the ISS. Further integration of ISS operational health maintenance activities and medical resources should minimize crew health risks for current and future spaceflight programs. The IPs should continue to share medical test results and collaborate in research. For example, opportunities for research concerning spaceflight associated visual impairment and intracranial hypertension strongly favor a collaborative approach.

Concerning excessive free fiber and dust accumulation aboard ISS, the ISS Program should continue the current increased emphasis on effective in-flight housekeeping, analysis of the sources of free fibers, such as clothing and packing materials, investigate/develop new materials, and to understand fully and improve the habitat onboard the ISS and thus help mitigate and prevent these conditions.

General:

A common theme throughout the discussions over the week was the topic of sharing data among the IPs. This included systems, operations, pre-flight and in-flight analyses, medical test results,

environment composition and engineering data such as plume loads and operational procedures from various visiting vehicles, especially for non-IP vehicles. The JC feels it is important for the ISS Program to establish clear, uniform data sharing policies and procedures in all cases. The JC commends the ISS Program and the IPs for the continued successful operation of the ISS with the attempt to maintain an international crew of six. The JC recognizes that continued vigilance is required to maintain the 6-PC capability.

Strategic Goals:

Wrapping up the meeting agenda items, the Joint Commission received a well-prepared and technically-sound presentation on mission and hardware planning requirements for beyond low earth orbit (BLEO) exploration missions. This presentation by TsNIIMash outlined an emerging strategy for Russia for the next 30 years.

The plan considered the moon as a "7th continent", and a lunar base leading to the Exploration of Mars. They also outlined the plan to use a nuclear thermal rocket, similar to the architecture of The Synthesis Group, and it was agreed that their presentation was very thorough.

The JC agreed to meet again in Houston to continue its review of the above issues. In preparation for that meeting, the JC will request additional information on the above-mentioned topics from the appropriate ISS Program points of contact.

Executive Secretary Miller asked the Committee Members if they had any questions or comments and there were none.

CLOSING

Don Miller: *Thanks again for all of your hard work on this assessment. I look forward to your participation at future meetings. We do not have a date for future meetings in Moscow, but I will let you know when that has been determined.*

I would also like to announce that Wil Harkins has retired from NASA and will no longer serve on the Committee. Wil was an excellent team leader and we wish him well on his retirement. His replacement has not yet been named, but I will inform the Committee when that occurs.

This meeting is adjourned at 1:28 PM (EDT).

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Attachment A

ADVISORY COMMITTEE MEMBERSHIP

Chairman

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

Members

Col. James Adamson, U.S. Army (Ret.)
Mr. Percy Baynes
Mr. Joseph Cuzzupoli
Dr. Charles Daniel
Dr. Daniel Heimerdinger
Maj. Gen. Ralph Jacobson, USAF (Ret.)
Dr. Ronald Merrell
Dr. Josef Schmid
Col. Jeffrey Williams, U.S. Army (Ret.)

Technical Advisors

Maj. Gen. Joe Engle, USAF (Ret.)
Maj. Bob Maiberger, U.S. Army (Ret.)

Executive Secretary

Dr. J. Donald Miller

Asst. Executive Secretary

Ms. Holly Stevens

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Attachment B

MEETING ATTENDEES

Members

Lt. Gen. Thomas P. Stafford – via teleconference
Mr. Percy Baynes – via teleconference
Mr. Joe Cuzzupoli – via teleconference
Dr. Charles Daniel – via teleconference
Dr. Ronald Merrell – via teleconference

Technical Advisors

Maj. Gen. Joe Engle – via teleconference
Maj. Bob Maiberger – via teleconference

Executive Secretary

Dr. J. Donald Miller

Asst. Executive Secretary

Ms. Holly Stevens – via teleconference

Others

Mr. Wilson B. Harkins
Mr. Doug Cooke, Subject Matter Expert
Mr. Tom Whitmeyer, NASA Headquarters Office of Safety and Mission Assurance
Ms. Katelyn Kuhl, NASA Headquarters, Office of International and Interagency Relations
Mr. Dan Leone, Space News, Staff Writer