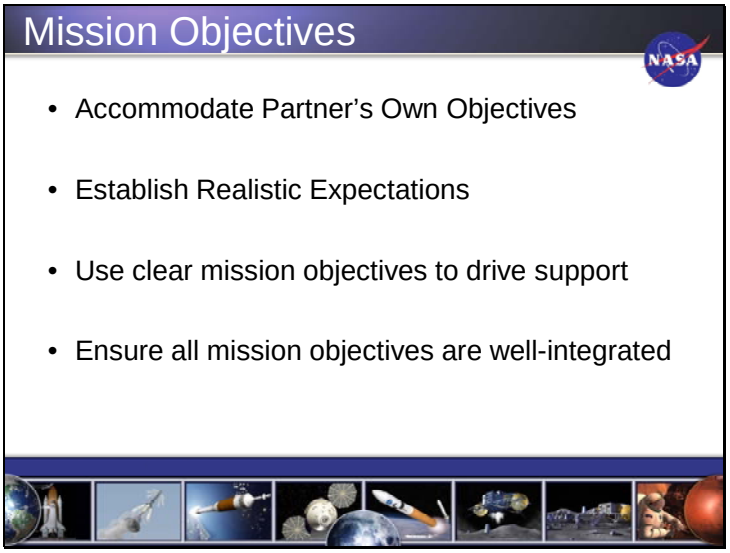
Slide 1

The ISS Program's Multilateral Coordination Board captured the lessons learned, and a summary of this effort as conducted by the ISS International Partners (NASA, Canadian Space Agency, ESA, JAXA, Russian Federal Space Agency) has been published in July 2009 ("International Space Station Lessons Learned as Applied to Exploration", Kennedy Space Center, July 22, 2009).

Slide 2

A total of 56 lessons learned grouped in 7 categories have been compiled.

Slide 3



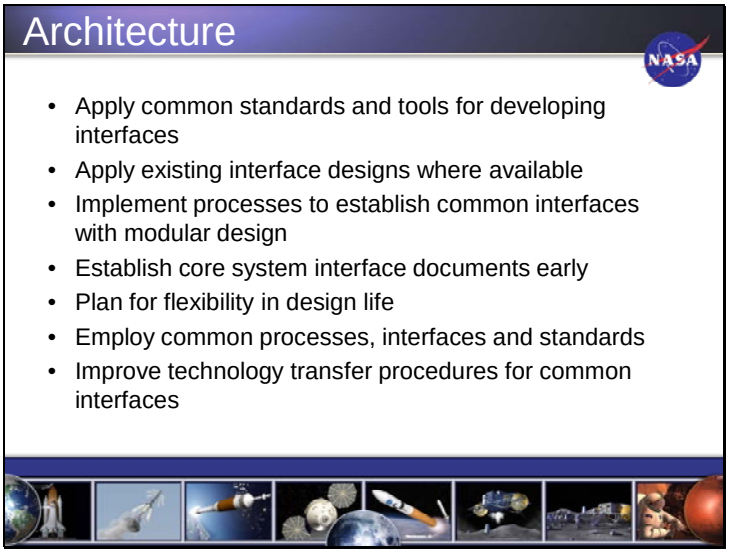
Accommodate Partner's own objectives (1st lesson): The most significant outcome of the station mission has been the sustainment and growth of each Partner/nation's aspirations for human spaceflight. This occurred because from the onset all Partners shared a common objective to build, operate and utilize a crewed laboratory in low orbit as an international partnership. The partnership was also flexible enough to foster collaboration with other non-Partner nations. Application for future: Develop a long-term shared vision for space exploration that transcends domestic policies and fosters a shared destiny among the Partners.

Establish realistic expectations (2nd lesson): The purpose of the mission should be defined as thoroughly and clearly as possible with planned achievements that are commensurate with planned spending. It is particularly important not to overestimate the mission objectives and scientific outputs. For future: goals must be realistic and well articulated to include the global problems that the mission will help resolve.

Use clear mission objectives to drive support: Properly formulated objectives will ensure stable political and social support. Stages of mission accomplishment must be timely with achievements reported promptly and comprehensively.

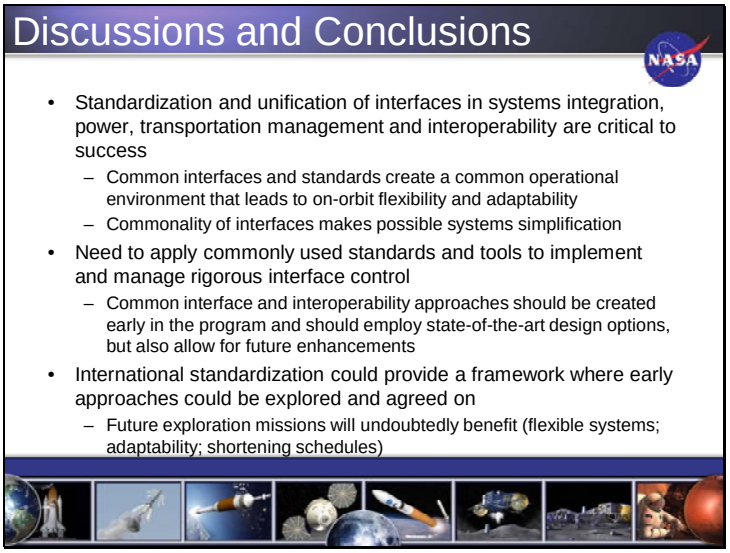
Ensure all mission objectives are well integrated: Standardization of technical interfaces and interoperability aspects are critical to success**.** For the future: functional objectives for the elements developed must be carefully integrated with close attention to technical interfaces and aspects of interoperability and crew safety.

Slide 4



Apply common standards and tools for developing interfaces: The actual design of the station interfaces evolved around industry standards where available; but also unique interfaces were created where needed. Recommendation for future: apply commonly used standards and tools to implement and manage rigorous interface control. Only when absolutely necessary should Partners develop unique capabilities to meet unique challenges.
Apply existing interface designs where available: standardization and unification of appropriate interfaces in basic spheres of interaction (system integration, power, transportation, management, etc.) are critical.
Implement processes to establish common interfaces with modular design. For future: a process to thoroughly address commonality issues and opportunities should be formally established at the highest level early in the exploration program and a modular design approach should be encouraged.
Establish core system interface documents early: common interface documents should be generated at the onset of the program and should accommodate design options that use state-of-the-art technology, but also provides hooks for enhancements as technology advances.
Plan for flexibility in design life: For future: provide capability for replacing aging systems
Employ common processes, interfaces and standards: The standardization of technical interfaces and interoperability are critical to success. In the ISS program, commonality of various interfaces made it possible to simplify the interface definition significantly. Common partnership interfaces and standards create a common operational environment that leads to on-orbit flexibility and adaptability as situations evolve. For future: agreements to utilize common processes, interfaces and standards are necessary to build-in flexibility and adaptability for future missions. Commonality of interfaces should be achieved as much as possible in the exploration program.
Improve technology transfer procedures for common interfaces: there are numerous obstacles in transferring technical information regarding the common interfaces. For future: improve the procedures for exchanging technical information and engineering data between the Partners regarding the common hardware interfaces.

Slide 5



More than 10% of lessons learned from ISS design and operations relate to the critical importance of standards.