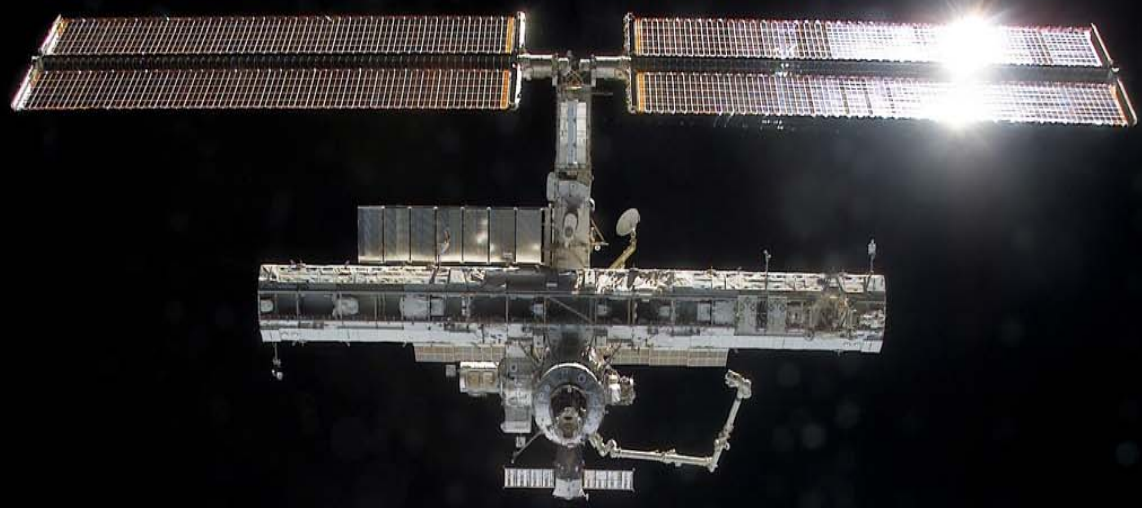


International Space Station

Charts provided by the ISS

For AMS Project Manager

Overall Status and Outlook

- The International Space Station (ISS) passed 3 years of continuous crewed operations, and five years of flight operations, in Nov. '03
- Expedition 8 to Expedition 9 crew handover completed within the last month
- The ISS team is rising to the challenges created by the grounding of the Space Shuttle
  - Russian Progress and Soyuz vehicles provide logistics and crew exchange
  - Innovative techniques used to conserve consumables
- Research onboard the ISS continuing
  - Investigations requiring limited upmass/downmass have been conducted
  - Visiting crews conduct significant science programs
- Consumables are re-supplied to provide adequate supplies with some margin
  - Adequate supplies for 2 crew, Water and Oxygen are most limiting

ISS Systems Status

- Critical ISS systems continue to operate well overall
- Three areas are deserving of special attention:
  - Elektron
    - Last Spare installed, ability to convert a previous failed to back up is available
      - Progress will also carry O2
  - 3rd Control Moment Gyro (CMGs) operating
    - One CMG hard failed; One CMG recovered with EVA
  - Exercise equipment degraded but functional
- Limitations in upmass have reduced on-orbit spares
- Environment onboard ISS is good
  - Critical sample return being accomplished
  - Integrated environmental monitoring approach with Russians

Expedition 8

- Expedition 8 completed 192 days onboard ISS with many accomplishments
  - First ISS EVA with 2 person crew
  - Expanded systems maintenance envelope
  - Numerous educational events with schools
  - Conducted experiments including several human physiology and psychology investigations in support of NASA's exploration vision
- Limited spares has required repair and maintenance of items previously felt to be non maintainable.
- Great preparation for exploration.
- Soyuz 7S landed April 30, 2004

Expedition 8
Oct 2003 – April 2004

Alexander Kaleri
Flight Engineer

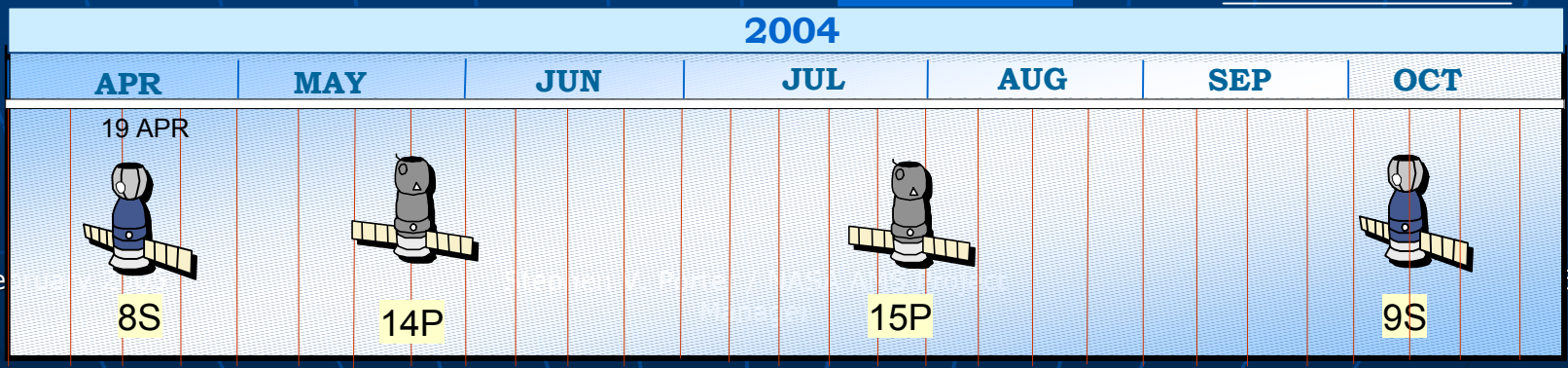
C. Michael Foale
Commander

Expedition 9

- Expedition highlights
  - Soyuz 8S launch April 19, 2004
  - Soyuz 9S return October 2004 (6.5 months)
- Scientific research continuing
- 2 EVAs planned to prepare the ISS to receive the European-built Automated Transfer Vehicle (ATV)
- Repaired US CMG contingency EVA

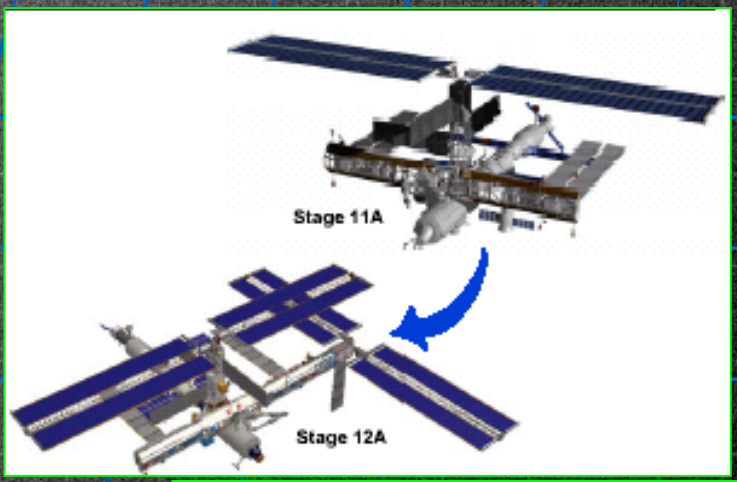
Michael Fincke
Flight Engineer

Gennady Padalka
Commander

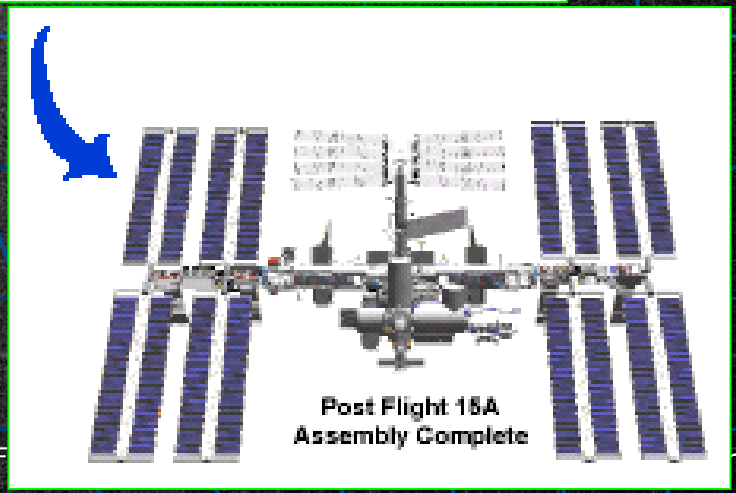


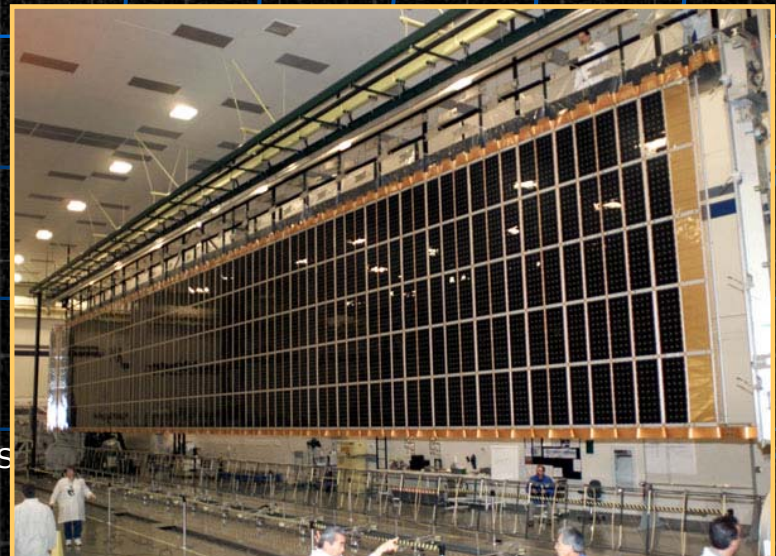
Shuttle return to flight initiates most challenging ISS assembly period to date

- **Transition to permanent power and thermal systems**

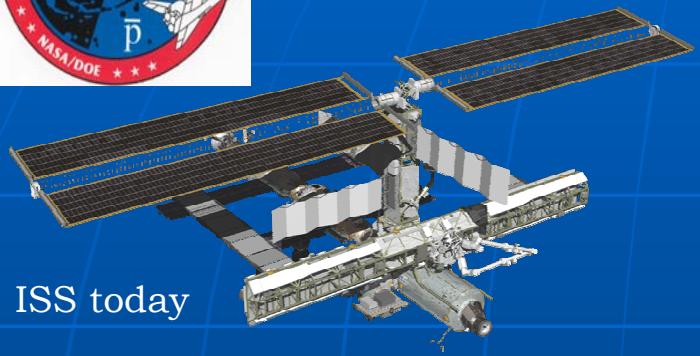


- Ø **Attachment and activation of truss segments and three solar arrays**
- Ø **Retraction and relocation of one solar array**
- Ø **Activation and reconfiguration of permanent central power and thermal systems and deactivation of temporary systems**

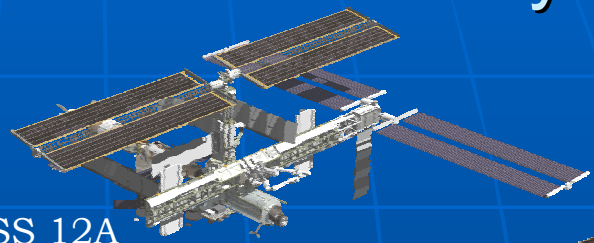




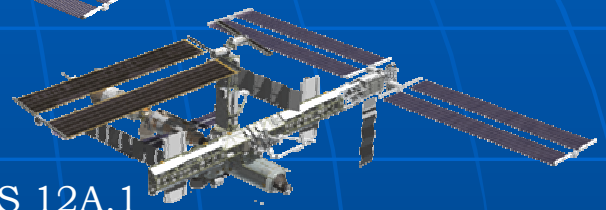
Next Steps in ISS Assembly



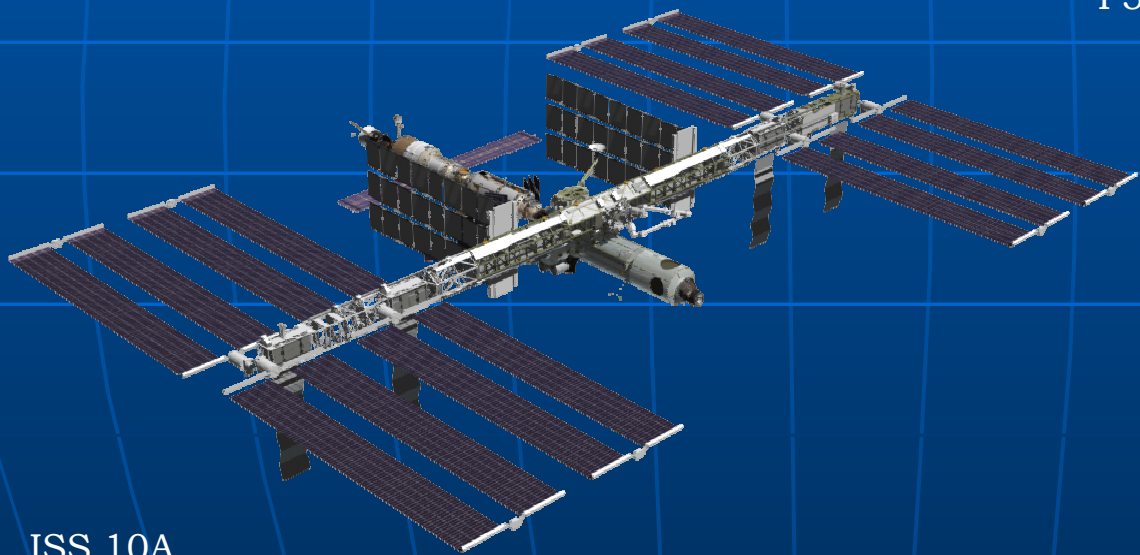
ISS today



ISS 12A
P3/4 Truss w/Solar Array

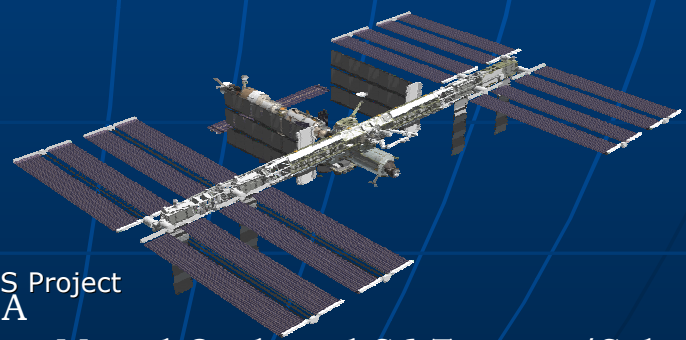


ISS 12A.1
P5 Deploy, P6 Solar Array Roll Up



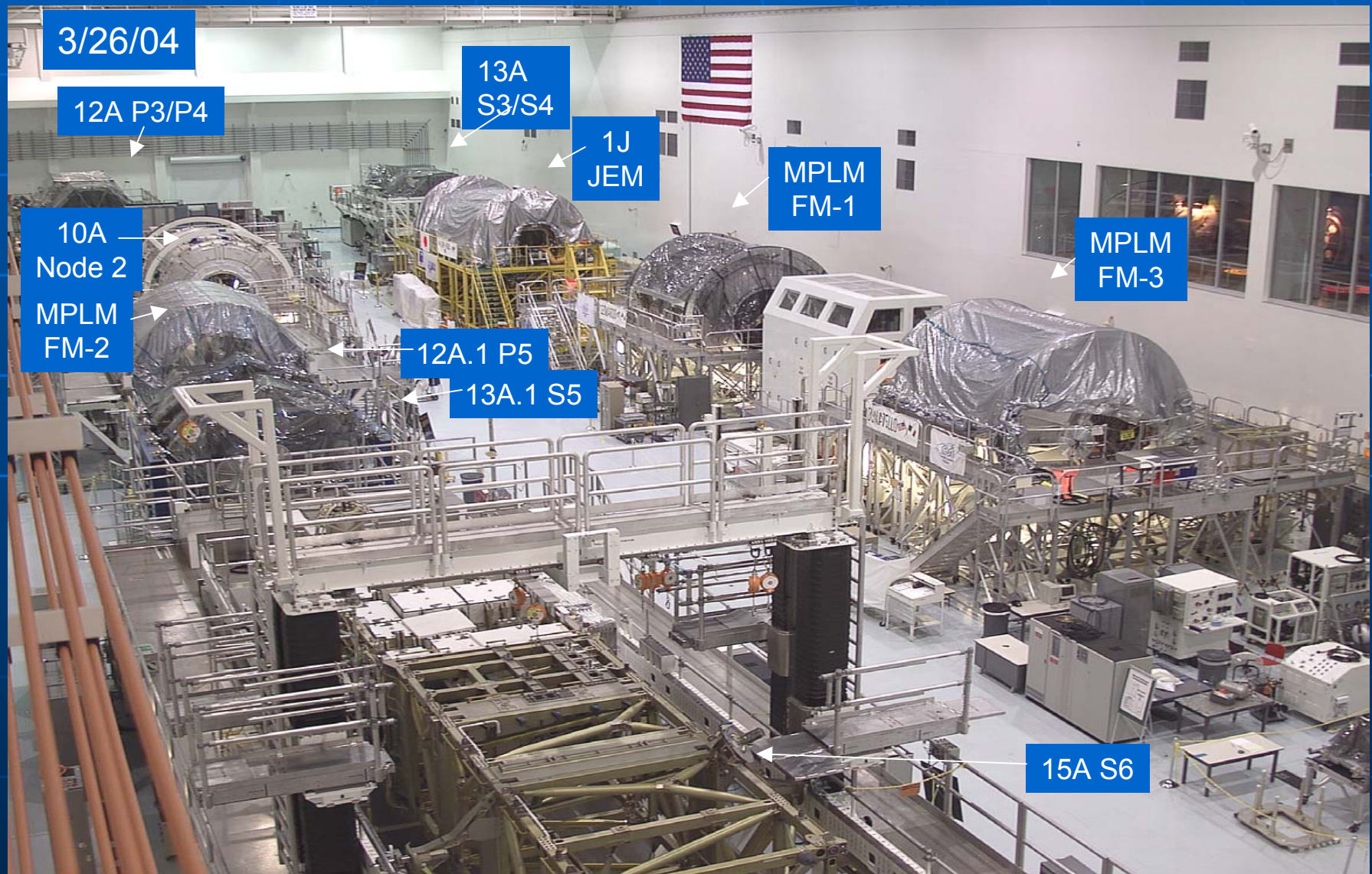
ISS 10A
Node 2 Completes U.S. Core Configuration, Sets Stage for International Partner Elements

ISS 13A
S3/S4 Truss w/Solar Array



ISS 15A
P6 Truss Moved Outboard S6 Truss w/Solar Array

KSC Hardware Processing



ISS and the Exploration Vision

- The President's Exploration Vision calls for NASA to complete assembly of the ISS and meet our international partner commitments
- ISS is a key component in the Exploration Vision
  - Platform for Research in bioastronautics and critical technologies
  - Demonstration of critical capabilities and countermeasures
  - Test bed for exploration; both hardware and processes
  - Prof. Ting's recent presentation to Code T / Exploration Systems Directorate as a part of this effort provides significant support for AMS
  - Retiring Shuttle in 2010 brings challenges for completing ISS assembly while conducting the planned research
- Upmass and downmass challenges post-Shuttle
- ISS assembly sequence planning and Shuttle manifests are being developed to address these challenges
- NASA is actively engaged with partners to work through challenges associated with the Exploration Vision
  - Partner research plans are unaffected by the Exploration Vision

ISS Summary

- ISS operations are continuing with 2 person crew
- It has not been easy but the international team has been successful in working though each challenge
  - **We often learn the most through adversity. We are learning.**
- Issues faced by the ISS team associated with Shuttle downtime offer important insights into agency exploration challenges
- The ISS team is looking forward to Shuttle Return to Flight and continued ISS assembly
- From the beginning our goal has been to keep ISS in an assembly ready configuration

  So far, we have been successful

  If we have to de-crew for a consumable or system availability issue, we will plan and execute it in a nominal manner

Inside NASA:

Charts Provided by SSP Program
For NASA AMS Project Manager

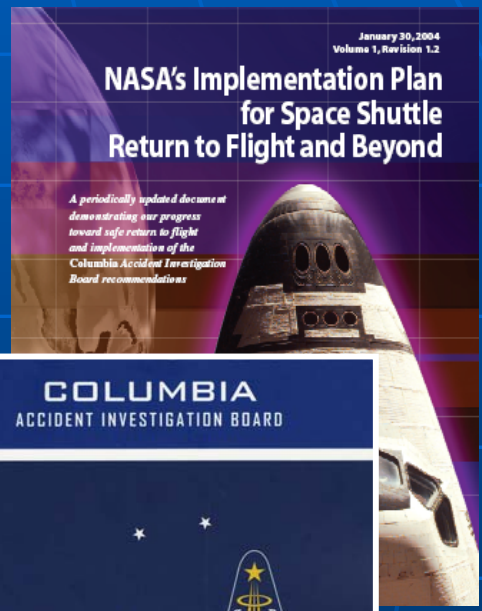
Space Shuttle Program Return to Flight

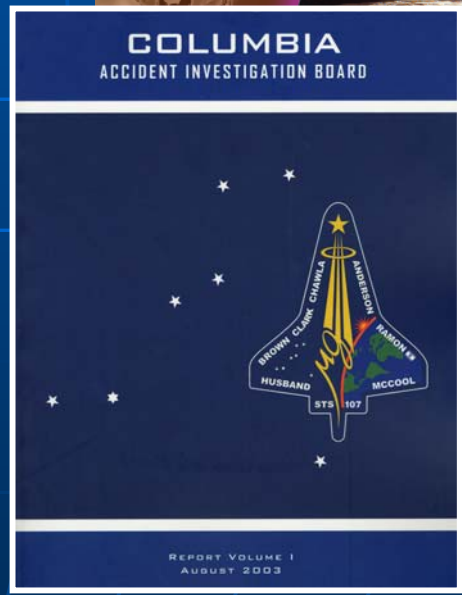
CAIB Report

- The Columbia Accident Investigation Board (CAIB) issued Volume I of its Final Report on August 26 – 207 days after the accident
  - 15 Return to Flight and 14 Long-Term actions
  - 138 Findings
  - 27 Observations
- Report Recommendations fall into three areas:
  - Requirements for returning safely to flight
  - Systemic cultural and organizational issues
  - Technical excellence
- Volumes II to VI were released on October 28
  - NASA has incorporated responses to these volumes into our RTF efforts and our Implementation Plan

RTF Process Status

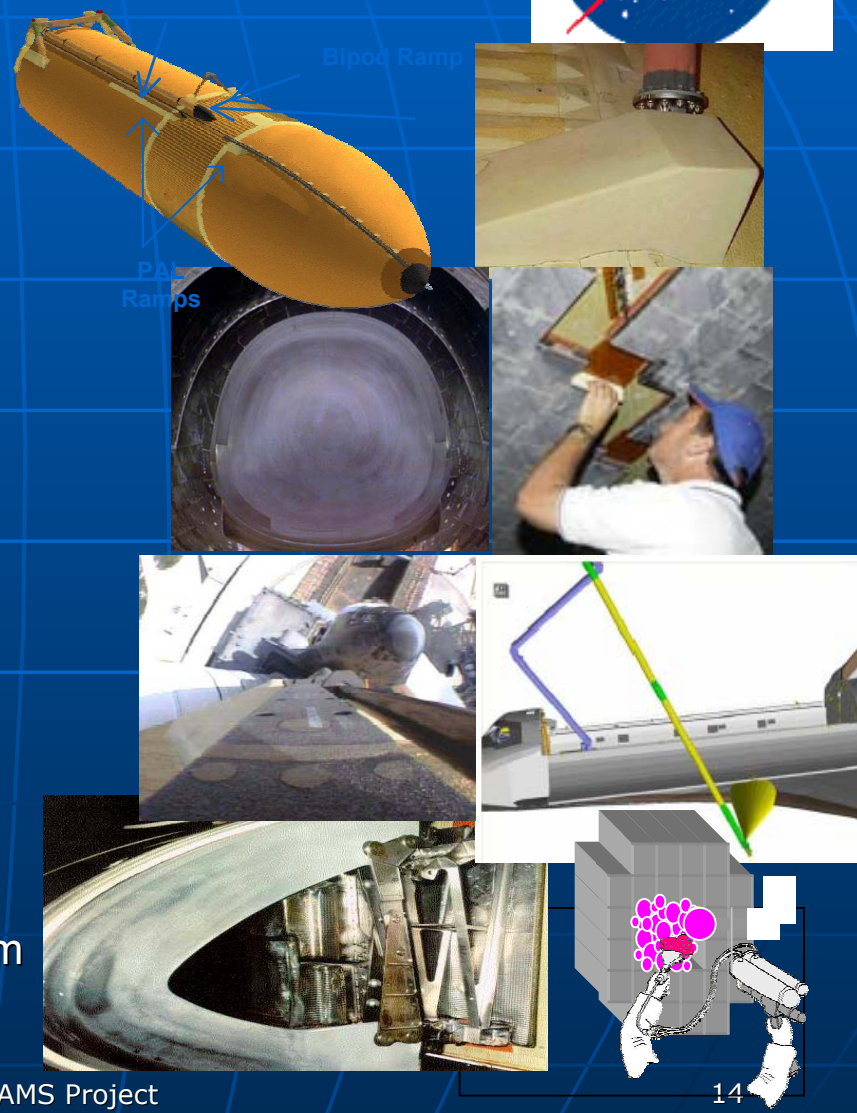
- We are operating in a different context than when the CAIB report was released
  - Exploration Initiative
  - Fly out Shuttle by 2010
  - Only mission is ISS support/assembly
- We will continue to embrace the CAIB report and comply with the intent of the CAIB recommendations
  - Working with the Stafford-Covey Task Group for external review of implementation of RTF recommendations
  - Have plans to close out key recommendations with RTFTG by end of 2004
- Our progress is captured regularly in updates to the *Implementation Plan for Space Shuttle RTF and Beyond*





Return to Flight Issue Overview

- Eliminating External Tank Critical Debris
  - Bipod Foam Ramp Redesign
  - Feedline Bellows Redesign
  - Intertank Flange Critical Debris Mitigation
- Ensuring Orbiter Flight Readiness
  - RCC Inspection/Installation
  - Wire and Flex Hose Inspections
  - Rudder Speed Brake Actuators
  - Non-Destructive Evaluations (NDE)
- Adding Capabilities to Improve Safety
  - Debris Transport Analysis
  - Orbiter Hardening
  - TPS inspection and damage sensors
  - Tile and RCC Repair
  - Improved Ascent and On-Orbit Imagery
  - Enhanced systems engineering and integration centralized in new Shuttle Program Office
  - Mission Management Team Training



External Tank Critical Debris Elimination

NASA is eliminating critical debris from the External Tank

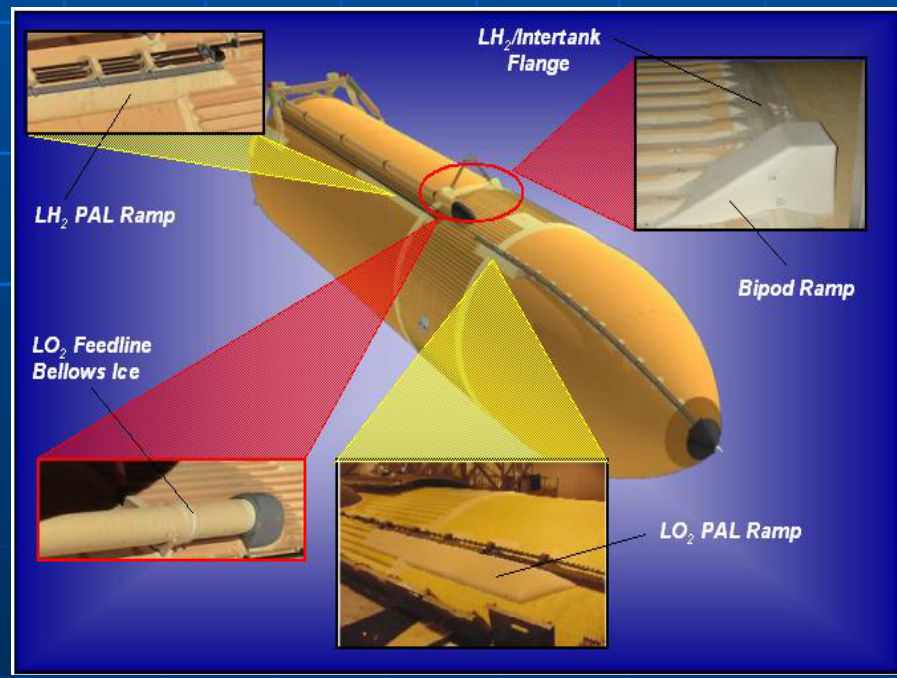
- Bipod Ramp Redesign to eliminate foam loss
- Feedline Bellows Drip Lip to prevent ice formation
- Improved LH2/intertank flange closeouts to prevent foam loss

•NASA now understands the failure mechanism in the Intertank area

•We have expanded the critical debris zone and reduced allowable debris size

•Implementing a redundant solution

- three step manual close out to eliminate voids and seal nitrogen leak paths
- volume fill to eliminate nitrogen formation in the intertank area

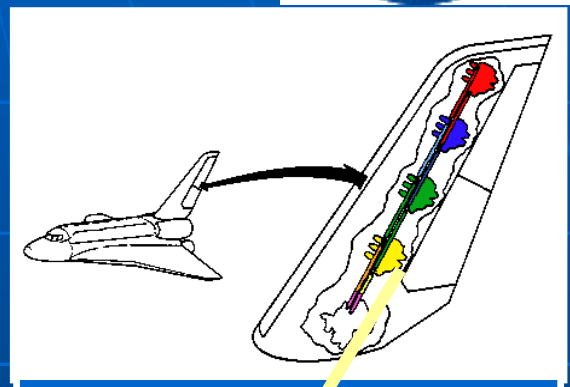


Thermal Protection System Tile Repair

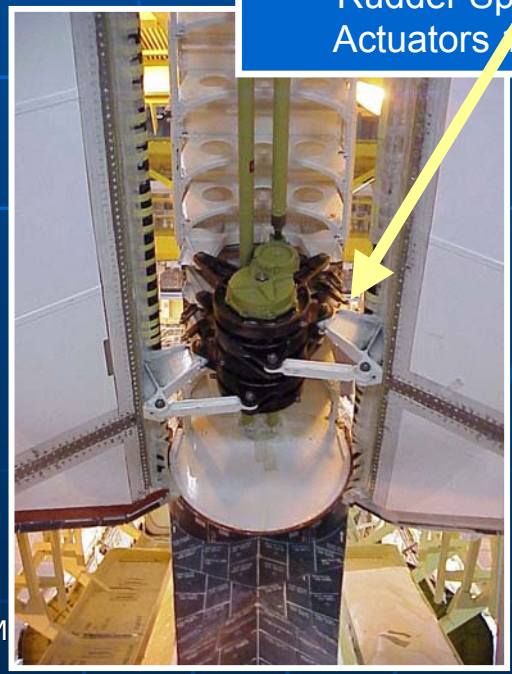
- NASA has made significant progress in developing a certifiable TPS tile repair capability
- This capability will be demonstrated on STS-114
- Space Station Remote Manipulator System (SSRMS) and Shuttle Remote Manipulator System (SRMS) operations have been developed that will allow access to all parts of the TPS for repair while the Shuttle is docked to the ISS
- RCC repair is still in the concept definition phase, but significant progress has been made

Rudder Speed Brake Actuators

- A good example of rigorous inspections detecting "unknown unknowns"
- The Shuttle Program initiated a "raising the bar" action (SSP-11) to inspect all of the Rudder Speed Brake (RSB) actuators
- All four RSB actuators on OV-103 had corrosion and were returned to the vendor for further inspection and refurbishment.
- Inspections on all Orbiters were performed
- SSP is inspecting and replacing or refurbishing as necessary all RSB actuators on all of the Orbiters prior to their first flight.



Rudder Speed Brake Actuators 1 through 4



Return To Flight Summary

- NASA accepts the CAIB findings and is complying with the intent of the recommendations
- We are "raising the bar" and completing additional actions deemed necessary to ensure a safe return to flight and continued safe operations of the Shuttle
- Currently, our return to flight is scheduled for March-April 2005
- We will continue to be milestone-driven and will launch STS-114 only when we have met our goals and established that it is appropriate to return to flight

Find the Problem, Fix It, and Return to Safe Flight