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# STS-115/12A MOD Flight Readiness Review



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**JSC Mission Operations Directorate  
Flight Director Office**

**DA8/J. McCullough, P. Dye, S. Stich  
August 2, 2006**



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**Mission Operations Directorate  
Flight Director Office**

# Agenda



- DA8 COFR Requirements/Endorsements
  - Flight Techniques & Joint Ops Panels/New Operations
  - Space Flight Meteorology Group (SMG)
  - Flight Rules (Volume A, B, C, D, STS-115/12A Annex)
  - Mission Staffing/Training/Certification/ Work Guidelines Compliance
  - Non-Critical Processors/Applications
  - Emergency Mission Control Center (EMCC)
  - Safety Status Review and OCAD
  - Command Procedures
  - Contingency Shuttle Crew Support/Rescue Flight (STS-300)
  - FCOH (SSP & ISS)
  - Level II Actions
- Standard Open Work
- Non-Standard Open Work
- Exceptions
- Flight Readiness Summary





# DA8 COFR Requirements/Endorsements



# DA8 COFR Requirements/Endorsements



REQUIREMENT (SHUTTLE)	Flight Director	Program Integration	Ops Safety	SPAN	Space Flight Meteorology	Procedures	Team 4	MOD Console					
Non-Crit Processors/Applications	G				G	G			G	Ready to support the flight			
EMCC	G				G	G	G						
Training - MCC/POCC	G			G	G		G	G					
Flight Rules	Y					G							
FTP - New Ops	G					G			Y	Non Standard Open work with expected resolution prior to flight.			
Flight Anomaly Resolution	G			G		G							
Anomaly - Procedures	G					G							
Exceptions/Action Items from prior reviews	G	G	G	G	G		G						
CIL/Hazards	G		Y			G			R	Open work without expected resolution without assistance, prior to flight, or unavoidable constraint violation.			
No Constraints	G	G											
Level II Actions	G	G											
Mission Requirements	G												
Exception/Resolution	G	G											
Command Procedures	G												
Flt Prep Process Plan Requirements Met		G								N/A			
Contractor Process Insight		G											



# DA8 COFR Requirements/Endorsements



REQUIREMENT (STATION)	Flight Director	Program Integration	Ops Safety	SPAN	Procedures	Team 4						
Non-Crit Processors/Applications	G				G				G	Ready to support the flight		
BCC	G				G	G						
Training - MCC/POIC/POCC	G			G		G						
Flight Rules	Y				G							
JOP - New Ops	G				G				Y	Non Standard Open work with expected resolution prior to flight.		
Flight Anomaly Resolution	G			G	G							
Anomaly - Procedures	G				G							
Exceptions/Action Items from prior reviews	G	G	G	G		G						
CIL/Hazards	G		Y		G				R	Open work without expected resolution without assistance, prior to flight, or unavoidable constraint violation.		
No Constraints	G	G										
Level II Actions	G	G										
Mission Requirements	G											
Exception/Resolution	G	G										
Command Procedures	G									N/A		



# New Operations (A/E FTP) – Ascent/Entry



- Ascent
  - STS-115 will fly a high-Q ascent (standard ISS Performance Enhancement)
    - » Mission design/requirements does not accommodate APM hit
    - » STS-115/ET-119 TPS performance was excellent
  - Modified ET pitch for ET handheld photography (new standard for all flights)
    - » Technique is same as STS-114/STS-121 but pitch maneuver delayed by 30 seconds
    - » Increases APM by ~ 90 lbs (saves ~100 lbs of OMS propellant)
  
- Deorbit Prep/Entry
  - Continue A/E FTP approved 3-String GPS Ramp Up Plan in preparation for STS-118 (June 2007), the first 3-String GPS/ No TACAN flight on OV-105
    - » STS-121 successfully used GPS in BFS after evaluated with high speed tracking
    - » STS-115 will be second flight GPS utilized during entry
    - » STS-115 will utilize Single-String GPS in PASS after PASS/BFS navigation confirmed good via high speed tracking. Also incorporate GPS in MM301 prior to deorbit burn.
    - » STS-115 Annex Flight Rule governs GPS operations
      - PASS/BFS On-Board Navigation must be valid.
      - Performed only on MCC call.
      - Flight Director will terminate GPS operation for significant orbiter, MCC, or landing site issues or failures.



# Ascent/Entry FTP –STS-121 Post Flight



- One Ascent/Entry Flight Techniques Panels (A/E FTPs) held in support of STS-115 on July 28, 2006
  - Reviewed STS-121 mission support including trajectory and systems performance, Space Flight Meteorology, Landing Site Support and MCC/Network support. Significant IFAs include:
    - » DOLILU P-load operator error (Flight Design Presentation)
    - » PDL Power Amp Failure (Network Presentation)
    - » GNC ISP Server (MSCOC Presentation)
    - » Istres Runway Remaining Markers (Recommend PH/KSC Launch and Landing IFA)
    - » Edwards-22 Wind Tower erroneous wind direction (Recommend PH/KSC Launch and Landing IFA)
    - » TAL Handar Peak Wind errors (PH/KSC Launch and Landing IFA)
  - Reviewed new low resolution AMPS balloon certification (used for DOLILU and landing site TAEM and A/L analysis)- no issues with new balloon upgrade for STS-115, reliability, and performance is improved
- As a result of this review, A/E FTP determined that flight rule updates were required to document:
  - Low-speed C-band tracking requirements for rendezvous (target for Annex PCN-1)
  - APU leak management for small leaks (hold and submit as real-time CR if required)



# Ascent/Entry FTP –STS-121 Post Flight (cont)



- Ascent/Entry Flight Techniques Panel splinter will be held on Friday August 4 to review RTLS weather rule proposal to improve launch probability
  - Use of VAHIRR similar to the LCC requirements implemented by the 45<sup>th</sup> Space Wing
  - Acceptance of only two HACS that are clear of anvils as long as other rule safety criteria met (similar to RTLS rainshower exception).
  - If proposal has merit and can be safely implemented for STS-115, rule will reside in flight rule annex





# Spaceflight Meteorology Group (SMG)



- All NWS/SMG software used to create mission critical products or required for mission support is ready for STS-115.
- All SMG forecasters required to support STS-115 are certified and meet currency requirements as listed in the SMG Training & Certification plan.
- Open work:
  - Close TAL Handar wind towers and Edwards AFB wind tower 22/04 IFAs.
  - Support A/E FTP Splinter discussion of RTLS anvil cloud flight rule updates

The undersigned certifies that the Spaceflight Meteorology Group is ready to support the STS-115 flight.

/s/ Frank C. Brody

Frank C. Brody

Chief, Spaceflight Meteorology Group



**Mission Operations Directorate**  
**Flight Director Office**

# New Operations-Orbit



- Shuttle
  - Late Inspection of RCC for MMOD Damage.
    - » FD9 Undock with a FD10 late inspection of all locations (Port, Stbd, and Nose Cap)
    - » Re-rendezvous protection plan developed.
    - » Allows for a more efficient and quicker inspection process
    - » Result of lessons learned from STS-121
  - Use of Extension Day for Focused Inspections (if required)
    - » STS-115 does not have a nominally planned Focused Inspection day
    - » Depending on launch day/time, cryo margins should support an additional day above this (for mission requirements)
  - Rendezvous/Dock/Payload Unberth and Handoff on FD3
    - » In order to allow sufficient time for the installation on FD4, handing off the payload must be done on Rendezvous day



# Flight Rules



- All required Volume A, B, C, and D Flight Rules have been developed, reviewed, and approved by the appropriate Flight Techniques, JOP, and FRCB forums
- The following publications will be utilized for STS-115:
  - Volume A, Final 2002, PCN-6 Errata dated 7/05/06
  - Volume B, Final, PCN-4 dated 6/23/06
  - Volume C, Final PCN-1, dated 6/13/06
  - Volume D, Final, dated 10/9/01
- STS-115/12A Flight Rule Annex
  - Final approved at 7/31/06 JPRCB
  - PCN-1 to be presented at future JPRCB
  - All required rules to support the STS-115/12A mission have been worked through the appropriate Flight Techniques, GJOP, and 115/12A JOP forums and are either developed/approved or are in work to support an Aug 10 cutoff
    - » Significant Open items discussed later.



# Flight Director Mission Staffing/Training/ Certification/Work Guideline Compliance



- STS-115/12A Flight Directors certified per Flight Director Certification Guide (DA8-00010) Final, PCN-1 , dated April 29, 2005
- “Four” additional certified Flight Directors available to support Team 4, EMCC and STS-301 work as required.
- All MOD Work Guidelines met, no issues anticipated

Flight Director	Position	Flight Specific Cert Status
Paul Dye	Shuttle Orbit 1, Lead	Anticipated 11 Aug 06
Steve Stich	Shuttle A/E	Anticipated 11 Aug 06
Catherine Koerner	Shuttle Orbit 2	Anticipated 11 Aug 06
Bryan Lunney	Shuttle Planning	Anticipated 11 Aug 06
Mike Sarafin	Shuttle “Team 4”	Anticipated 11 Aug 06
John McCullough	Station Orbit 2, Lead	Anticipated 11 Aug 06
Kelly Beck	Station Orbit 1	Anticipated 11 Aug 06
Kwatsi Alibaruho	Station Planning	Anticipated 11 Aug 06
Annette Hasbrook	Station “Team 4”	Anticipated 11 Aug 06



# SPAN Mission Staffing/Training/Certification/ Work Guideline Compliance



- Sufficient personnel provided by the Organizations to properly staff all SPAN positions without violating Work Guidelines.



# Non-Critical Processors/Applications



- All DA8 Non-Critical Applications certified
- No application changes since STS-121



# EMCC



- No changes to EMCC procedures since STS-121
- Personnel identified to support EMCC



# STS-115/12A SAFETY STATUS OVERVIEW



## DA8 COFR

Category	HRs Open	NCR/AR Open	Open ISS OCADs	Open STS OCADs	Open ISVRs
Shuttle Integration	0	2	-	0	0
Shuttle Orbiter	0	4	-	0	0
Shuttle SSME	0	0	-	-	-
Shuttle ET, SRB, RSRM	0	1	-	-	-
ISS 12A	21	3	5	-	24(12 Pre)
<b>GFE</b>					
- EVA	1	0	1	0	1
- Shuttle	11	0	-	0	11
- Station	3	2	3	-	5
<b>Payload</b>					
- Shuttle	0	0	-	-	0
- Station	3	6	0	0	0



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# ISS SAFETY ISSUES



- S0 bolt torque adequacy to support new truss elements (PGT issue)
- Attitude control down modes
  - RJD failures after P3/4 install
  - SARJ Loads
- Solar Array loads assessment is inconsistent with 4A work
  - Longeron shadowing
  - Jettison analysis
- P3/4 unberth clearance with stowed OBSS
- Campout exceeds 30% O2 after 1 failure (NCR-ISS-184)
- P4/P6 collision due to SARJ (need FT story of SARJ)



# Command Procedures



- Personnel are prepared and ready to execute the command procedures as documented per MOD Command Policy/Flight Rules.



# Contingency Shuttle Crew Support/STS-301



- Contingency Shuttle Crew Support (CSCS) /Rescue Flight Resource Book is located at [http://mod.jsc.nasa.gov/da8/rules/CSCS\\_Rescue\\_Flight\\_Resource\\_Book/cover.htm](http://mod.jsc.nasa.gov/da8/rules/CSCS_Rescue_Flight_Resource_Book/cover.htm)
- STS-115 Ascent/Entry Team will support STS-301
  - STS-300 Ascent Sim completed on 5/17/2006
    - » Served as refresher for Ascent/Entry Team
    - » No issues encountered
    - » STS-301 Simulations will be held after call-up
- STS-115/116 Teams will support Orbit Operations as required



# Flight Controller Ops Handbook (FCOH)



- FCOH procedures is ready to support STS-115/12A
  - SSP FCOH (JSC-26843)
    - » Final, Rev C, dated 3/1/05
      - Multiple updates done prior to STS 121/ULF1.1
      - Book Manager will incorporate any updates required for STS 115/12A
  - ISS FCOH (JSC-29229)
    - » Final, PCN-6, dated 10/10/03
      - By current operations, ISS FCOH is always up to date on Web site [http://mod.jsc.nasa.gov/da8/FCOH/iss\\_fcoh/ISS\\_FCOH\\_TOC.htm](http://mod.jsc.nasa.gov/da8/FCOH/iss_fcoh/ISS_FCOH_TOC.htm)
      - Multiple updates done prior to STS 121/ULF1.1
      - Book Manager will incorporate any updates required for STS 115/12A



# Level II Actions



- As of 7/26/06, there are no Space Shuttle Program “Open Actions/Constraints to Flight” assigned to MOD for STS-115/12A
- As of 7/26/06, there are no Space Station Program “Open Actions/Constraints to Flight” assigned to MOD for STS-115/12A





# Standard Open Work



# Standard Open Work



- **115/12A Annex Rules PCN (Inputs due 8/10/06)**
  - Mission priorities
    - » Updates for late inspection and other mission changes
  - Launch window
    - » Updates pending 8/03 PRCB decision on launch date (Aug 26 or 27)
  - Shuttle trajectory and guidance parameters
    - » Flight Design and Boeing analysis for contingency payload return for no dock case
  - Low-speed C-Band tracking requirements
    - » Document valid state vector sources for ISS tracking
  - Landing site weather criteria update
    - » Pending results of A/E FTP splinter
  - Mated attitude constraints updates
  - Launch-to-activation constraints updates
  - Power connector Inhibits updates
  - Docked loads updates
  - Orbiter/Station attitude control priorities (new rule – *see non-standard open work*)
    - » Will be finalized once NCR ISS-063-12A on PRCS usage is dispositioned
  - Contingency solar array jettison (new rule – *see non-standard open work*)
  - Mated FES dump constraints updates
  - Power transfer to the RSOS from the USOS updates pending negotiations (*see non-standard open work*)



# Standard Open Work



- Complete STS-115 Ascent/Entry and Orbit integrated simulations
- ISS reboost on August 23 to set up FD 3 rendezvous on each day in August 26- September 14 launch period
- Final FDF updates including ascent checklist updates based on Flight Design Uplink Cycle
- Robotics worksite 3 analysis to support SSRMS ops and OBSS unberth
- APFR loads constraints final analysis for EVA (due Aug 15)
  - Expectations have been rolled into the rules and procedures, awaiting final report to verify
- Verification of final safety hazard reports and NCRs vs flight products
- Finalize pressure management plan for docked mission
- Final SODF updates







# Non-standard Open Work



# Non-Standard Open Work



- Progress 21P plans and final negotiations for 12A
  - Prop availability as a backup for 2A solar array deploy if VRCS failed
- EVA campout safety paperwork closeout vs procedures and plans
- Orbiter/Station Attitude Control Priorities (new rule – will be in PCN)
  - Will be finalized once NCR ISS-063-12A on PRCS usage is dispositioned
- Contingency Solar Array Jettison (new rule – will be in PCN)
  - Document disposition plan for failed solar array using the roll-biased TEA attitude, EVA, and reboost
- Determine/resolve impacts to STS-115/12A due to Soyuz mission
  - Exercise requirements vs mission constraints
  - Russian planned activities during docked phase yet to be assessed
- Power Transfer to the RSOS from the USOS updates pending negotiations
  - Requires flight rule updates to STS-115/12A annex for violations of 12.2kw power management guideline (ref Vol B rule B9-154), and updates to CHT plan in 12A\_B9-1 once negotiation and analysis are completed
- USTO pulse pattern update testing and incorporation for the new P4 arrays
- FES dump constraints while docked (rule update)
  - Finalize negotiations on new information regarding FES impacts to CMG control
- Independent Safety Verification Review
  - ISS Flight 12A ISVR Report, ECD: Aug 17, 2006
    - » Verification of Late Hazard Reports



# Exceptions



- None



# Flight Readiness Summary



- Pending completion of all standard and non-standard open work, the Flight Director Office and Space Flight Meteorology Group are ready to support the STS-115/12A mission
- All Standard /Non-Standard “Open Work” will be closed out prior to Level 1 FRR (8/15-16/2006)





# Backup



# Cat 1 and 2 Objectives/Mission Priorities



1. PERFORM FD2 TPS INSPECTIONS
  2. PERFORM RPM DURING RENDEZVOUS AND DOCKING FOR ORBITER TPS TILE INSPECTION USING ISS IMAGERY
  3. INSTALL INTEGRATED TRUSS SEGMENT (ITS) P3/P4 TO ITS P1
  4. ACTIVATE ITS P3/P4 SYSTEMS TO RECEIVE SURVIVAL POWER FROM P6
  5. TRANSFER MANDATORY AND CRITICAL ITEMS PER 12A TRANSFER PRIORITY LIST
- 
6. CONFIGURE P4 FOR POWER GENERATION AND DISTRIBUTION AND DEPLOY P4 (CHANNEL 4A/2A) SOLAR ARRAY WINGS (SAW'S)
  7. DEPLOY SARJ DLA'S
  8. INSTALL FOUR OF FOUR AJIS STRUTS
  9. REMOVE LAUNCH LOCKS AND RESTRAINTS, ACTIVATE, AND CHECKOUT SARJ
  10. INSTALL ALL SARJ BRACE BEAMS
  11. DEPLOY P4 PHOTOVOLTAIC RADIATOR (PVR)
  12. TRANSFER REMAINING ITEMS PER 12A TRANSFER PRIORITY LIST
  13. COMPLETE EVA TASKS NECESSARY TO ENABLE MT TRANSLATION TO WORKSITE (WS)#8
    - A. ROTATE P1 MT STOP
    - B. REMOVE P3 SPACE VISION SYSTEM (SVS) TARGET - FACE 1
    - C. REMOVE AND STOW P3 KEEL PIN AND DRAG LINK
    - D. REMOVE P3 REMOTE POWER DISTRIBUTION ASSEMBLY (RPDA) COVERS.
    - E. POSITION APFR'S TO CLEAR FACE
  14. REMOVE CID'S 6 AND 8
  15. RELOCATE MT TO WS#8 AND CHECKOUT MSS

Note that Late Inspection will be added as priority 15, above MT translate via a flight rule CR to the PCN



# Remaining STS-115/12A Integrated Sims



- Orbit
  - None – all simulations complete
- Ascent/Entry
  - 8/7: FDO/Booster
  - 8/10: Terminal Countdown Demonstration Test
  - 8/15: Ascent #3
  - 8/21: Entry #3
  - 8/22: Ascent #4





# Orbit Flight Techniques Topics Applicable to 115/12A





# Orbit Flight Techniques



- No new work applicable to STS-115/12A





# Generic Joint Operations Panel Topics Applicable to 115/12A



# Generic JOP



- No new work applicable to STS-115/12A





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# STS-115/12A Joint Operations Panel Topics



# STS-115/12A JOP Topics



- ISS 12A Power Analysis
- STS-115/12A Water Management Plan
- STS-115/12A CO2 Management Plan
- ISS P1 Camera Plan
- Docked Attitude Control Priorities
- Contingency Solar Array Jettison Plan
- Shuttle/Soyuz Plan



# 12A ISS Power Analysis



- Generic flight rule (B9-154) maintain power channels below 12.2 kw whenever possible to protect against the failure of a single battery charge/discharge unit (BCDU) failure causing a load shed or loss of the power channel based on loading.
  - Negotiations and final analysis are still ongoing. Once these are completed, the periods that will exceed the 12.2 kw level will be documented in a Flight Rule (CR in work)
- Expect power levels exceeding 12.2 kw as follows:
  - FD04 – FD06 Post-EVA 1 P4 channel activation to post-solar array deploy on Channel 2B, peak levels 15.2 kW overall, 13.2 kW in eclipse, average level ~12.9 kW overall
  - FD04 – FD06 Start of battery thermal conditioning to post-solar array deploy on Channel 4B, peak levels 15.0 kW overall, 13.4 kW in eclipse, average level ~12.4 kW overall
  - FD07 Post-EVA 3 METOX & MT translation until METOX termination on Channel 4B, peak levels 14.0 kW overall, 14.0 kW in eclipse, average level ~12.5 kW overall
- Latest mission analysis indicates that we can only support 3 CHTs for the Russian segment at low beta angles during the following STS-115/12A windows:
  - FD04 start of high roll ops until FD05 start of EVA2 (<24 hrs)
  - FD06 after solar array deploy until FD07 start of EVA3 (~20 hrs)
  - FD07 post-EVA and METOX ops until FD09 undocking powerdowns (~42 hrs)
  - Assessment in May expected to provide 3 CHTs in low beta angles while in the high roll TEA attitude for the mission and stage. Mission-specific negotiations are ongoing



# STS-115/12A Water Management Plan



- The water management plan for STS-115/12A continues to be refined
  - Water Dump Constraints: Minimizing water dumps is highly desired post-solar array deploy (12A\_A2-2)
    - » Nominal plan consists of a water dump pre-rendezvous, evening of FD05 before solar array deploy, and then on FD10 (day after undock)
  - FES constraints: FES dumps will be scheduled to avoid periods where CMG disturbances are a concern (12A\_C2-65)
    - » Periods on FD03, FD04, and FD06 are identified
    - » Flight rule may be updated to include additional periods where momentum management is initiated (pending final analysis)
  - Water transfer: Limited by the number of CWC's available as well as ISS stowage and usage plans
    - » STS-121 transferred 15 full CWCs
    - » STS-115 plans 11 full CWC transfers, flying up 7 CWC bags for use
  - Plan is based on FD03 docking and FD09 undocking. Additional mission extension days beyond the +1 day (FD10 undock), or a reduction in the number of transferred CWCs would drive increased FES dump requirements of 8-10 hrs as well as an additional docked waste water dump



# STS-115/12A CO2 Management Plan



- The CO2 management plan for STS-115/12A will incorporate lessons learned from STS-121
  - Crew feedback to use LiOH to augment CDRA/Vozduhk ops during docked mission to reduce ppCO2 peaks
  - STS-115 added 6 LiOH cans to the flight since STS-121 to support
  - 6 additional LiOH cans on ISS above the stockpile limit
- CDRA on ISS is currently functioning in single bed mode due to stuck check valve
  - Booster fan bypass config for STS-115 is not supported unless CDRA is in dual bed ops. If the booster fan bypass is not done on the flight expect a ~26 lb additional cryo use based on a nominal docked duration





# ISS P1 Lower Outboard Camera



- On GMT 187, the P1 camera was powered for ULF1.1 docking and failed during positioning in the tilt axis at -82.30 deg (commanded to -90 deg). Only the tilt function failed to function
- Approximately 16 hours later, the crew powered the camera lights and adjusted the camera to use the lights. The tilt function was working at that time and continues to work nominally
- Current plan is to place the P1 camera in the (-105, 0) pan/tilt position when not required for other operations
- Required camera views for STS-115/12A are documented in Flight Rule 12A\_C2-59. The P1 camera is a prime view for many 12A ops. Alternate view options for this camera should it become unusable for 12A are summarized below:
  - Initial P4 BGA Rotation (-90, -20), Use PLB C Camera for P1
  - Port SARJ Checkout (-90, -20), Use PLB C Camera for P1
  - 2A Blanket Restraint System (BRS) Pin verification Left Blanket Box (LBB) (-105, 0)  
Alternate view is to have the EV crew view during EVA1
  - 4A Latch Motion & 1 Mast Bay deploy (-110, 15), Use Orbiter SRMS Elbow camera for P1
  - 4A Deploy Mast Bay Count/Tension Bar (-120, -15), Use PLB B Camera for P1
  - 2A Deploy Mast Bay Count/Tension Bar (-65, -15), Use PLB B Camera for bay count in place of P1 and Use SRMS Elbow for full view (in place of PLB B)
  - P4 PVR Deploy Full View (-90, 12), Use PLB C Camera for P1



# Docked Attitude Control Priorities



- The docked attitude control priorities for previous flights has been documented in Volume C of the generic flight rules (C8-51)
  - Lists Orbiter control as a higher priority than ISS prop usage if CMG only is not a viable option
- STS-121 VRCS heater failure created significant discussion during the flight with regards to PRCS priority in the rule
- NCR ISS-063-12A is currently in work to address the ISSP position on the use of PRCS for STS-115/12A
  - Will likely affect the operational plans developed and used on previous missions
  - Late in the mission planning effort since it is a fallout of STS-121
- ISSP assessing loads, certifications, and risk for PRCS ops
- Results will be documented in a flight rule for the planned STS-115/12A annex PCN
  - 12A\_C2-54 Docked Loads Constraints will also require update if PRCS is not considered a viable back-up option



# Contingency Solar Array Jettison Plan



- In the event that one of the P4 solar arrays fails to deploy properly and the real-time assessment is that jettison is required, the following plan has been developed:
- An EVA will be performed and the EVA manual SAW jettison procedures will be executed
  - Procedures are being updated/simplified to a no SSRMS support case
    - » Worksite 8 will not be cleared until EVA3 (2 crew x 1 hr 30 min to clear path)
    - » MT will not be able to be positioned until path is cleared (3 hr 30 min required for prep and translation)
    - » Robotics procedures not developed
    - » EVA SODF CR in work
  - Tip-off rates are a concern for release. Greater than 0.15 deg/s may pose recontact hazard before solar array can separate from ISS due to slow separation rates
- Jettison will be done in the roll biased TEA (Port side rolled approximately 45 deg)
  - Only configuration that allows for CMG control without thruster augmentation (jettison requires a sustained period of no-thrusters)
  - Roll bias provides approximately 40 - 70 ft (solar array dependent) delta height between the solar array CG and the stack CG for separation (produces an effective 0.09 to 0.15 fps retrograde delta-V)
- After approximately 10 min of release a Shuttle-based reboost of 1 fps will be conducted. Without a reboost, recontact estimates are on the order of a day later
- Plan will be documented in flight rule 12A\_C2-106 (CR in work)



# Shuttle/Soyuz Plan



- STS-115/12A and 13S mission windows are in close proximity to each other
- Items being worked:
  - Progress thruster availability
    - » 12A mission plans and analysis expect 21P to be present and available for attitude control during the shuttle joint mission. If prop is not available on the Progress it would impact our back-up plans for 2A solar array deploy support using USTO (if VRCS not available)
    - » Current plan has 21P docked for 12A nominal launch (expected for loads analysis). Workload at the end of launch window may require progress prop purge during 12A
    - » Issue is being worked by ISSP and MOD
  - Shuttle re-rendezvous option
    - » If MMOD damage is discovered post-undock, re-rendezvous is an option protected with the nominal burn plan
    - » This contingency would result in real-time negotiations with the Russians
  - ISS crew workload prior to Soyuz arrival
    - » Timeline between Shuttle undock and Soyuz docking may be tight if Shuttle launches at the end of the window
    - » Progress 21P undocking required
    - » Issue being worked with ISSP and International Partners by Increment Lead Flight Director and Planners
  - Exercise plan
    - » ISS crew is near the end of their increment where typically exercise requirements ramp up in preparation for crew return
    - » Shuttle mission objectives drive many periods where exercise constraints exist due to loads, resulting in days where ISS crew exercise requirements will not be met. Issue being coordinated with ISSP and International Partners by Increment Lead Flight Director and Surgeon



# SPAN Manning



- ISS SPAN Support: Manning provided by USA CAF Personnel
- ISS SPAN Systems: Manning provided by DF
- SSP SPAN Support: Manning provided by DA8 & DT
- SSP SPAN Systems: Manning provided by DF
- SPAN DO: Manning provided by DO
- SPAN DM: Manning provided by DM
- SPAN DX: Manning provided by DX
- SPAN Managers:
  - DT: L. Labra, D. Carelock, Banfield, Barckholtz
  - DF: Schaefer
  - DX:
  - DO: Cavallaro, Stapleton, Hess
  - DM:



# SPAN Manning



- SPAN SYSTEMS (DF)

- SSP

- Sarah Murray
- Terry Keeler
- Quinn Carelock
- Jeff Musler
- Cori Kerr
- Jerry Jason
- Ray Lachney

- ISS

- Alan Crocker
- Ken Bain
- Chris Farrar
- Ana Lopez
- Ed Van Cise
- Brian McDonald

- Station SPAN Support

- BAHADORANI, DAN
- HANNSZ, DON

- Shuttle SPAN Support

- MOFFITT, W. L. (LONNIE)
- LEE, ALBERT Y.
- MCLENDON, STEVE
- SPOHR, ROB
- CARELOCK, DANIELLE
- WILLIAMS, STEVE



# SPAN Manning



## • SPAN DM

- Schaf, Robert L.
- Gavin, Richard T.
- Hutchins, John E.
- Cordova, Henry S.
- Hussein, Amr A.
- Goodman, John L.
- Gonzalez, Edward P

## • SPAN DX

## • SPAN DO

- Korth
- Curtis
- Woodbury
- Blok
- Galpin
- Hess
- Price
- OJTs: Roger Smith;  
Lipsky; Veres;  
Hurt

