STS-131
SSP Flight Readiness Review

MS/Travis Robinson
March 10, 2010

Agenda

- Systems Engineering & Integration
  - SE&I FRR Roadmap
  - Flight Preparation Readiness
  - Main Engine Ignition (MEI) Instrumentation Results for STS-130
  - GUCP Pyro Bolt Interface Loads
  - Integrated Debris Risk Summary
  - Integrated In-flight Anomalies (IFAs)
  - Integrated Hazard Report Summary
  - Imagery Status
  - Radar Status
  - Flight Software Readiness
  - Payload and General Support Computer Readiness
  - Non-Standard Open Work Summary
  - Alternate/Dissenting Opinions
  - Certificate of Flight Readiness
  - Launch On Need (LON)
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   B. Orbiter
   C. ET
   D. SRB
   E. FSRM
   F. SSME
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   H. Imagery Integration - NASA Provided
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3. Analysis
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4. Integrated Safety
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7. Cert Statements & SPOC Accountabilities
   A. Open Work Summary
   B. Readiness Statements
   C. SPOC Accountabilities
   D. NASA SE&I Accountabilities

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Flight Preparation Readiness

- All standard Systems Engineering and Integration flight preparation activities have been completed or are planned. Non-standard open work will be addressed.
  - System requirements verification
  - Design requirements and induced environment updates; verification of element incorporation
  - Integrated vehicle performance evaluation
  - Real-time mission support preparation and certification of personnel as applicable
  - Review and disposition of waivers, deviations, and exceptions
  - Updates to Integrated Hazards baseline
  - Flight Software verification/Payload and General Support Computer (PGSC) Readiness
  - Review of element requirements changes and verifications for integration impacts
Main Engine Ignition (MEI) Instrumentation
Results for STS-130

- TSM acoustic levels were higher than STS-129 but within the updated design limit for Orbiter base areas – minor poke-outs within ground rules
- Base heat shield acoustics were near the high end of OV-102 and OV-103 flight experience but below the updated design level at most frequencies – within ground rules
- RCS stinger and vertical tail stinger microphone data processing in work

GUCP Pyro Bolt Interface Loads

- STS-119 GH2 Vent leak anomaly prompted a review of interface loads
- A recent reassessment of loads has revealed that the GUCP pyro bolt load has increased
  - 5888 lb versus 5655 lb
- The current documentation of the GUCP pyro bolt load and accompanying Factor of Safety exception is cumbersome and will be cleaned up as an NFS document change. Changes will be made to the following:
  - ICD-2-0A002, Space Shuttle Launch Pad & Platform, Figure 3.3-2.1
  - NSTS-07700, Vol. X, Flight and Ground System Specification, Table 3.2.2.1.5.2
  - STS 85-0169, Shuttle Loads Data Book
STS-131 Debris Risk Summary

Doug Drewry, MS2
Systems Engineering & Integration Office
Space Shuttle Program Office

Six IDBR-01 debris risks remain Infrequent/Catastrophic

- **Liftoff Debris**: is expected to remain at this risk level for the life of the Program due to the diversity of potential Debris sources although rigorous controls have been implemented and continuous vigilance is policy.
- **ET Umbilical Ice**: Accepted Risk; Closely monitored during pre-launch
- **Putty Repair**: Windows zero impact allowable keeps any impact in the “catastrophic” category, forward work may be used to reduce the likelihood to “Remote”.
- **T-0 Umbilical Ice**: Accepted Risk; NSTS 08303 Updated to include 0.1 lbm allowable external ice
- **LO2 IFR**: Implemented NDE of all IFR ramps to screen for large voids
- **ET Intertank Foam Loss**: Changed to Infrequent Catastrophic for STS-128
  - Continued Tensile Testing of ET high risk debris areas to mitigate risk
Integrated In Flight Anomalies

- **STS-130-I-001 (CoFR Exception)** – Unexpected Debris/Expected Debris Exceeding Mass Allowable Prior to Pad Clearance (Liftoff Debris)
  - Associated Hazard Report: IDBR-01 Cause AD - Infrequent Catastrophic

- **STS-130-I-002 (CoFR Exception)** – ET TPS Losses from the Intertank
  - Associated Hazard Report: IDBR-01 Cause G – Infrequent Catastrophic
    - "Update Acceptance Rationale for Cause G, IT Foam Debris" added to the VTL/Closure expected prior to the STS-132c update.
    - Routine Update: The rationale that exists in Cause G now states the loss of IT foam on STS-127/ET-131 was due to possible contamination on the post-Katrina External Tank. STS-130/ET-134 did not have similar environmental exposure, but did have IT foam losses during flight. The Acceptance rationale needs to be updated to remove any language associated with post-Katrina environments to reflect the actual risk of IT Foam to the program.
    - Actions from MAF TIM 3/4/10 outlined approach for developing PRA to quantify the risk to Special Tile & RCC

- **STS-130-I-003 (CoFR Exception)** - Ceramic Insert is Protruding from Window #2 Carrier Panel
  - 2 ceramic inserts around the windows were identified as protruding. None were liberated. One near window #2 during the flight and one near window #5 post flight. The one near window #2 had defects that should have prompted the part to be removed and replaced prior to STS-130. A follow on detailed inspection identified additional locations that failed the inspection criteria and have since been pull tested and or R&R’d acceptability for flight.
  - A design tolerance study has been conducted to identify locations that are required to be inspected. (Orbiter/PRT)

Orbiter Debris Impact summary

- **STS-130, OV-104**
  - TPS Hits w/damage > 1” = 10 (7 lower surface, 2 L OMS, 1 R OMS, 0 windows) (Total # of Hits = 62)
  - Prior to RTF Average for Lower Surface Hits >1” = 23; Since RTF = 14

STS-130 elliptical volume Hits>1” = 0.536 in³; RTF Average = 2.637 in³
STS-130 Total elliptical volume ALL Hits = 0.804 in³; RTF Average = 3.811 in³
STS-130 Putty Repair Debris Summary

- TPS putty repairs are listed as expected debris in NSTS 60559.
- Putty Repair loss is listed in IDBR-01 as cause AK and carried as an Infrequent Catastrophic Risk primarily because Windows have zero capability for impacts.
- There were no Putty repair losses on STS-130.

- OPO/TPS PRT continues risk reduction steps
  - Allowable Repair filler volume was reduced to limit putty repair masses
  - Tile Undercut revised for new repairs
  - Process/tooling/Training enhanced
  - Tiles with large repairs are being removed in critical areas FWD of the RCC and windows
  - Inspections continue (Tactile Test & Minimum gap inspections) and Tiles to be removed are ranked by size/location/repair type
  - CHIT’s will be initiated and a subset of tiles removed every flow until EOP

STS-130-I-001 Liftoff Debris

- Several pieces of debris were found on pad post-launch or were captured in imagery observations.

- Liftoff debris risk is currently characterized as infrequent, catastrophic due to significant uncertainties in controls and significant limitations in analysis.

- Debris release has been mitigated for identified potential sources of critical debris by performing repairs and adding inspections for system-level components. Ongoing mitigations include FOD awareness, attrition-based hardware removal, routine inspections and monitoring for facility corrosion.

- Observed STS-130 debris poses no increase in risk.
Summary of Liftoff Debris Categories

STS-114 through STS-130:
Liftoff Debris Instance Chronology

Total Item Count Trend

Baseline established with data from STS-114 through STS-127.

STS-130 debris count is slightly below the IIFA baseline -3σ limit. The very low rust count over the last 3 missions may partially account for the drop below the limit.
**BACKGROUND**

- **STS-127** experienced significant foam loss across the Intertank
  - Investigation initiated a review of tank processing history and possible causes
  - Review identified contamination prior to foam application as the probable cause

- Plug pulls were implemented as a process check to ensure no gross contamination issues prior to STS-128
  - STS-128 had no foam losses from +Z side of Intertank
  - Crew Hand Held imagery was not available for –Z side of Intertank
  - SRB video at separation provided limited views but no observed –Z losses

- Plug pulls were continued as a process check for STS-129
  - STS-129 had eight foam losses from –Z area with unknown times of release
  - Good DETTPS Umbilical imagery showed no +Z Intertank foam losses

- Additional plug pulls were added prior to STS-130 to sample platform access areas in addition to the high risk areas

- **STS-130** experienced two +Z Intertank foam losses
  - Currently tracking 21 observations of missing TPS on STS-130/ET-134 Intertank
  - 2 Areas on +Z were determined to be adhesive failures similar to STS-127/ET-131 losses
    - One occurred during ASTT (+Z losses observed at 119 sec and 485 sec MET)
    - Conditional PRA done for the STS-130 Intertank foam release during ASTT
      - 1/10,000 for Special Tile
      - 1/10,000 for RCC

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**STS-130 Intertank TPS Losses (φ: ± 110deg)**

- **NIRD 130-007 (~-67)**
  - Release time: unknown
  - Failure mechanism: multiple popcorning and/or erosion

- **NIRD 130-006 (~-47)**
  - Release time: unknown
  - Failure mechanism: multiple popcorning and/or erosion

- **NIRD 130-003 (8)**
  - Release time: unknown
  - Failure mechanism: adhesive

- **NIRD 130-004 (~-21)**
  - Release time: ~405 MET
  - Failure mechanism: adhesive

- **NIRD 130-008 (~-119)**
  - Release time: unknown
  - Failure mechanism: under review

- **NIRD 130-009 (~-125)**
  - Release time: unknown
  - Failure mechanism: under review

- **NIRD 130-020 (~-107)**
  - Release time: unknown
  - Failure mechanism: under review

- **NIRD 130-021 (~-106)**
  - Release time: unknown
  - Failure mechanism: under review

- **NIRD 130-022 (~-96)**
  - Release time: unknown
  - Failure mechanism: under review

- **NIRD 130-023 (~-110)**
  - Release time: unknown
  - Failure mechanism: under review
### Flight Comparison / Likelihood Assessment

<table>
<thead>
<tr>
<th>Flight</th>
<th>STS-127</th>
<th>STS-128</th>
<th>STS-129</th>
<th>STS-130</th>
<th>STS-131</th>
</tr>
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<tbody>
<tr>
<td>Debris Release</td>
<td>○ 37 Losses</td>
<td>○ 8 Losses</td>
<td>○ 21 Losses</td>
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<td>Debris Zone ((\Phi_r = \pm 110^\circ))</td>
<td>○ 12 Losses</td>
<td>○ 2 Losses</td>
<td>○ 9 Losses: 103.3 thru 134.1 sec</td>
<td>○ 1 Loss: 119 sec</td>
<td></td>
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<tr>
<td>During ASTT</td>
<td>○ 9 Losses: 0.236 lbm max</td>
<td>○ 1 Loss: 0.023 lbm</td>
<td>○ 3-5 Losses, minor damage</td>
<td>○ Focused Inspection</td>
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<tr>
<td>Largest Mass Vehicle Impacts</td>
<td>○</td>
<td>○</td>
<td>○</td>
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</table>

**Critical Damage**

- STS-127
  - NONE
- STS-128
  - NONE
- STS-129
  - 8 Losses
- STS-130
  - 21 Losses
- STS-131
  - ~3-5 Losses, minor damage

**Focused Inspection**

- EVA Repair/CSCS
ET Intertank TPS Losses
Factors effecting Risk Assessment

• IDBR-01, Cause G documents Intertank foam debris
  • “External Debris Impact to SSV During Ascent Due to ET Foam – NCFI 24-124 located on the
    Intertank Acreage”
  • Cause Upgraded to Infrequent/Catastrophic following STS-127
    (Tracking VTL item to update Cause G removing references to Katrina as a cause – STS-132)

• DIG assessment identifies a 20 to 30 second window of risk during ascent
  • ET physics model indicates heating is likely insufficient prior to 100 sec to cause liberation
  • DTA and Orbiter damage capability demonstrates risk diminishes after 120 seconds

• Relatively short window of exposure & several events are required to line up to result in
  critical damage
  • IT Debris release,
  • Release from a critical debris zone,
  • Within ASTT,
  • Debris large enough to cause critical damage,
  • Debris Impacts vehicle
  • Impact angle and orientation of debris as it impacts also effect level of damage

• Debris concern is limited to Foam loss on +Z side of Intertank
  • Majority of +Z losses have been on lower half of the Intertank (i.e., lower risk areas)

Intertank TPS Losses
STS-131 Flight Rationale

• Intertank debris has improved significantly since STS-127, but flight history suggests random
  debris losses from this area will remain a SSP risk.

• ET process controls such as certification of cleaning processes, personnel, and spray
  processes provide confidence in overall TPS foam application and integrity.

• Plug pulls provide confidence that a wide-spread process/contamination issue does not exist
  and provide additional assurance that weak bond issues do not exist in the high risk areas
  (critical debris zones)
  • This rationale recognizes that plug pull tests are not controls and do not prevent foam loss but it
    does increase confidence in tested areas.

• Additional Plug Pulls done for STS-131/ET-135 in work platform areas where most losses
  have occurred
  • ET-135 is the last tank using platform cleaning

• Imagery demonstrates that debris can liberate as a single piece, however flight evidence and
  testing show debris is likely to breakup into smaller pieces
  • Smaller foam pieces decrease the likelihood for critical damage to RCC
  • Breakup increases tile impact risk but smaller pieces decrease the potential for critical damage
**ET Intertank TPS Losses**

**STS-131 Flight Rationale (Continued)**

- **Intertank Risk assessments:**
  - Loss Mass has been generally overestimated by EPAT and Imagery
  - Foam losses on -Z side of Intertank are not good indications for potential loss on the +Z side
    - Foam on +Z side is vented and thicker than –Z Intertank foam
  - MSFC Hot Gas Facility testing has shown our predicted Break-Up model is likely conservative
  - Flight observations indicate we have overestimated the pop-off velocity in our modeling which effects transport and influences a higher RCC risk
  - Damage models assumed worst case orientations for debris impactors
    - Not realistic with tumbling pieces of foam, many possible orientations
    - Only a fraction of the pieces will impact at the most critical locations AND angles of impact.
    - STS-127 actual damage was very minor compared to what model predictions estimated.

- **Qualitative assessment indicates the overall likelihood of experiencing catastrophic damage is probably remote, However due to uncertainties it continues to be carried as an Infrequent/Catastrophic risk.**
  - Debris TIM at MAF March 4, 2010 to determine if a realistic PRA to quantify the SSP risk could be developed.
  - Currently developing PRA for Special Tile and RCC

**STS-131 Risk is acceptable based on Qualitative Assessment and confidence gained by bond adhesion test performed in critical zone**
STS-131
SSP Flight Readiness Review

Integrated Hazard Report
and
Integrated In-flight Anomalies
Summary

MS3/JJ Hill
March 10, 2010

Integrated Hazard Report Changes
Since STS-130

• IMPS-01 Contamination in the Integrated MPS H2 System
  • Change Request S050425JW (Baseline Revision H)
  • Add ORBI 306 "Fire/Explosion In The Orbiter Aft Compartment Caused By MPS Propellant Leakage/Component Rupture" as a Control to IMPS-01-C
  • Delete Open Work IMPS-01-OW-005 within IMPS-01-C
    • Action to MV: Implement design controls to reduce the hazard likelihood for flow control valve (FCV) poppet failures.
    • Update required to ORBI-311 prior to STS-131 (Action S050425JGR4 with 3/25/10 ECD)
  • Update References
  • Update Background content
  • Change Flight Effectivity to STS-131 through STS-999
  • No change in overall risk classification: ACCEPTED RISK
### Integrated Hazard Report Changes Since STS-130

**IMPS-05, Over Pressurization of the Integrated MPS H2 System**

- **Change Request S050425JY (Baseline Revision H)**
- **Delete Open Work IMPS-05-OW-013 within IMPS-05-Q**
  - Action to MV: Implement design controls to reduce the hazard likelihood for flow control valve (FCV) poppet failures. (This action is also captured in IMPS-01-OW-005 and should be reported to the SICB)
- **Update required to ORBI-311 prior to STS-131 (Action S050425JGR4 with 3/25/10 ECD)**
- **Update references**
- **Change Flight Effectivity to STS-131 through STS-999**
- **Overall risk classification downgraded to previous classification (due to open work closure): CONTROLLED**

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### Integrated In-flight Anomalies (IFAs) Summary

**CoFR Exceptions**

- **STS-130-I-001 “Unexpected Debris/Expected Debris Exceeding Mass Allowable Prior to Pad Clearance (Liftoff Debris)”**
  - Status – ECD 3/9/10
- **STS-130-I-002 “ET TPS Losses from the Intertank”**
  - Status – ECD 3/23/10
- **STS-130-I-003 “Ceramic Insert is Protruding from Window #2 Carrier Panel”**
  - Status – ECD 3/9/10
### Integrated Hazard Risk Matrix

#### Hazard Reporting Policy

Hazard Reporting Policy

- Essential to Shuttle Safety
- Reporting of all hazardous events
- Reporting of all failures
- Reporting of all effects that threaten crew or vehicle safety

**Integrated Hazard Risk Matrix**

<table>
<thead>
<tr>
<th>Hazard Report #</th>
<th>Integrated Hazard Titles</th>
<th>Likelihood</th>
<th>Severity</th>
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<tr>
<td></td>
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<td>Remote</td>
<td>Critical</td>
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<tr>
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<td>Infrequent</td>
<td>Catastrophic</td>
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<tr>
<td></td>
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<td>Probable</td>
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**Accepted Risk Distribution Totals**

- *Controlled Risk*: 292
- *Accepted Risk*: 268
- *Remote Risk*: 147
- *Critical Risk*: 11
- *Infrequent Risk*: 11
- *Probable Risk*: 12
- *Catastrophic Risk*: 6

**Risk Summary**

- 22 of 38 IHR’s are classified as Controlled Risk
- 16 of 38 IHR’s are classified as Accepted Risk
- *Previous Flight*

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**Integrated Hazard Risk Matrix**

### “Controlled Risk” Hazard Reports

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<th>Hazard Report #</th>
<th>Hazard Title</th>
<th>Likelihood</th>
<th>Severity</th>
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<td>IARO-01</td>
<td>Aerodynamics Environment not per Specified Design</td>
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<td>IEPD-01</td>
<td>Inability to Power Critical Functions</td>
<td>Infrequent</td>
<td>Catastrophic</td>
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<td>IFS01</td>
<td>ET/SSB System Interface Failure</td>
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<td>IFS02</td>
<td>ET/Otter System Interface Failure</td>
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<td>MSS/Otter System Interface Failure</td>
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<td>IFS04</td>
<td>Outer Mold Line Configuration Error</td>
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<td>IFSW-01</td>
<td>Flight Software Generic Problems can cause loss of vehicle command and control</td>
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<td>Erroneous Inputs to Flight Software can cause loss of vehicle command and control</td>
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<td>Underpressurization of the Integrated MPS O2 System</td>
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<td>Excessive Flow from ET/Otter/SSME External to SSME</td>
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<td>CO2 Geysor Event during Cryo Loading</td>
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<td>MPS-16</td>
<td>Loss of MPS H2 System</td>
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<td>MPS-17</td>
<td>Inadvertent SSME Shutdown</td>
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<td>PVR-01</td>
<td>Pyrotechnic System Malfunction</td>
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<td>ET/SSB System Interface Failure</td>
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<td>Tail Service Mast (TSM) T-0 System/SSME Malfunction</td>
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<td>VLD-02</td>
<td>System Instability Results in Structural Failure of SSV</td>
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**Controlled Risk Distribution Totals**

- Remote: 253
- Critical: 2
- Infrequent: 11
- Probable: 11
- Catastrophic: 6
• Infrequent Catastrophic
  One (IMPS-01-C - Deletion of Flow Control Valve Open Work)

• Remote Catastrophic
  One (IMPS-05-Q - Deletion of Flow Control Valve Open Work)
**Imagery Hardware**

**Vehicle Cameras (ELVIS)**

- **ET LO2 Feedline Camera (ET-135)**
  - Camera system installed and on schedule with nominal checkouts
  - Ready to support. No open issues.

- **Ground Network & TV**
  - Nominal ISS trajectory ground station coverage
  - Ready to support. No open issues.

- **SRB Cameras (BI-142)**
  - Hardware installation and closeouts on schedule with nominal checkouts
  - Ready to support. No open issues.

- **Digital ET TPS (DETTPS) Umbilical Well Still Camera**
  - Camera configured for daylight settings through Apr 8
  - Camera and flash functional test in VAB on 2/27 successful
  - Flash memory card:
    - Camera appears to be using #2 flash memory card (#1 should be prime) - most likely due to corrupt card in slot 1
    - Loss of redundancy for availability of memory cards (only one is used)
    - Camera operating well on card 2
    - Minor procedural change for crew
  - Ready to support. No open issues.

- **Crew Handheld High Definition (HD) Video Camera**
  - STS-130 HD downlink issue is believed to be related to a problem with ch2 on the Mux
  - Mux ch2 in OV103 was used successfully on STS-128 for HD video
  - Plan for STS-131 is to use ch2 with ch1 available as backup
  - Ready to support. No open issues.

**Imagery Hardware**

**Vehicle Cameras (non-ELVIS)**

- **Orbiter MiniCam**
  - STS-130 performance of camera in pilot’s Window 4 was very good
  - Daylight exposure issues observed on STS-129 will be addressed on STS-131 and subs:
    - Use fixed shutter speed (1/1000)
    - Auto gain OFF to avoid over-exposing tank against dark sky
  - STS-131 FRD includes requirement for crew downlink as time allows (currently in the Flight Plan at the end of FD2, after OBSS surveys)
  - Ready to support. No open issues.
Imagery Hardware

Ground and Airborne

Ground Cameras
- Cameras configured nominally per Launch & Landing PRD
- Ready to support.

Airborne Cameras
- HYTHIRM scheduled to support BLT DTO
- Ready to support. No open issues.

Photo Targets

- Prior to STS-130 Launch:
  - FE01 (235' level) removed due to delamination, most likely due to installation on irregular surface
  - FE03 (235' level) and FE07 (175' level) also on irregular surfaces were inspected and both appeared nominal
- Post STS-130 Launch:
  - All FSS targets performed well except FE04 (235' level) - heating effects (see below)
  - Several MLP targets had been burned or significantly degraded (see below), as expected
  - No targets were observed liberating or contributing to liftoff debris environment
- All 19 targets (MLP and FSS combined) will be in place (repaired/replaced as necessary) for STS-131
- Study underway to compare physical performance of each target (MLP and FSS) and usefulness of targets for photogrammetric analyses
- Ready to support. No open issues.
Lighting Predicts, April 5 – April 30

Launch
- Apr 5 – Apr 30: DARK

ET Sep Imagery
- Apr 5 – Apr 8: DAYLIGHT
- Apr 9 – Apr 30: DARK

Handheld ET (post-pitcharound) Imagery
- Apr 5 – Apr 11: DAYLIGHT
- Apr 12 – Apr 13: DAYLIGHT, Non-Optimal
- Apr 14 – Apr 30: DARK

Post ET-Sep Mnvs
- Apr 5 – Apr 13: Nominal +X, Nominal Pitch
- Apr 14 – Apr 30: Nominal +X**, No Pitch

**For launch dates of Apr 14th – Apr 30th: MOD may execute modified +X (20sec) vs. the nominal (11 sec) burn

MOD, SE&I Agreements for Crew HH ET Photography
1. Pitch mnvr for handheld ET photography will not be attempted if nominal photography time is dark.
2. Pitch mnvr will not be performed "late"
3. Pitch mnvr and ET handheld photography will not be attempted on LON mission

CoFR Products & Readiness

STS-131 Imagery Readiness Review was held with the IATs and hardware teams on 2/12/10.

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<thead>
<tr>
<th>Area of Responsibility</th>
<th>Statement</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations Integration Plan</td>
<td>NSTS 60540, Operations Integration Plan, Rev B approved at 06/27/06 SICB. End-to-end readiness level of hardware, procedures, tools, and facilities have been assessed to ensure Open Work and issues will be resolved prior to flight.</td>
<td>Ready</td>
</tr>
<tr>
<td>Engineering Image Analysis Products, Training, and Staffing</td>
<td>Imagery engineering analysis, and “I-Squared” SE&amp;I personnel and tools are ready to support STS-131.</td>
<td>Ready</td>
</tr>
<tr>
<td>Imagery Laboratory Readiness</td>
<td>Imagery labs at JSC, KSC, and MSFC have the required capabilities and configurations to support anticipated and unexpected analysis.</td>
<td>Ready</td>
</tr>
<tr>
<td>Camera Hardware Readiness</td>
<td>All ground and vehicle requirements for imagery and other data collection assets have been implemented for flight and associated operational readiness has been demonstrated.</td>
<td>Ready</td>
</tr>
</tbody>
</table>
Debris Radar Configuration for STS-131:

- STS-131 NDR Configuration:
  - 1 MCR C-band radar
  - 2 NASA X-band radars
    - NASA #1 on SRB vessel Liberty Star
    - NASA #2 on Runnymede-Class ARMY LCU
  - Operational SRB tracking, following ASTT, by both X-band radars
  - No planned changes in operations from STS-129
  - The Navy NMIS radars will be at the MCR site, but powered off during the NASA radar mission.
  - NDR Readiness will be reviewed on 03/12/10.
**NDR Issues During STS-130:**

**NDR-C1 Radar:**
Problem: Minor noise problem prevented the use of Phase Compensation Tables (PCTs) which are intended to improve data quality (Same status since STS-125).
Resolution: unresolved.

**NDRX-3 Radar:**
Problem: None.

**NDRX-4 Radar:**
Problem: Radar ranging did not work while tracking SRB, post ASTT.
Resolution: Under evaluation.

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**Readiness for STS-131:**

- **Team Readiness**
  - Complete, both ascent and analysis teams ready
- **Facility Readiness**
  - Complete
- **Radar Readiness**
  - NDR-C1 – GREEN
  - NDR-X3 - GREEN
  - NDR-X4 - GREEN