

>
> It is asking for a password.....

>
> -----Original Message-----
> From: HIRSHORN, STEVEN R. (JSC-DF) (NASA)
> Sent: Wednesday, February 12, 2003 08:31
> To: BARCKHOLTZ, RANDALL J. (RANDY) (JSC-CB) (USA); CHILDRESS, J.
> M. (MARK) (JSC-DO121) (NASA); CURRIE, DAVID W. (JSC-CB) (USA); DL DA8
> Flight Directors; DL DF Shuttle Management; DL DF Station Management; DL
> MOD OFC/DIV CHIEFS; FOSSUM, MICHAEL E. (JSC-CB) (NASA); JOHNSON, GREGORY
> H., LTCOL. (BOX) (JSC-CB) (NASA); Polly Schroeder; SERIALE-GRUSH, JOYCE M.
> (JSC-EA) (NASA); SHACK, PAUL E. (JSC-EA42) (NASA); SMITH, JON M. (MIKE)
> (JSC-TA) (NASA)
> Cc: JASON, JERRY P. (JSC-DF52) (NASA); MILLER, KOURI E.
> (JSC-DF711) (NASA)
> Subject: FW: Vehicle Mapping Charts

>
> Folks,

>
> There was another VERY descriptive presentation by the Vehicle
> Mapping Team yesterday to the Orbiter Vehicle Engineering Working Group.
> The shortcut below is to the 2D Graphical Event Sequence, which is the
> charts that show the temp/press sensor indications/locations and failures.
> They have tweaked the timeline a bit, but one significant addition is that
> they have added a graphical field showing the Orbiter's ground track and
> position at the time of each event. Anyway, this is an update and some
> very good charts and I wanted to pass it on.

>
> Steven R. Hirshorn
> Technical Assistant for Shuttle Integration
> Systems Division
> NASA / JSC / MOD / DF
> Phone: (281) 483-0652

>
> Fax: (281) 483-3997
> e-mail: steven.r.hirshorn1@nasa.gov

>
> -----Original Message-----
> From: KROEGER, DENNIS J. (JSC-EP) (NASA)
> Sent: Wednesday, February 12, 2003 8:12 AM
> To: HIRSHORN, STEVEN R. (JSC-DF) (NASA)
> Subject: RE: Vehicle Mapping Charts

>
> Steven,
> Here you go.
> For future reference, the most recent version of the charts can be
> found through this link:
> << File: columbia sensor wire locations Rev 2.ppt.lnk >>

From: "HILL, PAUL S. (JSC-DA8) (NASA)" <paul.s.hill@nasa.gov>
To: DL ESAT <DL-ESAT@ems.jsc.nasa.gov>
Subject: Detailed debris data
Date: Mon, 10 Feb 2003 14:36:24 -0600
Importance: high
X-Mailer: Internet Mail Service (5.5.2653.19)

A reminder and an urgent "request" for everyone on distribution:

Do not describe any of the video more specifically in any way that is not clearly supported by data and consensus of the responsible team. Examples of this follow. There may be others. Let me know if these examples don't illustrate the point.

- * "X piece of debris was seen from Bisenger and is a tile." (The Photo Team has not reviewed this tape yet. There is no way we know if it is a tile. We may know, after analysis, that it is something that behaves more like a tile than an ET door.)
- * "Y piece of debris was seen to separate at ZZZZ GMT." (If the Photo Team has not declared it an actual, verified and supportable time, it isn't yet.)
- * "A MLG door was seen to fall off over Nevada." (A MLG door can not be resolved in any video yet reviewed. There is early speculation that some debris behaves more like a MLG door than it does a tile, but we don't know it's anything yet.)

In other words:

- * Stick to what we know.
- * Some of what we think we know from initial video screening, we must all assume is really only a hypothesis. Wait for the process to crank out something we know.
- * The ESAT's role in this is culling out the hot list video, which you have all done a great job of, then shepherding it through the system for photo and ballistic analysis. This latter part is moving now and progressing. The next part of our role will be then to forward reduced 80k' foot prints to NTSB and Barksdale, with the hope of finding radar hits to further reduce the foot prints after working through the NTSB system.

Anyone who doesn't understand needs to talk to me. If you're not sure whether or not we "know" something, I'll help with that too. There is extreme sensitivity all the way up the chain to the Program Manager regarding speculation vs. data and fact. What we're doing is too damned important to wreck the train over this.

PSH

Early Sightings

- 17 on hot list:
 - Video in house on all but 5.
 - Discrete debris sep times will be submitted to the timeline team today.
 - Las Vegas-NV video through 250X telescope expected in today or tomorrow, digital still arrived over the weekend.
 - Preliminary work has been done to shrink the foot prints for these events.
 - » Based on assumed mass ballistic coefficients from top level review of the video.
 - » Detailed ballistic analysis is in work to improve accuracy for handover to the NTSB.
 - » The examples on the next 5 pages illustrate where this is going. These were distributed Friday.
- Misc sensor work:
 - No update: USGS seismic sensor and NOAA infrasonic data are being studied.



DOD Data

- NAVSPASUR received a total of 7 radar hits in AZ and NM.
 - No updates: Vector development is in work.
- Beale AFS radar:
 - Preliminary analysis shows 24 detects between 200-300k ft altitude, off shore, not necessarily 24 objects.
 - DOD is continuing the analysis.
 - This may lead to vectors on discrete debris.
- Object correlated to Columbia 17 Jan 1559Z:
 - USAF still working, and all details still considered preliminary
 - » Data suggests asymmetric shape, (~50 cm diameter if modeled for spherical obj)
 - » Sep velocity may range 1-5 m/s.
 - MOD is pulling data:
 - » PLB video:
 - PLB survey 1701-1704, 1719-1725, 1740-1753Z.
 - Will confirm today if any earlier PLB views are available.
 - » Flight data and crew activity being reviewed:
 - MOD found only very small accelerations in pitch and roll ~1604 Z which do not correlate to any jet firings or other known activity.
 - Appears to be a step increase in error but not in rate, implying a 'closed system', i.e. a crewmember pushing off and stopping, rather than a force being applied that adds angular momentum to the system.
 - SAMS review in work.
 - No dumps in progress, but a manual fuel cell purge was on the timeline at 1600Z, this is in work.



DOD Data, continued

- **Aerospace Corp support has been requested for ballistic analysis support.**
 - Long history with this type of analysis from composite data similar to the data we are evaluation (e.e. Mir deorbit, ET, Ariane, C-GRO)
 - Coordinated through DOD and confirmed ready to support.



Early Sightings

- **16 on video hot list:**
 - Still looking for Las Vegas-NV video through 250X telescope.
 - Work has progressed very well with the imagery team.
 - » Discrete debris separation times expected to be reviewed through the Orbiter tomorrow.
 - » Ballistic analysis on these times and related data is in work.
 - Foot prints for radar searches are imminent.
 - Ames has offered expertise for video analysis:
 - » Size, mass and constituent estimation in particular.
 - » We're working to set up data exchange, etc.

- **Misc sensor work:**

- No update: USGS seismic sensor and NOAA infrasonic data are being studied.
- Working to pull in similar data now from other sites.



DOD Data

- NAVSPASUR and Beale AFS radar data analysis in work.
- Object correlated to Columbia 17 Jan 1559Z:
 - USAF still studying
 - » Requested various material properties, ephemeris and accelerometer data.
 - » In work.
 - USAF still working, and all details still considered preliminary
 - » Data suggests asymmetric shape.
 - » Sep velocity may range 1-5 m/s.
 - MOD is pulling data:
 - » PLB video:
 - PLB survey 1701-1704, 1719-1725, 1740-1753Z.
 - Will confirm today if any earlier PLB views are available.
 - » Flight data and crew activity being reviewed:
 - MOD found only very small accelerations in pitch and roll ~1604 Z which do not correlate to any jet firings or other known activity.
 - Appears to be a step increase in error but not in rate, implying a 'closed system', i.e. a crewmember pushing off and stopping, rather than a force being applied that adds angular momentum to the system.
 - SAMS review in work.
 - No dumps in progress, manual fuel cell purge started after ~1615Z.



Early Sightings

- **Debris shedding event times:**

- Recent accomplishments -- Photographers sending video from California and Flagstaff of previous entries for luminosity and spectral comparison, some of which is using the same cameras used for 107.
- On going -- Remaining string of events through AZ / NM

- **Relative motion and ballistics:**

- On going:
 - » Comparing ballistics solutions with Aerospace.
 - » Serial work on next events is in work, with a preliminary indication of a much more significant event in Flagstaff video than the "Flash" and debris-6 already added to the timeline.
- Issues, Concerns:
 - » Analyzing a difference between JSC and Aerospace solutions for the first studied event.
 - » Foot prints for both solutions have been distributed and are in use for radar searches.
 - » For comparison, specific files exist which match both solutions, and an RCC panel matches one of them. (This does not imply that this object is either a tile or an RCC panel.)

- **Radar data searches:**

- Recent accomplishments:
 - » Began radar search of the California coast for any possible tracked debris.
 - » Several potential threads are under study based on searches in the debris-6 foot (13:54:33) print.
- On going -- Serial work on next events as ballistic analysis progresses.

- **Additional detailed imagery analysis:**

- On going: Luminosity and spectral analysis with ARC and Aerospace.
- Issues, Concerns -- Will identify 5-15 public camcorders needed for focal length and spectral calibration.



Early Sightings, continued

- **Misc sensor work:**

- Recent accomplishments – Conference summary:
 - » Infrasonic conference summary:
 - A Hawaii station may have data for us from over the Pacific.
 - We've asked for DCIST help with existing DOD expertise integrating this data with other DOD sensor data.
 - The goal will be to accurately correlate infrasonic data back to the Orbiter for a known shedding event seen in video, then shift the focus to over the Pacific.
 - Again, a preliminary report is expected at the end of the week, detailed conclusions will take time.
 - » **Confirmed USGS seismic data has been archived for comparison to previous 39 deg inclination entries.**
- On going:
 - » NOAA and Los Alamos National Lab integration and correlation of infrasonic data to the timeline.
 - » Integration and review of USGS seismic sensors.
- Issues, Concerns –
 - » The "Center for Monitoring Research at the Defense Threat Reduction Agency in Arlington, VA" has apparently "forbidden" DOE to get involved in the investigation.
 - » Various data is being withheld from LANL, including Air Force Technical Applications Center data.



DOD Data

- Imagery:
 - On going – Requested AMOS thermal mapping for upper surface and leading edge damage assessment, and missing thermal protection.
- Object correlated to Columbia 17 Jan ~1500Z:
 - No new DOD data.
 - On going – Engineering telecons with DOD regarding materials, dimensions and RF properties of various thermal protection components.
- NAVSPASUR and Beale AFS radar data during entry
 - No new DOD data.
- **Other DOD remote sensors:**
 - Recent accomplishments:
 - » First two discrete, off-nominal external events are coming to the OVE WG today, including one event off shore, and should be on the next rev of the timeline.
 - On going:
 - » Clarify the confidence and significance of the second two off-nominal external events and add to the timeline.



HILL, PAUL S. (JSC-DA8) (NASA), 10:08 AM 2/19/2003, FW: timeline inputs

From: "HILL, PAUL S. (JSC-DA8) (NASA)" <paul.s.hill@nasa.gov>

To: DL ESAT <DL-ESAT@ems.jsc.nasa.gov>,
"HARPOLD, JON C. (JSC-DA) (NASA)"
<jon.c.harpold@nasa.gov>,
"EPPS, RONALD C. (RON) (JSC-DM) (NASA)"
<ronald.c.epps@nasa.gov>,
"COLLINS, MICHAEL F. (MIKE) (JSC-DM) (NASA)"
<michael.f.collins@nasa.gov>,
"SHANNON, JOHN P. (JSC-DA8) (NASA)"
<john.p.shannon@nasa.gov>,
"BRISCOE, ALAN L. (LEE) (JSC-DA) (NASA)"
<alan.l.briscoe@nasa.gov>

Subject: FW: timeline inputs

Date: Wed, 19 Feb 2003 08:08:24 -0600

X-Mailer: Internet Mail Service (5.5.2653.19)

FYI. I took these to the 0730 this morning, they should be going to Ralph with the next timeline rev.

PSH

> -----Original Message-----

> From: HILL, PAUL S. (JSC-DA8) (NASA)

> Sent: Wednesday, February 19, 2003 7:29 AM

> To: MCCORMACK, DONALD L. (DON) (JSC-MV6) (NASA)

> Subject: timeline inputs

>

> I'm on my way down...

>

> <<remote sensor inputs.ppt>>



remote sensor inputs.ppt

X-Sender: wbihner@mail.hq.nasa.gov

X-Mailer: QUALCOMM Windows Eudora Version 4.3.2

Date: Tue, 07 Jan 2003 15:34:44 -0500

To: prutledg@hq.nasa.gov, jlloyd@hq.nasa.gov, mgreenfi@hq.nasa.gov,
boconnor@hq.nasa.gov, wready@hq.nasa.gov, mkosteln@hq.nasa.gov,
mcard@hq.nasa.gov, wfrazier@hq.nasa.gov, rpatrica@hq.nasa.gov,
Amanda.Goodson@msfc.nasa.gov, bob.peercy@west.boeing.com,
john.branard@kmail.ksc.nasa.gov, lbriscoe@ems.jsc.nasa.gov,
jmullin@hq.nasa.gov, rglanvil@ems.jsc.nasa.gov,
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ronald.d.dittemore@nasa.gov, linda.j.ham@nasa.gov,
Craig.B.Clokey@USAHQ.UnitedSpaceAlliance.com,
mkowales@mail.hq.nasa.gov, pcounts@hq.nasa.gov, bwatkins@hq.nasa.gov,
whill@hq.nasa.gov, dwhitehe@hq.nasa.gov, sortega@hq.nasa.gov,
awest@hq.nasa.gov

From: Bill Bihner <wbihner@hq.nasa.gov>

Subject: STS-107 FRR SMAR

Cc: Roy.Bridges-1@ksc.nasa.gov, Jefferson.D.Howell1@jsc.nasa.gov,
Arthur.G.Stephenson@nasa.gov, William.Parsons@ssc.nasa.gov

Good Afternoon,

Attached please find the Code Q FRR-Edition Safety and Mission Assurance Report (SMAR) for STS-107.

If there are any questions, please give me a call.

Thanks,

Bill

William J. Bihner, Jr
NASA/QE
(202) 358-4441



STS-107 SMAR FRR.doc

PAR-5 MINUTES JANUARY 03, 2003

<http://wwwsrqa.jsc.nasa.gov/par/>

The next PAR-5 will be held on Friday, 1/17/02 at 09:30 am Central. (1/3, & 1/10 PAR5s are cancelled)

The PAR-5 is a weekly telecon for representatives in the PAR process.

Debbie Bazan, JSC PAR Coordinator, (281) 244-1862 dbazan@ems.jsc.nasa.gov Note: Current changes indicated to the right by *****
PRESENTERS REVIEW THEIR ITEMS AND SUBMIT ANY CHANGES OR REQUESTS FOR CHANGES TO THE PAR-5 COORDINATOR
PRIOR TO THE NEXT MEETING.

STS-107 (OV-102) FLIGHT MILESTONE DATES

SORR	NA	PAR:	12/20/02
FRR:	01/09/03	FRR Tagup:	01/07/03 (moved from 1/06/03)
Prelaunch MMT:	01/14/03	PMMT Tagup:	01/10/03
Shuttle Launch:	01/16/03		

Special Topics: Due COB 01/03/03

1. SHUTTLE
 - A. JSC-(VMI: Arnold Baldwin, Backup: Ross Engle)
 1. OV-103 BSTRACrack (Bill Prince/18)
 - B. MSFC
 1. SRB-Cable Connector (Randall Tucker)
 2. SRB-BSM Paint Chip FOD (Randall Tucker)
 - C. KSC-TBD
2. INDEPENDENT ASSURANCE (PAR only)
 - A. JSC Independent Assessment (Mac Himel)
 - B. KSC SHIA (Mark Gordon)
 - C. MSFC HEDS (Angelia Walker)
3. EVA-No scheduled EVAs

JSC One Pagers (Shuttle): Due COB 01/03/03

1. Critical Process Changes/First Flight
 - A. tbd
2. New or Upgraded Hazards & Cils -NONE
3. Flight Rules with Safety Impacts (Jim Gardner/11)

MSFC One Pagers (Shuttle):

1. Critical Process Changes/First Flight
 - A. tbd
2. New or Upgraded Hazards & Cils -NONE

KSC One Pagers (Shuttle):

1. Critical Process Changes/First Flight -NONE
2. New or Upgraded Hazards & Cils -NONE

THE FOLLOWING ITEMS WERE DISCUSSED AT THE STS-107 PAR, FRR TAGUP:

Mission Overview:

1. Mission Success Criteria
 - A. Shuttle (Jim Gardner/1)
 - B. Shuttle Crew Constraint Exceptions (Jim Pendergast/2)
2. Payload Overview (includes NCRs)
 - A. JSC (Dean Moreland/5)
 - B. MSFC (tbd)
 - C. GDSFC (Roger Counts)
3. Shuttle Software Overview
 - A. JSC (Jane Moorhead/7)
 - B. MSFC SSME S/W (Roz Strickland)

Special Topics:

1. SHUTTLE
 - A. JSC-(VMI: Arnold Baldwin, Backup:Ross Engle)
 1. Spacehab Hull Damage and Repair (see JSC payload overview) (Dean Moreland/8)
 2. OV-103 BSTRACRACK (Bill Prince/18)
 - B. MSFC
 1. SSME-STs-113 Main Engine #1 Nozzle Leak (Martin Carson)
 2. SRB-Amphenol Connector Pin Lack of Retention (Randall Tucker)
 3. SRB-BSM Paint Chip FOD (Randall Tucker)
 - C. KSC-TBD
2. INDEPENDENT ASSURANCE
 - A. JSC Independent Assessment (Mac Himel)
 - B. KSC SHIA (Mark Gordon)
 1. Space Hab & Experiment Package Configuration Management (Mark Gordon)
 - C. MSFC HEDS (Angelia Walker)
3. EVA-No scheduled EVAs

JSC One Pagers (Shuttle):

1. Critical Process Changes/First Flight
 - A. First Flight of two AMECs (Al Arnold/10)
2. New or Upgraded Hazards & Cils -NONE
3. Flight Rules with Safety Impacts (Jim Gardner/11)
 - A. EOM Nosewheel Steering Flight Rule Change (Jim Gardener/11)
4. STS-109 Freon Coolant Loop 1 Flow Degradation (Tien Do/12)
5. STS-113 O2 Leak in Mid-body (Tien Do/Megan Bell/13)
6. STS-113 FES Primary B Controller Failure (Tien Do/Megan Bell/14)
7. STS-113 Right OMS Bi-propellant Valve Open Indication (Dan Clements/15)
8. Flowliner CRES Issue (Bill Prince-9)
9. Body Flap Actuator Corrosion (Dan Zait/19)
10. EVA:STS-113 EVA Crewmember Boot Fit (Charles Sager/16)
11. EVA:Biomed Cable Damage (Charles Sager/17)

MSFC One Pagers (Shuttle):

1. Critical Process Changes/First Flight
 - A. SRB-First flight of Pacific Scientific Separation Bolts (Randall Tucker)
 - B. SRB-Cleaning Solvent Specification Change (Randall Tucker)
 - C. SSME-First flight of Controller Coolant Duct Redesign (Rosalyn Patrick)
2. New or Upgraded Hazards & Cils -NONE
3. ET-Waive LO2 LWT Normal Mission & RTLS Ullage Pressure Curves for ET-93 (Keith Layne)
4. ET-Vent Valve Relief Pressure (Keith Layne)
5. SRB-BSM Motor FOD (Randall Tucker)
6. RSRM-STs-113 Postflight Observations-Foreign Material in RSRM Nozzle-to-Case Joint Radial Bolt Hole (Chris Cianciola)
7. RSRM-STs-113 Postflight Observations-Flashing on RSRM Nozzle-to-Case Joint Packing-with-Retainers (Chris Cianciola)

KSC One Pagers (Shuttle):

1. Critical Process Changes/First Flight -NONE
2. New or Upgraded Hazards & Cils -NONE

Mission Overview:

1. Mission Success Criteria
 - A. 10P
(Bobbie Jenkins)
2. Payload Overview (includes NCRs)
 - A. 10P Payloads
(Jeff Nill)
3. ISS 10P Overview
(Bobbie Jenkins)
4. ISS S&MA CoFR Status
(Jim Wade)

Special Topics:

1. STATION
 - A. tbd *****
2. INDEPENDENT ASSURANCE
 - A. JSC Independent Assessment (Mac Himel)
 - B. KSC SHIA (Mark Gordon)
 - C. MSFC HEDS (Angelia Walker)
3. EVA
 - A. tbd

JSC One Pagers (Station):

1. Critical Process Changes/First Flight -NONE
2. New or Upgraded Hazards & Cils -NONE

STS-114/ULF1 (OV-104) FLIGHT MILESTONE DATES

SORR	02/04/03	PAR:	tbd
FRR:	02/13/03	FRR Tagup:	tbd
Prelaunch MMT:	02/27/03	PMMT Tagup:	tbd
Shuttle Launch:	03/01/03 (NET)		

Mission Overview:

1. Mission Success Criteria
 - A. Shuttle (Jim Gardner-1)
 - B. Station (Boeing)
 - C. Shuttle Crew Constraint Exceptions (Jim Pendergast-2)
2. Station Overview (Boeing)
 - Open work
 - ISS S&MA Readiness Status
 - ISS Software (IV&V)
 - On-orbit Status & - Vehicle Status
 - ISS on orbit repair priority table
3. EVA Overview (includes NCRs)
(Trent Barrett-5)
4. Payload Overview (includes NCRs)
 - A. JSC (tbd-6)
 - B. MSFC (tbd)
5. Shuttle Software Overview
 - A. JSC (Jane Moorhead-7)
 - B. MSFC SSME S/W (Roz Strickland)

Special Topics:

1. SHUTTLE
 - A. JSC-TBD (VMI: Arnold Baldwin, Backup:Jeremy Verostko)
 - B. MSFC-TBD
 - C. KSC-TBD
2. EVA-TBD
3. STATION
 - A. Pistol Grip Tool Undertorqued (EVA/Station)
 - B. SSRMS Close Call Lessons Learned (tbd)
4. INDEPENDENT ASSURANCE
 - A. JSC Independent Assessment (Mac Himel)
 - B. KSC SHIA (Sharolee Huet)
 - C. MSFC HEDS (Angelia Walker)

JSC One Pagers (Shuttle):

1. Critical Process Changes/First Flight -NONE
2. New or Upgraded Hazards & Cils -NONE
3. Flight Rules with Safety Impacts (Jim Gardner)
4. GFE: Prebreathe Protocol (Adrian Sanderlin)
5. GFE: Ergometer Use On ISS (Adrian Sanderlin)

MSFC One Pagers (Shuttle):

1. Critical Process Changes/First Flight
 - A. RSRM 1st Flight of Press Fit Bushings on Oversized Pinholes *****
 - Replaces shrink fit method made obsolete by elimination of vapor degreaser
 - Certified by test and two static motor test firings
2. New or Upgraded Hazards & Cils-NONE

KSC One Pagers (Shuttle):

1. Critical Process Changes/First Flight -NONE
2. New or Upgraded Hazards & Cils -NONE

JSC One Pagers (Station):

1. Critical Process Changes/First Flight -NONE
2. New or Upgraded Hazards & Cils -NONE
3. ORCA Ops During Sleep Flight Rule (Scott Seyl)

6S FLIGHT MILESTONE DATES

6S SORR 04/03/03
6S Launch: 04/26/03

ISS 6S PAR: tbd

Mission Overview:

1. Mission Success Criteria
 - A. 6S
(Bobbie Jenkins)
2. Payload Overview (includes NCRs)
 - A. 6S Payloads
(tbd)
3. ISS 6S Overview
(Bobbie Jenkins)
4. ISS S&MA CoFR Status
(Jim Wade)

Special Topics:

1. STATION
 - A. tbd
2. INDEPENDENT ASSURANCE
 - A. JSC Independent Assessment (Mac Himel)
 - B. KSC SHIA (Mark Gordon)
 - C. MSFC HEDS (Angelia Walker)
3. EVA
 - A. tbd

JSC One Pagers (Station):

1. Critical Process Changes/First Flight –NONE
2. New or Upgraded Hazards & Cils –NONE

STS-115/12A (OV-105) FLIGHT MILESTONE DATES

SORR	05/01/03	PAR:	tbd
FRR:	05/08/03	FRR Tagup:	tbd
Prelaunch MMT:	05/21/03	PMMT Tagup:	tbd
Shuttle Launch:	05/23/03		

Mission Overview:

1. Mission Success Criteria
 - A. Shuttle (Jim Gardner-1)
 - B. Station (Boeing)
 - C. Shuttle Crew Constraint Exceptions (Jim Pendergast-2)
2. Station Overview (Boeing)
 - Open work
 - ISS S&MA Readiness Status
 - ISS Software (IV&V)
 - On-orbit Status & - Vehicle Status
 - ISS on orbit repair priority table
3. EVA Overview (includes NCRs)
(Stacie Greene-5)
4. Payload Overview (includes NCRs)
 - A. JSC (Walter Stoerkel-6)
 - B. MSFC (tbd)
5. Shuttle Software Overview
 - A. JSC (Jane Moorhead-7)
 - B. MSFC SSME S/W (Roz Strickland)

Special Topics:

1. SHUTTLE
 - A. JSC-TBD (VMI: tbd, Backup:tbd)
 - B. MSFC-TBD
 - C. KSC-TBD
2. EVA-TBD
3. STATION-TBD
4. INDEPENDENT ASSURANCE
 - A. JSC Independent Assessment (Mac Himel)
 - B. KSC SHIA (Sharolee Huet)
 - C. MSFC HEDS (Angelia Walker)

JSC One Pagers (Shuttle):

1. Critical Process Changes/First Flight -NONE
2. New or Upgraded Hazards & Cils -NONE
3. Flight Rules with Safety Impacts (Jim Gardner)

MSFC One Pagers (Shuttle):

1. Critical Process Changes/First Flight -NONE
2. New or Upgraded Hazards & Cils-NONE

KSC One Pagers (Shuttle):

1. Critical Process Changes/First Flight -NONE
1. New or Upgraded Hazards & Cils -NONE

JSC One Pagers (Station):

1. Critical Process Changes/First Flight -NONE
2. New or Upgraded Hazards & Cils -NONE

11P FLIGHT MILESTONE DATES

11P SORR 05/01/03
11P Launch: 05/26/03

ISS 11P PAR: tbd

Mission Overview:

1. Mission Success Criteria
 - A. 11P
(Bobbie Jenkins)
2. Payload Overview (includes NCRs)
 - A. 11P Payloads
(tbd)
3. ISS 11P Overview
(Bobbie Jenkins)
4. ISS S&MA CoFR Status
(Jim Wade)

Special Topics:

1. STATION
 - A. tbd
2. INDEPENDENT ASSURANCE
 - A. JSC Independent Assessment (Mac Himel)
 - B. KSC SHIA (Mark Gordon)
 - C. MSFC HEDS (Angelia Walker)
3. EVA
 - A. tbd

JSC One Pagers (Station):

1. Critical Process Changes/First Flight -NONE
3. New or Upgraded Hazards & Cils -NONE

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Date: Mon, 13 Jan 2003 15:33:37 -0500

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awest@hq.nasa.gov

From: Bill Bihner <wbihner@hq.nasa.gov>

Subject: STS-107 PMMT SMAR

Cc: Roy.Bridges-1@ksc.nasa.gov, Jefferson.D.Howell1@jsc.nasa.gov,
Arthur.G.Stephenson@nasa.gov, William.Parsons@ssc.nasa.gov

Good Afternoon,

Attached please find the Code Q Pre-Launch Mission Management Team Edition of the Safety and Mission Assurance Report (SMAR) for STS-107.

NOTE that the only change to this document from the FRR version is the update to the BSTRA ball status based on a special PRCB meeting on Sunday, January 12. OV-102 has been cleared to fly one additional mission, STS-107. Actions assigned by the Shuttle Program Manager will determine the longer term solution(s) to the BSTRA issue.

If there are any questions, please give me a call.

Thanks,

Bill

William J. Bihner, Jr.
NASA/QE
(202) 358-4441



STS-107 SMAR PMMT1.doc

Gordon-1, Mark, 03:59 PM 1/13/2003, FW: STS-107 Payload Configuration Management Independent Assessment

From: "Gordon-1, Mark" <Mark.W.Gordon@nasa.gov>
To: "Patrican, Richard" <rpatrica@mail.hq.nasa.gov>
Cc: "HIMEL, MALCOLM" <malcolm.j.himel1@jsc.nasa.gov>, mcard@mail.hq.nasa.gov,
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"Angelia.Walker@msfc.nasa.gov" <Angelia.Walker@msfc.nasa.gov>,
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Subject: FW: STS-107 Payload Configuration Management Independent Assessment
Date: Mon, 13 Jan 2003 14:59:57 -0500
X-Mailer: Internet Mail Service (5.5.2656.59)

Rich,

Attached is the Final report for the subject assessment. The report has also been delivered to the KSC Shuttle and Payload Directors. For their information, I have included Mike Card, Mark Kowaleski, Bill Bihner, Angela Walker and Bill Harris to the distribution.

Mark.....

> -----Original Message-----

> From: Welford-1, Danny
> Sent: Monday, January 13, 2003 1:13 PM
> To: Wetmore-1, Mike; Talone-1, John
> Cc: Garrido-1, Humberto (Bert); Lebron-1, Edmundo (Eddie); Tilley-1, Randall; Gordon-1, Mark; Glaser-1, William; Handley-1, Charles; Fooks-1, Gary; Gardner-1, Ruth; Lyons-1, Doug; Phelps-1, Ron; Higgins-1, William; Smith-2, Lisa (NASA)
> Subject: STS-107 Payload Configuration Management Independent Assessment

>
> A copy of the Final Report for the recently completed Independent Assessment is attached for your review. Additionally, a signed copy is being delivered to your office. If you have any questions or require additional assistance, please contact Mark Gordon at 7-5962. Thanks again for the support and assistance provided by your organization.

>
> Danny
> 7-4186

>
> > <<Final Report 011303.doc>>



Final Report 011303.doc

**STS-107 SPACEHAB/FREESTAR
Configuration Integrity
Independent Assessment**

Final Report
January 13, 2003

Assessment Team

Mark Gordon
SHIA/QA-D

Bill Glaser
TYBRIN Corporation

Chuck Handley
TYBRIN Corporation

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Executive Summary

This assessment evaluated the effectiveness of the Configuration Integrity process for the experiments installed in the SPACEHAB Module, the Orbiter Middeck, and the Fast Reaction Experiments Enabling Science, Technology, Applications and Research (FREESTAR) to be flown on the STS-107 Mission. A number of these experiments were processed in facilities external to KSC. The intent of this assessment was to determine if there were configuration integrity and management processes in place, and were the processes followed.

Discussions with the GSFC FREESTAR Mission Manager indicated that GSFC does not provide Quality coverage at the experiment developer or vendor facilities. However, once the experiment is delivered to GSFC for integration into the FREESTAR, the experiment is under GSFC configuration and integrity control. The SHIA Assessment Team reviewed the Configuration Management documentation and discussed their processes with GSFC personnel at KSC. The Assessment Team determined the six experiments flying on the FREESTAR were closely monitored by GSFC QA personnel during all processing phases at KSC.

In addition to the FREESTAR experiments, there are 32 experiments flying on STS-107. Five are Orbiter Middeck experiments and 27 are located in the SPACEHAB Module. Twenty SPACEHAB and two Middeck experiments were processed at the SPACEHAB Payload Processing Facility (SPPF). The SHIA Assessment Team reviewed the Configuration Management and experiment turnover documentation provided by SPACEHAB. The SHIA Assessment Team determined 16 experiments had been turned over to SPACEHAB at the SPPF, and an independent verification of the experiment content was performed by SPACEHAB personnel before these experiments were installed in the SPACEHAB Module. The 17 remaining experiments are late stowage items. Four (4) of these late stowage experiments will be turned over to SPACEHAB from facilities external to KSC. However, there will be a detailed turnover inventory by SPACEHAB personnel prior to the experiment delivery to the Pad for installation in the SPACEHAB Module or the Orbiter Middeck. This inventory information is part of the Configuration Management process and is verified against the Interface Control Documents for each experiment. This is the final verification that the experiment is in the approved configuration for flight.

The final conclusion of this independent assessment is the STS-107 payloads have been processed per an approved and documented configuration management process and evidence has been obtained which indicates the process has been executed, thus assuring the integrity of the payload. This assessment has been performed with the collaboration of KSC NASA Security. The risk to the STS-107 mission should be considered LOW.

Purpose

The purpose of this assessment is to evaluate the effectiveness of the processes, procedures, methods and associated implementation used to assure the flight vehicle configuration and integrity of the SPACEHAB Module, payloads and science (including Shuttle mid-deck experiments and FREESTAR) elements to be flown on STS-107.

Methodology and Chronology

The initial research for this assessment was to review the available SSP and SPACEHAB documentation that was applicable to Configuration Management. This review indicated there was very little SSP documentation available that could be used to determine the integrity of SPACEHAB Module or the experiments. No SPACEHAB documentation was available on any Boeing or SPACEHAB web sites that did not require a password for access.

On May 31, 2002, an assessment in-briefing was conducted with the SPACEHAB Vice President of Ground Operations and the KSC ISS/Payload Mission Manager (See Attachment A - Attendee List). During the in-briefing, the SPACEHAB Vice President stated that the information the Assessment Team requested was proprietary and out-of-scope of the contract deliverables. Further discussions attempted to determine what documentation was available and whether the Assessment Team could talk with SPACEHAB personnel that processed the experiments. The SPACEHAB Vice President of Ground Operations and the KSC ISS/Payload Mission Manager informed the Assessment Team that the NASA COTR at JSC would be the future point of contact for all SPACEHAB questions. Furthermore, a SPACEHAB Payload Processing Facility (SPPF) visit and review of processing documents would not be possible without SSP direction.

On June 6, 2002, an in-briefing telecon was conducted with the SSP SPACEHAB Payload Integration Manager (PIM), Contract Officer (CO), Contracting Officers Technical Representative (COTR), and the Flight Manager; and KSC and Boeing Security (See Attachment A - Attendee List). In addition to briefing the SSP on the purpose of the assessment, the Assessment Team inquired what nonproprietary documentation was available to the Team and whether the Team could visit the SPPF and talk with the processing personnel. The Assessment Team was given a list of documentation the COTR thought would be useful for the assessment. The COTR requested the Assessment Team provide a list of the type of documents needed for review. The COTR would coordinate a site visit with SPACEHAB. Searches for the list of documents provided by the COTR determined the documents were on a Boeing password protected server.

On June 13, 2002, a list of questions for SPACEHAB was sent to the to the COTR. These questions were forwarded to SPACEHAB on June 14, 2002.

Meanwhile, NASA HQ CODE M had received inquires concerning the purpose of this assessment. On June 14, 2002, a telecon was conducted with NASA HQ CODE M by the Assessment Team and the JSC SSP COTR (See Attachment A - Attendee List), to provide necessary information on the subject assessment. SPACEHAB believed this was

to be a comprehensive assessment and might affect their work schedule. CODE M agreed with the need for the assessment but would not get involved unless the Assessment Team had difficulty obtaining documentation and requested CODE M assistance.

On June 18, 2002, NASA KSC and Boeing Security arranged a visit to the SPPF, and invited the SHIA Assessment Team to accompany the Security Team. The SPACEHAB Vice President of Ground Operations discussed the personnel and facility security processes and conducted a walkdown of the facility.

On June 20, 2002, the COTR informed the Assessment Team that the SSP had directed his support of the assessment cease unless the assessment was approved by the Program Office. SPACEHAB had refused to support the assessment because their understanding of the assessment effort was out-of-scope of the contract. Based on this information, the Assessment Team decided to address the questions to the SSP rather than SPACEHAB.

On June 21, 2002, a list of questions for the SSP was sent to the COTR. The COTR suggested a telecon to review the SPACEHAB integration process from start to finish. The telecon was scheduled for June 27, 2002. In addition, the Assessment Team requested access to the JSC Payload Safety Review Panel (PSRP) and the Ground Safety Review Panel (GSRP) database. The Assessment Team had obtained hardcopies of some of the experiment data packages from the KSC GSRP Chairman. It appeared these data packages might provide information about the processing of the experiments at the SPPF or KSC Off-line Labs. Access to this database was obtained from JSC on June 24, 2002.

The June 27, 2002 telecon was rescheduled to July 3, 2002 due to the problem that was found with the Shuttle Orbiters Main Propulsion System flowliners.

On July 1, 2002, an in-briefing telecon was conducted with the FREESTAR Mission Manager. The Mission Manager briefed the experiment processing at GSFC, integration into the FREESTAR, and the operations at KSC, as well as the Configuration Management process. These discussions indicated GSFC does not provide Quality coverage at the experiment developer or vendor facilities. However, all experiment processing at KSC is monitored by GSFC Quality personnel.

Earlier in the assessment, the SPACEHAB Vice President of ground operations stated the information the Assessment Team requested was proprietary and out-of-scope of the contract deliverables. Since applicable information had been difficult to obtain, the Assessment Team wanted to determine what SPACEHAB documentation was a contract deliverable. On June 26, 2002, a copy of the SPACEHAB contract was obtained from ISS/Payloads S&MA. A review of the contract indicated there were a number of documents categorized as contract deliverables that may contain the information necessary to complete this assessment. An email requesting these documents was sent to the COTR on July 2, 2002.

On July 3, 2002, a telecon was conducted with the COTR, the SSP Flight Manager/Integration Safety Manager, NASA and Boeing Security (See Attachment A - Attendee List). The Assessment Team reviewed what had been accomplished to the present and reiterated NASA's contractual and ethical requirements for handling corporate proprietary information. NASA KSC Security briefed their concerns and plans. The

COTR stated SPACEHAB no longer had a concern about their proprietary documentation as long as it would be protected. The COTR then explained the SPACEHAB Integration process, the SSP "insight" of the process, and the contract deliverables. In addition, the COTR stated the documents that had been requested would be copied by SPACEHAB and sent to the COTR and would then be sent to the SHIA Assessment Team.

On August 12, 2002, the documents were sent to the SHIA Assessment Team. The SHIA Assessment Team did an extensive review of the Experiment Turnover and Preflight Integration forms to understand the process. Of the requested information, the SPACEHAB Experiment Integration and Flight Certificates and the attached Experiment Turnover and Preflight Integration forms provided evidence of a process for insuring the Configuration Integrity of experiments turned over to SPACEHAB for installation into the Module. This documentation also provides evidence the process has been followed. However the SHIA Assessment Team was unable to obtain the copies of the documentation for this process. The remaining experiments scheduled for late stow have not been delivered to SPACEHAB. The Experiment Integration and Flight Certificates and Experiment Turnover and Preflight Integration forms for these experiments will not be available until experiment turnover to SPACEHAB.

Over the next several weeks, numerous questions arose as the SHIA Assessment Team wrote the draft assessment report. This resulted in several emails to the COTR in an attempt to answer questions concerning how the Experiment Turnover and Preflight Integration forms are used in the Configuration Management process.

The SHIA Assessment Team also interfaced with Bionetics, KSC ISS/Payload Processing Quality, and JSC S&MA personnel to determine if these organizations provide Quality coverage in the Off-line labs where experiments are processed prior to turnover to SPACEHAB. These organizations only provide Quality functions in the Off-line labs when requested by the Experiment Developer or NASA for CODE U sponsored experiments.

On November 8, 2002, the SHIA Assessment Team requested the Interface Control Documents (ICD) for all the experiments to be flown on STS-107. Excerpts of the ICDs for the 16 experiments that have been turned over to SPACEHAB for installation into the Module were received on December 5, 2002. The SHIA Assessment Team compared several Experiment Turnover and Preflight Integration forms to the ICDs and verified they agreed. Discussions with Boeing Quality personnel at the SPPF verified that they perform the turnover inventory, compare the inventory to the ICD, and forward this information to Boeing Huntsville Configuration Management personnel for the final configuration verification.

Assessment Documentation

NSTS 07700 Volume IV, Configuration Management Requirements.
 NSTS 21095 SPACEHAB Payload Integration Plan.
 NSTS 21426 SPACEHAB-General Research/Logistics Missions Carrier Integration Plan.
 NSTS 21426 Annex 1 Payload Data Package Annex.
 NAS 9-97199 Contract for SPACEHAB Module Integration and Operations Services.
 JSC-29270B, STS-107 CODE U Payload Phase 0/I/II/III Integrated Ground Safety Compliance Data.
 NAS 9-97199 Contract for SPACEHAB Module Integration and Operations Services
 DRL No. 7 STS-107 SDSPACEHAB Safety Analyses & Hazard Analyses Reports.
 FREESTAR Integrated Ground Safety Data Package, Phase II/III

MDC W5162, SPACEHAB Program Configuration Management Plan.
 MDC 2000W5800C, Mission Requirements and Allocations Document for STS-107.
 MDC 99W5794, STS-107 SPACEHAB Phase III Ground Safety Review Data.
 MDC 94W5719B SPACEHAB PAYLOAD PROCESSING FACILITY
 EXPERIMENTER'S HANDBOOK
 STS-107 SPACEHAB Experiment Integration and Flight Certificates.
 SPI-EI047B, SPACEHAB Experiment Turnover and Preflight Integration Forms.
 ICD-SH/PAYLOAD/STS-107 SPACEHAB/Payload Interface Control Documents

L&L VOL II P/L - ANNEX KR4 - SPACEHAB RESEARCH/LOG (STS-107) PRD.
 L&L VOL II P/L - ANNEX LA - FREESTAR PRD.

Definitions of Important Assessment Terms

Observation: Factual information/data noted during the performance of an audit/assessment.

Finding: A conclusion/judgment resulting from the execution of an assessment/audit, which is supported by observations.

Recommendation: A suggested/proposed action, response and /or solution to findings.
 Note: Acceptance and/or implementation of a recommendation are not a requirement.
 Recommendations are provided to assist/support resolution of findings.

Assessment Results

1. Process to Verify "closed out" Experiments Prior to Installation.

Observation

The SHIA Assessment Team discussed with the COTR whether there was a process to verify that "closed out" flight packages/experiments provided by outside sources meet approved specifications. The COTR stated that the Experiment Integration and Flight Certificates are provided by the experiment Originator and are part of the SPACEHAB Integrated Readiness Review. The Flight Certificates are the only verification (to our knowledge) of the integrity of experiments that are processed in facilities that do not have independent Quality support. The COTR requested that SPACEHAB provide the Flight Certificates to the SHIA Assessment Team on July 3, 2002. The Flight Certificates for the experiments that had been turned over to SPACEHAB for installation into the Module were received from the COTR on August 19, 2002. Also received with the Flight Certificates were the Experiment Turnover and Preflight Integration Forms. These forms were part of the experiment turnover process and had not been specifically mentioned in previous discussions with the COTR. The SHIA Assessment Team did an extensive review of the Experiment Turnover and Preflight Integration forms to understand the process. The Turnover forms are also part of the Configuration Management process. The Turnover forms provided an independent look at the content of the experiments. The turnover process for experiments installed in the SPACEHAB Module or the Orbiter Middeck, utilize the SPACEHAB SPI-EIO47 Appendix G process. The experiments are turned over from the Payload Developer with a Flight Certificate and the Acceptance Data Package. SPACEHAB verifies the part numbers and then cleanliness inspections, sharp edge inspections, and weight and balance are performed. SPACEHAB personnel compare the turnover inventory forms to the Interface Control Document (ICD) for each experiment. Attachment D shows a sample of the Experiment Integration and Flight Certificate and the Experiment Turnover and Preflight Integration forms. Attachment E is an excerpt of the ICD for that experiment. Late stow experiments will also have a turnover inventory performed. Attachment C lists the late stow experiments.

Finding

The SPACEHAB Experiment Integration and Flight Certificates, the Experiment Turnover and Preflight Integration forms, and the ICDs provide evidence of a process for insuring the Configuration Integrity of experiments turned over to SPACEHAB for installation into the Module and Orbiter Middeck. This documentation also provides evidence a process has been followed. However, the SHIA Assessment Team was not permitted to review the SPI-EIO47 procedure or the complete ICDs for this process.

While the Assessment Team was reviewing the Experiment Turnover and Preflight Integration forms, they noted that some experiments did not have a "Q" Buy on Appendix G, Item 2.3, the Material Acceptance Tag (MAT). The Assessment Team requested the COTR have SPACEHAB explain the significance of the MAT tag since some experiments have no "Q" buy on this item, e.g. HLS MPFE, AMS, and ZCG.

SPACEHAB stated the MAT is a Boeing provided parts tag for Boeing provided hardware. A MAT is not required for experimenter provided hardware. There is no "Q" by the item that is experiment provided hardware and does not include Boeing provided hardware. There were some payload Appendix G cases where a "Q" was found, but there was either an annotation that the MAT was not required or the "Q" existed with no annotation. SPACEHAB stated all of these cases are correct because the owners and implementers (i.e. the SPACEHAB technicians and engineers) of the Appendix G process understand a MAT is not required for payload hardware. SPACEHAB stated that more specificity in the Appendix G would clarify the intent of the block. SPACEHAB is reviewing two options for updating the Appendix G line item that will require the QE to take positive action by placing an X in a 'not required' block and signing every task.

Recommendation

None

2. SSP SPACEHAB CoFR Verification.**Observation**

The Assessment Team conducted a telecon with the SPACEHAB COTR on July 3, 2002 to discuss the SSP SPACEHAB CoFR 3 and CoFR 6 Reviews. The SPACEHAB COTR provided a detailed overview of the contract documentation provided to the SSP and the SSP responsibilities in the CoFR process. The COTR provided the SHIA Assessment Team with an overview of the end-to-end process that is used to provide insight into the integration process leading to the Integrated Readiness Review and the final CoFR signoff by the COTR. The COTR and the SPACEHAB Vice President of Flight Services sign the CoFR 3 endorsement.

Finding

Based on the verbal description provided by the COTR, the SPACEHAB CoFR process is well understood and in accordance with SSP CoFR requirements.

Recommendation

None

3. Quality Coverage of Code U Experiments Processed at the SPPF and Integrated into the SPACEHAB Module.

Observation

JSC provided Quality coverage for all CODE U JSC Human Life Sciences (HLS) experiments integrated into the SPACEHAB Module at the SPPF. The SHIA Assessment Team was unable to obtain processing documents for any Code U experiment processed at the SPPF and integrated into the SPACEHAB Module. There is no JSC or KSC Quality coverage provided in the SPPF Customer Work Areas (CWA). However, portions of the HLS experiments were processed in the Baseline Data Collection Facility in the O&C Building at KSC. The NASA KSC ISS/Payload Processing Directorate (UB) provided Quality coverage for some of the processing procedures. Quality coverage for these experiments is documented in a Memorandum Of Agreement (MOA) or is requested in the Launch & Landing Program Requirements Document (PRD). Reference Attachment C, Note 8 and the "Quality provided by" column in the Table of Experiments for the experiments that had Quality coverage provided by JSC and KSC.

Finding

The MOA process for requesting support in the O&C Building Off-line labs is based on a 1992 Agreement. UB Quality has a good working relationship with the JSC HLS Quality personnel and there doesn't appear to be a problem with scheduling support. However, it would appear the MOA request for support should be standardized to the more formal PRD process.

Recommendation

Assess the MOA approach for requesting UB Quality support in the SPPF and O&C Off-line Labs to determine if the PRD process would be more appropriate.

4. Bionetics Quality Support for Code U Experiments Processed in the Life Science Support Facility (LSSF).

Observation

The SHIA Assessment Team conducted a telecon with the Bionetics LSSF Manager on September 25, 2002. The Assessment Team wanted to know whether Bionetics provided Quality support to the Payload Developer when an experiment was processed in the LSSF labs. Bionetics only provides Quality support if requested by the Payload Developer. Bionetics provided Quality coverage for the Biological Research in Canisters (BRIC-14) and the BIOTUBE Magnetic Field Apparatus (MFA). Reference Attachment C, Note 8 and the "Quality provided by" column in the Table of Experiments for the experiments that had Quality coverage provided by Bionetics.

Finding

The experiments processed in the LSSF are sponsored by NASA HQ CODE U. The agreement for Quality support for these experiments is with CODE U. This support is requested by the Ground Support Requirements Document (GSRD) process.

Recommendation

None

5. Configuration Management Processes the GSFC Shuttle Small Payload Project Uses to Document the Configuration of the FREESTAR Experiments.**Observation**

A telecon was conducted with the GSFC FREESTAR Mission Manager on July 1, 2002. The Mission Manager provided a description of each experiment, where it was assembled, and the contractor responsible for the experiment. The Mission Manager explained the GSFC Configuration Management process and the use of the Configuration Confirmation Log (CCL) to document the FREESTAR and experiment interfaces. The Mission Manager also indicated that GSFC does not provide Quality coverage at the experiment developer or vendor facilities. However, once the experiment is turned over to GSFC, it remains in a secure environment. The GSFC Shuttle Small Payloads Project (SSPP) Configuration Management personnel provided copies of the Configuration Confirmation Log (CCL) to the SHIA Assessment Team. The CCL process only provides verification of the interfaces of the experiments to the FREESTAR and the FREESTAR to the Orbiter. The CCL does not provide information on the experiment content. The SHIA Assessment Team could not find any experiment or FREESTAR Ground Safety Review Panel (GSRP) or Payload Safety Review Panel (PSRP) data packages on the JSC Payload Data Management System database. The SHIA Assessment Team obtained a hardcopy of the GSRP data from the KSC GSRP chairman. The GSRP data packages detailed the processing of the experiments in the KSC Multi Payload Processing Facility (MPPF). Attachment F is a list of the experiments that comprise the FREESTAR and where they were processed at KSC prior to integration in to the Orbiter Payload Bay.

Finding

Discussions with GSFC QA personnel at KSC confirmed the experiments are closely monitored during all processing phases at KSC. The process is well understood by the Quality personnel and is adequate.

Recommendation

None

Attachment A

Assessment In-Briefings

In-briefing, 5-31-2002.

Attendees:

Martin McLellan, Vice President Ground Operations, SPACEHAB
Todd Corey, NASA KSC ISS/Payloads STS-107 Mission Manger
Mark Gordon, NASA KSC SHIA IA Lead
Bill Glaser, TYBRIN
Chuck Handley, TYBRIN

In-briefing telecon, 6-5-2002.

Attendees:

Frank Moreno, SSP SPACEHAB PIM
Vanessa Ellerbe, STS-107 Flight Manager
Ron Johnson, CO
Tom McPherson, JSC SSP SPACEHAB COTR
Gary Fooks, NASA KSC Security
Joan Hines, Boeing Security
Mark Gordon, NASA KSC SHIA IA Lead
Bill Glaser, TYBRIN
Chuck Handley, TYBRIN

Information telecon, 6-14-2002.

Attendees:

Stan Nichols, NASA HQ CODE M
Tom McPherson, JSC SSP SPACEHAB COTR
Mark Gordon, NASA KSC SHIA IA Lead
Bill Glaser, TYBRIN
Chuck Handley, TYBRIN

In-briefing telecon, 7-1-2002.

Attendees:

Tom Dixon, FREESTAR Mission Manager
Mark Gordon, NASA KSC SHIA IA Lead
Bill Glaser, TYBRIN
Chuck Handley, TYBRIN

Information telecon, 7-3-2002.

Attendees:

Tom McPherson, JSC SSP SPACEHAB COTR
Skip Larsen, SSP Flight Manager/ Integration Safety Manager
Todd Corey, NASA KSC ISS/Payloads STS-107 Mission Manger
Mark Gordon, NASA KSC SHIA IA Lead
Bill Glaser, TYBRIN
Chuck Handley, TYBRIN
Gary Fooks, NASA KSC Security
Joan Hines, Boeing Security

Attachment B

STS-107 SPACEHAB/FREESTAR CONFIGURATION INTEGRITY Independent Assessment Plan

1. **Assessment Lead:** Mark Gordon
Assessment Team: Bill Glaser and Chuck Handley (TYBRIN Corp)
2. **Project Name:** STS-107 SPACEHAB/FREESTAR Configuration Integrity
3. **Objectives:**

To evaluate the effectiveness of the processes, procedures, methods and associated implementation used to assure the flight vehicle configuration and integrity of the SPACEHAB Module, payloads and science (including Shuttle mid-deck and FREESTAR) elements flying on STS-107.

4. **Customer/Advocacy:** Associate Director, Safety and Mission Assurance/SHIA
5. **Responsibilities/Authority:** QA Business Objectives Agreement (BOA)
6. **Project Summary:**

This assessment will evaluate the Configuration Integrity processes for the experiments flown in the SPACEHAB Module, the Orbiter Middeck, and the FREESTAR.

7. **Requirements:**
 - a. Establish an Assessment Checklist (KDP-P-2351, Rev. C) with requirements/attributes to be evaluated for this assessment. Relevant documents include:
 1. NSTS 07700 Volume IV, Configuration Management Requirements.
 2. NSTS 21095 SPACEHAB Payload Integration Plan.
 3. NSTS 21426 SPACEHAB-General Research/Logistics Missions Carrier Integration Plan.
 4. NSTS 21426 Annex 1 Payload Data Package Annex.
 5. JSC-29270B, STS-107 CODE U Payload Phase 0/I/II/III Integrated Ground Safety Compliance Data.
 - b. Establish an overall schedule for the assessment, including document reviews, checklist preparation and coordination, the in-brief, interviews, field visits, documentation, the out-brief, and final report distribution. The Associate Director, Safety & Mission Assurance shall participate in the in-brief and out-brief, and shall have overall authority over the scope of this effort.
 - c. Obtain an assessment control number from the Assessment Division of the Safety, Health and Independent Assessment Directorate.
 - d. Coordinate the assessment checklist and supplementary questions with the Associate Director, Safety & Mission Assurance.

- e. Assess the appropriateness of the requirements.
- f. Conduct interviews and collect evidence of compliance such as documented processes and procedures as available for each requirement.
- g. Assess the degree of implementation and effectiveness for all lockout/tagout work performed in support of the Space Shuttle Program.
- h. Document all findings, observations and recommendations.
- i. Coordinate and obtain approval on report contents prior to final release and distribution.
- j. Generate any corrective/preventive/improvement action items required to reach full compliance.

8. Results:

- a. Upon completion of the assessment, a draft report will be generated documenting findings, observations and recommendations.
- b. Draft report will be reviewed and coordinated with the Chief, Assessments Division.
- c. Prior to finalizing the report,
 - (1) The assessed organizations (PH and USA) will be given the opportunity to review the draft report, and discuss suggestions for clarification or corrections with the panel through the assessment lead.
 - (2) The Associate Director, Safety and Mission Assurance will be provided a copy for discussion, clarification and/or further investigation.
- k. Final report will be released and distributed to all affected parties.

9. Reporting:

- a. The assessment lead will keep the Chief, Assessments Division and the Associate Director, Safety and Mission Assurance informed of progress and/or issues, especially those that may affect schedule.
- b. Corrective/preventive/improvement actions will be recorded and tracked by TYBRIN for the Assessment Lead.
- c. The organization responsible for working the corrective/preventive/improvement action(s) shall report to the Safety & Mission Assurance (S&MA) Board and/or the Safety and Health Council upon their request.

10. **Schedule:** Complete by October 31, 2002.

11. **Resources:** Estimate 0.2 FTE of effort.

Signed
Bert Garrido
Associate Director, Safety & Mission Assurance

Attachment C**NOTES FOR USING STS-107 EXPERIMENTS TABLE**

This table is an attempt to give a quick overview of the several hundred pages of information that have been perused to try to determine if there were government or other independent eyes on these experiments when they were being processed. The following are general notes:

1. Experiments that were processed in the SPACEHAB Payload Processing Facility (SPPF) off-line labs by the Payload Developers did not have independent verification according to the SPACEHAB Vice President of Ground Operations.
2. CODE U Human Life Science (HLS) experiments integrated into the SPACEHAB Module in the SPPF have Quality coverage provided by JSC Mission and Project Management Office (SM) QA.
3. Experiments processed in the SPPF and turned over to SPACEHAB for integration into the Module are certified by the responsible payload organization by a signed Experiment Integration and Flight Certificate (EI&FC). The components of the experiment are inventoried on an Experiment Turnover and Preflight Integration (ET&PI) form by SPACEHAB personnel (See Attachment D). This is an "independent eyes" check and is indicated by an "X" in the FC/ET column.
4. Experiments processed in the Life Science Support Facility (LSSF) by the Payload Developers did not have Bionetics Quality coverage. Bionetics was requested to provide Quality coverage for the Biotube and BRIC experiments processed in the LSSF.
5. There was some conflicting information between the Ground Safety Review Packages (GSRP), Payload Safety Review Packages (PSRP) and the Mission Requirements and Allocations Document (MRAD) as to where the experiment was processed. The Table contains the best guess.
6. Late stow experiment requirements are defined in the Time-critical Ground Handling Requirements (TGHR) List. Late Stow experiments are identified by TGHR in the Late Stow column. Late stow experiments will have an EI&FC and ET&PI inventory done when turned over to SPACEHAB for delivery to KSC. This indicates that the late stow experiments processed in the SPPF will have "independent eyes" look at them.
7. Experiments with "Haz" in the Where Processed column had steps in the preparation process that were considered hazardous in the Ground Safety Review Data. This could include eye protection when mixing chemicals or a process that produced fumes and required a Fume Hood.
8. The "QA provided by" column lists the organization that provided Quality coverage (as best as can be determined) for an experiment. KSC Quality coverage is requested through the L&L PRD. Some experiments requested KSC Quality coverage by MOA. This is indicated in the "QA provided by" column.

STS-107 SPACEHAB Experiments Processing Table

#	Experiment	Originator	Flight Location	Where Processed	QA provided by	Late Stow	FC ET
1	APCF – Advanced Protein Crystallization Facility	ESA	Module Aft BH	SPPF		TGHR L-40	
2	ARMS - Advanced Respiration Monitoring System	SPACEHAB ESA	Module Fwd BH Module Floor	SPPF			X
3	AST 10/1 - Astroculture Plant Growth Chamber	Code U WCSAR	Module Aft BH	LSSF		TGHR L-43	
4	AST 10/2 – Glovebox	Code U	Module Rack	LSSF		TGHR L-48	
5	BDS-05 – Bioreactor Development System-05	Code U	Module Aft BH Middeck	O&C Haz	UB MOA	TGHR L-42 L-24	
6	Biobox	ESA	Module Aft BH	FIT		TGHR L-40	
7	Biopack	ESA	Middeck	FIT O&C		TGHR L-20	
8	Biotube- Magnetic Field Apparatus	Code U	Module Aft BH	LSSF	Bionetics	TGHR L-48	
9	BRIC – Biological Research in Canisters	Code U	Middeck	LSSF Haz	Bionetics	TGHR L-24	
10	CIBX (Instrumentation Technology Associates) Biomedical Experiment	Code U ITA, Inc Commercial	Module Aft BH	LSSF O&C	UB MOA	TGHR L-50	
11	CEBAS - Closed Equilibrated Biological Aquatic System	SPACEHAB OHB	Middeck	O&C		TGHR L-19	
12	CM-2 Combustion Module-2	Code U					
	a). LSP – Laminar Soot Processes	Code U	Module Racks	SPPF			X
	b). SOFBALL – Structure of Flame Ball at Low Lewis Number	Code U	Module Racks	SPPF			X
	c). Water Mist	Code U	Module Racks	SPPF			X
	d). OARE – Orbital Acceleration Research Experiment System	Code U	Mounted in Payload Bay				
13	CMCPG - Macromolecular Protein Crystal Growth	SPACEHAB Commercial	Middeck	SPPF		TGHR L-24	
14	COM2PLEX – Combined 2 Phase Loop Experiment	SPACEHAB ESA	Module Rooftop	SPPF			X
15	CPCG-PCF - Protein Crystal Growth – Protein Crystallization Facility	Code U CBS&E UA Commercial	Module Aft BH	O&C	UB PRD	TGHR L-40	
16	ERISTO – European Research In Space and Terrestrial Osteoporosis	ESA	Module Aft BH	SPPF		TGHR L-40	
17	Ergometer	Code U/ESA	Module	SPPF			X
18	FAST - Facility for Adsorption & Surface Tension	NASA/ESA	Module Aft BH	SPPF		TGHR L-40	
19	FRESH-2 – Fundamental Rodent Experiments Supporting Health-2	Code U Ames	Module Fwd BH	LSSF	UB	TGHR L-47	

#	Experiment	Originator	Flight Location	Where Processed	QA provided by	Late Stow	FC ET
20	HLS- Human Life Sciences	All Code U					
21	PhAB-4 – Physiology and Biochemistry - 4		Middeck, Module	O&C	UB MOA	TGHR L-24	
	a). Latent Virus						
	b). PTO - Protein Turnover						
	c). CaKin - Calcium Kinetics during Space Flight						
	d). Renal Stone						
22	MPFE –MicrobialPhysiology Flight Experiment	Part of HLS	Middeck, Module Aft BH	O&C	UB		X
	a). AMS – Automated Microbiology System		Module Aft BH				X
23	Sleep-3 – Sleep-Wake Actigraphy and Light Exposure During Spaceflight		Middeck			L-24?	
24	Additional HLS Support Hardware:						
	a). EOR/F – Enhanced Orbiter Refrigerator/Freezer		Module Aft BH	SPPF IVT then to O&C	JSC		X
	b). TEHM – Thermo Electric Holding Module		Module Aft BH	SPPF IVT then to O&C	JSC		X
	c). Centrifuge		Module Fwd BH	SPPF	JSC		X
25	MGM - Mechanics of Granular Materials	Code U	Module Aft BH	SPPF			X
26	MSTRS – Miniature Satellite Threat Reporting System	SPACEHAB DOD	Module Fwd BH & Rooftop	SPPF			X
27	OSTEO - Osteoporosis Experiment in Orbit	SPACEHAB/ CSA	Middeck	SPPF		TGHR L-21	
28	SAMS–FF – Space Acceleration Measuring System - Free Flyer	NASA/GRC	CM-2 Dbl Rack, Module Fwd BH, Module Aft BH	SPPF			X
29	SHFDF - SPACEHAB Flight Data File	SPACEHAB	Module rack Middeck			L-48 L-24	
30	StarNav – Star Navigation	SPACEHAB Texas A&M	Module Rooftop	SPPF			X
31	S*T*A*R*S Bootes – Space Technology & Research Students - Bootes	SPACEHAB	Module Aft BH	ASTROTEC		TGHR L-40	
32	VCD FE - Vapor Compression Distillation - Flight Experiment	NASA/ISS	Module rack	SPPF			X
33	ZCG-01- Zeolite Crystal Growth Furnace	Code U	Module Aft BH, Module rack, Middeck	SPPF Level IV then to O&C		TGHR L-40 L-24	

Attachment D

Sample Experiment Integration and Flight Certificate and Experiment Turnover and Preflight Integration forms.

3

SPACEHAB PAYLOAD INTEGRATION AND FLIGHT CERTIFICATE

PAYLOAD NAME: ZCG-1 MISSION: STS-107

The responsible payload organization hereby certifies that the below-listed conditions for payload integration and flight are met, and that any associated open items, noncompliances, or constraints affecting this certification are identified in the attached list of exceptions. Upon closure of the identified exceptions, the payload is ready for integration into the SPACEHAB module and for its intended mission.

Table with 2 columns: CONDITION FOR INTEGRATION AND FLIGHT, RESPONSE. Rows a-f with 'YES' responses.

Signed:

Signature of Nurcan Bac, PED, Northeastern University

Date: 2/11/02

EXPERIMENT TURNOVER AND PREFLIGHT INTEGRATION

SPI-EI047B

APPENDIX G

DATA RECORD FOR EXPERIMENT ZC6

- Preop 1.3 PSR# / 037 Not required TL
- Task 2.1 Verify receiving documentation complete.
 - 2.2 Receive experiment hardware from experimenter representative.
MDA rep J. Junt
Exp rep Walt A. Proctor
 - 2.3 Record part numbers on following sheet and create MAT tag for each item.
as required.
 - 2.3.1 Verify toxicity decal requirements per ^{SCE} FAA 179. 5519A
none required, X (installed)
 - 2.4 Verify no sharp edges.
 - 2.5 Verify cleanliness.
 - 2.6 Photograph items Not performed TL
 - 2.7 Weight 22.38 lb. Scale Q 2102 Due Date 4/17/02
 - 2.8 Xcg N/A Ycg 9.0" Zcg 10 7/8" 10.875
Reference point Left Bottom 5
 - 2.9 Turnover to Logistics or installation/testing Engineer

Postop 1.0 Completed (Fax data sheet)

TL JT 2/11/02
 TL JT 2/11/02
 TL JT 2/12/02
 TL JT 2/11/02
 QE _____
 TL JT 2/4/02
 T M 70645 2/11/02
 T N 70645 2/11/02
 T M 70645 2/11/02
 T N 70645 2/11/02
 T M 70645 2/11/02
 TL JT 2/11/02
 TL _____

Attachment E

Sample of Section 1.6. SPACEHAB/Payload Interface Control Document

ICD-SH/ZCG-1/STS-107A

SPACEHAB/ZCG-1 ✓
Interface Control Document

SPACEHAB Integration - BOEING

SPACEHAB STS-107

DECEMBER 2001


The Boeing Company
Huntsville, Alabama

CONTROLLED
COPY

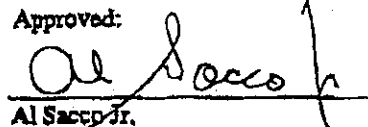
ICD-SH/ZCG-1/STS-107A
DECEMBER 2001

SPACEHAB/ZCG-1 INTERFACE CONTROL DOCUMENT

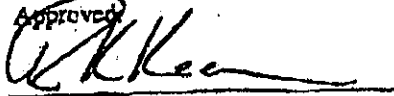
Approved:


Doug A. Biggs
Senior Manager
Integration and Operations
SPACEHAB Program
BOEING - Huntsville

Approved:


Al Sacco Jr.
Principle Investigator

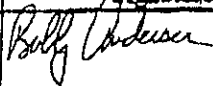
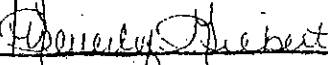
Approved:


R. K. Keen
Chief Mission Engineer
SPACEHAB Program
BOEING - Huntsville

Approved:


Nurcan Bac
Program Manager

The Boeing Company
SPACEHAB Program Experiment Integration
499 Boeing Boulevard, MC JR-08
P.O. Box 240002
Huntsville, Alabama 35824-6402

Signatures Req'd.	Name	Signature	Date
ICD Engineer, Payload Coordinator	Steven W. Pyle BOEING-HSV		12-12-01
Configuration MGT	Beverly Amacher BOEING-HSV		14 DEC 2001

1.6. Flight Hardware

Flight hardware shall be as specified in Table 1-1. The part numbers listed in **bold** will be verified by BOEING during the hardware turnover process pre- and post-mission. The turnover dates and ground processing requirements for all of the payload flight hardware are provided in detail in Section 3 of the ICD Appendix A.

Table 1-1. Flight Hardware

Item	Part Number	Serial Number	Provided By	Stowage	Quantity	Location	Remarks
Autoclave Activation Tool	WPI-0328	N/A	PED	No	2	Middeck	Stowed in Clear Autoclave Box.
Autoclave Clear	ZGBE003	N/A	PED	No	12	Middeck	Stowed in Clear Autoclave Box
Autoclave Extraction Tool	F4-10247	N/A	PED	No	1	Middeck	Stowed in Clear Autoclave Box.
Autoclave in Al Housing (female)	F4-70402-3	N/A	PED	Yes	7	Middeck	Male (F4-70388-3) and Female (F4-70402-3) Autoclaves will be assembled and provided in Ziplock bag.
Autoclave in Al Housing (male)	F4-70388-3	N/A	PED	Yes	7	Middeck	Male (F4-70388-3) and Female (F4-70402-3) Autoclaves will be assembled and provided in Ziplock bag.
Autoclave in Ti Housing (female)	F4-70402-1	N/A	PED	Yes	2	Middeck	Male (F4-70388-1) and Female (F4-70402-1) Autoclaves will be assembled and provided in Ziplock bag.
Autoclave in Ti Housing (male)	F4-70388-1	N/A	PED	Yes	2	Middeck	Male (F4-70388-1) and Female (F4-70402-1) Autoclaves will be assembled and provided in Ziplock bag.
Autoclaves in Al Housing (female)	F4-70402-5	N/A	PED	Yes	13	Middeck	Male (F4-70388-5) and Female (F4-70402-5) Autoclaves will be assembled and provided in Ziplock bag.

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Table 1-1. Flight Hardware (continued)

Item	Part Number	Serial Number	Provided By	Stowage	Quantity	Location	Remarks
Autoclaves in AI Housing (male)	F4-70388-5	N/A	PED	Yes	13	Middeck	Male (F4-70388-5) and Female (F4-70402-5) Autoclaves will be assembled and provided in Ziplock bag.
Clear Autoclave Box	ZGBE011	N/A	PED	Yes	1	Middeck	Box contains Clear Autoclaves, Cover Removal Tool, Autoclave Extraction, two Activation Tools, four pair of gloves and two 18" X 3.5" poly bags.
Cover Removal Tool	F4-70406	N/A	PED	No	1	Middeck	Stowed in Clear Autoclave Box
Poly bag	274-29H	N/A	PED	No	2	Middeck	Clear Autoclave activation bags. Made from 18" X 20" ziplock. Stowed in Clear Autoclave box.
Biological Gloves	6005PFM	N/A	PED	Yes	8	Middeck	Stowed in the Clear Autoclave Box. Four pair.
ZCG Facility Assembly	F4-10243-1	N/A	PED	No	1	SH	ZCG Facility Assembly weight includes the weight of the ZECS, Furnace, and Mounting Plate
ZCG Furnace Module Assembly	F4-36370-1	N/A	PED	No	1	SH	Weight included in ZCG Facility Assembly weight.
ZCG Mounting Plate	F4-36500-1	N/A	PED	No	1	SH	Weight included in ZCG Facility Assembly weight.
Zeolite Electronic Control System	NAS 90-1568	90003	PED	No	1	SH	Weight included in ZCG Facility Assembly weight.
3.5 inch 1.44 Megabyte Disk	051111-12881	N/A	SH	Yes	3	SH	
Bolt	NAS6704HU14	N/A	SH	No	8	SH	To mount ZCG Furnace Assembly to Bulkhead

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Table 1-1. Flight Hardware (continued)

Item	Part Number	Serial Number	Provided By	Stowage	Quantity	Location	Remarks
Double Experiment Mounting Plate	9062704-505	N/A	SH	No	1	SH	
Double Rack Soft Stowage Kit	9K60061-501	N/A	SH	No	1	SH	Actual volume used is one half bag.
Screwdriver, Battery Powered w/battery installed	SED33109793-301	N/A	SH	Yes	1	SH	
SH Soft Stowage Bag (half bay)	pS70101-401	N/A	SH	Yes	1	SH/Middeck	Contains ZCG module stowage items.
Washer	NAS1587-4C	N/A	SH	No	8	SH	
ZCG Furnace Assembly Power Cable	9062792-507	N/A	SH	No	1	SH	Cable will be pre-routed and connected prior to launch.
ZECS Data Cable	9064029-507	N/A	SH	No	1	SH	ZECS Data Cable will be pre-routed and connected prior to launch.
35mm Camera	SED3110611-305	N/A	SSP	No	1	SH	Shared mission resource
Cable, DC PWR Adapter (25')	SED39126013-301	N/A	SSP	No	1	SH	Shared resource to be used on a contingency basis.
Cable, PGSC DC PWR (6')	SED39122875-301	N/A	SSP	No	1	SH	Shared resource to be used on a contingency basis
Camcorder Lens 15X	SED33104773-301	N/A	SSP	No	1	SH	Shared mission resource
Camcorder Pwr Cable 15'	SED39122893-301/302	N/A	SSP	No	1	SH	Shared mission resource
Camera Lens 35-70mm	SED33104059-302	N/A	SSP	No	1	SH	Shared mission resource

Table 1-1. Flight Hardware (continued)

Item	Part Number	Serial Number	Provided By	Stowage	Quantity	Location	Remarks
DC PWR Supply Assy (28V -> 20V)	SED39126010-305	N/A	SSP	No	1	SH	Shared resource to be used on a contingency basis
Film Cassette	SED33101584-302	N/A	SSP	Yes	5	SH	
Film Container	SED33101586-302	N/A	SSP	Yes	5	SH	
Hi-8mm Camcorder Tapes	SED33103757-324	N/A	SSP	Yes	2	SH	Dedicated to ZCG use
L-2 Camcorder	SED3310477	N/A	SSP	No	1	SH	Shared mission resource
Middeck Foam	see Remarks	N/A	SSP	No	1	Middeck	See STS-107 CCCD drawing for part numbers and further details.
Middeck Lightweight Locker Shell	see Remarks	N/A	SSP	No	1	Middeck	See STS-107 CCCD drawing for part numbers and further details.
Middeck Lightweight Tray	see Remarks	N/A	SSP	No	1	Middeck	See STS-107 CCCD drawing for part numbers and further details.
PGSC	SDZ39129262-303	N/A	SSP	No	1	SH	Shared resource to be used on a contingency basis.
RS232C (25-9 pin) Cable	SED33103335-305	N/A	SSP	Yes	1	SH	Contingency use with shared PGSC
Spare Screwdriver Batteries	SED33109793-323	N/A	SSP	Yes	12	SH	
Ziplock bag	528-50000-2	N/A	SSP	Yes	6	SH	For stowage of used screwdriver batteries.

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Attachment F

STS-107 FREESTAR Experiments Processing Table

#	Experiment	Originator	Integrated into FREESTAR	Processed at KSC	Quality Coverage
1	CVX-2 Critical Viscosity of Xenon	LeRC Zin Technologies	GSFC	MPPF Post ship test CVX-TST-047	GSFC QA
2	LPT Low Power Transceiver	GSFC HQ CODE M ITT Industries	MPPF	MPPF	GSFC QA
3	MEIDEX Mediterranean Israeli Dust Experiment	Tel Aviv University Orbital Science Corporation	GSFC	MPPF Post ship test T504-TP-210-1	GSFC QA
4	SEM-14 Space Experiment Module	GSFC SSPPO Wallops	MPPF	MPPF	GSFC QA
5	SOLCON-3 Solar Constant Experiment	Royal Meteorological Institute of Belgium	GSFC	MPPF Post ship test SSPP-PROC-150 SSPP-PROC-151	GSFC QA
6	SOLSE-2 Shuttle Ozone Limb sounding Experiment	GSFC Code 916	GSFC	MPPF Post ship test 870-REF-0065	GSFC QA