

NASA JSC
Payload Safety Review Panel
Joint PSRP/SRP Alpha Magnetic Spectrometer-02
Delta Phase III Flight Safety Review Continuation

Minutes of Meeting
January 21, 2011

1.0 INTRODUCTION

1.1 **General:** The Payload Safety Review Panel (PSRP), chaired by JSC/OE/M. Surber, met via teleconference on January 21, 2011, with representatives of the JSC/Engineering Directorate (Jacobs), the Payload Organization (PO), at the Regents Park III Conference Facility for an Alpha Magnetic Spectrometer (AMS)-02 Delta Phase III Flight Safety Review (FSR) Continuation. JSC/NA2450/P. Mensingh, the supporting Payload Safety Engineer (PSE), and R. Rehm, the supporting Safety Engineer (SE), introduced the meeting and attendees (see Attachment 1).

1.2 **Background:** The PSRP held the following previous AMS-02 meetings:

- Helium Venting Technical Interchange Meeting (TIM) on 04/20/00
- Phase 0/I FSR on 01/16/01
- Vacuum Jacket Leakage Special Topic Meeting on 10/11/01
- Gauss Limit Special Topic Meeting on 10/16/01
- TIM on 01/17/03
- Phase II FSR on 05/21-25/07
- Hazard Report (HR) TIM on 10/10/07
- Non-compliance Report (NCR) TIM on 12/10/08
- Burst Disk TIM on 08/13/09
- Phase III Joint PSRP/SRP FSR on 01/12-15/10
- Joint PSRP/SRP TIM on 03/23/10
- Status TIM on 06/22/10
- Delta Phase III Joint PSRP/SRP on 08/03/10

1.3 **Scope:** This meeting focused on the continuation of the Joint PSRP/SRP Delta Phase III review of the AMS-02. The PSRP reviewed no previous action items (AIs) associated with this payload in this meeting.

1.4 **Conclusion:** No agreements and no AIs resulted from this meeting. The PSRP approved and signed six hazard reports (HRs) for Phase 0/III, deleted no HRs prior to or during the review. The Phase III FSR remains open pending final verification closures and completion of the Payload Safety Certificate.

2.0 SIGNIFICANT SAFETY DISCUSSION

2.1 **Safety Assessment:** The PO reported that integration of the STS and ISS hardware and all integrated power and data testing with ISS has been completed. The PO continues to perform operation simulations while waiting for the delayed STS-134 flight.

2.2 **Bonding and Grounding Open Items:** All AMS-02 hardware meets the SSP 30245, Space Station Electrical Bonding requirements except for the eight aluminum tracker radiator strut

brackets and the Multi-Layer Insulation (MLI). All the brackets are anodized and pose little risk of static discharge due to their small size. The radiator itself is bonded and grounded. Non-grounded MLI is internal to the payload with a small exposed area. The MLI coated blankets are cut into sections for covering the tubing sections between brackets. There is little air flow around the MLI and little risk for static discharge.

2.3 Isolation Capacitance Testing Results Summary: The PO presented a summary of the isolation capacitance results of functional testing between A and B buses at the AMS-02 flight power interfaces to address hazard report AMS-02-F17, Safety Verification Method (SVM) 2.3.2. The power bus isolation requirement stipulates that power from two independent ISS power feeds shall provide a minimum of 1-megohm (1M Ω) isolation in parallel with not more than 0.03 microfarads of mutual capacitance. The Task Performance Sheet (TPS) successfully measured isolation resistance for all buses with capacitance both compliant and non-compliant. The PO is working to quantify the capacitance of the EMI filter which may have been included in the capacitance measurement. Most likely, the isolation measurement includes the EMI input filter. If this can be quantified, then it can be subtracted out from the measurements. If the measurement is flawed because the EMI input filter cannot be quantifiably removed, then P-SPIICE analysis may be used. The plan is to reach resolution between the ISS EPS, AMS-02, and Power Distribution System hardware provider within a month. Total power demand from the shuttle arm was measured to be below the 16.7A requirement. The total power is a stack up of the power demand from both buses, individually measured. Using both buses simultaneously would be an off-nominal operation. It is not possible to use both buses simultaneously on the Shuttle. The PSRP considers the safety hazard to be a fairly low risk for propagation.

2.4 Safety Assessment:

2.4.1 Form 1428, Fire Detection and Suppression Reporting Form: *Not applicable to this hardware.*

2.4.2 Form 622, Reflow and Series Payload Hardware Reflight Assessment Reporting Sheet: *Not applicable to this hardware.*

2.4.3 Form 1114A, Certificate of Payload Safety Compliance: *Not presented but the rationale was discussed in this meeting.* The 15 years safe life is based upon materials and structures. The PO will submit a revised draft of the certificate reflecting that there is no limit on the safe life.

2.4.4 Form 906, ISS Cargo/Experiment Flight Safety Certificate Form: *Not applicable to this hardware.*

2.5 Hazard Report Discussion:

2.5.1 AMS-02-F01, Structural Failure of Hardware: *Approved as modified and signed at the Phase III level.*

2.5.2 AMS-02-F05, Rupture of AMS-02 Pressurized Systems: TRD Gas System (Xe & CO₂), Tracker Thermal Control System, Thermal Control Systems: *Approved as modified and signed at the Phase III level.*

2.5.3 AMS-02-06, Excessive Thrust/Overturning Moments: *Approved as modified and signed at the Phase III level.* The remaining open SVTL was closed based on the Shuttle declining the Payload Interface Revision Notice (PIRN) because the violation of the AMS-02 magnetic field being continuously present during all orbiter based operations and ISS operations does not occur.

2.5.4 AMS-02-F07, Excessive Field Strengths: EMI, Magnetic (DC Field): *Approved as modified and signed at the Phase III level.*

2.5.5 AMS-02-F10, Flammable Materials in the Payload Bay: *Approved as modified and signed at the Phase III level.*

2.5.6 AMS-02-F17, Electrical Power Distribution Damage: *Approved as modified and signed at the Phase III level.* The PO could not ensure that all heater strings initiated at the same time. The resistance values from the heater spec sheets matched what the Power Distribution System (PDS) developers used in their analysis. Memo (ESCG-4295-10-ADV SY-MEMO-0040, “SSRMS Current Limits,” dated September 20, 2010) was attached to the HR.

JSC/NA2450/P. Mensingh
Payload Safety Engineer

JSC/NA2450/B. Trust
Technical Writer

JSC/NA2450/R. Rehm
Safety Engineer

Status of Hazard Reports Presented

(Note: See the text of the minutes for more details.)

The PSRP reviewed no HRs in this meeting.

Number	Title	Status	Comments
1114A	Certificate of Payload Safety Compliance	Not approved	2.4.3
AMS-02-F01	Structural Failure of Hardware	Approved	2.5.1
AMS-02-F05	Rupture of AMS-02 Pressurized Systems: TRD Gas System (Xe & CO2), Tracker Thermal Control System, Thermal Control Systems	Approved	2.5.2
AMS-02-F06	Excessive Thrust/Overturning Moments	Approved	2.5.3
AMS-02-F07	Excessive Field Strengths: EMI, Magnetic (DC Fields)	Approved	2.5.4
AMS-02-F10	Flammable Materials in the Payload Bay	Approved	2.5.5
AMS-02-F17	Electrical Power Distribution Damage	Approved	2.5.6

Previous Action Item Status

<The PSRP reviewed/assigned no previous AIs associated with this payload in this meeting.>

ATTACHMENT 1

Payload Safety Review Attendance Log

Payload: AMS-02 Delta Phase III Flight Safety Review

Meeting Date: January 21, 2011

Mail Code	Name	Phone 281	X
CHAIRPERSON			
OE	Surber, M. R.	483-4626	X
SUPPORT PERSONNEL			
CB	Rickard, J.	483-3760	X
DA8/USA	Knutson, D.	483-4405	X
EA441	Henning, G. N.	483-0533	X
EA451	Punch, D.T.	244-0678	X
NE14	Guidry, R. W.	244-5510	X
NT/SAIC	Nobles, D.	335-2129	X
Boeing	Lively, C.	226-5824	X
LMCO/SF	Ghalayini, S.	218-3111	X
ESCG/JACOBS	Manha, W.	461-5711	X
ESCG/JACOBS	Hall, C.	461-5565	X
ESCG/JACOBS	Shuhatovich, A.	461-5805	X
ESCG/JACOBS	Russell, D.	461-5144	X
ESCG/JACOBS	Runnells, J.	461-5019	X
NA2450/GHG	Mensingh, P.	335-2363	X
NA2450/GHG	Rehm, R.	335-2364	X
NA2450/JES	Trust, B.	335-2401	X

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