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PAYLOAD FLIGHT HAZARD REPORT		a. NO:	AMS-02-F02
b. PAYLOAD	Alpha Magnetic Spectrometer-02 (AMS-02)		c. PHASE: III
d. SUBSYSTEM:	Materials, AMS-02 DDRS-02	e. HAZARD GROUP: Injury/Illness	f. DATE: August 4, 2010
g. HAZARD TITLE:	Toxic Material Offgassing		i. HAZARD CATASTROPHIC CATEGORY: CRITICAL X
h. APPLICABLE SAFETY REQUIREMENTS:	NSTS 1700.7B 209.3		
j. DESCRIPTION OF HAZARD:	<p style="text-align: center;">Offgas evolution of toxic vapors from materials of construction of hardware used within the Orbiter crew habitable volume can result in injury/illness.</p> <p>This hazard report covers the AMS-02 provided hardware to be used within the Shuttle Orbiter crew habitable volume during AMS-02 systems check out prior to deployment to the ISS. This hardware consists of interface cables and a RS 422 interface card to be Interfaced with the standard PGSC/NGLS through a USB port.</p>		
k. CAUSES	<p style="text-align: center;">1. Use of hardware/materials of construction which offgas excessive levels of toxic products.</p> <p><i>(list)</i></p>		
o. APPROVAL	PAYLOAD ORGANIZATION	SSP/ISS	
PHASE I			
PHASE II			
PHASE III	 TRENT MARTIN 8/4/10	 Michael R. Smith 8/6/10	

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PAYLOAD FLIGHT HAZARD REPORT		a. NO: AMS-02-F02
b. PAYLOAD	Alpha Magnetic Spectrometer-02 (AMS-02)	c. PHASE: III
I. HAZARD CONTROL (CONTROL), m. SAFETY VERIFICATION METHODS (SVM), n. STATUS OF VERIFICATIONS (STATUS)		OPS CONTROL
1. CAUSE: Use of hardware/materials of construction which offgas excessive levels of toxic products.		
<p>1.1 CONTROL: Materials of construction of the AMS-02 Interior cabling have been selected based on material ratings and past flight experience for cable construction to minimize offgassing potential.</p> <p>1.1.1 SVM: Material Selection Assessment for Offgas Rating.</p> <p>1.1.2 SVM: JSC ES4 approval of material certification.</p> <p>1.1.3 SVM: QA certification of as built hardware.</p> <p>1.1.1 STATUS: Closed. ESCG Memorandum ESCG-4390-08-SP-MEMO-0021_RevA, "IVA Offgassing and Flammability," dated February 17, 2009</p> <p>1.1.2 STATUS: Closed. JSC Materials and Fracture Control Certification MATL-09-036, "Alpha Magnetic Spectrometer (AMS-02) Data Interface Hardware," Approved 3/25/2009</p> <p>1.1.3 STATUS: Closed. DDRS-02 TPS providing QA approval: DDRS-02 Assembly p/n SED39136116-301 (s/n 1001 = 2A0920129, s/n 1002 = 2A0920130), USB422 Assembly p/n SED39137921-301 (s/n 1013 = 2A0920093, s/n 1014 = 2A0920094, s/n 1015 = 2A0920095, s/n 1016 = 2A0920096), USB-422/PDIP Cable Assy p/n SED39136111-301 (s/n 1001 = 2A0720285, s/n 1002 = 2A0720285), USB A/B Cable Assy p/n SED39136130-801 (s/n 1001 = 2A0920015, s/n 1002 = 2A0920100). Review and Summary Date January 21, 2010</p>		
<p>1.2 CONTROL: The DDRS2 USB interface hardware will be conformally coated and constructed of materials selected for IVA offgassing compatibility.</p> <p>1.2.1 SVM: Review of Design.</p> <p>1.2.2 SVM: QA inspection of flight hardware.</p> <p>1.2.3 SVM: Material Selection Assessment for Offgas Rating.</p> <p>1.2.4 SVM: JSC ES4 approval of material certification.</p> <p>1.2.1 STATUS: Closed. ESCG Memorandum ESCG-4390-08-SP-MEMO-0021_RevA, "IVA Offgassing and Flammability," dated February 17, 2009</p> <p>1.2.2 STATUS: Closed. DDRS-02 TPS providing QA approval: DDRS-02 Assembly p/n SED39136116-301 (s/n 1001 = 2A0920129, s/n 1002 = 2A0920130), USB422 Assembly p/n SED39137921-301 (s/n 1013 = 2A0920093,</p>		

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b. PAYLOAD	Alpha Magnetic Spectrometer-02 (AMS-02)	c. PHASE:	III
<p>s/n 1014 = 2A0920094, s/n 1015 = 2A0920095, s/n 1016 = 2A0920096), USB-422/PDIP Cable Assy p/n SED39136111-301 (s/n 1001 = 2A0720285, s/n 1002 = 2A0720285), USB A/B Cable Assy p/n SED39136130-801 (s/n 1001 = 2A0920015, s/n 1002 = 2A0920100). Review and Summary Date January 21, 2010</p> <p>1.2.3 STATUS: Closed. Material Assessment documented in attachment to JSC Materials and Fracture Control Certification MATL-09-036, "Alpha Magnetic Spectrometer (AMS-02) Data Interface Hardware," Approved 3/25/2009</p> <p>1.2.4 STATUS: Closed. JSC Materials and Fracture Control Certification MATL-09-036, "Alpha Magnetic Spectrometer (AMS-02) Data Interface Hardware," Approved 3/25/2009</p>			
<p>1.3 CONTROL: DDRS-02 COTS USB A-B connector will be tested for offgassing if material analysis and acceptance is not possible.</p> <p>1.3.1 SVM: JSC ES4 Approval of materials analysis or offgas testing results (Note: If analysis is deemed sufficient the analysis will be tracked under SVM 1.1.1)</p> <p>1.3.1 STATUS: Closed. JSC Materials and Fracture Control Certification MATL-09-036, "Alpha Magnetic Spectrometer (AMS-02) Data Interface Hardware," Approved 3/25/2009</p>			
Notes:			

ACRONYMS	
AMS-02 – Alpha Magnetic Spectrometer 02	Ops – Operations
COTS – Commercial Off the Shelf	QA – Quality Assurance
DDRS2 – Digital Data Recording System 2	SVM – Safety Verification Method
PGSC – Payload General Support Computer	

JSC MATERIALS AND FRACTURE CONTROL CERTIFICATION

PROJECT/SUBSYSTEM MANAGER: T. Martin/EA321 REF: MATL-09-036 p.1 of 4

HARDWARE NAME: Alpha Magnetic Spectrometer (AMS-02) Data Interface Hardware PART NUMBER: See Attachment 2

APPLICABLE REQUIREMENTS:

Materials Requirements:

- NSTS 1700.7B, Safety Policy and Requirements for Payloads Using the Space Transportation System
- SE-R-0006D, Space Shuttle System Requirements for Materials and Processes
- SSP 30233G, Space Station Requirements for Materials and Processes
- JSC 27301E, Materials Control Plan for JSC Flight Hardware
- JSC 49774A, Standard Manned Spacecraft Requirements for Materials and Processes
- Other:

Fracture Control Requirements:

- NASA-STD-5003, Fracture Control Requirements for Payloads Using the Space Shuttle
- SSP 30558C, Fracture Control Requirements for Space Station
- SSP 52005B, ISS Payload Flight Equipment Requirements and Guidelines for Safety-Critical Structures

SPECIFIC ASSESSMENTS:

- | | | |
|---|--|---------------------------------|
| <input checked="" type="checkbox"/> Flammability | <input checked="" type="checkbox"/> Age Life | <input type="checkbox"/> Other: |
| <input checked="" type="checkbox"/> Toxicity | <input type="checkbox"/> Atomic Oxygen/Ultraviolet | |
| <input checked="" type="checkbox"/> Stress Corrosion Cracking | <input type="checkbox"/> Thermal Vacuum Stability | |
| <input checked="" type="checkbox"/> General Corrosion | <input type="checkbox"/> Fluid Compatibility: | |
| <input type="checkbox"/> Fracture Control (<input checked="" type="checkbox"/> Not Applicable; Concurrence: M.S.) | <input checked="" type="checkbox"/> Microbiological Resistance | |

LOCATION:

- | | | | |
|--|--|--|--|
| <input checked="" type="checkbox"/> Orbiter Crew Cabin | <input checked="" type="checkbox"/> Spacehab | <input checked="" type="checkbox"/> ATV | <input checked="" type="checkbox"/> HTV |
| <input type="checkbox"/> Orbiter Payload Bay | <input checked="" type="checkbox"/> MPLM | <input checked="" type="checkbox"/> Space Station: | <input checked="" type="checkbox"/> Internal <input type="checkbox"/> External |
| <input checked="" type="checkbox"/> Progress | <input checked="" type="checkbox"/> Soyuz | <input type="checkbox"/> Other: | |

MATERIALS USAGE AGREEMENTS (MUAs):

- No MUAs
- MUA Number(s):
Deviation:

LIMITATIONS:

No Limitations

- Materials:
- Fracture Control:

This JSC Materials and Fracture Control Certification is consistent with existing Materials or Fracture Control Reciprocal Agreements.

APPROVALS

 Fracture Control Manager, S. Forth	3/25/09 Date	 GFE Materials Control Manager, M. Pedley	3/25/09 Date
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ATTACHMENT 1

Hardware Acceptance Summary Report for Materials

The following data interface hardware will be used in the crew compartment during various stages of data transmission from the AMS-02 payload in the Shuttle Cargo Bay to the T0 umbilical and the Next Generation Laptop System (NGLS):

1. AMS-02 RS422 T-0/PDIP Cable Assembly (SED39136112-302)
2. DDRS-02 Assembly (SED39136116-301)
3. USB 422 Assembly (SED39137921-301)
4. AMS-02 USB-422/PDIP Cable Assembly (SED39136111-301)
5. USB A/B Cable Assembly (SED39136130-801)

The AMS-02 RS422 T-0/PDIP cable will be used to patch RS422 signal from the payload to the Shuttle T0 umbilical for GSE monitoring and control prior to launch. The cable is connected between the Payload Data Interface Panel (PDIP) connectors J103 and J105. The cable is made of flight approved materials including nonflammable HR Plus Expando sleeving, Teflon-coated lacing cord, Scotch Weld 2216, P213 glass cloth tape, FEP Type C tape, Velcro fastener straps, Vibratite Formula 3, Teflon-insulated data bus cable, Twinax plug connector, and NLS plug connector. The use of Vibratite Formula 3 on non-structural, non-critical fasteners on soft-stowed hardware is acceptable.

The DDRS-02 Assembly will be used to patch RS422 signal from the payload to the NGLS A31P hard drive for data storage during on-orbit operations. It consists of one USB 422 unit connected to the USB A/B cable at one end and the USB-422/PDIP cable at the other end.

The USB 422 Assembly provides in-line conversion of RS422 synchronous serial signals to a USB 2.0 interface. The USB 422 unit consists of a single PCB housed in an anodized 6063-T6 enclosure with Twinax and USB type B connectors. The unit draws less than 0.5 amps and is powered by the NGLS USB 5.0 VDC source. The materials used in the USB 422 unit include RTV 3145 adhesive, RTV 3140 conformal coating, Kynar shrink tubing, Velcro fasteners, and Loctite 21463. The use of Loctite 21463 on non-critical fasteners of soft-stowed hardware is acceptable.

The USB-422/PDIP Cable Assembly is connected between the PDIP connector J105 and the USB 422 Assembly. The cable is made of flight approved materials including Teflon-insulated cable (M27500-22RE2S06), HR plus Expando sleeve, FEP Type C tape, P213 glass cloth tape, Vibratite Formula 3, and NLS plug connectors. The use of Vibratite Formula 3 on non-critical fasteners of soft-stowed hardware is acceptable.

The USB A/B Cable Assembly is connected between the USB 422 Assembly and NGLS. The cable is made of flight approved materials including the USB 2.0 cable wrapped with FEP Type C tape, P213 glass cloth tape, and Velcro fastener straps. No thread locking compound or adhesive is used in the USB A/B cable Assembly.

The AMS-02 data interface hardware will be soft stowed in crew cabin for launch and landing.

Stress Corrosion Cracking:

All metallic materials were evaluated for SCC and found acceptable.

General Corrosion:

All metallic materials were evaluated for corrosion and found acceptable.

Flammability:

All non-metallic materials are "A" rated for flammability or used in non-flammable configuration by analysis.

Toxicity:

All non-metallic materials are "A" rated or better for toxicity, or used in quantities below their maximum allowable limits for Shuttle and ISS per MAPTIS>

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ATTACHMENT 2

Aging:

The AMS-02 data interface hardware was evaluated for aging and found acceptable. It is replaceable as needed.

Microbiological Resistance:

The AMS-02 data interface hardware was evaluated for microbiological resistance and found acceptable based on its accessibility for cleaning.

Conclusion:

There are no limitations on the use of the AMS-02 data interface hardware in Orbiter and ISS habitable areas.

MPE - C. Chang

June 2005A

Attachment to MATL - 09-036

AMS-02 RS422 T-0/PDIP Cable Assembly	SED39136112-302
DDRS-02 Assembly	SED39136116-301
USB422 Assembly	SED39137921-301
AMS-02 USB-422/PDIP Cable Assembly	SED39136111-301
USB A/B Cable Assembly	SED39136130-801

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