

**MINUTES FOR THE PHASE III**

**GROUND SAFETY REVIEW**

**FOR THE**

**ALPHA MAGNETIC SPECTROMETER-02  
(AMS-02)**

**February 22 – 23, 2010**

**Kennedy Space Center**

Phase III Ground Safety Review for the Alpha Magnetic Spectrometer-02 (AMS-02)  
February 22 – 23, 2010

The Phase III Ground Safety Review (GSR) for the AMS-02 was held at Kennedy Space Center. A list of meeting attendees is attached following these minutes. (Attachment 2)

NOTE: After the AMS-02 Phase III GSR, it was decided to replace the cryogenic magnet with a permanent magnet. For the record, these minutes reference the cryogenic presentations and hazard reports discussed at the review. However, all actions related to the cryogenic magnet/systems are no longer necessary, and are not included in these minutes.

Mr. Paul Kirkpatrick, Chairman, Ground Safety Review Panel welcomed the meeting attendees and introduced the GSRP members.

Mr. Trent Martin, NASA JSC/AMS-02, Project Manager had the AMS-02 team introduce themselves and presented an overview of the AMS-02.

Mr. Timothy Urban, JSC/Jacobs ESCG presented an overview of the Ground Operations, Flight Avionics / Electrical and the Electrical Ground Support Equipment (EGSE).

Mr. Chris Tutt, JSC/Jacobs ESCG/AMS-02 Project Manager presented an overview of the Composite Overwrapped Pressure Vessels (COPVs), Flight Heaters and the Magnet, Venting and Magnetic Fields.

Mr. Craig Clark, JSC/Jacobs ESCG presented an overview of the Thermal System and the Thermal GSE.

Mr. Ken Bollweg, NASA JSC/AMS-02 Deputy Project Manager presented the AMS-02 Cryogenic Ground Support Equipment (CGSE).

Mr. Phil Mott, JSC/Jacobs ESCG, presented an overview of the Ground Handling Equipment (GHE) and Assembly Operations for the GHE and the TRD Ride Along Bottle.

### **HAZARD REPORTS**

Mr. Eric Harvey, JSC/Jacobs ESCG, presented the Hazard Reports.

#### **GHR-AMS02-001 - Fire Hazard Due to Flammable Materials and/or Equipment Failure**

Hazard report was approved with modifications.

#### **GHR-AMS02-002 - Toxic Materials in Flight Hardware**

Hazard report was approved with modifications.

#### **GHR-AMS02-003 - Liquefaction of Atmospheric Gases**

Hazard report was approved with modifications.

#### **GHR-AMS02-004 - Rupture of the AMS-02 Pressurized Components**

This hazard report was not approved. Two causes need to be added to this hazard for COPV stress rupture and fatigue failure.

#### **GHR-AMS02-005 - Exposure to High-Pressure Gas Plume Effects**

Hazard report was approved with modifications.

**GHR-AMS02-006 - Injury to Personnel due to Excessive Low Temperatures**

Hazard report was approved with modifications.

**GHR-AMS02-007 - Loss of Breathable Atmosphere in KSC Facilities.**

Hazard report was approved with modifications.

**GHR-AMS02-008 – Excessive Ionizing Radiation**

This Hazard report was deleted at Phase II. Ionizing radiation source was deleted from the AMS-02 design.

**GHR-AMS02-009 - Structure Failure of Hardware during Ground Handling / Moving / Operations**

Hazard report was approved with modifications.

**GHR-AMS02-010 - Structural Failure of the AMS-02 Primary Support Stand (PSS) During Static Operations**

Hazard report was approved with modifications.

**GHR-AMS02-011 - Electric Discharge / Shock**

Hazard report was approved with modifications.

**GHR-AMS02-012 - Excessive Noise Levels**

Hazard report was approved with modifications.

**GHR-AMS02-013 - Magnetic Fields**

Hazard report was approved with modifications.

**GHR-AMS02-014 - Sharp Edges**

Hazard report was approved with modifications.

**GHR-AMS02-015 - Touch Temperatures – Hot**

Hazard report was approved with modifications.

**GHR-AMS02-016 - Exposure to Laser**

Hazard report was approved as written.

**GHR-AMS02-017 - Injury / Damage from Hand Tools or Loose Hardware**

Hazard report was approved with modifications.

**PHASE III ACTION ITEMS**

The Phase III Action Items are listed in Attachment 1. These are a result of the GSDP comments and discussions from the review. All comments at Phase III are actions.

**SUMMARY**

The Phase III Ground Safety Review was completed with one hazard report not accepted (two hazard causes need to be added), one hazard report accepted as written, and the rest of the hazard reports accepted with modifications.

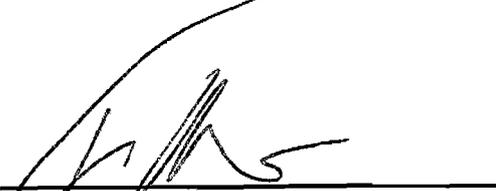
The Chairman thanked everyone for their participation.

The minutes were prepared by Maxine Daniels.



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Paul D. Kirkpatrick  
Chairman,  
ISSP / SSP Ground Safety Review Panel



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Trent Martin  
NASA JSC AMS-02 Project Manager

**Distribution:**

NE-F3/M. Simpson  
NE-O-C/J. Mathis  
SA-B1/J. King  
SA-C/M. Smith  
SA-C1/J. Minnear  
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SA-C2/S. Brunelle  
SA-C2/D. Moore  
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JSC/OE/N. Vassberg  
JSC/OE/S. Wolf  
Boeing/C. Hardison  
Boeing/721S-S215/P. Lintereur  
Boeing/721S-S243/J. Degano  
Boeing/721S-S245/J. Balzer  
Boeing/721S-S280/M. Kinslow  
USK-291/G. Garrett

# Attachment 1

## ACTION ITEMS FROM THE PHASE III GROUND SAFETY REVIEW FOR THE ALPHA MAGNETIC SPECTROMETER-02 (AMS-02), FEBRUARY 22-23, 2010

1. You do not need to provide a Launch Site Safety Plan. Identify the individual(s) that will be your safety point(s) of contact. We recommend the individual(s) be a safety professional(s).
2. For testing of components on the AMS which is not performed by AMS (such as PRCU, EBCS alignment, ACAS, etc.), AMS needs to provide assurance to the GSRP (in the AMS GSDP) of the safety of the AMS hardware.
3. If EBCS installation or other operations are performed by AMS, the safety of the GSE, operations and AMS hardware needs to be assessed in the AMS GSDP.
4. Testing in the OPF (SIT, etc.) needs to be assessed per #2 or #3, above.
5. Include a safety assessment of the ground operations and GSE (if applicable) for installation of AMS-02 payload hardware into the Orbiter crew compartment.
6. Provide the safety verification closure documents referenced in the hazard reports, in an Appendix to the GSDP.
7. In Safety Discussion Section 7.12, add that the magnetic field as measured does not extend outside the foot print. A 5 gauss line will be marked in the foot print.
8. Add thermal blanket fire to Appendix B.
9. Provide a list of the AMS-02 GSE/GHE which identifies the KSC locations where it will be used, or a statement that all AMS-02 GSE/GHE will be used at a particular location except those in the list.
10. Check the clearance of the TRD GSE bottle with the Orbiter RMS and OBSS.
11. Add the use of slings under GSE for lifting to the Safety Discussion Section.
12. Provide the TBD figures, appendices, tables, matrices and data in the tables and matrices. Also, some of the figures with text on them are unreadable. Provide readable figures.
13. Page 88, Section 5.10.5, page 91, Section 6.1.3, and page 94, Section 6.2.1 – Integration of the lower USS to the upper USS is mentioned; however, page 86, Section 5.10.3, states the lower USS will already be attached to the upper USS when AMS arrives at KSC. Please clarify.
14. Page 90, Table 5.11-1 – Identify the acronyms: GS, UNK & CCC in the electrical code column. Add them to the acronym list.
15. Page 95, Section 7 – For COTS equipment used by AMS, statements need to be added identifying whether any COTS hardware has been modified and is it being used for the purpose it was designed. If modified or used for other purposes the safety of the modifications/uses needs to be assessed.

ACTION ITEMS FROM THE PHASE III GROUND SAFETY REVIEW FOR THE  
ALPHA MAGNETIC SPECTROMETER-02 (AMS-02), FEBRUARY 22-23, 2010

16. Page 96, Section 7.2 Toxicity – There is no requirement for KSC Biomedical Office approval of procedures used. That should be deleted.
17. All deleted HRs – Reference all of the deleted HRs for completeness.
18. GHR-001, Cause 1, SVM 1.4.1 and 1.4.2 – Correct the rationale.
19. GHR-001, Cause 1, SOV 1.4.2 –Memo applies to flight hardware. Any ground flammable material? Also, reference Mike Cardinale's e-mail.
20. GHR-001, Cause 6, HC 6.2 – How did you come up with the 40 C set point?
21. GHR-004, Hazard Causes – Add two causes. One for COPV stress rupture, and one for COPV fatigue failure.
22. GHR-009, Add that the lifting equipment will be load tested to 1.25 times the rated load within 1 year prior to use.
23. GHR-009, Hazard Control 5.1 – Does not meet the requirements in 4.5.1.2.f.
24. GHR-009 – Add shipping cover eyes to Lifting/Handling Matrix.
25. GHR-009, Matrices – Provide values to verify safety factors.
26. GHR-009, Matrix – For GSE that is hoisted, indicate whether attach points are permanent or removable.
27. GHR-010, PSS Matrix – Update the PSS matrix to indicate a yield factor of 3, per Phase III presentation.
28. GHR -010, LUSS Shipping Assembly Matrix – Why was this proof-loaded? Also, the yield design load is less than the rated load?
29. GHR-011, EGSE Matrix – Update the matrix to include all AMS-02 GSE that is electrically powered, not just the AMS-02 GSE required to support the AMS-02 flight electrical hardware.
30. GHR-011, Matrix – Resolve “?” and editorial comments
31. Page D-2 – Identify the status of #18 (Open/Closed)?
32. Page D-17 – Change “easily ionized helium” to “typically ionized helium”.
33. Provide Appendix C – 13830 requirement

# MEETING ATTENDANCE ROSTER

AMS-02 - Phase III Ground Safety Review, February 22 - 24, 2010

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