Engineering and Science Contract Group

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ESCG-4460-10-LODY-DOC-0001
October 5, 2010

TO: B.G. Brown/MO2

FROM: M. Maculo/ESCG-6EB

SUBJECT: Review of the Alpha Magnetic Spectrometer – 02 Structural Verification Plan and Model Correlation Report

The Space Shuttle Program Cargo Integration Structures Working Group (SSP CI SWG) reviewed the following documents.

[1] Alpha Magnetic Spectrometer – 02 (AMS-02) Structural Verification Plan for the Space Transportation System and the International Space Station, JSC-28792 Rev. G, dated July 22, 2010
[2] Alpha Magnetic Spectrometer-02 Structural Verification Plan, ES2-06-003, dated January 31, 2006
[3] Post-test Analysis for the Alpha Magnetic Spectrometer (AMS-02) Modal Test, ESCG-4460-09-LODY-MEMO-0312, dated November 2009
[4] Summary of the Fundamental Frequencies for Components of the Alpha Magnet Spectrometer (AMS)-02, ESCG-4460-09-LODY-DOC-0057, dated May 1, 2009
[5] Review of Alpha Magnetic Spectrometer-02 (AMS-02) Documents, MSAD-05-0070, dated January 2005

The SWG previously accepted revision D of the Structural Verification Plan (SVP) in letter ES2-06-003, but the current version has incorporated changes to previous releases, including removing references to nominal landing, updates to the air transportation load factors, updates to the yield factors-of-safety from 1.1 to 1.0 for liftoff and landing, updates to the finite element model natural frequencies, changes made due to replacing the cryogenic magnet with the permanent magnet and additional rationale on component testing. Based on the information provided in the SVP, the AMS-02 complies with NSTS 14046 E, Payload Verification Requirements. The SSP CI SWG approves the SVP.

It should be noted that component static strength tests specified in the SVP were not performed. Component level tests were to be performed on the low margin elements of the structure, including highly loaded joints, fittings, and tubes. Component tests were to be performed to 1.4 times flight loads or to failure. Two of the component tests, the Lower Joint and the Interface Plate tests, were not performed. The SWG is working with the payload organization regarding this issue and the static test correlation will be documented in a separate SWG memo.

A modal survey test was conducted and the results were used to obtain a test-verified model, which is documented in the correlation report. As documented in reference [4], AMS-02 hardware that was not included in the modal test was verified to be above 50 Hz or have an inconsequential affect on AMS-02 global dynamics. Switching the cryogenic magnet to the permanent magnet does not invalidate the test verification of the AMS-02 based on a review of the modeling and comparisons of the mode shapes. No additional model uncertainty factors are required. The correlation report meets NSTS 14046 E requirements. The SWG accepts the AMS-02 model as test verified and approves its use in the Verification Loads Analysis (VLA).

The SVP includes a significant amount of detail related to International Space Station (ISS) on-orbit verification as well as the pressure and vacuum systems. These items are beyond the typical SWG oversight and should be reviewed and concurred with by the appropriate ISS, materials, pressure systems and safety organizations.

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