

National Aeronautics and  
Space Administration

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Reply to Attn of:

EA2-07-050

**SEP 14 2007**

TO: Distribution

FROM: EA/Alpha Magnetic Spectrometer (AMS) Project Manager

SUBJECT: Responsibilities of AMS Designated Verifiers (DV) for CERN Integration Activities

We have now started integration activities at the AMS clean room in Geneva, Switzerland. As a DV for AMS, you will be asked to perform a myriad of tasks as the resident NASA representative when you are assigned at the clean room. Our goal will be to rotate the same group of people in and out of Geneva as necessary to support this entire integration activity. At a minimum, you must follow the guidelines that are listed below. It is all of our responsibilities to ensure that once we have completed integration, that there is a complete set of records that document how the AMS payload was built up. I expect the DV on duty at CERN to copy all other AMS DVs when corresponding about activities that are occurring on our flight hardware in Geneva. We must maintain full and open communication for this to succeed.

1. The DV on duty in Geneva will act as the Payload Integration and Testing Manager as defined in JSC-63123. See <http://ams-02project.jsc.nasa.gov/html/Documents.htm> for details.
2. DV is responsible for ensuring that he has all Task Preparation Sheets (TPSs) required for work scheduled during his stay. This may be coordinated with other personnel to actually write and manage these, but it is the DV's responsibility to ensure he/she understands, manages and secures these documents.
3. DV is responsible for ensuring that he has all AMS Task Sheets (ATSS) required for work scheduled during his stay. This will be coordinated with collaboration personnel to actually write and manage these, but it is the DV's responsibility to ensure he/she understands these documents.
4. DV must hold a pre-task review with all available parties. At the review, all of the tasks to be performed that day should be discussed, and the DV should make sure that all parties are aware of the current state of the Structural Test Article (STA) Vacuum Case (VC) or the Flight Magnet (evacuated, cold, warm, etc.).
5. DV is responsible to verify the work performed on the above ATSS.
6. DV is responsible to verify all work covered on NASA TPS (torquing and lockwiring). For any other MIP required, special training must be taken, or certified NASA personnel must perform, and verify, those MIPs.
7. DV is responsible for ensuring that a completed copy of each ATS is received from the collaboration for submittal to NASA Quality Assurance (QA) with the completed TPS. This can be an electronic (.pdf) or paper copy. The completed ATS must have initials and dates for work performed by the collaboration personnel.

8. DV is responsible for ensuring the safety of all NASA/ESCG hardware and personnel.
9. DV shall coordinate in process ATS modifications with ESCG personnel to ensure that NASA QA and ESCG accept the changes before modification work can commence. For simple changes that can not be pre-coordinated due to time-zone issues, the on-site DV has the authority to allow the process to proceed assuming final approval of the modification.
10. DV will coordinate with CERN personnel, specifically the Mechanical Integration Team (MITeam), to ensure originals of all ATSS are collected at CERN and stored, logically, in a secure place. The MITeam will post copies of the completed ATSS on a web site and store the originals in the AMS MITeam office. A second copy will returned to Houston and be stored with Mike Fohey.
11. DV should ensure that the proper photos per the attached spread sheet are taken. This spreadsheet will be mounted in the cleanroom area. The photos should be sent to the entire DV team plus Leland Hill. I will be responsible to make sure they are on the AMS website. Leland Hill will be sure that they are used in the Safety Data Package.
12. DV team for review prior to signoff off the paperwork. I will set up a teleconference to make a final signature decision on each of the major elements. The on-site DV will sign as the Payload Integration and Test (PIT) Manager. In the event that all of the paperwork is not available, after a teleconference consultation, I will make the final decision as to whether or not the hardware is ready for installation. The AMS Major Components are defined as:
  - a. Thermal Control System
  - b. Tracker Thermal Control System
  - c. Tracker
  - d. Anti Coincidence Counter (ACC)
  - e. Lower Time of Flight (TOF)
  - f. Upper TOF
  - g. Transition Radiation Detector (TRD)
  - h. TRD Gas System
  - i. Magnet System
  - j. External Magnet Components (those items not mounted directly to the Vacuum Case)
  - k. Ring Imaging Cherenkov Counter (RICH)
  - l. Electromagnetic Calorimeter (ECAL)
  - m. Global Positioning System (GPS)
  - n. Star Trackers

Please let me know if you have any questions.



Trent Martin

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# AMS Major Component Pre-Integration Checklist

The following checklist must be completed prior to integration of any of the major AMS subsystems onto the NASA provided Payload Integration Hardware. All open issues must be documented and dispositions must be approved by all parties.

Name of Major AMS Component: \_\_\_\_\_

## Integration Review Items

- All integration plans and procedures have been completed and approved.
- All hardware, including interfaces fasteners, is available for integration.
- Mechanical and electrical interfaces have been verified against the interface control documentation.
- All applicable functional, unit-level, subsystem, and qualification testing has been conducted successfully.
- Integration facilities, including clean room, ground support equipment, handling fixtures, cranes, and electrical test equipment are ready and available.
- Support personnel have been adequately trained and will be available at the integration facility.
- Handling and safety requirements have been documented.
- All known system discrepancies have been identified and disposed in accordance with an agreed-upon plan.
- All previous design review success criteria and key issues have been satisfied in accordance with an agreed-upon plan.
- The quality control organization is ready to support the integration effort.

## Acceptance Data Package Items

- | Y                        | N                        | N/A                      |  |
|--------------------------|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Historical Log/Notes/Comments Received               |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Waivers/Deviations Received                          |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Unexplained Anomalies Reported                       |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Unplanned/Deferred Work Reported                     |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Preplanned/Assigned Work Reported                    |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Identification-as-Designed Configuration             |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Operating Time/Cycle Reported                        |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Age Sensitive/Time Action Items Reported             |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Non-standard Calibration Data Reported               |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Repair Limitations Data Reported                     |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Pressure Vessel Data Received                        |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Non-flight Hardware/Temporary Installations Reported |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Certifications Received                              |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | MSDS Received  |

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With only the exceptions listed below, all above criteria have been successfully completed or are not applicable and the following components are ready for integration onto the NASA provided Payload Integration Hardware.

\_\_\_\_\_  
Payload Integration and Test Manager

\_\_\_\_\_  
Date

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Exceptions\Resolution Plan (No signature required if there are no exceptions)

- 1.
- 2.
- 3.

I agree with list of exceptions and agree to implement the resolution plan as described above.

\_\_\_\_\_  
Experiment Integration and Test Manager

\_\_\_\_\_  
Date

# AMS Photos Required for Assembly, Posterity, Safety Hazard Reports, Certification, TPSs, VTL, etc.

Est. Date	Video required?	Location	Description	Comments	Fit Sfty Hazard #	Grnd Sfty Hazard #	TPS # & Step	VTL #
	No	CERN Clean Room (?), KSC (?)	Photos of all carbon-fiber composite hardware after MLI installation	Photos intended to show no exposure to AO.	AMS-02-F01, SVM 10.1.2			
	No	SM	Closeout photos of flight helium tank	All internal pressure and temperature sensors should be shown in at least one picture.	AMS-02-F04, SVM 2.1.6			
	No	SM(?), CERN Clean Room (?)	Photo of helium tank and VC burst disks		AMS-02-F03, SVM 1.2.2, AMS-02-F04, SVM 2.2.2			
	No	MIT(?), CERN Clean Room (?)	Photo of TRD Gas tanks showing isolation valves		AMS-02-F04, SVM 4.1.2			
	No	SM(?), CERN Clean Room (?)	Photo of vent pump plumbing	Photo should show proper installation of valves	AMS-02-F06, SVM 1.1.4			
	No	CERN Clean Room	Photos of TRD Box C gas vents		AMS-02-F06, SVM 1.2.2			
	No	KSC	Photos of magnet GSE interfaces		AMS-02-F06, SVMs 2.4.2 and 2.4.3			
	No	KSC	Photos of TRD GSE interfaces		AMS-02-F04, SVM 4.3.2, AMS-02-F06, SVMs 2.3.2 and 2.5.1			
	No	KSC	Photo of EVA connector panel		AMS-02-F06, SVM 4.2.1, AMS-02-F07, SVMs 1.4.2 and 3.1.2			
	No	CSIST(?)	Closeout photo of U0-crate	Photo must show all high voltage elements properly potted	AMS-02-F08, SVM 2.4.2			
	No	CERN Clean Room	Photo of installed TRD	Photo must be taken after MLI installed	AMS-02-F08, SVM 2.4.2			
	No	KSC	Photo of FRGF		AMS-02-F11 SVM 3.1.2			
	No	KSC	Photo of PVGF		AMS-02-F11 SVM 3.1.2			
	No	KSC	Photo of PAS in ready-to-launch configuration	Photo must clearly show position of the stiffness adjustment pins and the release mechanism locking features.	AMS-02-F11, SVM 4.3.4 and 5.1.4			
	No	KSC	Photo of as-installed EBCS		AMS-02-F11, SVM 7.1.2			
	No	CERN Clean Room	Representative photos of EVA connectors		AMS-02-F08, SVM 1.4.2, AMS-02-F12, SVMs 1.2.2 and 1.3.2			
	No	CSIST	Closeout photo of UPS battery boxes		AMS-02-F13, SVM 1.4.2, 1.5.2, and 4.1.2			
	No	CERN Clean Room	Photo of UPS battery box installation showing burst disk vent path		AMS-02-F13, SVM 4.1.4			
	No	CERN Clean Room or KSC	Photo of all EVA keep-out zones		AMS-02-F07, SVM 1.6.5, AMS-02-F14, SVM 3.1.2			
	No	CERN Clean Room	Photos of EVA translation paths and worksites	At least one photo at each worksite should be taken as close to astronaut's nominal head location as practical.	AMS-02-F11, SVM 1.2.2, AMS-02-F14, SVMs 1.1.2, 3.1.2, 4.3.2 and 8.1.2			
	No	CERN Clean Room (?), KSC (?)	Photo of each potential air liquefaction location showing drip protection		AMS-02-F15, SVM 2.1.2			

	No	SM (?), CERN Clean Room (?)	Photo of each vent which can release cryogenic gas	Photos must be taken after MLI installed	AMS-02-F06, SVMs 1.1.2 and 2.1.2, AMS-02-F14, SVM 4.3.2, AMS-02-F15, SVM 3.1.2		
Already Exists	No	INFN-Bologna, RWTH	Photo of representative sample of TOF/ACC PMTs	All controls against shatterable material release or electric shock should be shown in at least one photograph.	AMS-02-F08, SVMs 2.5.2 and 2.5.3, AMS-02-F16, SVM 1.1.2		
Already Exists	No	INFN-Bologna, LAPP-AnneCy	Photo of representative sample of RICH/ECAL PMTs	All controls against shatterable material release or electric shock should be shown in at least one photograph.	AMS-02-F16, SVM 1.2.2		
Already Exists	No	INFN-Pisa	Photo of ECAL superlayer showing fiberoptic cables embedded in lead matrix		AMS-02-F16, SVM 1.9.2		
	No	CGS Assembly Facility	Closeout photos of 120V distribution boards	Photos should clearly show all fuses	AMS-02-F17, SVM 1.2.2		
	No	JSC	Closeout photos of "the box" behind the PVGF	Photos should show the 16.7A fuse protecting the atm.	AMS-02-F17, SVM 1.2.2		
	No	CGS Assembly Facility	Photos of diodes in PDS protecting ROEU and PVGF	Photos must show that diodes have been connected with the correct orientation.	AMS-02-F17, SVM 2.1.2		
	No	CERN Clean Room	Photos of each close clearance point tracked through NSTS 37329 process		AMS-02-F11, SVMs 2.3.2 and 6.1.4, AMS-02-F18, SVM 1.1.1		
	No	CERN Clean Room	Close-up picture of TAS LFCR Box and exiting fiberoptic cables	Photos must show both connectors and vent filters.	AMS-02-F17, SVM 1.7.2, AMS-02-F20, SVMs 2.1.2 and 2.2.2		
	No	RWTH(?), CERN Clean Room (?)	Pictures of fiberoptic cables running between various TAS laser elements		AMS-02-F16 1.3.2, SVM AMS-02-F20, SVMs 1.2.2, 2.3.2, and 2.4.2		
	No	CERN Clean Room	Pictures of vents for all vented hardware (including MLI blankets)	Photos must show vent has no obstructions. Photos of detectors must be taken after all MLI installed. Photos of MLI should include representative samples from each blanket manufacturer. Photos of vents with filters must clearly show filters.	AMS-02-F16, SVMs 1.1.2, 1.4.2, 1.5.2, 1.6.2, 1.7.2, and 1.10.2, AMS-02-F20, SVM 2.5.2; STD-AMS-02-F01, SVM 3.a.1		
	No	CERN Clean Room	Pictures of representative sample of MLI grounding straps and attachment mechanisms	Photos must include representative sample from each blanket manufacturer.	AMS-02-F04, SVM 6.1.2, STD-AMS-02-F01, SVM 12.1.3		
	No	JSC (?), KSC(?)	Pictures of assembled DDRS	Photos must clearly show no IVA access to powered elements.	STD-AMS-02-F02, SVM 10.a.1		