

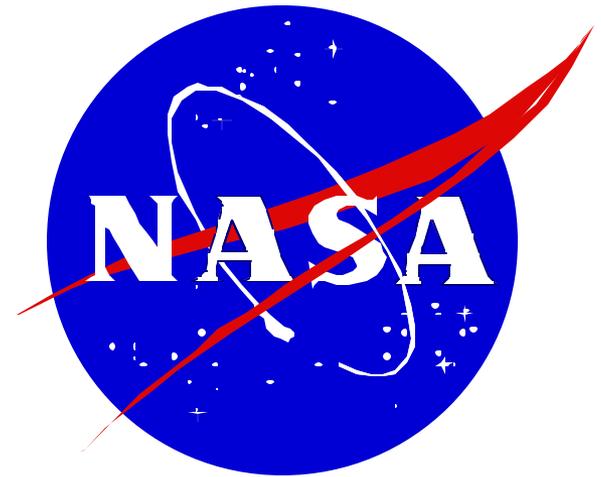
Alpha Magnetic Spectrometer – 02

Overview

Mission Integration Plan Kick-off Meeting

August 25, 2004

Trent Martin
281-333-6114





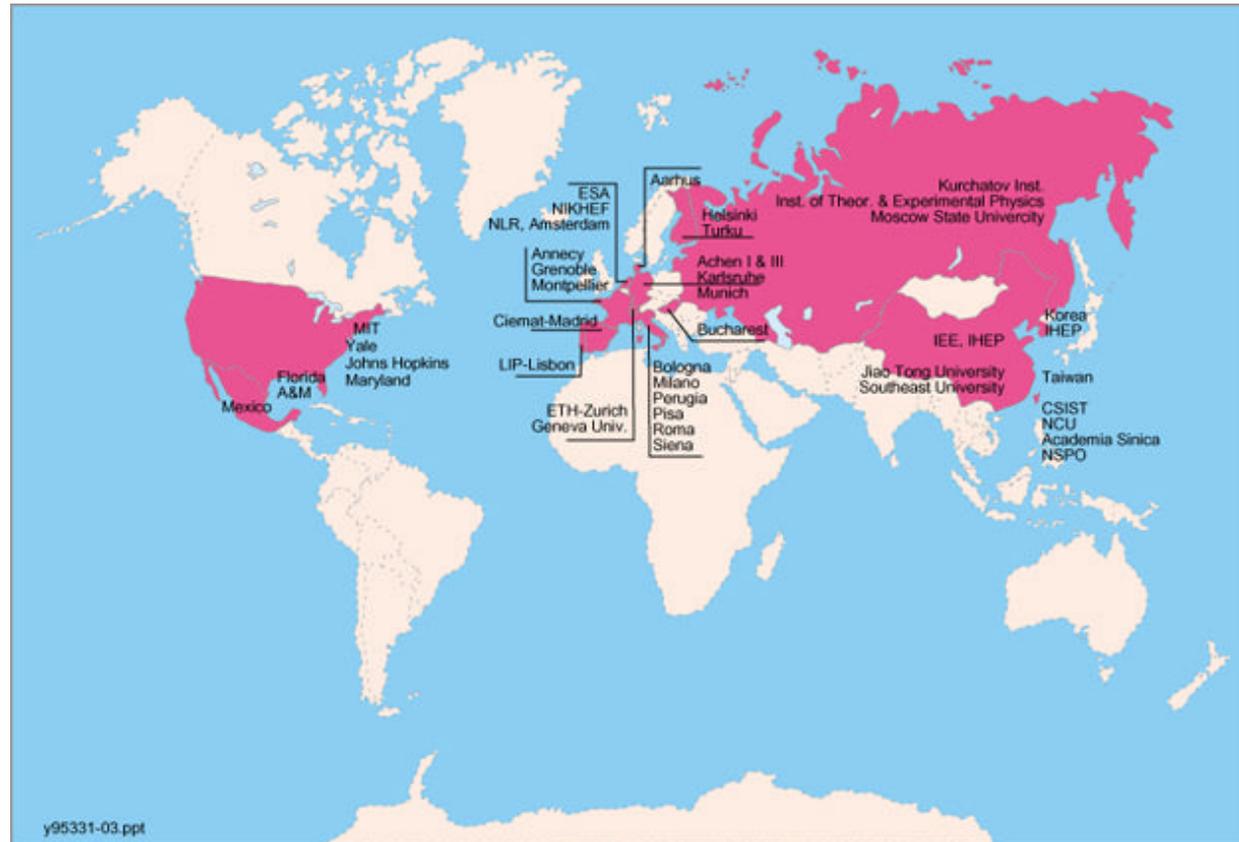
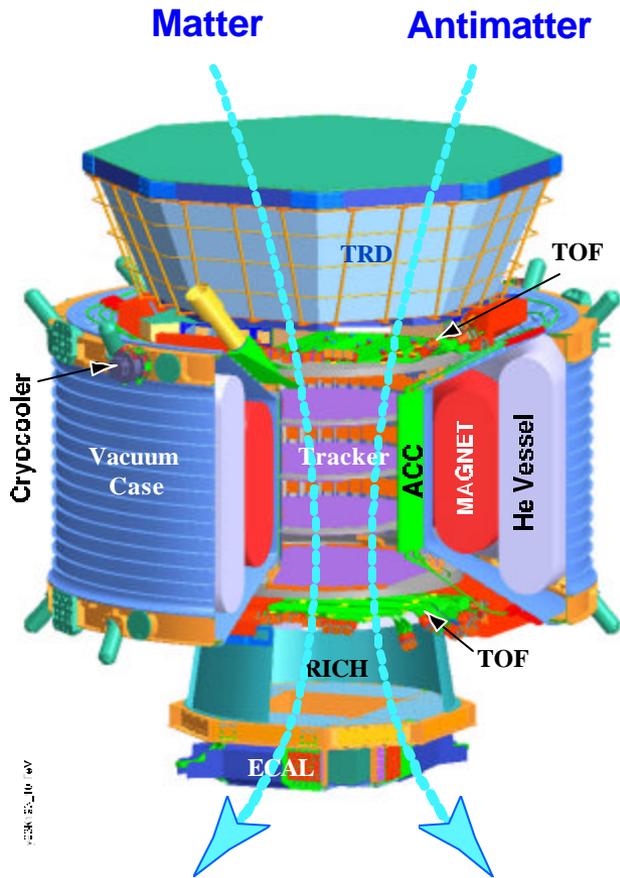
Alpha Magnetic Spectrometer



- Description
 - The AMS-02 employs a unique, superconducting electromagnet (SFHe @ 2deg K) to produce a strong, uniform magnetic field (~0.8 Tesla) combined with a state-of-the-art precision spectrometer to search for anti-matter (anti-helium and anti-carbon), dark matter, dark energy and to understand Cosmic Ray propagation.
- Investigators:
 - The AMS team, led by Nobel laureate Prof. Samuel Ting/MIT, has approximately 200 physicists from multiple countries participating.
 - USA sponsorship by the U.S. Department of Energy.
 - Flown under a NASA / DOE interagency agreement (9/95) for two flights: Engineering Test on Shuttle (STS-91) and 3 yr Science Mission on ISS.
 - NASA/JSC Engineering Directorate is assigned Project Management and Payload Integration.



AMS: International Collaboration



478 Physicists, Engineers
and Technicians in 17
Countries

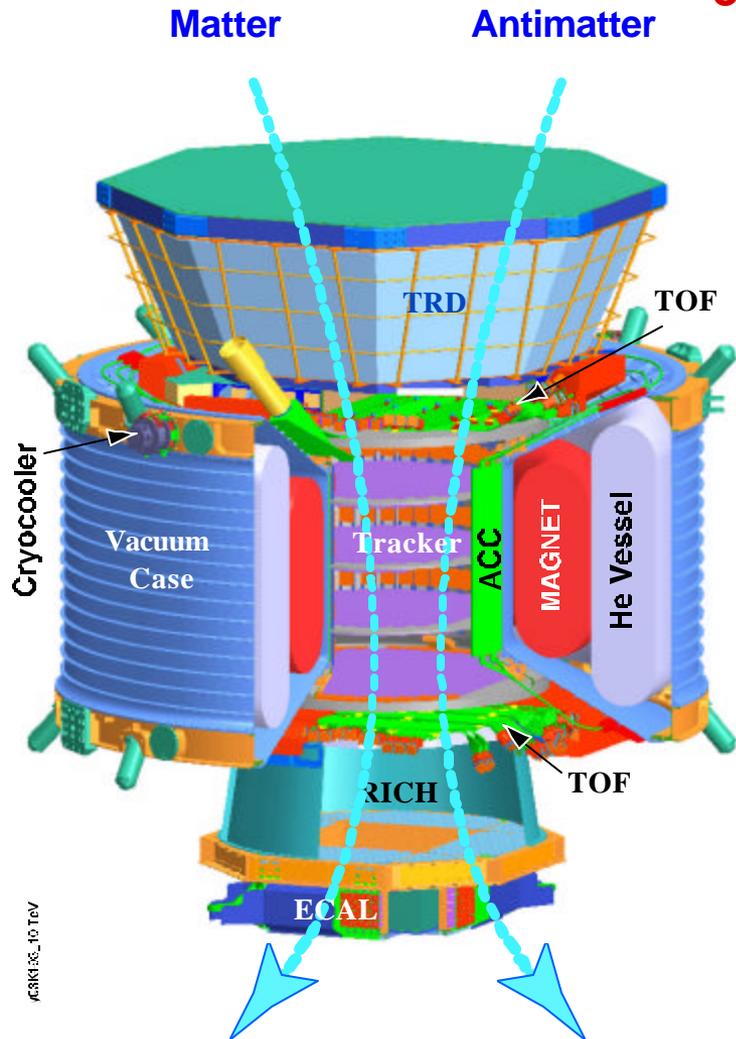
Led by MIT

Sponsored by DoE

AMS: A TeV Magnetic Spectrometer in Space

(3m x 3m x 3m, 7t)

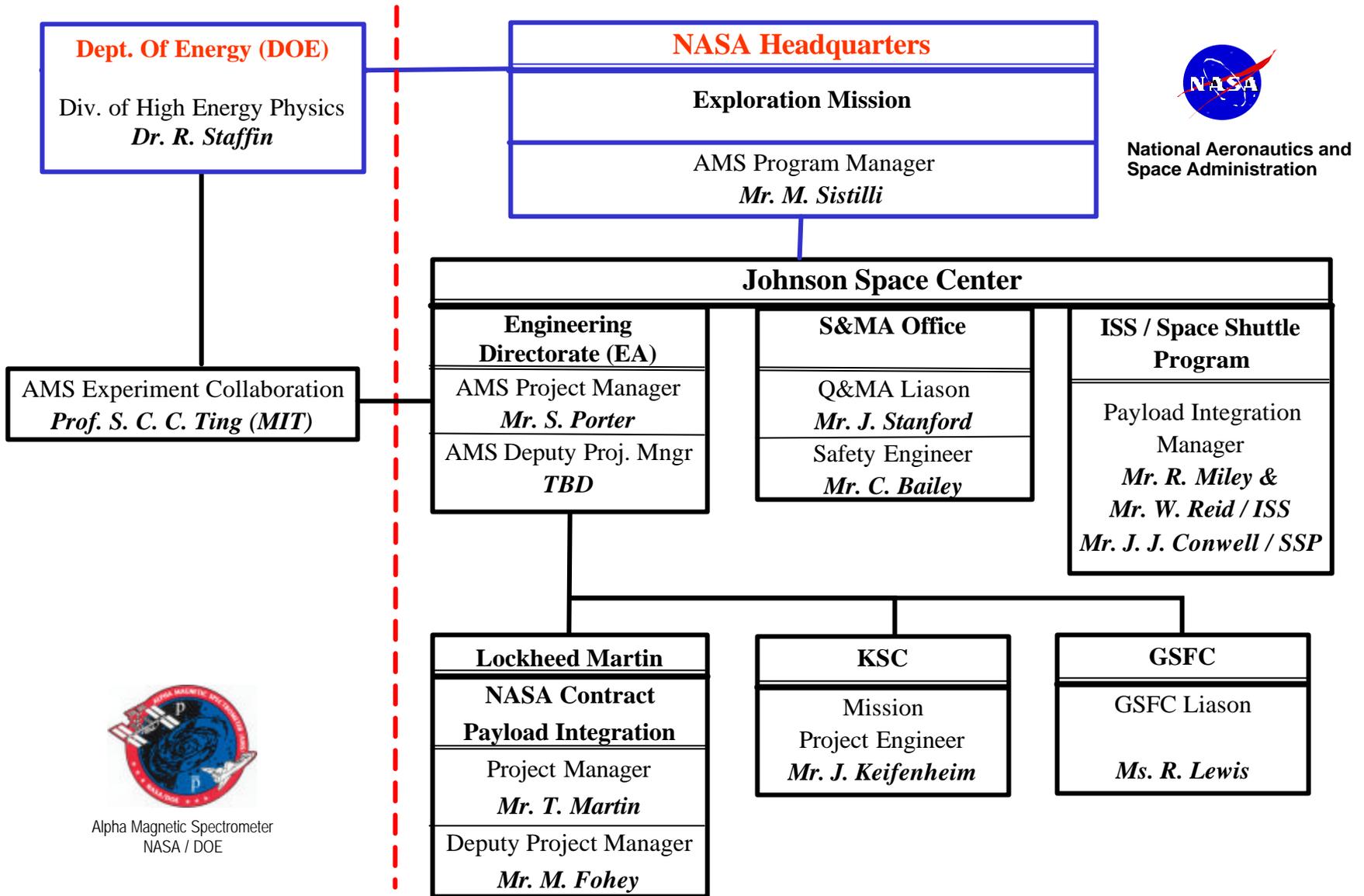
300,000 channels of electronics $Dt = 100 \text{ ps}$, $Dx = 10\text{m}$



	0.3 TeV	e^-	e^+	P	$\bar{\text{He}}$	γ
TRD						
TOF						
Tracker						
RICH						
Calorimeter						

AMS-02 to TeV

AMS Project Functional Organization Chart



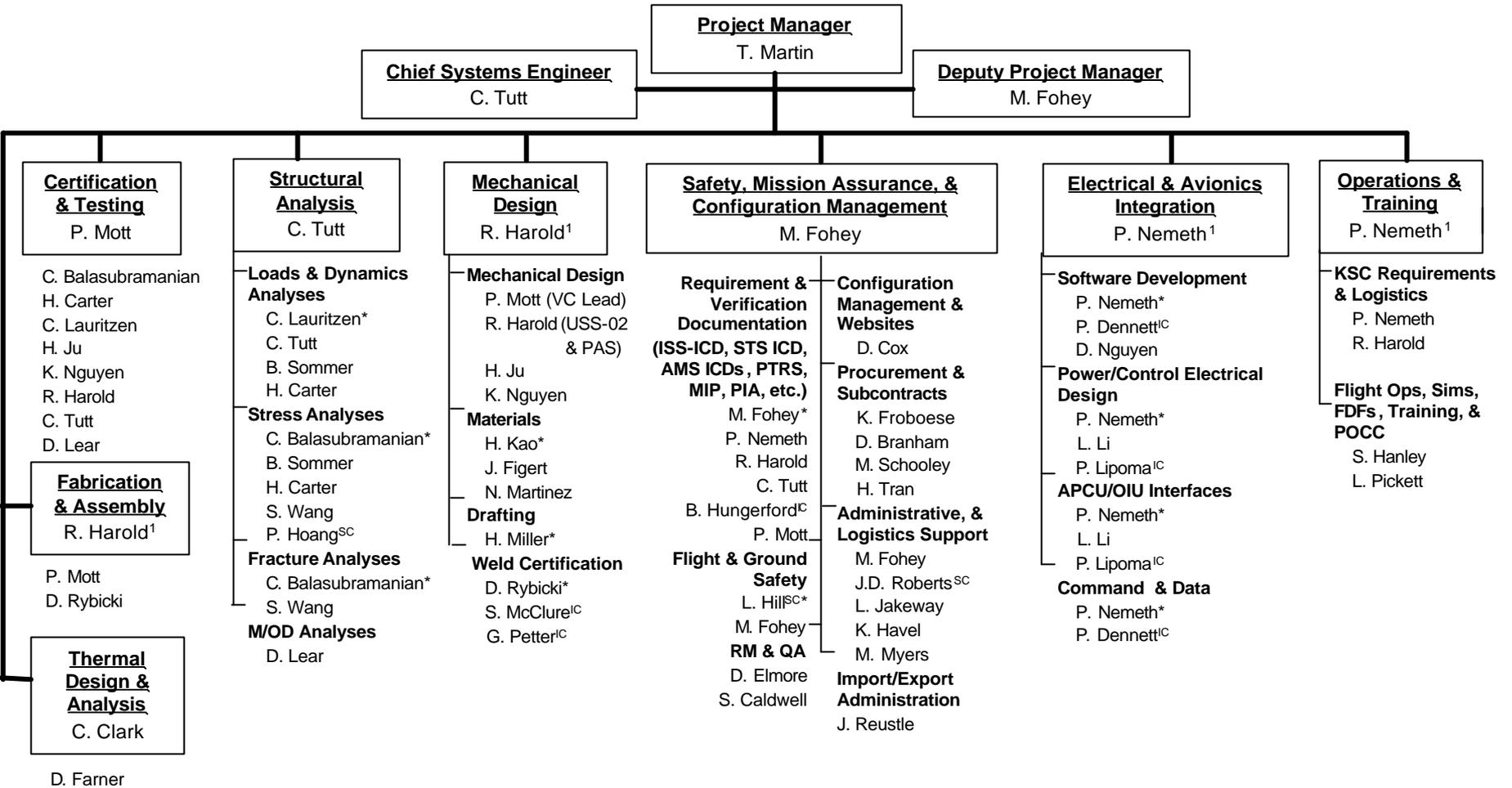
National Aeronautics and Space Administration



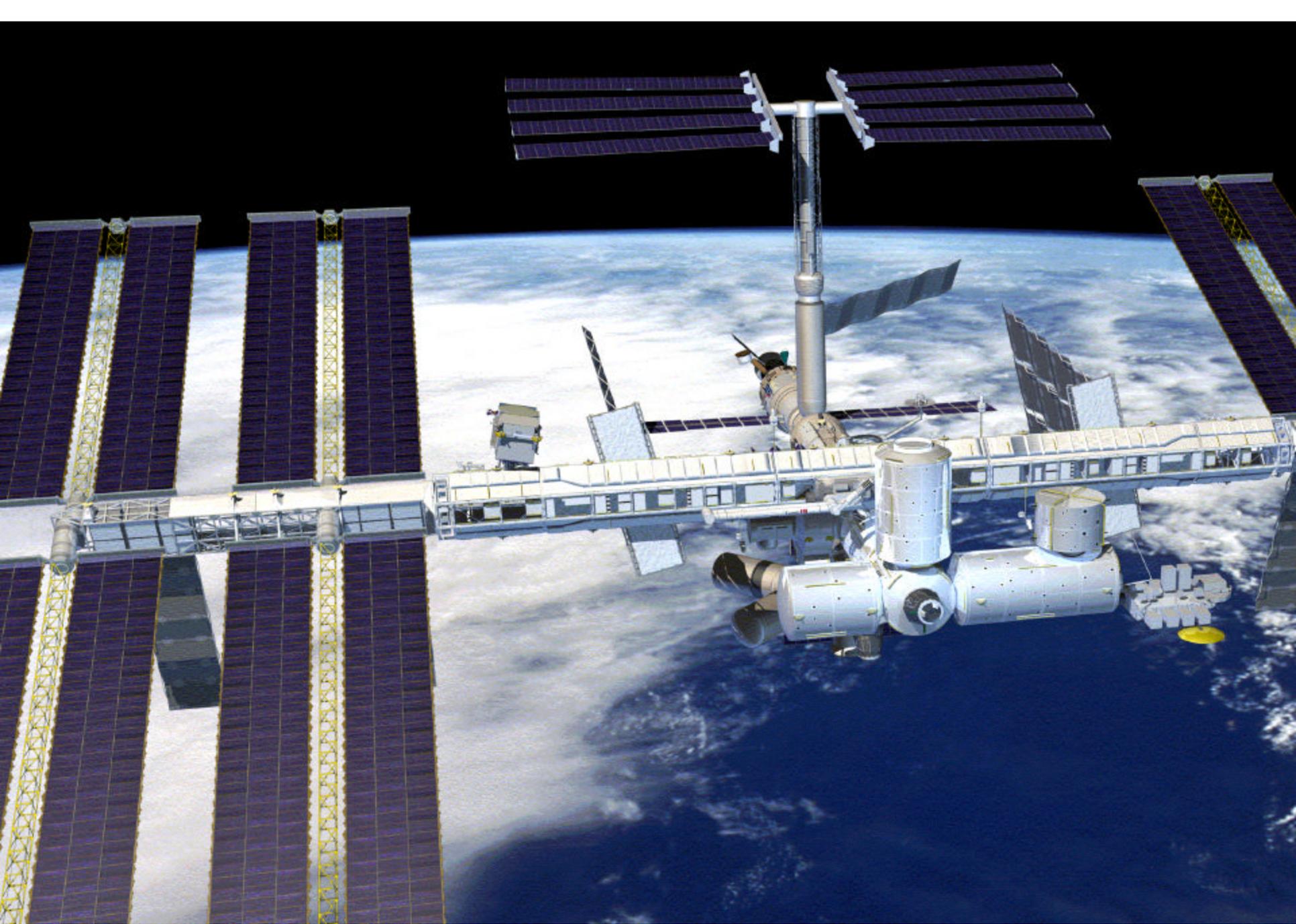
Alpha Magnetic Spectrometer
NASA / DOE

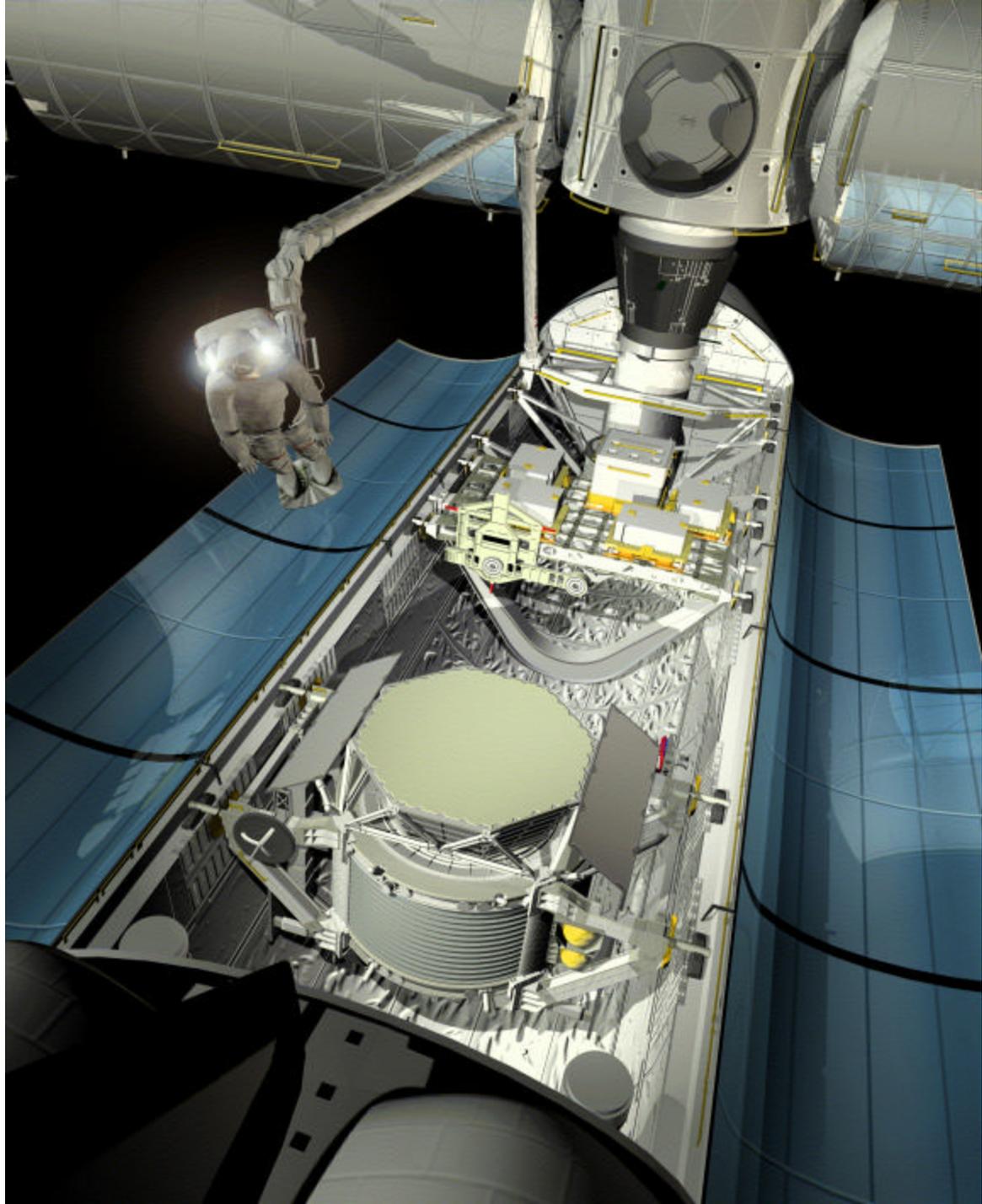
Alpha Magnetic Spectrometer (AMS-02) Project

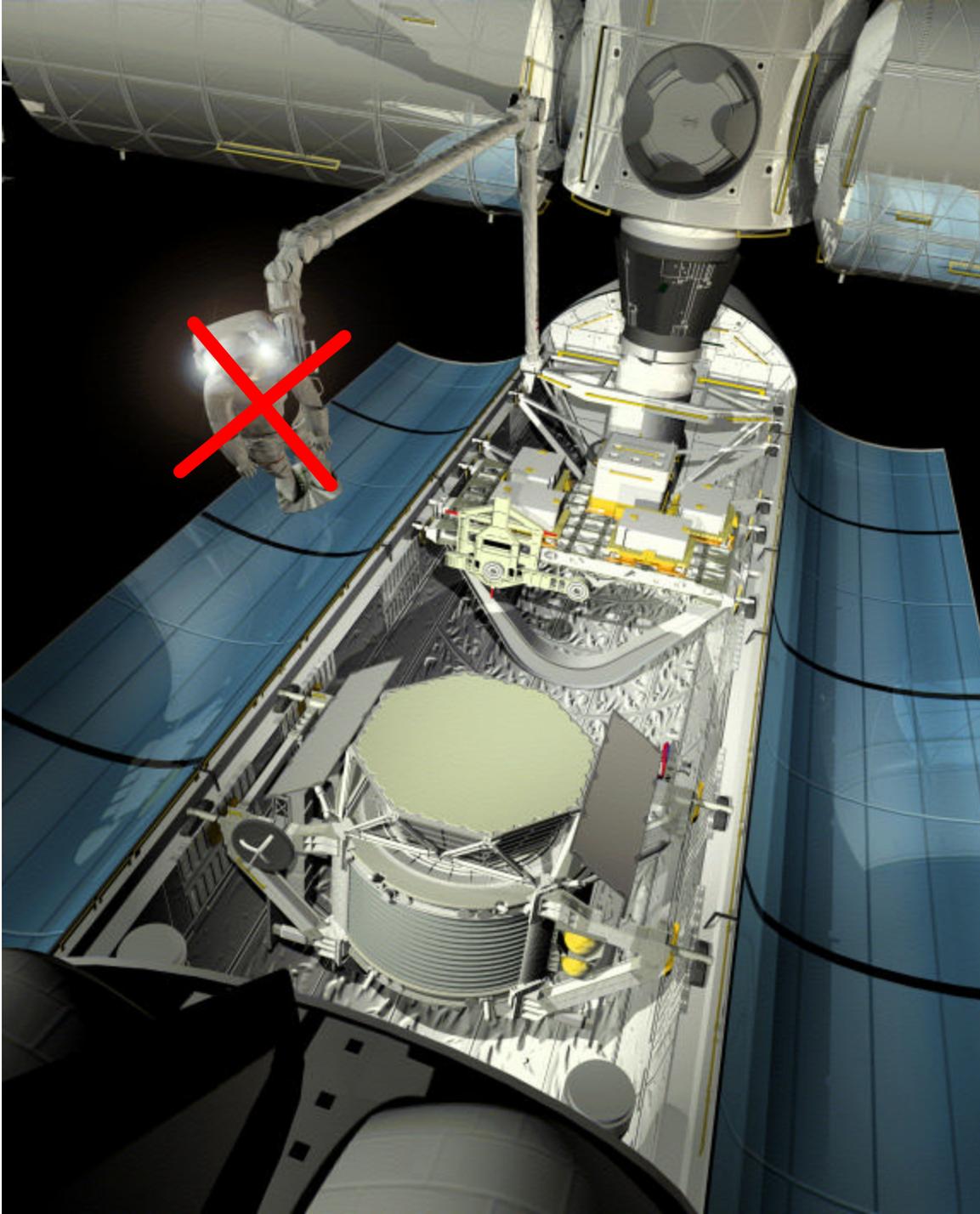
LMSO Functional Organization Chart



M/OD – Meteoroid & Orbital Debris 1 – Indicates multiple lead assignment
 USS-02 – Unique Support Structure –02* – Project lead in area or function shown
 IC – Independent Contractor
 VC – Vacuum Case for Magnet SC – Sub-Contractor





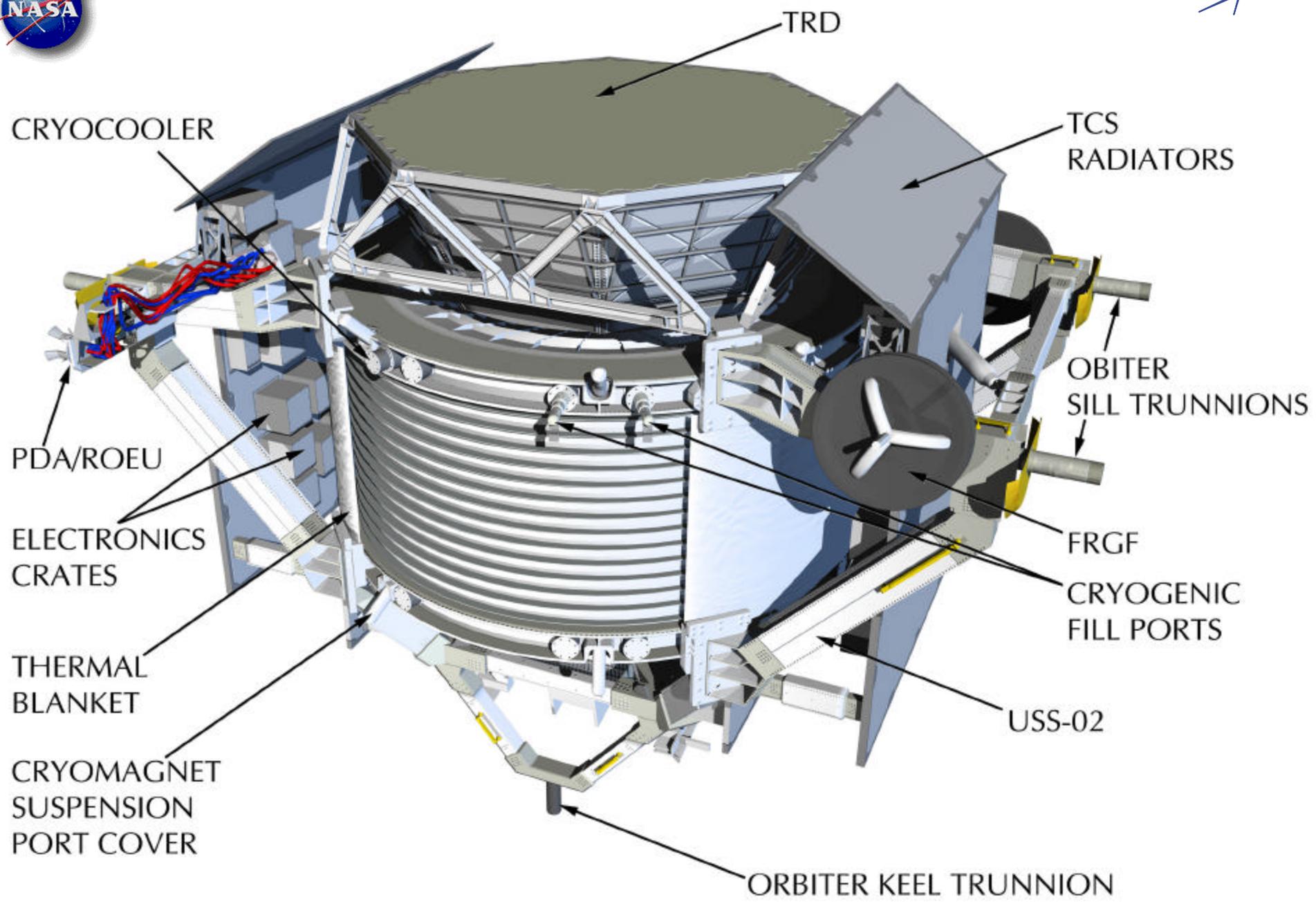


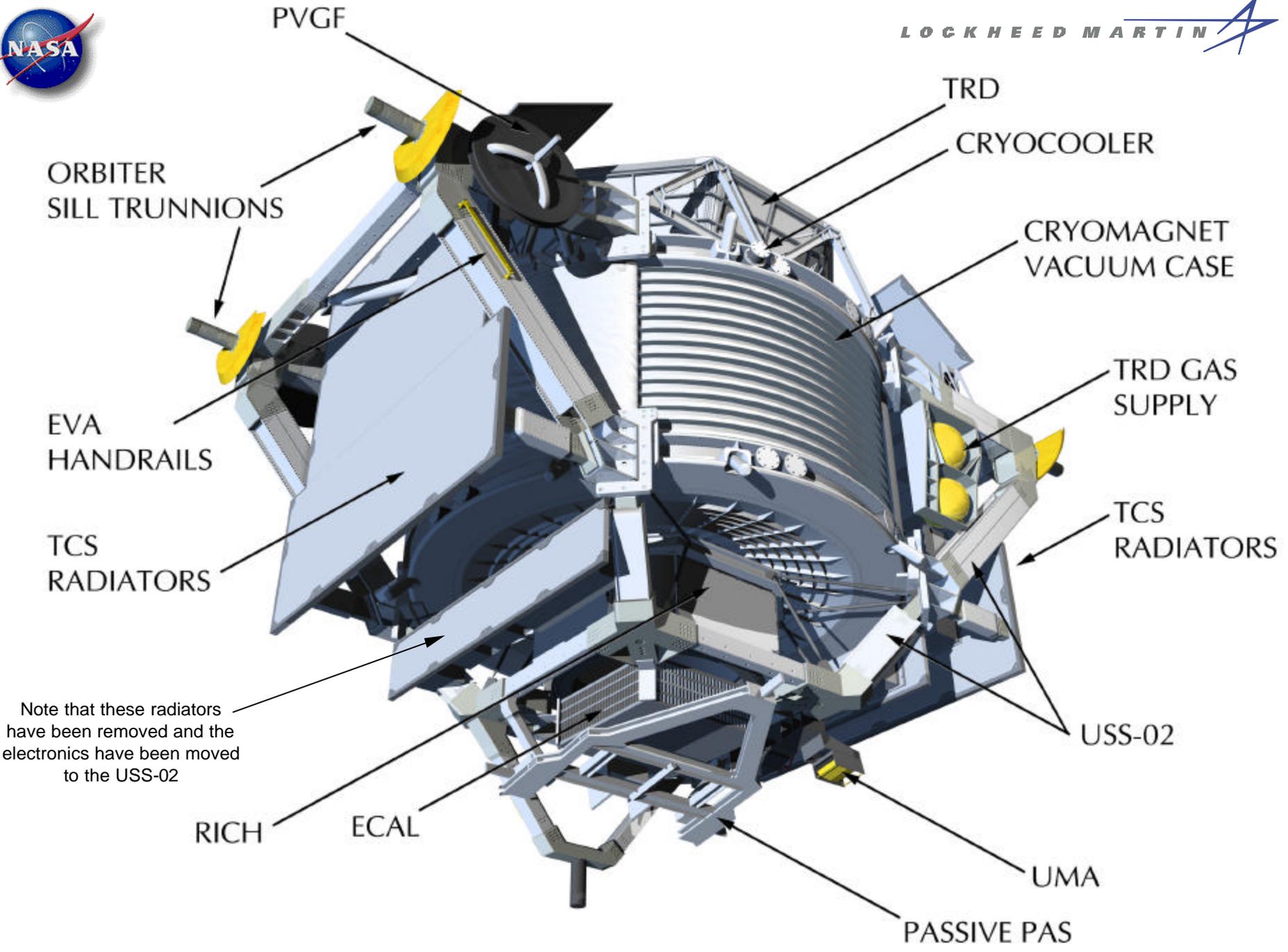
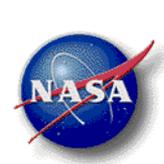


AMS Top Level Specifications

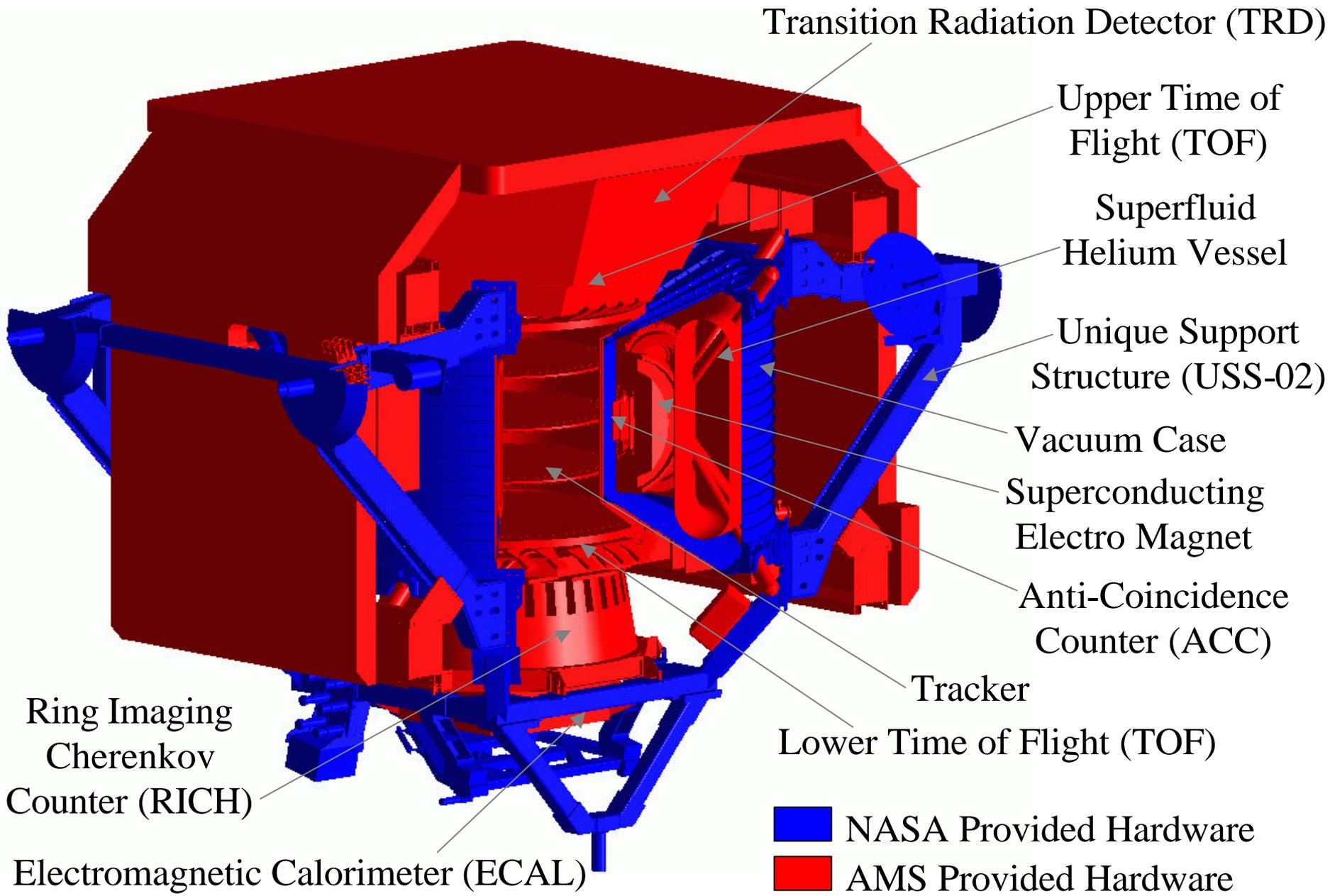
	AMS Unpress	STS Cabin	ACOP
Upmass	14,809 lbs	72 lbs	144 lbs
Volume	¼ Bay Payload	2 ft ³	5.8 ft ³
Power	2,000 W Cont. (ISS & STS) 2,300 W Peak (ISS)	60 W Cont. (STS)	200 W. Cont. (ISS)
High-rate Data	2 Mbps	2 Mbps	Up to 20 Mbps
Crew Time	Robotic only during install	10 Hrs Total	20 Hrs/Yr
Magnetic Field	8500 G Center of Magnet, 2000 G Max Fringe Field at VC		

(1400 G Center of Magnet on AMS-01)





PASSIVE PAS



Transition Radiation Detector (TRD)

Upper Time of Flight (TOF)

Superfluid Helium Vessel

Unique Support Structure (USS-02)

Vacuum Case

Superconducting Electro Magnet

Anti-Coincidence Counter (ACC)

Tracker

Lower Time of Flight (TOF)

Ring Imaging Cherenkov Counter (RICH)

Electromagnetic Calorimeter (ECAL)

 NASA Provided Hardware

 AMS Provided Hardware



Prelaunch – Payload Bay



- T0 Umbilical power for Vent Pump, Cryocoolers, Valves, CAB, Critical monitoring functions & J Crate
- SFHe Tank Top off complete at L-88 hours
- Magnet will not be charged in Shuttle
- L-30 Minutes – Close SFHe Tank vent valve and deactivate vent pump and cryocoolers
- Continuously monitor health status of cryosystem until L-9 minutes
- L-9 Minutes – Go/No Go call from AMS



Ascent



- Launch – T0 Disconnect
- SFHe Tank nominal vent valve operations during ascent utilizing barometric switch with backup BFS GPC Command



Baseline Nominal Operations



On-Orbit STS Operations



- Power up experiment (Max - 2kW)
- Activate and thermally condition experiment
- Magnet cannot be charged in Shuttle because it cannot receive power
- Dock to ISS on MET Day 3



Transfer



- Give Go/No-Go call to transfer AMS
- Grapple AMS FRGF with SRMS
- Disconnect Remotely Operated Electrical Umbilical (ROEU)
- Release longeron and keel trunnions
- Remove AMS from payload bay
- Handoff from SRMS (FRGF) to SSRMS (PVGf)
- Place AMS on S3 Upper Inboard Payload Attach Site using External Berthing Cues System (EBCS)
- Attach AMS mechanically with PAS and electrically with UMA



Baseline Nominal Operations



On-Orbit ISS Operations

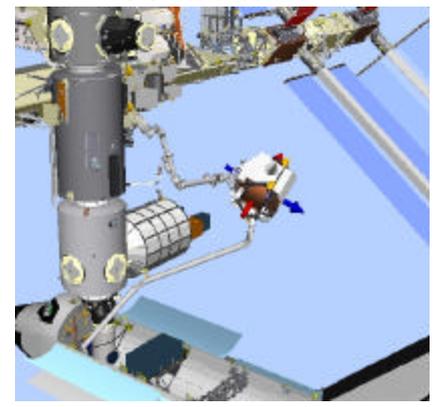


- Activate Experiment
- Charge Magnet (with crew monitoring at ACOP)
- Stay/No Stay Decision from AMS before Shuttle leaves
- 3-5 Years of Continuous Operations
- Primary control from ground
- Crew interface available through Express Rack Laptop (nominal ops require very little crew involvement)

TBR



Transfer



TBR



- Grapple AMS with SSRMS using PVGF
- Detach AMS mechanically with PAS and electrically with UMA
- Remove payload from S3 Attach Site
- Handoff from SSRMS (PVGF) to SRMS (FRGF)
- Detach SSRMS
- Place back in payload bay
- Attach longeron and keel trunnions
- Reconnect ROEU
- Disconnect SRMS





Baseline Nominal Operations



Landing



- Barometric Switch closes vent-valve on re-entry if not performed prior to removal from ISS
- No special ground processing requirements

