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	DATE: February 15, 2007	
	RE: AMS Star Tracker Field of View Assessment, Revision B	
	CC: Gene Cook/OZ, Vic Sanders/Boeing, AJ Alfonzo/Boeing, Stacey Dries/Boeing, Chris Tutt/Jacobs, Paul Nemeth/Jacobs, Trent Martin/EA, Paula Morris/ER, Larry Grissom/ER, Shakeel Razvi/OM, RS Library	
	PAGES: 9	**Action Item: 2171, Revision B**

Abstract:

The MAGIK Robotic Analysis Team has completed an action to assess the field of view (FOV) coverage for the Alpha-Magnetic Spectrometer – 02 (AMS-02) Star Tracker Camera 1 (ASTC1). The analysis determined that the FOV for ASTC1, the ISS starboard tracker, is impeded by the zenith, aft, port payload located on the ExPRESS Logistics Carrier (ELC), referred to as ELC payload 1 in this analysis, and the S4 and S6 solar arrays. In order for the ELC payload 1 to remain clear of the AMS ASTC1 FOV, the ELC payload 1 height needs to be reduced by approximately 25 inches.

Revision A incorporates a more recent model of the ELC, dated October, 2006 and updates the reduction in height of the intruding ELC payload 1 to a reduction of 25 inches as a result.

Revision B adds figures to provide additional definition of the protrusion of the ELC payload into the field of view of the AMS Star Tracker Camera 1.

Assumptions:

- ISS Flight 19A configuration (based on SSCB Approved Assembly Sequence dated February 22, 2006) was used for this analysis.
- The AMS CAD model used in this analysis was created by the MAGIK Team from a high fidelity model received from the ISS CAD Modeling Team in May, 2003. Pedigree information for other pertinent models may be obtained from the MAGIK Team upon request.
- The AMS ASTC1 Star Tracker eyepoint, viewing vector and field of view information was received from Bob Miley/OZ and Chris Tutt/Jacobs via email in January 2007.
- The ELC CAD model used in this analysis was created by the MAGIK Team from a high fidelity model received from Rodney Nabizadeh in October, 2006. Pedigree information for other pertinent models may be obtained from the MAGIK Team upon request.
- The AMS ASTC Star Tracker lens produces a rectilinear image.
- This analysis addresses clearance issues by measuring distances between 3D graphic models. Areas not addressed in this document - lighting, EVA/EVR tasks, thermal and/or pressure effects on elements, and dynamics - could have a significant influence on the measurements and overall feasibility.

- 3D graphical models used in this analysis are a result of the MAGIK Team's "best efforts" to obtain accurate models reflecting actual volumetric dimensions of the various ISS elements and/or create in the best possible manner an encompassing low fidelity model representative of the hardware and kinematically applicable to MAGIK analyses. Applicability is defined by the probability of interaction with the robotic arm(s), EVA on the arm, or a robotically moved hardware."Best efforts" include obtaining/creating models directly from the ISS CAD Modeling Team, the hardware designers, a 3rd party (a source other than the hardware designers), drawings/information from hardware designer or customer, or the ISS External Cargo Handbook (D684-11233-01). The MAGIK created models are lower fidelity, comparative to the source model, consisting of less detail. For applicable areas, the encompassing shape has a tolerance of +0.5/ -0.1 inch with respect to the source model; meaning the nearest source surface should be no greater than 0.5 inch from the surface on the encompassing shape. Non-applicable areas are modeled to tolerances of +1.5/ -0.1 inch.

Discussion and Results:

The analysis was performed by positioning a camera representing the AMS Star Tracker at the eyepoint provided (see Table 1). The field of view was set to a 28 degree cone (full cone angle) oriented in the direction of the provided viewing vector (see Table 1) and the view was evaluated for protrusions into the camera field of view for the Star Tracker.

	Eyepoint (relative to S3 Upper Inboard Payload Attach System Coordinate System)			Viewing Vector (center of viewing cone)			Viewing Cone (full cone angle)
	X (in)	Y (in)	Z (in)	X-component	Y-component	Z-component	Degrees
ASTC1 (ISS Starboard)	-0.7874	-19.1543	108.3496	-0.3687	-0.3558	0.8588	28

Figure 1 and Figure 2 illustrate overall views of AMS located on the S3 upper inboard Payload Attach Site (PAS).

Figure 3 illustrates an overall view of AMS located on the S3 upper inboard PAS showing the FOV cone for the ASCT1 Star Tracker.

Figure 4 – Figure 6 show the AMS payload and the representative ASTC1 Star Tracker. Figure 7 illustrates the FOV available from the ASTC1Star Tracker (ISS Starboard). Note that the S4 and S6 solar arrays will be visible in the ASTC1 FOV at certain alpha and beta angles. Additionally, the FOV for ASTC1 is impeded by the top of ELC payload 1, as shown in Figure 7. In order for the ELC payload 1 to remain clear of the AMS ASTC1 FOV, the ELC payload 1 height needs to be reduced by approximately 25 inches.

Figure 8 shows an additional overview of the ASTC1 viewing cone. Figure 9 provides a close-up of the ASTC1 viewing cone impeded by the ELC payload 1. Figure 10 – Figure 11 show a modified ELC payload 1 with the volume intersected by the viewing cone removed to illustrate how much of the ELC payload 1 protrudes into the ASTC1 FOV.
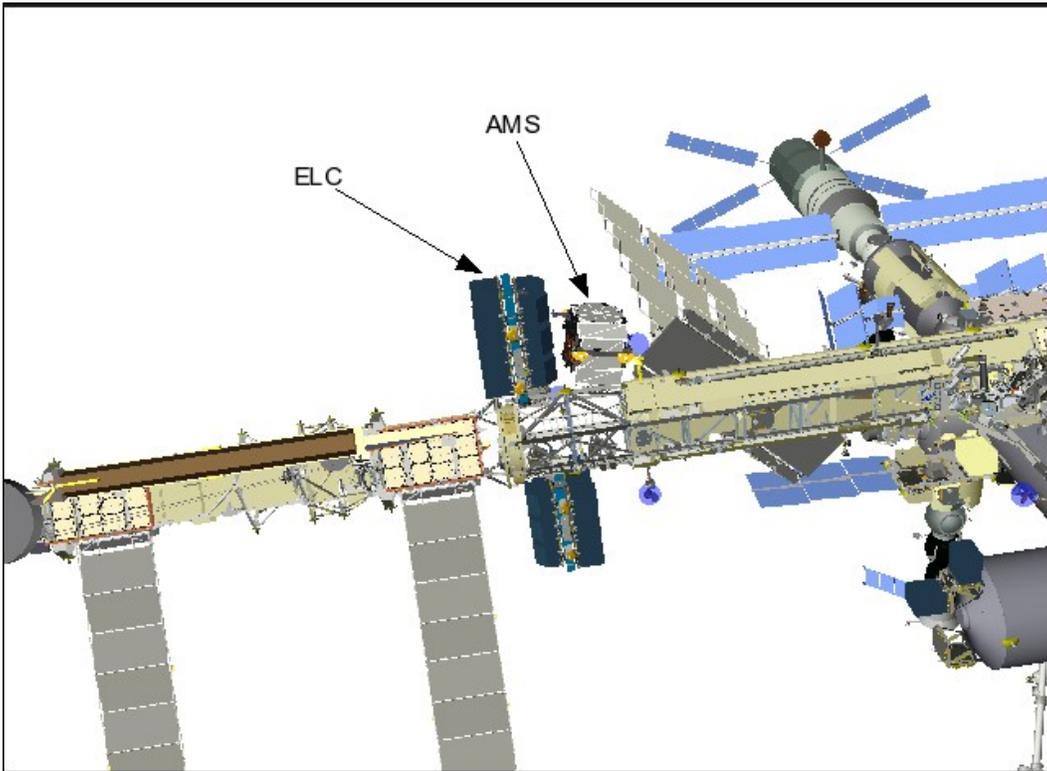
Figure 1: Overall view of AMS and ELC on S3 Upper Inboard PAS
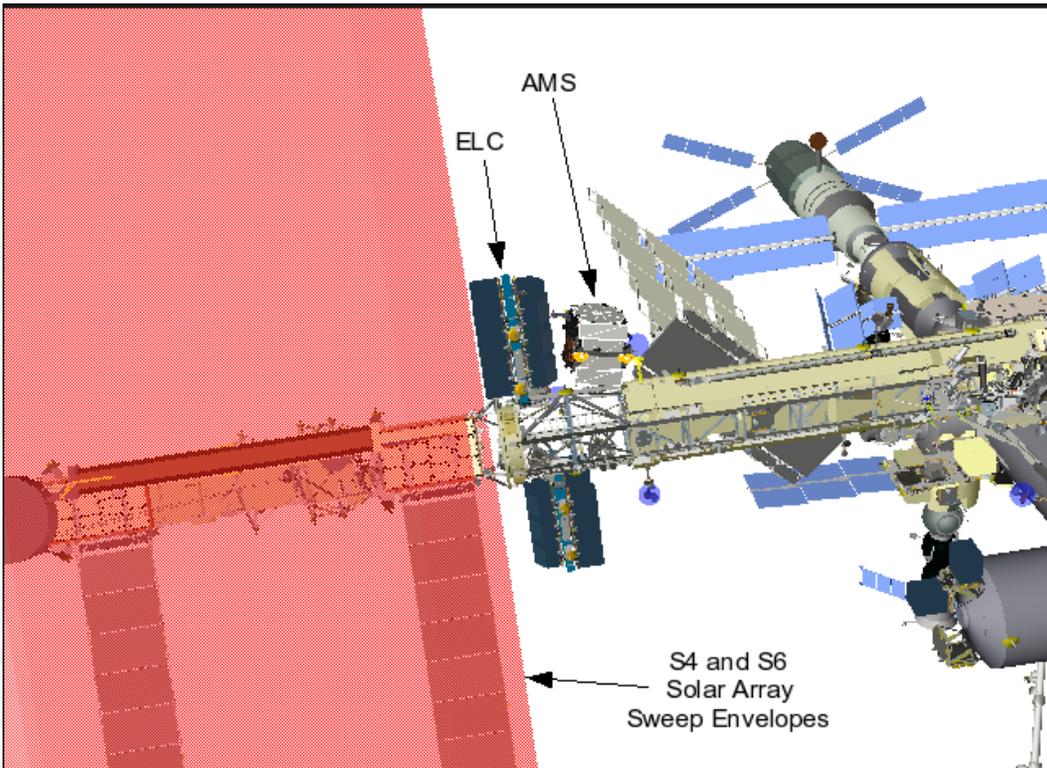*View Looking ISS Aft, Port and Nadir*

**Figure 2: Overall view of AMS and ELC on S3 Upper Inboard PAS with S4 and S6
Solar Array Sweep Envelopes**
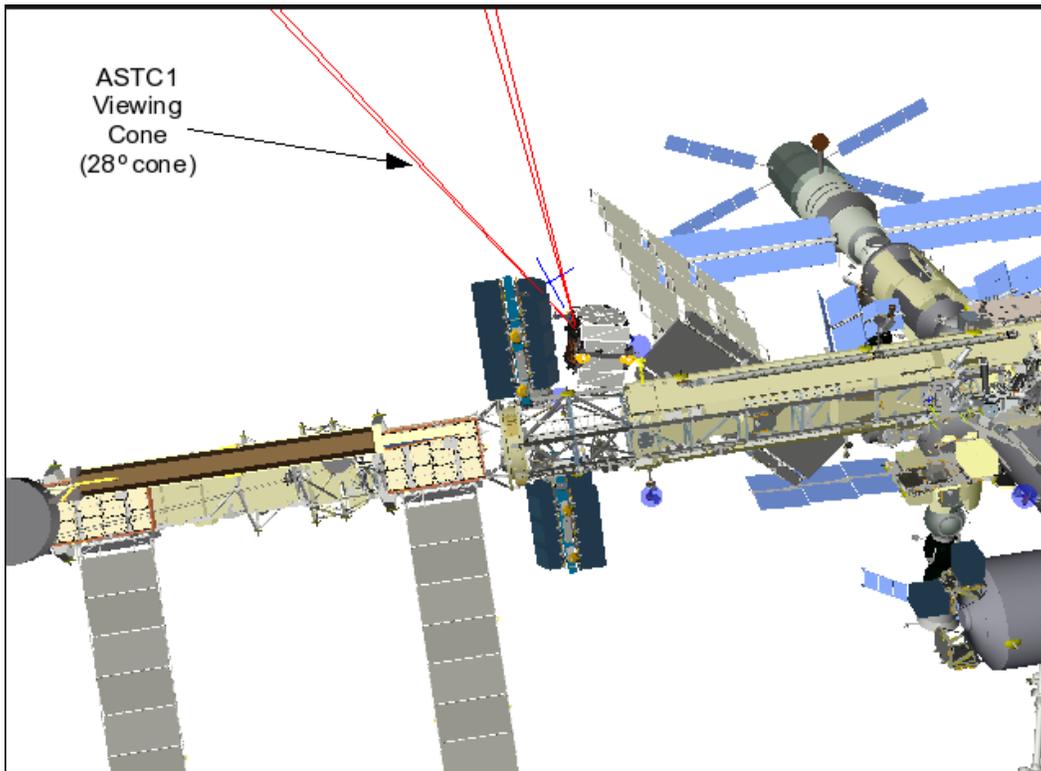*View Looking ISS Aft, Port and Nadir*

Figure 3: Overall view of AMS and ELC showing ASTC1 Viewing Cone
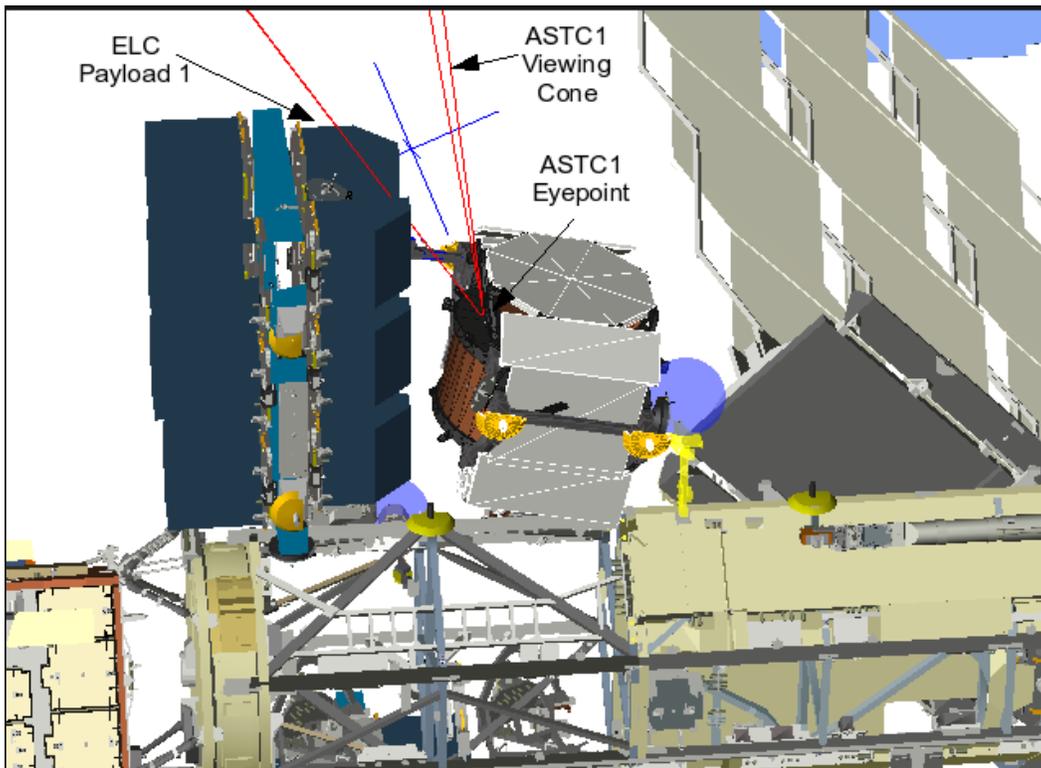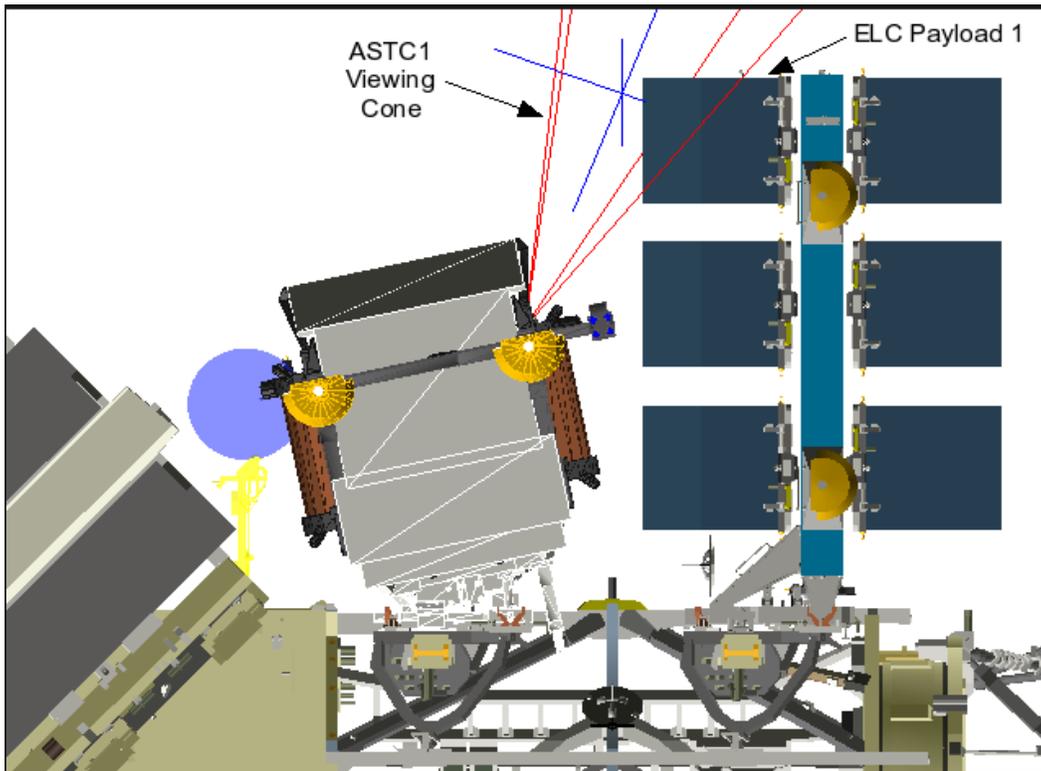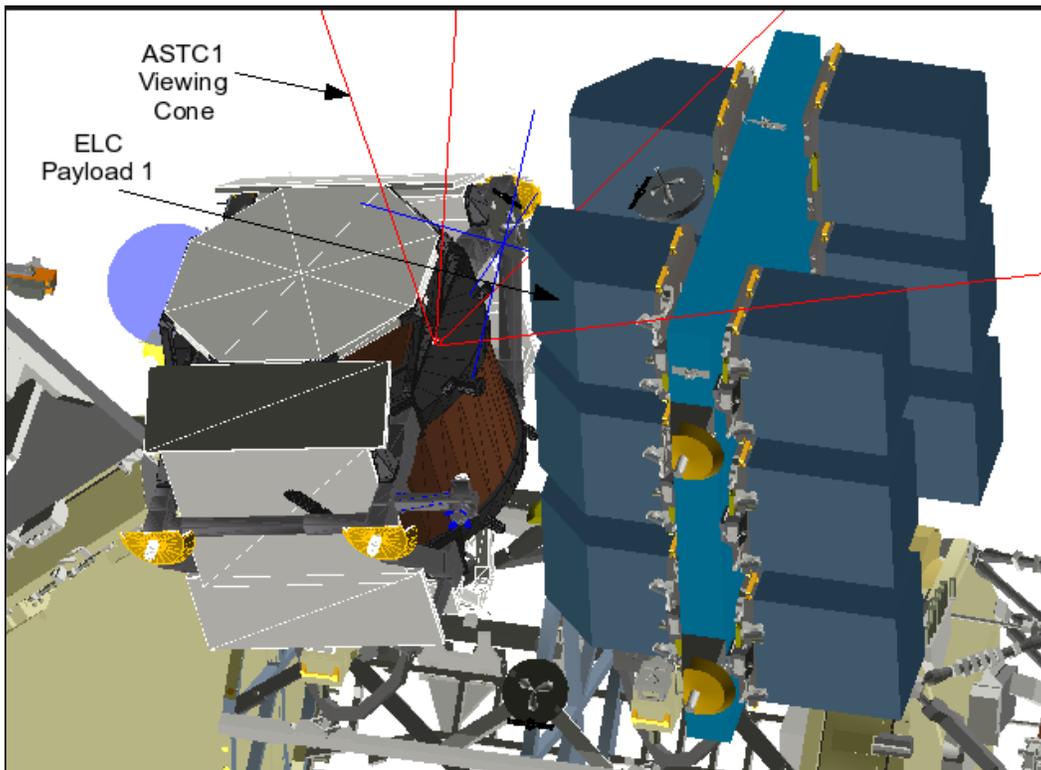*View Looking ISS Aft, Port and Nadir*

Figure 4: Overall view of AMS ASTC1 Viewing Cone and Eyepoint
View Looking ISS Aft, Port and Nadir

Figure 5: View of AMS ASCT1 Viewing Cone Impeded by ELC Payload 1
View Looking ISS Forward

Figure 6: View of AMS ASCT1 Viewing Cone Impeded by ELC Payload 1
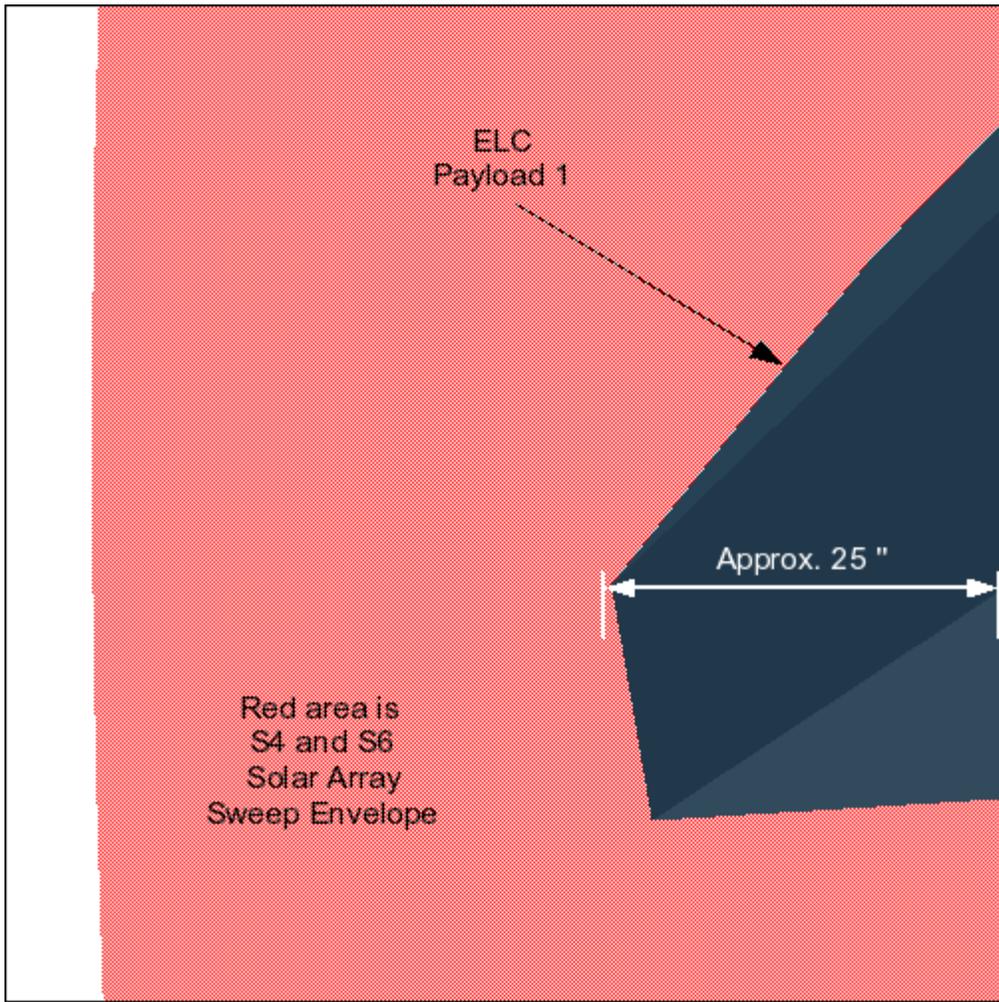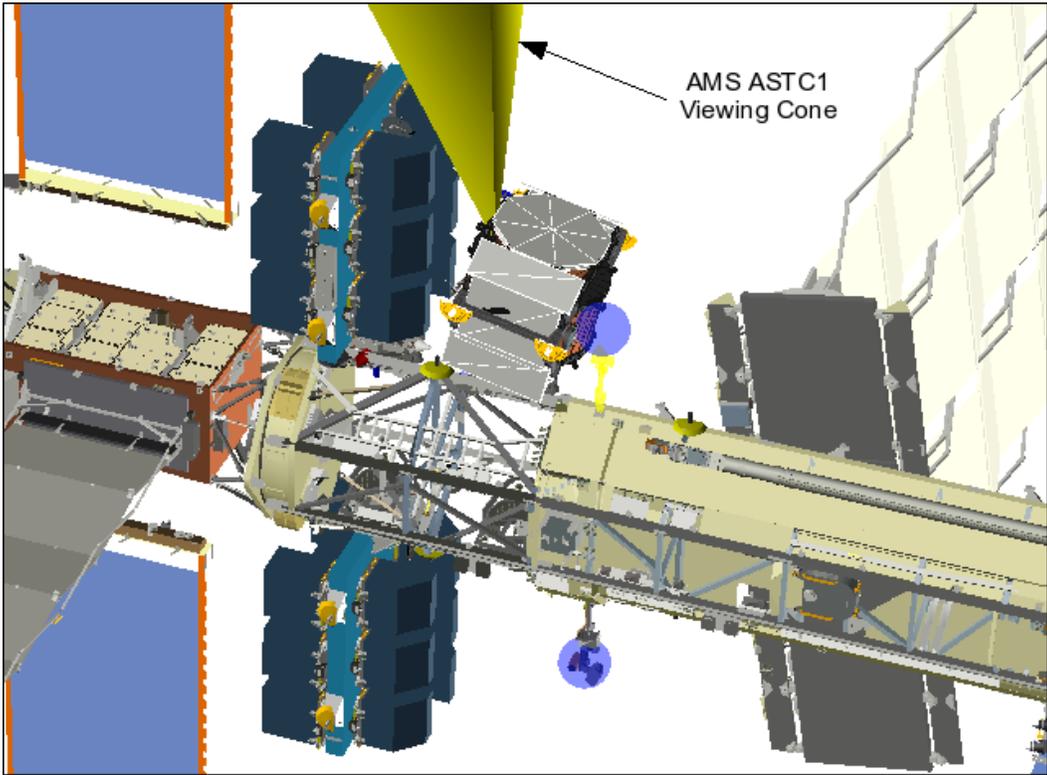*View Looking ISS Forward, Port and Nadir*

ELC
Payload 1

Approx. 25 "

Red area is
S4 and S6
Solar Array
Sweep Envelope

Figure 7: View available from AMS ASTC1

Figure 8: View of AMS ASCT1 Viewing Cone
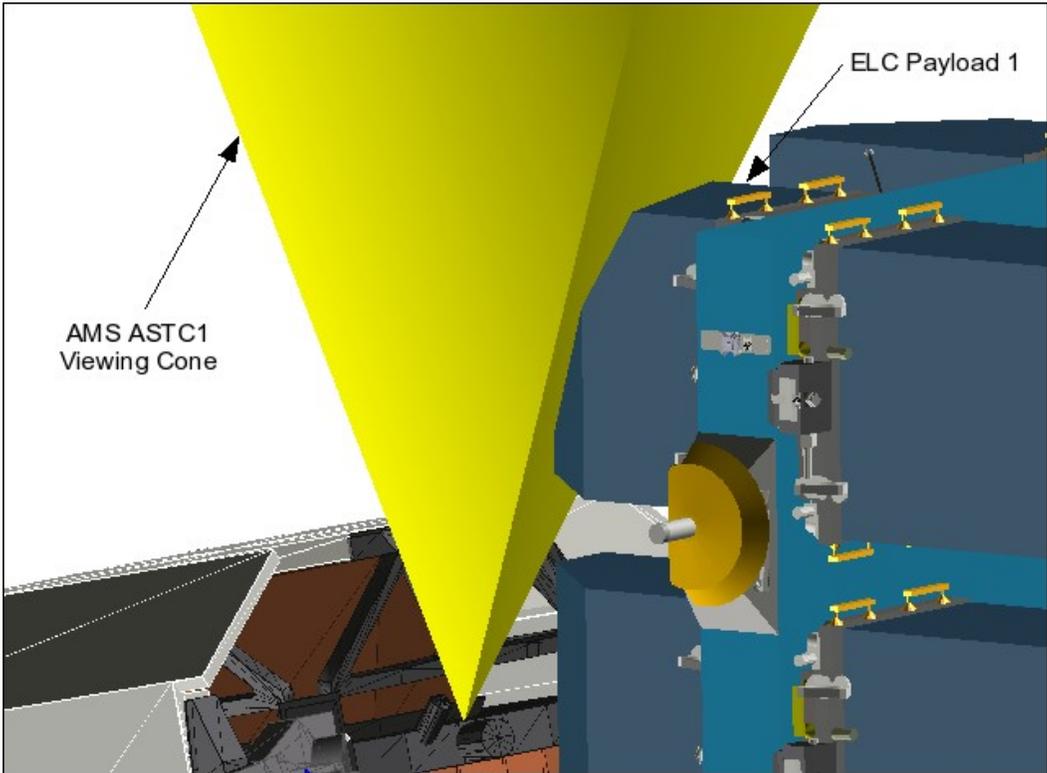*View Looking ISS Aft, Starboard and Nadir*

Figure 9: Close-up View of AMS ASCT1 Viewing Cone Impeded by ELC Payload 1
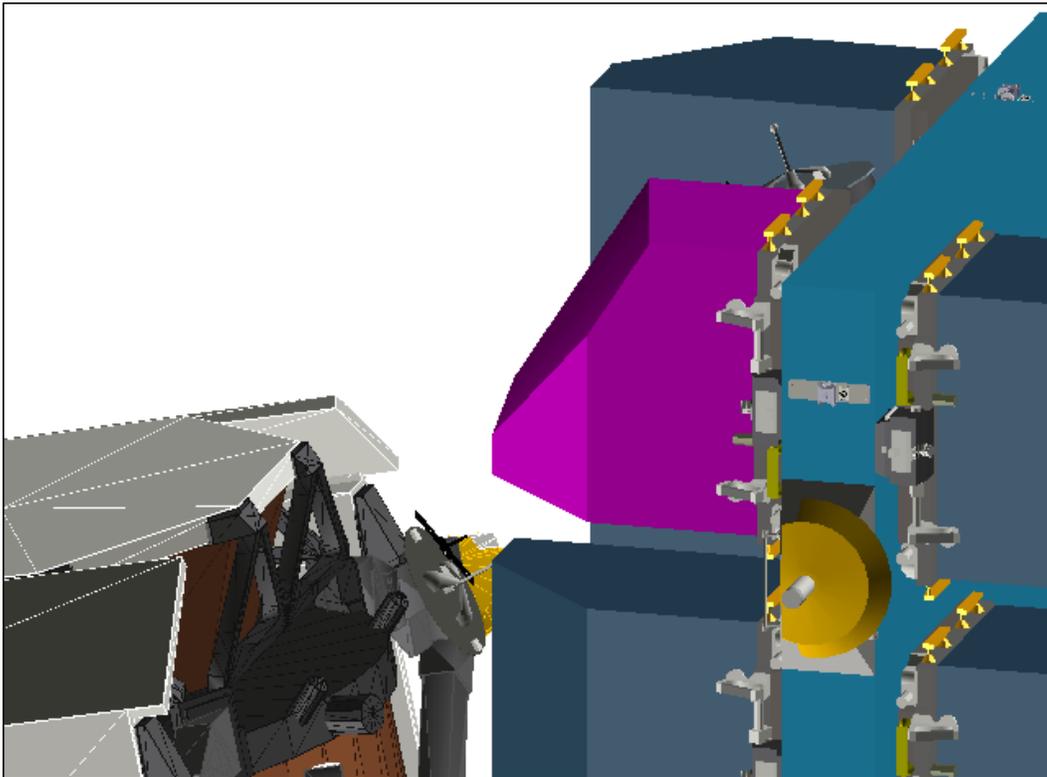*View Looking ISS Forward, Port and Nadir*

Figure 10: View of Modified ELC Payload 1 Volume with Cut-out for ASTC1 Viewing Cone
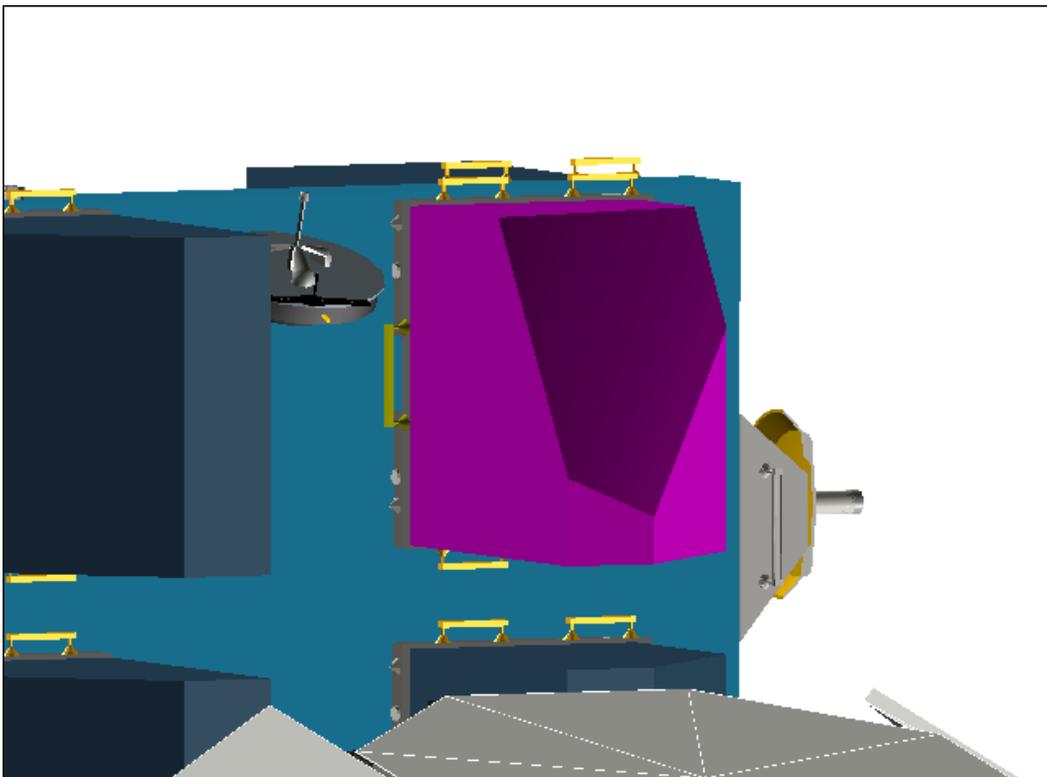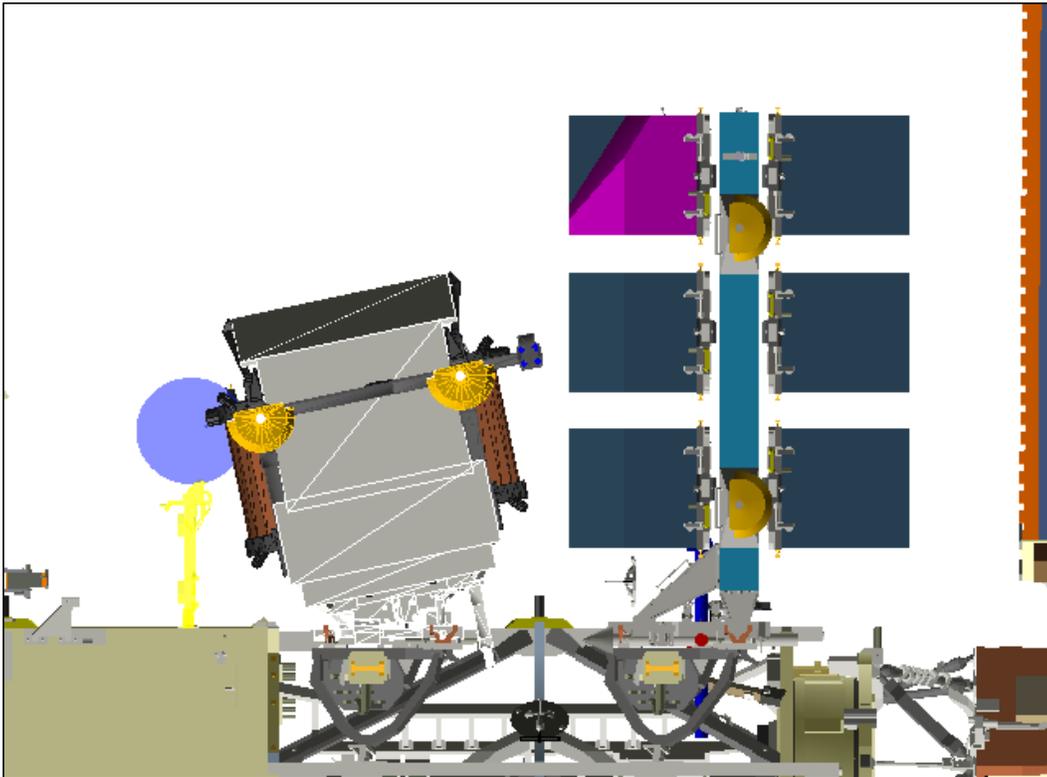*View Looking ISS Forward, Port and Nadir*

Figure 11: View of Modified ELC Payload 1 Volume with Cut-out for ASTC1 Viewing Cone
View Looking ISS Aft, Starboard and Nadir

Figure 12: View of Modified ELC Payload 1 Volume with Cut-out for ASTC1 Viewing Cone
View Looking ISS Forward