



International Space Station Program

**D684-13038-01**

**EVA Analysis Report:  
S3 Secondary Translation  
Path With AMS Installed**

Type 4 Document

**11/05/2008**

Submitted to: National Aeronautics and Space Administration  
Johnson Space Center  
Contract No. NAS15-10000

**REVISION AND HISTORY PAGE**

<b>Rev.</b>	<b>Description</b>	<b>Publication Date</b>
-	Initial release per SSCN 010446	11-19-08

*ERU: /s/ Mary C. Nooney 11-19-08*

**PREFACE**

The D684-13038-01 is an internal Prime Contractor document and is not required for delivery to NASA. This document is controlled by the MSER EVA & CSI Team and any changes to this document must be approved by MSER EVA & CSI Team.

/s/ Terri B. Puckett

\_\_\_\_\_  
Manager

11-10-08

\_\_\_\_\_  
Date

**INTERNATIONAL SPACE STATION PROGRAM  
S3 Secondary Translation Path With AMS Installed  
11/05/2008**

**CONCURRENCE**

PREPARED BY:	Mariana Monsalve	AG-92-J3ES
	PRINT NAME	ORGANIZATION
	/s/ Mariana Monsalve	11-7-08
	SIGNATURE	DATE
FLIGHT LEAD:	Fernando Ramos	AG-92-J3ES
	PRINT NAME	ORGANIZATION
	/s/ Fernando Ramos	11-10-08
	SIGNATURE	DATE
TEAM LEAD:	James A Pomier Jr	AG-92-J3EQ
	PRINT NAME	ORGANIZATION
	/s/ James A Pomier Jr	11/10/2008
	SIGNATURE	DATE
DQA:	Stephanie Gill	AG-92-J3ES
	PRINT NAME	ORGANIZATION
	/s/ Stephanie Gill	11/7/2008
	SIGNATURE	DATE
REQUIREMENTS LEAD:	Portia Jones	AG-92-J3EQ
	PRINT NAME	ORGANIZATION
	/s/ Portia Jones	11-10-08
	SIGNATURE	DATE
HARDWARE FOCAL:	Leonardo Cornejo	AG-92-J3ES
	PRINT NAME	ORGANIZATION
	/s/ Leonardo Cornejo	11-10-08
	SIGNATURE	DATE

**INTERNATIONAL SPACE STATION PROGRAM  
S3 Secondary Translation Path With AMS Installed  
11/05/2008**

**LIST OF CHANGES**

All changes to paragraphs, tables, and figures in this document are shown below:

<b>REVISION</b>	<b>DATE</b>	<b>PARAGRAPH(S)</b>
-----------------	-------------	---------------------

**TABLE OF CONTENTS**

**1.0 PURPOSE ..... 1-1**  
    1.1 GENERAL NOTES ..... 1-1  
    1.2 SCOPE ..... 1-1

**2.0 DOCUMENTATION..... 2-1**  
    2.1 APPLICABLE DOCUMENTS..... 2-1  
    2.2 REFERENCE DOCUMENTS ..... 2-1

**3.0 CONFIGURATION ..... 3-1**  
    3.1 HARDWARE FAMILIARIZATION..... 3-1  
        3.1.1 AMS LOCATION..... 3-2

**4.0 ANALYSIS..... 4-1**  
    4.1 SECONDARY TRANSLATION PATH VIOLATIONS FROM S3 TO AMS ..... 4-2  
        4.1.1 TRANSLATION PATH VIOLATIONS – FACES 2 and 3..... 4-2

**5.0 APPLICABLE REQUIREMENTS ..... 5-1**  
    5.1 REQUIREMENT PARAGRAPH MAPPING ..... 5-1  
        5.1.1 COMPLIANCE MATRIX FOR TRANSLATION PATH ENVELOPE ..... 5-1

**6.0 CONCLUDING REMARKS ..... 6-1**

**APPENDIX A: LIST OF ABBREVIATIONS AND ACRONYMS..... A-1**

**LIST OF FIGURES**

Figure 3.1-1 ISS Configuration ..... 3-1

Figure 3.1.1-1 AMS Installed on S3 ..... 3-2

Figure 3.1.1-2 S3 Translation Paths with AMS installed..... 3-3

Figure 3.1.1-3 View of faces of S3 with AMS installed ..... 3-4

Figure 3.1.1-5 Handrail Usage for Secondary Translation Path – S3 Faces 2 to 6..... 3-5

Figure 4.0-1 Interferences in S3 Secondary Translation Path..... 4-1

Figure 4.1.1-1 Translation Path Violations on S3 ..... 4-2

Figure 4.1.1-2 Translation Path Violations on S3 Section A-A ..... 4-3

## 1.0 PURPOSE

The purpose of this document is to characterize the Secondary Translation Path for S3 Truss Segment of the International Space Station (ISS) with the Alpha Magnetic Spectrometer (AMS) installed. This analysis includes the geometry of the translation path and the violations of that path in accordance to:

- SSP57003D - Attached Payload Hardware Interface Control Requirements Document
- SSP41162AY - Attached Payload Hardware Interface Control Requirements Document

## 1.1 GENERAL NOTES

1. The Three-Dimensional (3D) graphical models used in this report are results of the efforts made by the Extravehicular Activity (EVA) & Crew System Integration (CSI) Team to obtain accurate models from the ISS 3D Computer-Aided Design (CAD) Team. These models reflect the as-designed configuration. If the necessary models are not available from the ISS 3D CAD Team, then they are obtained from the hardware designers, released drawings or other documentation from the hardware designers.
2. All measurements are in units of inches.
3. The ISS Coordinate System (CSYS) was used to reference views of this document.
4. The pictures shown in this report were taken from the Unigraphics (UG) file that corresponds to the document number of this report. Refer to HOU-EGD-066 for the location of the file.
5. The table in Section 4.1 describes violations of the translation path volume by name and by the dimension of the violation in inches.
6. The Primary Translation Path shown for S3 in this report is based on Space Station Program (SSP) document SSP30256 Preliminary/Proposed Interface Revision Notice (PIRN) 142.
7. A requirement violation may be caused by multiple sources/structures. In the event of multiple violations, the greatest obstruction is recorded.

## 1.2 SCOPE

This document contains a qualitative and quantitative analysis of proposed Secondary Translation Path for the S3 Truss with AMS installed on the Zenith Inboard Payload Attach System (PAS) of S3. The requirement assessed for the translation path is shown as a 43 inch diameter envelope path from the S3 Truss Primary Translation Path to the AMS. These requirements are defined in SSP57003C paragraph 3.11.1.1.

**2.0 DOCUMENTATION****2.1 APPLICABLE DOCUMENTS**

DOCUMENT NUMBER	REV.	TITLE
SSP41162	AY	Segment Specification for the United States On-Orbit
SSP57003	D	Attached Payload Hardware Interface Control Requirements Document

**2.2 REFERENCE DOCUMENTS**

DOCUMENT NUMBER	REV.	TITLE
57213-NA-0005	-	Exception to AMS EVA Translation Path Interference Violation.
D684-12654-01	-	EVA Analysis Report: EVA Aids on S3
EVA AIT Minutes 9-4-2008	-	Minutes for September 4, 2008 EVA AIT
HOU-EGD-066	-	EVA&CSI Graphical Analysis Process
MDC96H0579	E	P3/S3, EVA Aids Locations
SP-M-229	T	Prime Item Development Specification for Integrated Truss Segment S3

### 3.0 CONFIGURATION

This section shows views from the CAD models of AMS installed on the S3 Truss.

### 3.1 HARDWARE FAMILIARIZATION

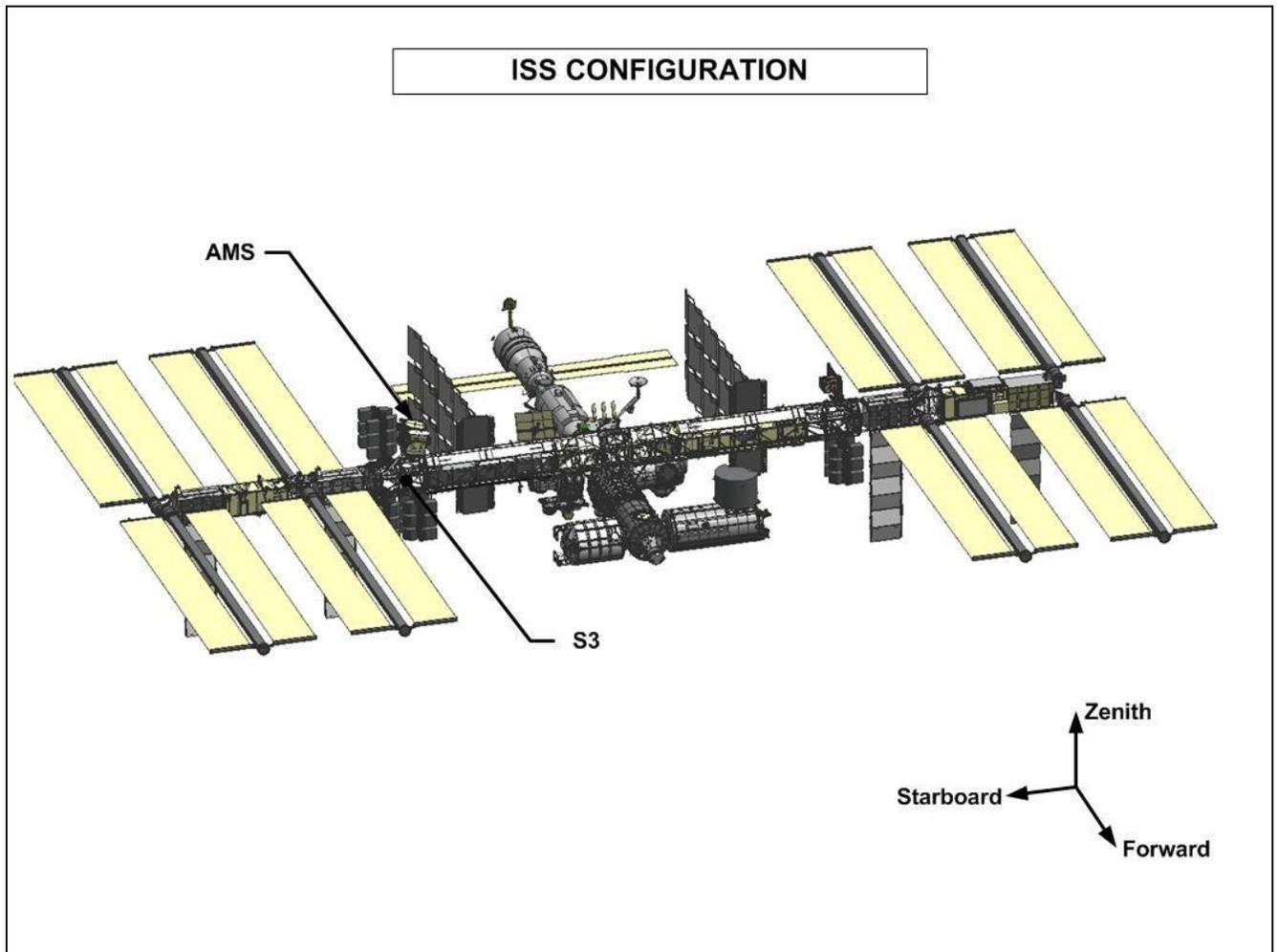


Figure 3.1-1 ISS Configuration

### 3.1.1 AMS LOCATION

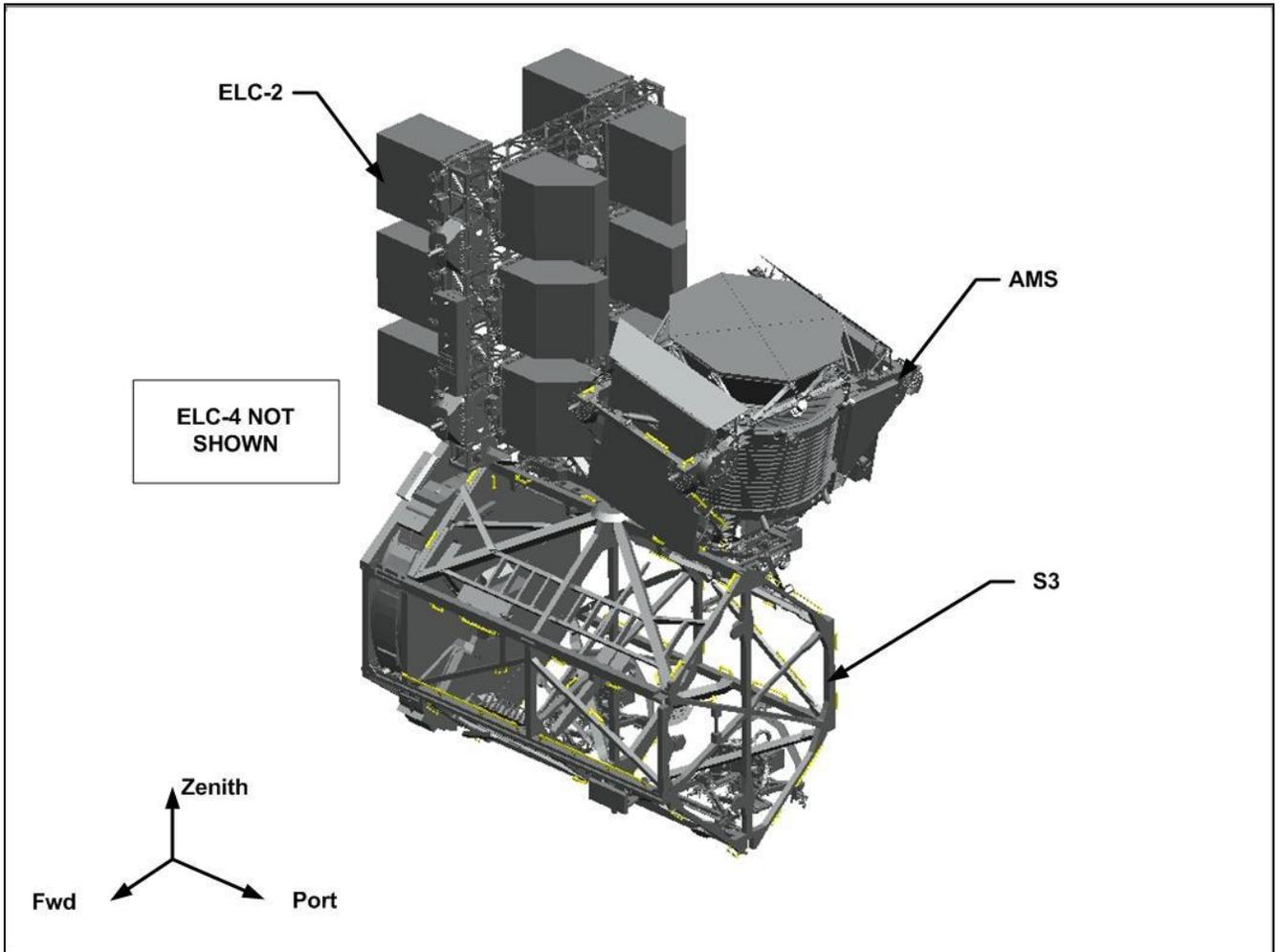


Figure 3.1.1-1 AMS Installed on S3

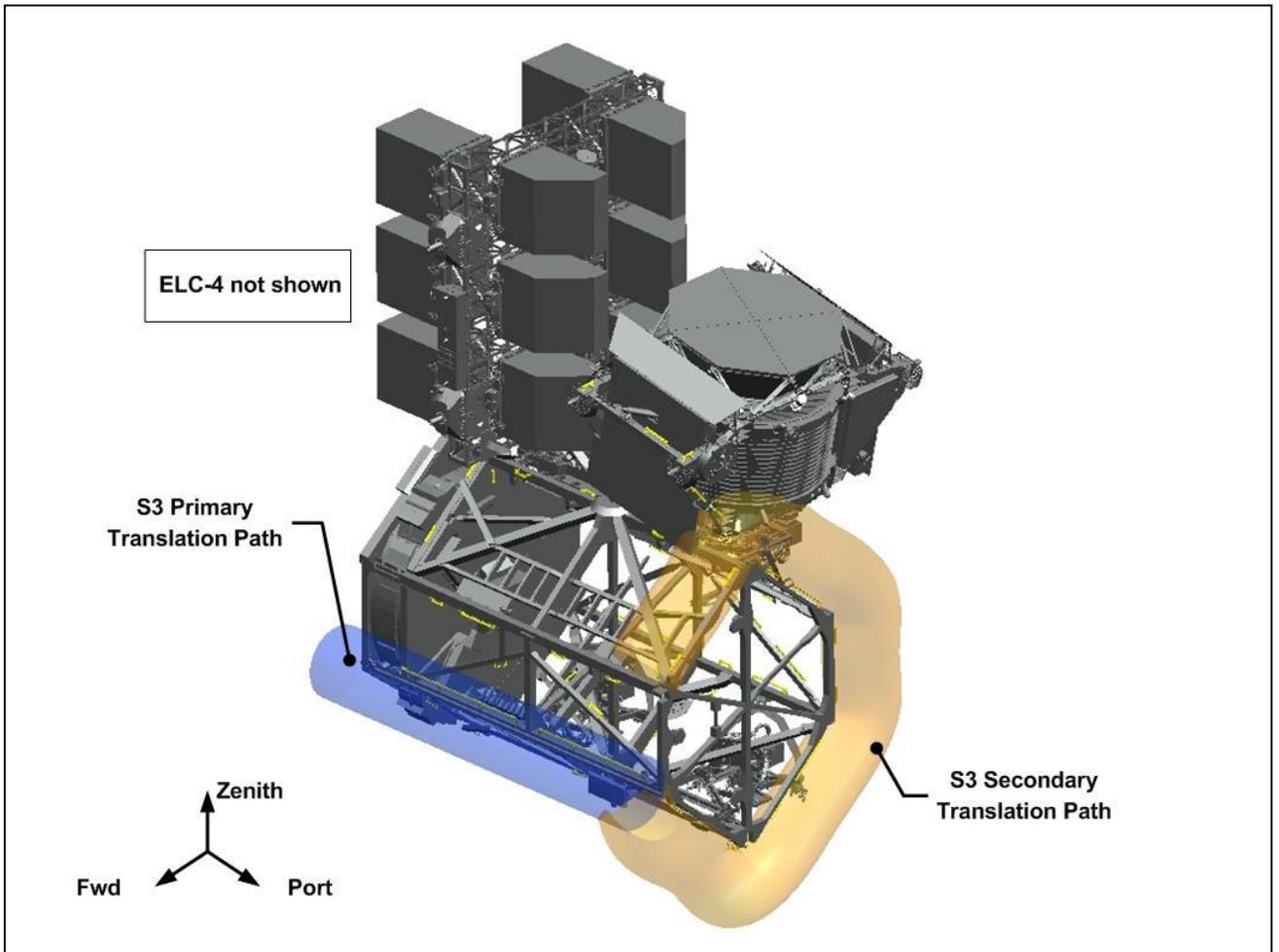


Figure 3.1.1-2 S3 Translation Paths with AMS installed

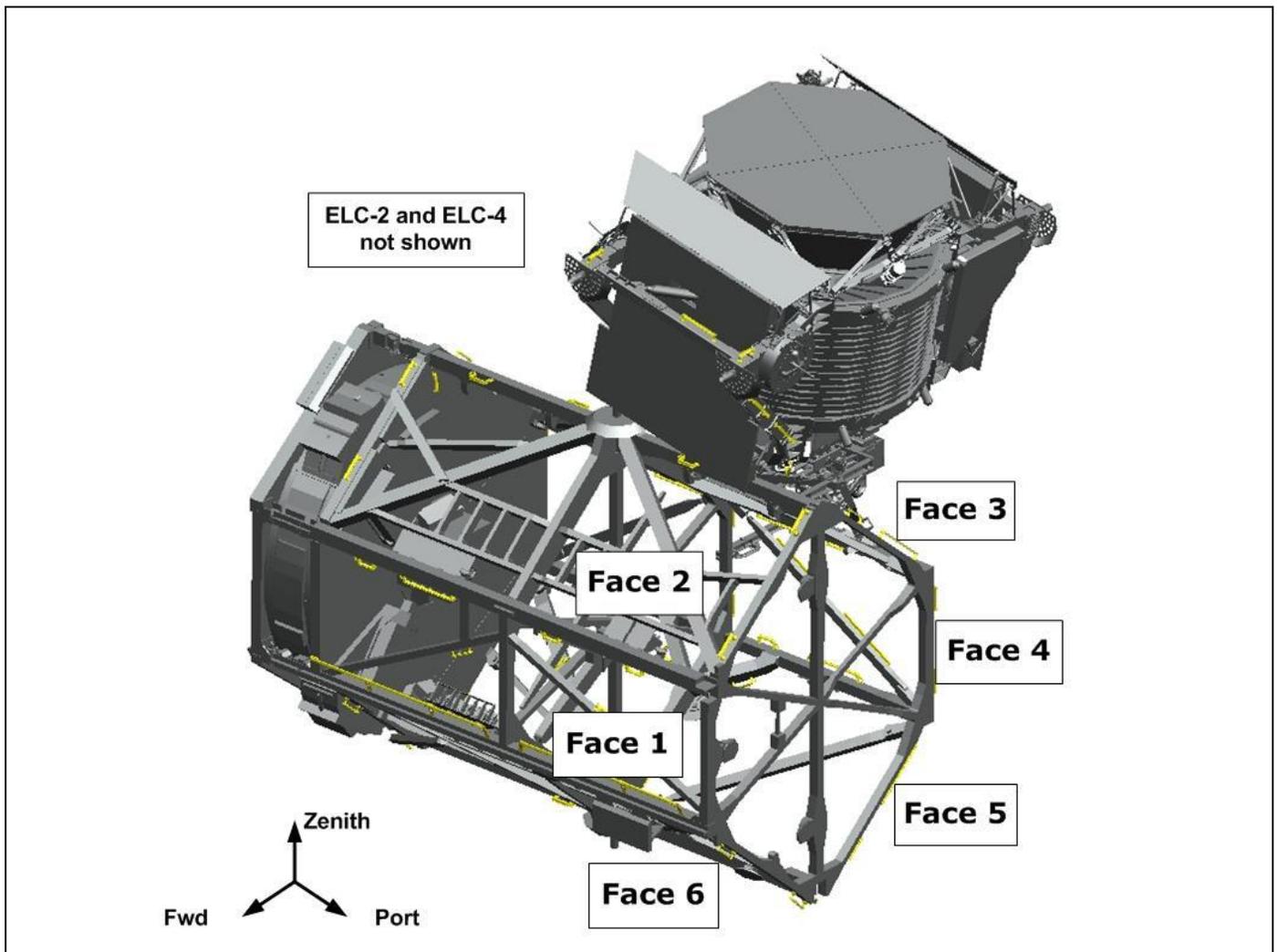


Figure 3.1.1-3 View of faces of S3 with AMS installed

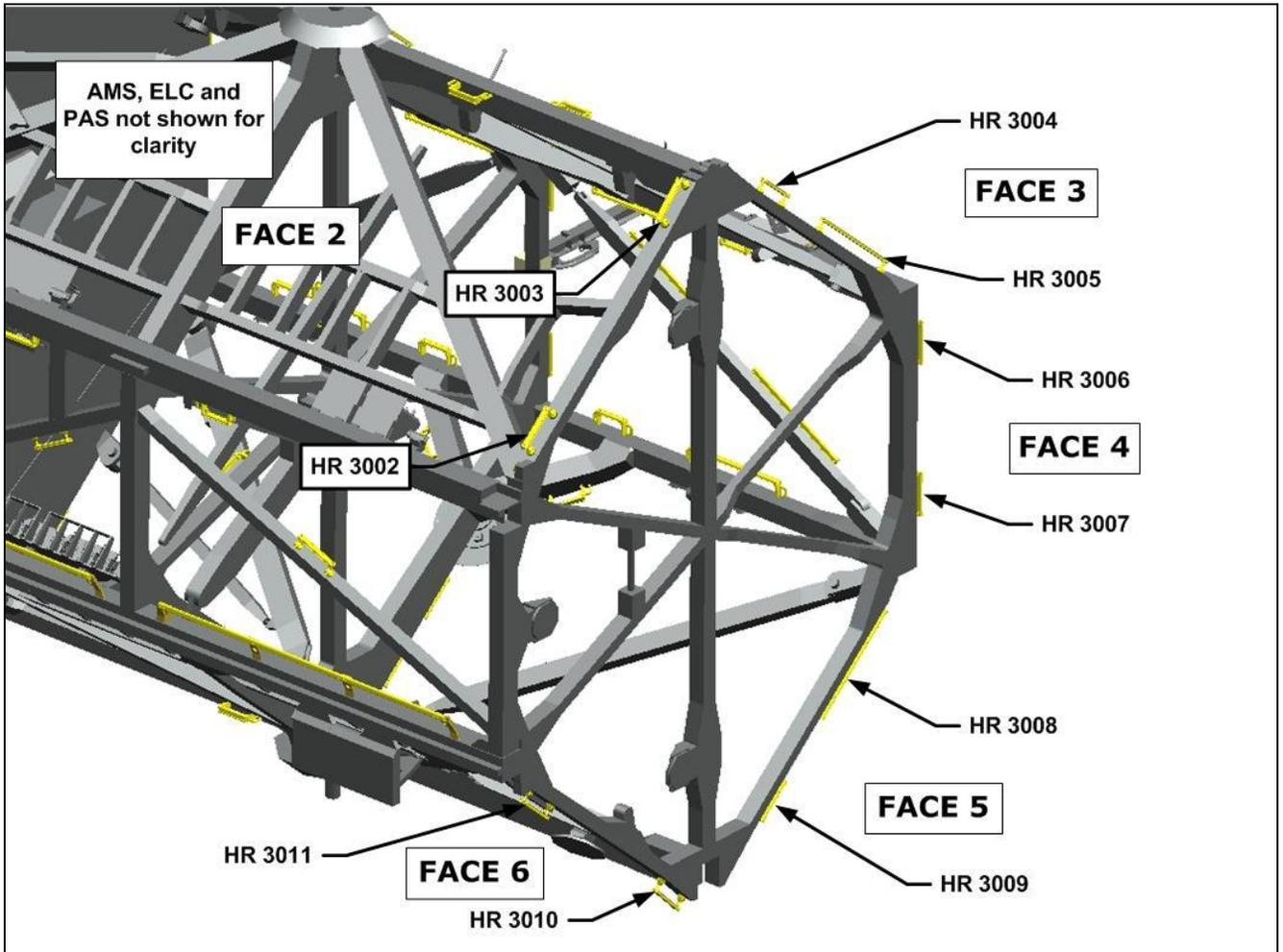
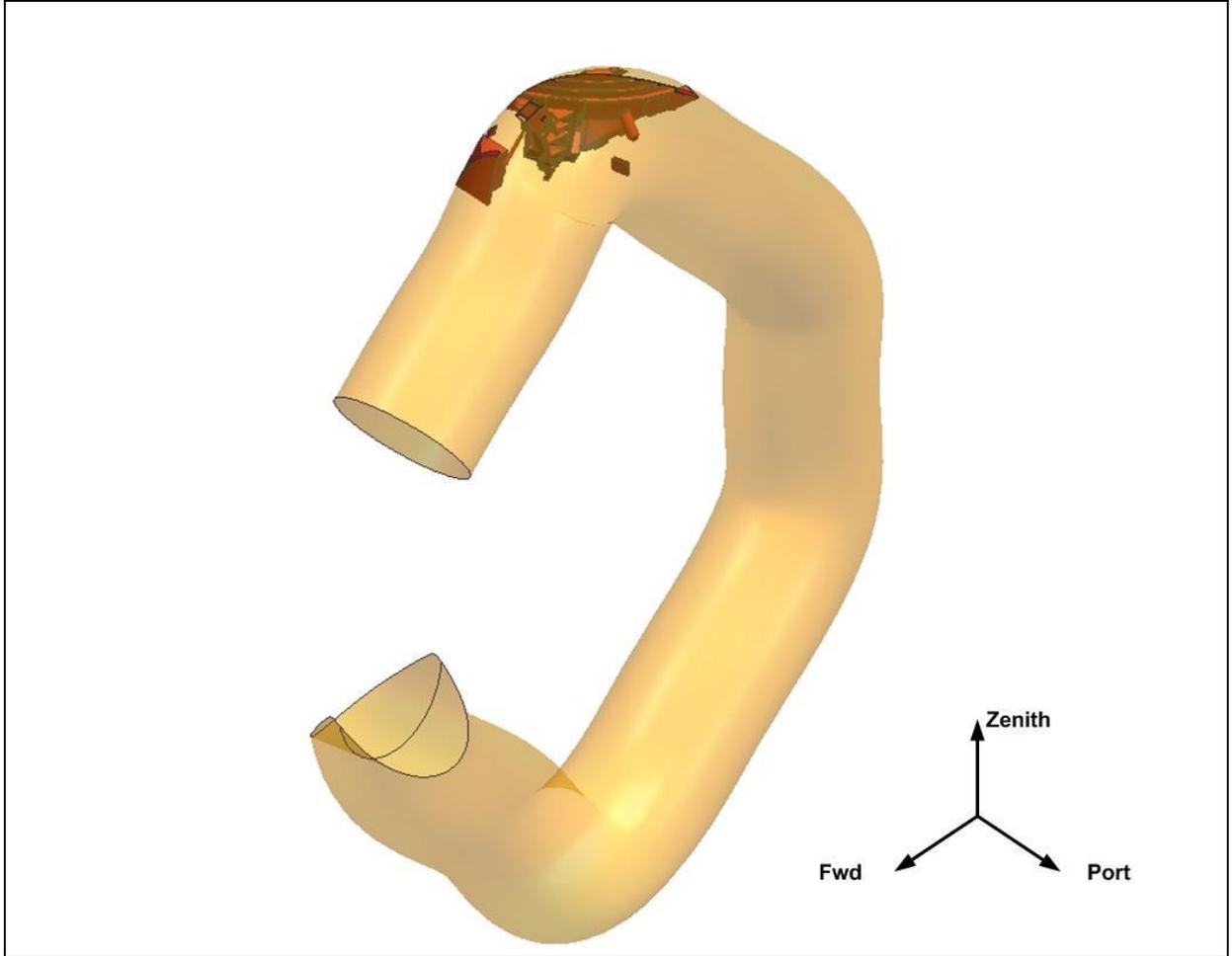


Figure 3.1.1-5 Handrail Usage for Secondary Translation Path – S3 Faces 2 to 6

**4.0 ANALYSIS**



**Figure 4.0-1 Interferences in S3 Secondary Translation Path**  
(Note: S3 and AMS Not Shown for Clarity)

#### 4.1 SECONDARY TRANSLATION PATH VIOLATIONS FROM S3 TO AMS

##### 4.1.1 TRANSLATION PATH VIOLATIONS – FACES 2 AND 3

The AMS is within the 43 inch translation path envelope of the S3 Truss as shown in Figure 4.1.1-1 and Figure 4.1.1-2. In approximate dimensions (radially in the translation envelope), the following violations were found:

Violation	Dimension
AMS	17.5 inches

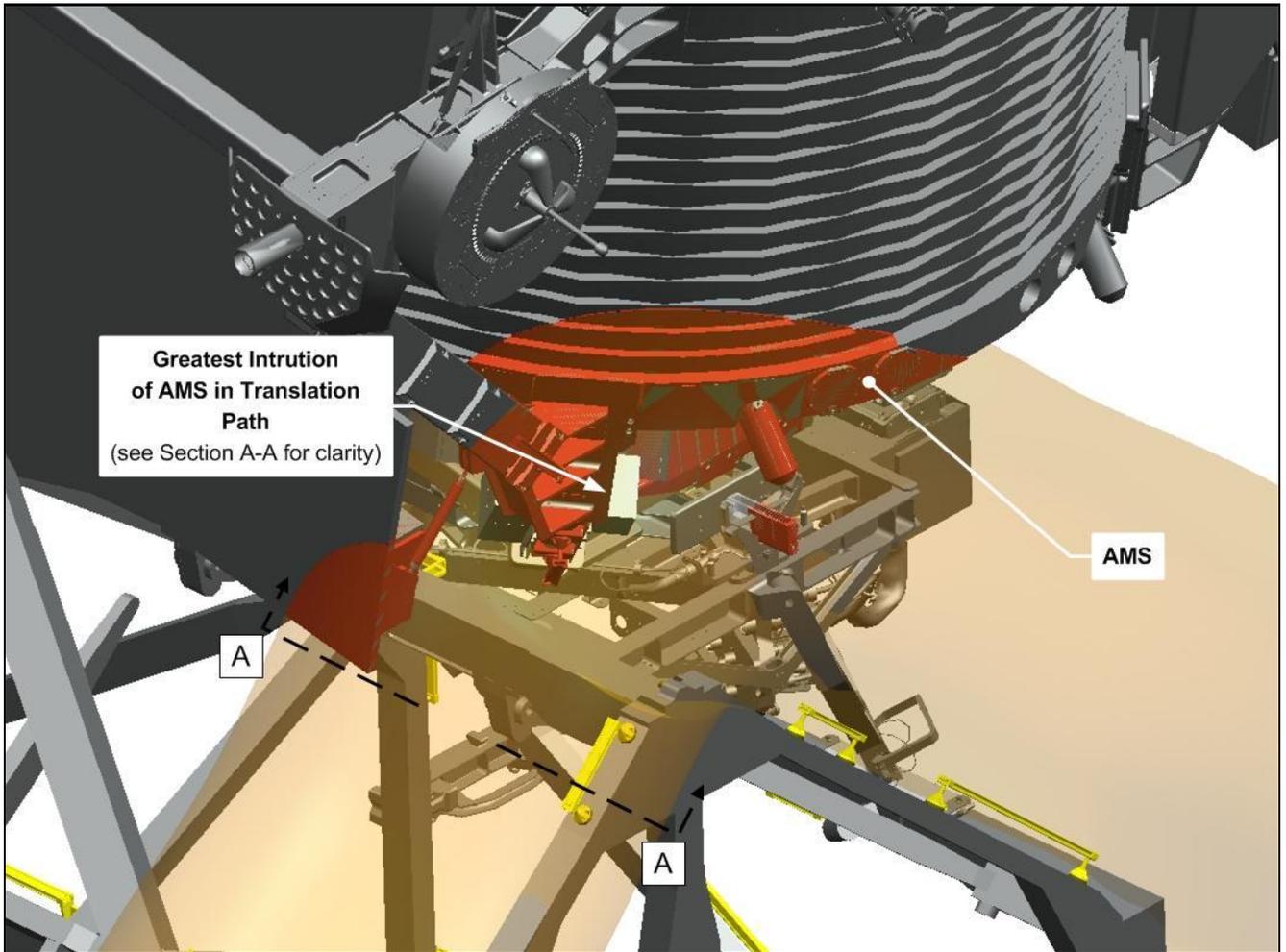


Figure 4.1.1-1 Translation Path Violations on S3

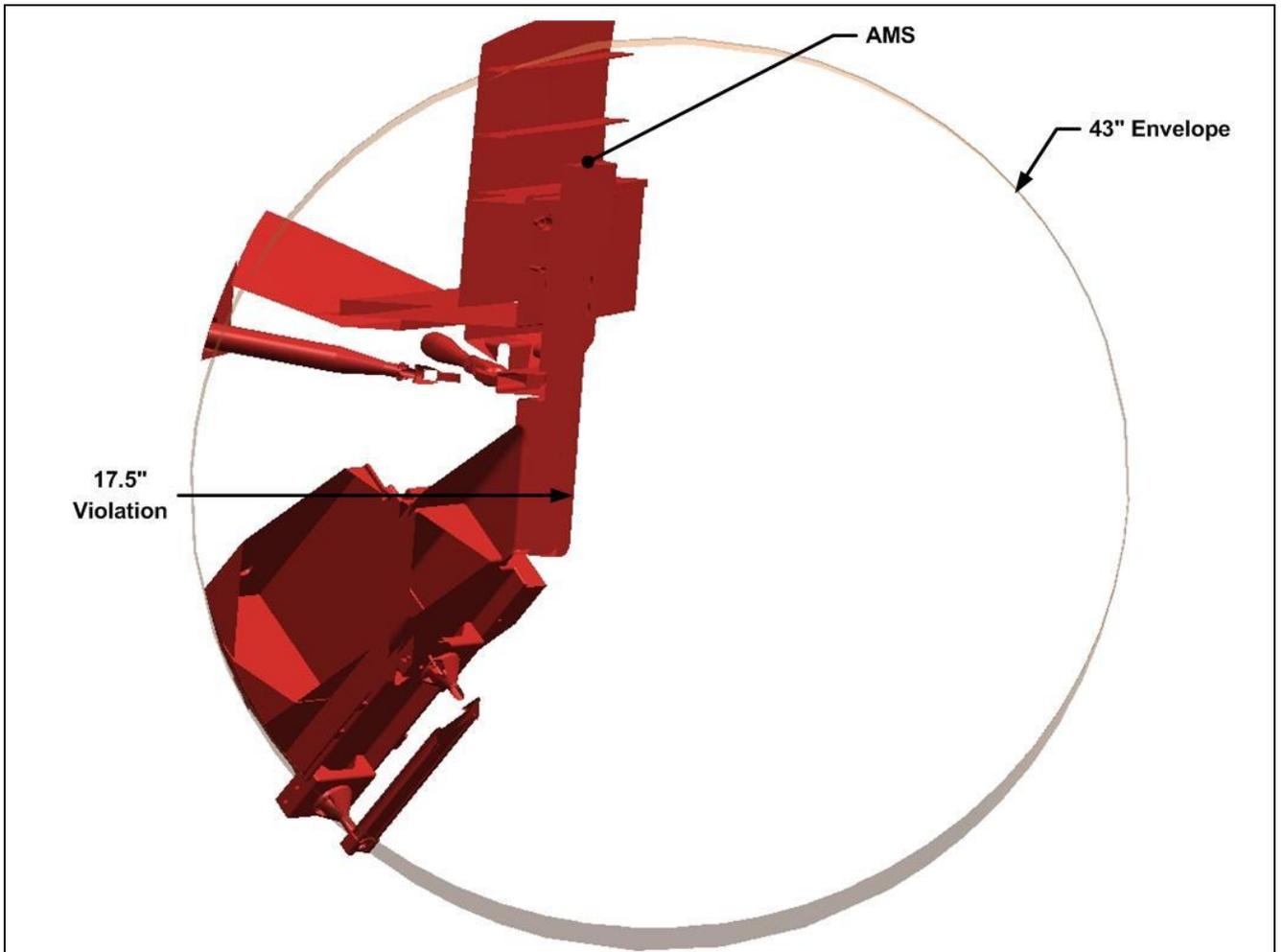


Figure 4.1.1-2 Translation Path Violations on S3 Section A-A

## 5.0 APPLICABLE REQUIREMENTS

SSP57003C            Attached Payload Hardware Interface Control Requirements Document  
 SSP41162AY        Segment Specification for the United States On-Orbit

### 5.1 REQUIREMENT PARAGRAPH MAPPING

Document Number	EVA Translation Paths
SSP57003C	3.11.1.1
SSP41162AY	3.3.6.12.10

#### 5.1.1 COMPLIANCE MATRIX FOR TRANSLATION PATH ENVELOPE

Item	EVA Translation Paths
AMS	Ce

## **6.0 CONCLUDING REMARKS**

The following violation was granted an exception at the EVA AIT on Sept 4, 2008 and the exception is noted in 57213-NA-0005:

EVA Translation Path is Non-Compliant because the 43-inch diameter envelope is violated by AMS.

**APPENDIX A: LIST OF ABBREVIATIONS AND ACRONYMS**

3D	Three-Dimensional
<b>A</b>	
AIT	Analysis Integration Team
AMS	Alpha Magnetic Spectrometer
<b>C</b>	
CAD	Computer Aided Design
CAS	Common Attachment System
CSI	Crew System Integration
CSYS	Coordinate System
<b>D</b>	
DQA	Document Quality Assurance
<b>E</b>	
EAR	EVA Analysis Report
ELC	Express Logistics Carrier
ERU	Engineering Release Unit
EV	Extravehicular Crewmember
EVA	Extravehicular Activity
EVA & CSI	Extravehicular Activity and Crew Systems Integration
<b>F</b>	
Fwd	Forward
<b>H</b>	
HR	Handrail
<b>I</b>	
ISS	International Space Station
<b>M</b>	
MSER	Mechanical, Structural, Extravehicular Activity and Robotics
<b>N</b>	
NASA	National Aeronautics and Space Administration
<b>P</b>	
PAS	Payload Attach System
PID	Prime Item Development
PIRN	Preliminary/Proposed Interface Revision Notice
<b>R</b>	
Rev.	Revision
<b>S</b>	
SSP	Space Station Program