

Element:  
ACIS

Evaluators:  
EDI, SMA

Requirement Number:  
3.2.3.3

### AXAF-I Verification Requirement Compliance Data Submittal

Type of Review:  
 Verification Item Closure  
 Requirement Closure

Verification Item:  
3.2.3.3

Requirement Title:  
Critical Components

Compliance Data/Location:  
MA-25/ACIS-800-A-18VR/Bldg 4200 Rm 522  
MA-253/36-01510.079 (2)/Rm 522 Bldg 4200 (Closure Report)  
MA-304/ACIS-800-I-05/Rm 522 Bldg 4200  
~~MA-300/ACIS-800-I-05/Rm 522 Bldg 4200~~  
Comments:

Verification Method  
Analysis

EDI TOPS CONCURS WITH SMA TOPS DISPOSITION BELOW.

**SMA TOPS DISPOSITION:**

The ACIS FMEA and CIL have not been updated to incorporate MSFC comments which indicate there could possibly be additional single point failures; therefore this requirement has not been met.

**Status**

Open 5/15/97 due 6/13/97

**Recommendation:**

**Action Required for Closure:**

Approve  
 Disapprove  
 Other (Explain)

FMEA and CIL must be updated to assure that all single point failures have been identified and retention rationale provided.

**MSFC Evaluator:**

**Date:**

**Organization:**

**Phone Number:**

JEFF WESLEY      6/22/97      EB14      4-3383

**Disposition:**

**Action Required for Closure:**

Approve  
 Disapprove  
 Other (Explain)

Per the Acceptance Review, ACIS will update the CIL with the retention rationale comments and will take the FMEA comments pertaining to another possible single point failure and will update the FMEA and CIL as appropriate and will resubmit the Single Failure Point Waiver with the updates. *FMEA & CIL submitted. Update waiver submitted? 8/16/97*

**Chief Engineer:**

**Date:**

Anthony R. Lavole      7/3/97

# Massachusetts Institute of Technology

## CENTER FOR SPACE RESEARCH

### WAIVER REQUEST

<b>Date Prepared:</b> 9/3/97	<b>Waiver No.</b> 36-017 Rev. A
<b>Initiated By:</b> Philip Bontemps	
<b>COMPONENT AFFECTED:</b> Various <b>P/N:</b> Various (See below) <b>Name:</b> Various (See below)	<b>ITEM AFFECTED:</b> <b>P/N:</b> <b>Name:</b>
<b>Original Requirements:</b> Components having failures in categories 1, 1R that are less than two fault tolerant, 2 or 2P, as defined in MSFC CR-5320.9, shall not be used.	
<b>Waiver Requested:</b> ACIS contains no hardware of criticality 1, 1R or 2, however, the ACIS Critical Items List (36-01407, Rev B) does identify eleven failure modes with criticality 2P. This waiver request is submitted to obtain authorization to use the following hardware, the failure of which could result in a criticality 2P failure. 1) PSMC Mother Board, 2) Focal Plane Support Assembly (FSA), 3) Optical Blocking Filter (OBF), 4) Detector Assembly Door Mechanism, 5) Detector Assembly Housing, 6) Venting Subsystem, 7) Detector Assembly Backplate, 8) DEA Backplane and 9) DPA Power Distribution Board	
<b>Justification/Reason:</b> Below is a summary of retention rationale from the ACIS CIL. <b>Reference the CIL for more detail.</b> 1) PSMC Mother Board (P/N 849AC407001): The loss of connector J11 on the PSMC mother board could prevent opening of the Detector Assembly door. ACIS believes successful environmental testing of the PSMC, periodic connector inspection and MIL-STD-975 derating, combined with a history of no failures, is adequate rationale for waiver approval and use of the PSMC Mother Board. 2) Focal Plane Support Assembly (P/N 849AC112026): Failure of an FSA flange or O-ring could result in OBF destruction due to loss of Housing vacuum integrity. ACIS believes successful environmental testing (at Qualification Levels) of the Engineering Unit camera and protoflight testing of the Flight camera, combined with O-ring inspections prior to installation, is adequate rationale for waiver approval and use of the Focal Plane Support Assembly. 3) Optical Blocking Filter (P/N 36-10115 and 36-10116):	

A ruptured OBF could result in severely degraded science. ACIS believes successful environmental testing of the Flight and Engineering Unit OBFs and a good frame design, combined with OBF inspections for abnormalities prior to installation, is adequate rationale for waiver approval and use of the Optical Blocking Filters.

4) Detector Assembly Door Mechanism (P/N 849AC113000):

a) Failure of the "open door" actuator could prevent opening of the Detector Assembly door for CCD exposure to space. ACIS believes successful environmental testing of the Flight actuator/door mechanism and life cycle testing of the Qualification Unit actuator/door mechanism, combined with dye penetrant inspection of all mechanical flight assemblies, is adequate rationale for waiver approval and use of the Detector Assembly Door Mechanism.

b) Failure of the door to hold vacuum during launch and ascent could result in possible OBF destruction or contamination. ACIS believes successful environmental testing of the Flight and Qualification Detector Housing (with OBF installed), combined with dye penetrant inspection of all mechanical flight assemblies, is adequate rationale for waiver approval and use of the Detector Assembly Door Mechanism.

5) Detector Assembly Housing (P/N 849110000):

Failure of the Housing to hold vacuum could result in possible OBF destruction or contamination. ACIS believes successful environmental testing of the Flight and Qualification Detector Housing (with OBF installed), combined with dye penetrant inspection of all mechanical flight assemblies, is adequate rationale for waiver approval and use of the Detector Assembly Housing.

6) Venting Subsystem (P/N 849AC123001):

a) Failure of the Venting Subsystem valves to hold vacuum could result in possible OBF destruction. ACIS believes successful vibration testing of the Flight Venting Subsystem mounted on the Qualification camera, combined with NDE inspection of all mechanical flight assemblies, is adequate rationale for waiver approval and use of the Venting Subsystem.

b) Failure of the Venting Subsystem vent tube or pressure transducers to hold vacuum could result in possible OBF destruction. Successful vibration testing of the Flight Venting Subsystem mounted on the Qualification camera, combined with dye penetrant and X-ray inspection of all welds has shown adequate weld penetration and has demonstrated Venting Subsystem ability to withstand specified dynamic environments. Additionally, special attention has been given to transducer O-ring inspection and installation, followed by successful Detector Housing leak testing. ACIS believes that the combined efforts described above

provide adequate rationale for waiver approval and use of the Venting Subsystem.

7) Detector Assembly Backplate (P/N 36-10107):

Failure of the Backplate to hold vacuum could result in possible OBF destruction. ACIS believes successful Backplate Helium leak testing of connector welds is adequate rationale for waiver approval and use of the Backplate.

8) DEA Backplane (P/N 36-03001.03):

Loss of backplane connection to the XA11 Interface and Thermal Control CCA would result in loss of DEA operation due to loss of power availability. ACIS believes successful environmental testing of the DEA, periodic connector inspection and MIL-STD-975 derating, combined with a history of no failures, is adequate rationale for waiver approval and use of the DEA Backplane and XA11 connector.

9) DPA Power Distribution Board (P/N 36-30317):

Loss of the A11J20 connector on the DPA power distribution board would result in loss of power to the DPA. ACIS believes successful environmental testing of the DPA, periodic connector inspection and MIL-STD-975 derating, combined with a history of no failures, is adequate rationale for use of the Power Distribution Board and A11J20 connector.

**Related Action and Effect:**  
(include cost/price)

FUNCTION	APPROVAL SIGNATURE	DATE
MIT Performance Assurance Manager	<u>Brian Klatt</u>	<u>9/4/97</u>
MIT Project Engineer	<u>Robert Johnson</u>	<u>9/8/97</u>
MIT Project Manager	<u>William Mayer</u>	<u>9/8/97</u>
NASA Representative	_____	_____
NASA Project	_____	_____

**ACIS Verification Summary Report**

<b>Specification:</b>	ACIS Contract End Item Specification
<b>Requirement Number/Title:</b>	3.2.3.3 Critical Components (VRSD3.2.3.3)
<b>Requirement Statement:</b> Components having failures in categories 1, 1R that are less than two fault tolerant, 2 or 2P, as defined in MSFC CR-5320.9, shall not be used.	
<b>Verification Method:</b>	Analysis
<b>Procedure Number:</b>	
<b>Configuration:</b>	
<b>Cycle Time:</b>	
<b>Verification Discussion/Results:</b>	
<p>Reference waiver 36-017.</p> <p>ACIS contains no hardware of criticality 1, 1R or 2, however, the ACIS Critical Items List (36-01407, Rev A) does identify nine failure modes with criticality 2P. For this reason a waiver has been generated (36-017) addressing the following hardware:</p> <p>PSMC Mother Board  Focal Plane Support Assembly (FSA)  Optical Blocking Filter (OBF)  Detector Assembly Door Mechanism  Detector Assembly Housing  Venting Subsystem  Detector Assembly Backplate.</p>	

 6/6/97  
ACIS Cognizant Engineer Date

**ACIS Verification Summary Report**

<b>Specification:</b>	ACIS Contract End Item Specification
<b>Requirement Number/Title:</b>	3.2.3.3 Critical Components (VRSD3.2.3.3)
<b>Requirement Statement:</b> Components having failures in categories 1, 1R that are less than two fault tolerant, 2 or 2P, as defined in MSFC CR-5320.9, shall not be used.	
<b>Verification Method:</b>	
<b>Procedure Number:</b>	N/A
<b>Configuration:</b>	
<b>Cycle Time:</b>	
<b>Verification Discussion/Results:</b>	
<p>The ACIS instrument contains 9 items with a criticality of 2P (See 36-01407, Rev A).</p> <p>A Waiver Request has been submitted to MSFC to cover these nine items. A copy of the Waiver Request is attached.</p>	
<p><i>William Mayer</i>      6/11/97  ACIS Cognizant Engineer      Date</p>	

**Massachusetts Institute of Technology**  
**CENTER FOR SPACE RESEARCH**

**WAIVER REQUEST**

<b>Date Prepared:</b> 6/3/97	<b>Waiver No.</b> 36-17
<b>Initiated By:</b> Philip Bontemps	
<b>COMPONENT AFFECTED:</b> Various P/N: Various (See below) Name: Various (See below)	<b>ITEM AFFECTED:</b> P/N: Name:
<b>Original Requirements:</b> Components having failures in categories 1, 1R that are less than two fault tolerant, 2 or 2P, as defined in MSFC CR-5320.9, shall not be used.	
<b>Waiver Requested:</b> ACIS contains no hardware of criticality 1, 1R or 2, however, the ACIS Critical Items List (36-01407, Rev A) does identify nine failure modes with criticality 2P. This waiver request is provided to permit usage of the following hardware, the failure of which could result in a criticality 2P failure. 1) PSMC Mother Board, 2) Focal Plane Support Assembly (FSA), 3) Optical Blocking Filter (OBF), 4) Detector Assembly Door Mechanism, 5) Detector Assembly Housing, 6) Venting Subsystem and 7) Detector Assembly Backplate.	
<b>Justification/Reason:</b> Below is a summary of retention rationale from the ACIS CIL. Reference the CIL for more detail. 1) PSMC Mother Board (P/N 849AC407001): The loss of connector J11 on the PSMC mother board could prevent opening of the Detector Assembly door. ACIS believes successful environmental testing of the PSMC, periodic connector inspection and MIL-STD-975 derating, combined with a history of no failures, is adequate rationale for waiver approval and use of the PSMC Mother Board. 2) Focal Plane Support Assembly (P/N 849AC112026): Failure of an FSA flange or O-ring could result in OBF destruction due to loss of Housing vacuum integrity. ACIS believes successful environmental testing (at Qualification Levels) of the Engineering Unit camera and protoflight testing of the Flight camera, combined with O-ring inspections prior to installation, is adequate rationale for waiver approval and use of the Focal Plane Support Assembly. 3) Optical Blocking Filter (P/N 36-10115 and 36-10116): A ruptured OBF could result in severely degraded science. ACIS believes	

successful environmental testing of the Flight and Engineering Unit OBFs and a good frame design, combined with OBF inspections for abnormalities prior to installation, is adequate rationale for waiver approval and use of the Optical Blocking Filters.

4) Detector Assembly Door Mechanism (P/N 849AC113000):

a) Failure of the "open door" actuator could prevent opening of the Detector Assembly door for CCD exposure to space. ACIS believes successful environmental testing of the Flight actuator/door mechanism and life cycle testing of the Qualification Unit actuator/door mechanism, combined with dye penetrant inspection of all mechanical flight assemblies, is adequate rationale for waiver approval and use of the Detector Assembly Door Mechanism.

b) Failure of the door to hold vacuum during launch and ascent could result in possible OBF destruction or contamination. ACIS believes successful environmental testing of the Flight and Qualification Detector Housing (with OBF installed), combined with dye penetrant inspection of all mechanical flight assemblies, is adequate rationale for waiver approval and use of the Detector Assembly Door Mechanism.

5) Detector Assembly Housing (P/N 849110000):

Failure of the Housing to hold vacuum could result in possible OBF destruction or contamination. ACIS believes successful environmental testing of the Flight and Qualification Detector Housing (with OBF installed), combined with dye penetrant inspection of all mechanical flight assemblies, is adequate rationale for waiver approval and use of the Detector Assembly Housing.

6) Venting Subsystem (P/N 849AC123001):

a) Failure of the Venting Subsystem valves to hold vacuum could result in possible OBF destruction. ACIS believes successful vibration testing of the Flight Venting Subsystem mounted on the Qualification camera, combined with NDE inspection of all mechanical flight assemblies, is adequate rationale for waiver approval and use of the Venting Subsystem.

b) Failure of the Venting Subsystem vent tube to hold vacuum could result in possible OBF destruction. ACIS believes successful vibration testing of the Flight Venting Subsystem mounted on the Qualification camera, combined with dye penetrant and X-ray inspection of all welds, is adequate rationale for waiver approval and use of the Venting Subsystem.

7) Detector Assembly Backplate (P/N 36-10107):

Failure of the Backplate to hold vacuum could result in possible OBF destruction. ACIS believes successful Backplate Helium leak testing of connector welds is adequate rationale for waiver approval and use of the Backplate.

Related Action and Effect:  
(include cost/price)

FUNCTION	APPROVAL SIGNATURE	DATE
MIT Performance Assurance Manager	<u>Graem Klatt</u>	<u>6/4/97</u>
MIT Project Engineer	<u>RT</u>	<u>6/4/97</u>
MIT Project Manager	<u>William Mayer</u>	<u>6/4/97</u>
NASA Representative	_____	_____
NASA Project	_____	_____