PRINT DATE: 01/23/96

FAILURE MODES EFFECTS ANALYSIS (FMEA) – CIL HARDWARE
NUMBER:05-1-FC2042 -X

SUBSYSTEM NAME: GUIDANCE, NAVIGATION, & CONTROL
REVISION: 0 02/09/88

PART DATA

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
	:FORWARD AVIONICS BAYS 1, 2	
LRU	:ACCELEROMETER ASSEMBLY	MC621-0043-2043

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
ACCELEROMETER ASSEMBLY (AA) NO.'S 1, 2, 3 AND 4.

REFERENCE DESIGNATORS:
81V79A15
82V79A16
82V79A17
81V79A41

QUANTITY OF LIKE ITEMS: 4
FOUR FORWARD

FUNCTION:
PROVIDES OUTPUT VOLTAGES PROPORTIONAL TO THE NORMAL AND LATERAL VEHICLE ACCELERATIONS APPLIED TO THE INPUT AXES OF EACH ASSEMBLY. CAPABILITY IS PROVIDED FOR RESPONSE TO APPLIED TEST STIMULI FOR FAULT DETECTION PURPOSES.

FAILURE MODES EFFECTS ANALYSIS FMEA – CIL FAILURE MODE
NUMBER: 05-1-FC2042-02

REVISION#: 1 01/22/96

SUBSYSTEM NAME: GUIDANCE, NAVIGATION, & CONTROL
LRU: ACCELEROMETER ASSEMBLY CRITICALITY OF THIS
ITEM NAME: ACCELEROMETER ASSEMBLY FAILURE MODE: 1R2

FAILURE MODE:
ERRONEOUS OUTPUT. THIS IS ONLY TRUE FOR SOFT FAILURES BELOW REDUNDANCY MANAGEMENT TRIP LEVEL.

MISSION PHASE: LO LIFT-OFF
DO DE-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY: 102 COLUMBIA
103 DISCOVERY
104 ATLANTIS
105 ENDEAVOUR

CAUSE:
VIBRATION, TEMPERATURE, PIECE PART FAILURE, MISHANDLING/ABUSE, CONTAMINATION, THERMAL SHOCK AND MECHANICAL SHOCK.

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN A) PASS
B) FAIL
C) PASS

PASS/FAIL RATIONALE:
A)

B)
FAILS REDUNDANCY SCREEN "B" BECAUSE THE ERRONEOUS OUTPUT SIGNAL MAY BE BELOW THE REDUNDANCY MANAGEMENT DETECTION LEVEL.

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:
NO EFFECT FOR FIRST FAILURE, REDUNDANCY MANAGEMENT (IMVS) ENABLES CONTINUED FLIGHT CONTROL OPERATION.

(B) INTERFACING SUBSYSTEM(S):

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SAME AS (A)

(C) MISSION:
NO EFFECT FOR FIRST FAILURE.

(D) CREW, VEHICLE, AND ELEMENT(S):
NO EFFECT FOR FIRST FAILURE. SECOND FAILURE COULD RESULT IN LOSS OF CREW/VEHICLE AS A RESULT OF EXCESSIVE VEHICLE STRUCTURAL LOADING, DUE TO THE INABILITY OF SOFTWARE TO ISOLATE FAILURES DURING ASCENT (FIRST STAGE) AND ENTRY/AERODYNAMIC FLIGHT.

(E) FUNCTIONAL CRITICALITY EFFECTS:
CRITICALITY 1R BECAUSE LOSS OF ACCELERATION DATA MAY CAUSE LOSS OF VEHICLE.

-DISPOSITION RATIONALE-

(A) DESIGN:
ALL ELECTRICAL, ELECTRONIC, AND ELECTROMECHANICAL (EEE) PIECE PARTS WHICH MAKE UP THE AA ARE CONTROLLED TO THE ORBITER PROJECT PARTS LIST (OPPL) REQUIREMENTS OF MF0004-400. PASSIVE EEE PARTS AND ELECTRICAL CONNECTORS ARE MILITARY QUALIFIED AND 100% SCREENED TO OPPL REQUIREMENTS. MICROCIRCUITS ARE QUALIFIED TO MIL-M-38510 AND SCREENED TO MIL-S-883, LEVEL B. SEMICONDUCTOR DEVICES ARE JANTXV LEVEL. CIRCUIT DESIGN LIMITS WORST CASE JUNCTION TEMPERATURES TO 95°C AND ELECTRICAL STRESSES TO 50% OF RATED CAPABILITY FOR ALL PARTS. THE AA AS AN ASSEMBLY HAS A CERTIFIED LIFE OF 10,000 HOURS (100 MISSIONS) EQUIVALENT TO TEN YEARS.

THE AA IS DESIGNED AS A HERMETICALLY SEALED UNIT TO PREVENT OR ELIMINATE THE ENVIRONMENTAL EFFECTS OF RAIN, SAND, DUST, AS WELL AS MOISTURE. INTERNAL COMPONENTS ARE CONFORMAL COATED TO ELIMINATE THE ADVERSE EFFECTS OF MOISTURE, PRESSURE, AND/OR TEMPERATURE VARIATIONS IN ADDITION TO SHORT CIRCUIT PROTECTION. THE AA ALSO INCORPORATES INTERNAL BITE TO DETERMINE CIRCUIT INTEGRITY THROUGH EXTERNALLY APPLIED STIMULI.

(B) TEST:
ACCEPTANCE TESTING, WHICH INCLUDES ACCEPTANCE THERMAL TESTING (ATT) AND ACCEPTANCE VIBRATION TESTING (AVT.), IS PERFORMED ON EACH UNIT. QUALIFICATION TESTING, INCLUDING VIBRATION, SHOCK, TEMPERATURE, HAS BEEN SUCCESSFULLY COMPLETED TO CERTIFY DESIGN. INTEGRATED/SUBSYSTEM VERIFICATION IS PERFORMED DURING TURNAROUND. FUNCTIONAL TEST IS MONITORED TO VERIFY STATUS SIGNALS INDICATING ACCELEROMETER/ELECTRONICS INTEGRITY.

(C) INSPECTION:
RECEIVING INSPECTION
INCOMING MATERIAL IS VERIFIED BY RECEIVING INSPECTION.

CONTAMINATION CONTROL
FINAL ASSEMBLY AND REWORK PERFORMED IN A CLEAN ROOM.

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ASSEMBLY/INSTALLATION
QUALITY PLANNING ENSURES ALL DRAWING AND PROCUREMENT REQUIREMENTS ARE PUT INTO IN-PROCESS WORK TICKETS. ALL ASSEMBLY BENCHES ARE EQUIPPED WITH GROUNDING STRAPS AND BENCH COVERS FOR USE DURING HANDLING OF STATIC SENSITIVE DEVICES. TORQUING VERIFICATION BY INSPECTION.

NONDESTRUCTIVE EVALUATION
RADIOGRAPHIC ANALYSIS, ULTRASONIC TESTING, DYE PENETRANT AND MAGNETIC PARTICLE ANALYSIS VERIFIED BY INSPECTION.

CRITICAL PROCESSES
POTTING, BONDING, FUSION WELDING, SOLDERING AND MATERIAL CLEANING VERIFIED BY INSPECTION.

TESTING
ENVIRONMENTAL ACCEPTANCE TESTING IS OBSERVED AND VERIFIED BY QUALITY CONTROL.

HANDLING/PACKAGING
RETURNED AND ACCEPTED GOODS ARE STORED IN A BONDED AREA. ANTI-STATIC BAGS ARE USED FOR HANDLING AND PACKAGING OF HARDWARE. SPECIAL QUALIFIED CONTAINERS ARE USED FOR HANDLING AND PACKAGING OF HARDWARE. SPECIAL QUALIFIED CONTAINERS ARE USED FOR IN-PLANT TRANSPORTATION AND SHIPPING.

(D) FAILURE HISTORY:
THE-2043 FLIGHT CERTIFIED CONFIGURATION OF THE AA, WHICH INCORPORATES A LIGHT EMITTING DIODE(LED) RETROFIT ACCELEROMETER IN BOTH THE NORMAL AND LATERAL AXES, HAS NO RELEVANT FAILURES AS COMPARED TO THE 2042 (LAMP) CONFIGURATION WHICH IT REPLACED. THIS REVIEW INCLUDES DEVELOPMENT, QUALIFICATION, ACCEPTANCE, FIELD TESTING, AND FLIGHT OPERATIONS.

(E) OPERATIONAL USE:
NONE

- APPROVALS -

EDITORIALLY APPROVED	: RI	: 1/24/96
EDITORIALLY APPROVED	: JSC	: 2-1-96
TECHNICAL APPROVAL	: APPROVAL FORM	: 95-CIL-004-RI