

April 19, 1996

CRITICAL ITEMS LIST

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1) CIL ITEM : J802 02
 2) TMEA CODE : J802
 3) COMPONENT : FLIGHT ACCELEROMETER
 4) PART NUMBER : R657010
 5) SYSTEM/SUBSYSTEM : SENSORS/J8XX (FASCO5 REDLINE ACTIVE)
 6) FAILURE MODE : INTERMITTENT SIGNAL

11VE)

7) PREPARED : SSHE RELIABILITY
 8) APPROVED :
 9) DATE : 04-19-96
 10) REVISION/CHANGE : -001/0
 11) EFFECTIVITY : -02
 12) HAZARD REFERENCE : SEE LISTINGS BELOW
 13) CCBO # : ME3-01-3285

PHASE	FAILURE DESCRIPTION/EFFECT	CRITICALITY
H	<p>SPIKING MAY CAUSE A SINGLE VOTE FOR ENGINE SHUTDOWN. THREE ACCELEROMETERS ON EITHER TURBOPUMP VOTING FOR SHUTDOWN RESULTS IN CONTROLLER INITIATED SHUTDOWN, MISSION ABORT.</p> <p>REDUNDANCY SCREENS: FASCO5 SYSTEM: LIKE REDUNDANCY</p> <p>A: PASS. REDUNDANT HARDWARE ITEMS ARE CAPABLE OF CHECKOUT DURING NORMAL GROUND TURNAROUND. B: PASS. LOSS OF A REDUNDANT HARDWARE ITEM IS DETECTABLE DURING FLIGHT. C: PASS. LOSS OF REDUNDANT HARDWARE ITEMS COULD NOT RESULT FROM A SINGLE CREDIBLE EVENT.</p>	<p>HAZARD REF: ME-C16,M, MF-D15,M</p>

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EIL ITEM: J802-02

DESIGN

DOCUMENT REF.

FAILURE CAUSE A: LOOSE FIT ON DAMAGED ACCELEROMETER CONNECTOR.

THE ACCELEROMETER (1) CONNECTOR IS SELECTED IN ACCORDANCE WITH GOVERNMENT STANDARDS (2). THE CENTER CONDUCTOR IS MADE FROM INCONEL X-750. THIS MATERIAL WAS SELECTED FOR ITS RESISTANCE TO CORROSION AND STRESS CORROSION CRACKING (3) AS WELL AS ITS ABILITY TO PERFORM IN THE ELASTIC STRAIN REGION (3). THE CONNECTOR AND ACCELEROMETER CASE IS MADE FROM 316 CRES. THIS MATERIAL WAS CHOSEN FOR ITS WELDABILITY, RESISTANCE TO CORROSION, AND STRESS CORROSION CRACKING (3), (4). THE THREAD SIZE AND TYPE IS COMPATIBLE WITH THE COAXIAL CABLE MATED TO THE ACCELEROMETER (5). THE CONNECTOR AND CABLE IS POTTED TO THE ACCELEROMETER TO FURTHER REDUCE THE POSSIBILITY OF A LOOSE CONNECTION (6).

(1) RES7010
(2) MIL-C-39012
(3) RSS-8582
(4) NSFC-SPEC-522
(5) RC133A
(6) RS007057

FAILURE CAUSE B: INTERNAL BROKEN ELECTRICAL CONNECTION WHICH MAKES CONTACT INTERMITTENTLY

THE ELECTRICAL WIRES FROM THE SENSING ELEMENT TO THE COAXIAL CONNECTOR ARE ROUTED UP THE INTERNAL CASE WALL. POTTING IS APPLIED AT BOTH CONNECTION ENDS AND OVER MOST OF THE CASE WALL PATH. UNPOTTED AREAS EXIST SO THE WIRE CAN REACT TO CHANGING THERMAL CONDITIONS WITHOUT BREAKING. THE EXPOSED WIRE AREAS ARE NOT OF SUFFICIENT LENGTH TO REACT TO THE VIBRATIONS ENCOUNTERED DURING OPERATION (1).

(1) RES7010-02

FAILURE CAUSE C: ACCELEROMETER LOOSE.

THE ACCELEROMETER CASE IS MADE FROM CRES 316 (1). THIS MATERIAL WAS CHOSEN FOR ITS WELDABILITY, RESISTANCE TO CORROSION, (2), (3). DESIGN REQUIREMENTS, SUBMITTED TO THE SUPPLIER, REQUIRE THAT THE INTEGRAL MOUNTING STUDS MAXIMUM TORQUE VALUE EXCEED THE TORQUE USED DURING INSTALLATION ON AN ENGINE (4). INSTALLATION, INCLUDING TORQUE VALUE, IS CONTROLLED BY SPECIFICATION (6).

(1) RES7010
(2) NSFC-SPEC-522
(3) RSS-8582
(4) RS007007

ALL CAUSES:

SYSTEM DESIGN PROVIDES REDUNDANCY IN THAT ALL THREE ACCELEROMETERS ON A PUMP MUST VOTE FOR SHUTDOWN (1). THEREFORE, MULTIPLE FAILURES MUST OCCUR TO CAUSE AN INADVERTANT SHUTDOWN. THIS END ITEM UNIT IS A VENDOR SUPPLIED ITEM. DRAWING SPECIFICATIONS AND MANUFACTURING PROCESSES ARE CONTROLLED BY ROCKETDYNE (2). ALL SENSOR DESIGNS ARE SUBJECTED TO A CRITICAL DESIGN REVIEW. ANY DESIGN CHANGES ARE RE-REVIEWED (1). HIGH CYCLE AND LOW CYCLE FATIGUE LIFE, AS WELL AS THE MINIMUM FACTORS OF SAFETY FOR THE ACCELEROMETERS, MEET CEI REQUIREMENTS (3).

(1) CP406RCDD8
(2) RES7010
(3) CP320RD0038
RSS-8546

CIL ITEM: J802-02		INSPECTION AND TEST	
POSSIBLE CAUSES	SIGNIFICANT CHARACTERISTICS	INSPECTION(S)/TEST(S)	DOCUMENT REF.
FAILURE CAUSE A:	RES7010-02 - ACCELEROMETER		RES7010
	MATERIAL INTEGRITY	MATERIAL INTEGRITY IS VERIFIED PER SPECIFICATION REQUIREMENTS.	RES7010
	CONNECTOR INTEGRITY	THE CONNECTORS ARE INSPECTED PER DRAWING REQUIREMENTS.	RES7010
		ACCELEROMETER CONTACT RETENSION FORCE WHEN MATED WITH A CABLE PIN IS TESTED PER DRAWING REQUIREMENTS.	RES7010
	INSTALLATION INTEGRITY	INSTALLATION REQUIREMENTS REQUIRE CONNECTOR INSPECTION PRIOR TO MATE. AFTER CONNECTOR MATE, THE CABLE IS SECURED TO THE ACCELEROMETER HOUSING AND THE CONNECTION IS POTTED.	MS007007 RC1336
FAILURE CAUSE B:	RES7010-02 - ACCELEROMETER		RES7010
	ACCEPTANCE TESTING	THE FOLLOWING TESTS ARE PERFORMED DURING MANUFACTURING AND ACCEPTANCE TESTING BY THE VENDOR:	
		- DC RESISTANCE DURING THERMAL CYCLING.	RES7010
		- INSULATION RESISTANCE BETWEEN THE CASE AND SIGNAL RETURN.	RES7010
		- CAPACITANCE MEASUREMENT (USED TO DETERMINE AXIAL SENSITIVITY).	RES7010
		- AXIAL SENSITIVITY DURING THERMAL CYCLING.	RES7010
		- TRANSVERSE SENSITIVITY AT AMBIENT TEMPERATURE.	RES7010
		- AXIAL SENSITIVITY VERSUS FREQUENCY VERIFICATION	RES7010
		- RESONANCE FREQUENCY	RES7010
		- AXIAL SENSITIVITY AMPLITUDE LINEARITY OVER A 3000G ACCELERATION RANGE.	RES7010
	- AXIAL SENSITIVITY DURING 10,000 HALF-SINE SHOCK.	RES7010	
	- PERFORMANCE IN A HIGH HUMIDITY ENVIRONMENT BY ONE OF THE TWO FOLLOWING METHODS: HUMIDITY/TEMPERATURE CYCLING FINE AND GROSS LEAK TESTING	RES7010	
	FOLLOWING RECEIVING INSPECTION, THE ACCELEROMETERS ARE SUBJECTED TO A SPURIOUS VOLTAGE SPIKING TEST.	RL00398	

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CIL ITEM: J802-02		INSPECTION AND TEST	
POSSIBLE CAUSES	SIGNIFICANT CHARACTERISTICS	INSPECTION(S)/TEST(S)	DOCUMENT REF.
FAILURE CAUSE C, D:	RES7010-02 - ACCELEROMETER		RES7010
	MATERIAL INTEGRITY	MATERIAL INTEGRITY IS VERIFIED PER SPECIFICATION REQUIREMENTS.	RES7010
	INSTALLATION INTEGRITY	ACCELEROMETER INSTALLATION, INCLUDING TORQUE REQUIREMENTS, IS CONTROLLED PER SPECIFICATION REQUIREMENTS.	RS007007
ALL CAUSES:	RES7010-02 - ACCELEROMETER		RES7010
	HOT FIRE ACCEPTANCE TESTING (GREEN RUN)	ALL ACCELEROMETERS USED FOR FASCOS ARE SUBJECTED TO HOT FIRE ACCEPTANCE TESTING.	RLO0461
	PRE-FLIGHT CHECKOUT	ALL ACCELEROMETERS USED FOR THE FASCOS SYSTEM ARE TESTED, WITH THE HARNESS ASSEMBLY INSTALLED, AFTER ANY MAINTENANCE OR REPAIR BY THE SIGNATURE RESPONSE TEST:	OMR50 V41AMD.D50
		ALL ACCELEROMETER DATA FROM THE PREVIOUS FLIGHT OR GREEN RUN IS REVIEWED. ANY ANOMALOUS CONDITION NOTED REQUIRES FURTHER TESTING OR HARDWARE REPLACEMENT PRIOR TO THE NEXT FLIGHT. IN THE EVENT OF MAINTENANCE OR REPAIR, THE ABOVE CHECKOUTS ARE APPLICABLE (LAST TEST).	HSFC PLW 122B
FAILURE HISTORY:	COMPREHENSIVE FAILURE HISTORY DATA IS MAINTAINED IN THE PROBLEM REPORTING DATABASE (PRMS/PRCA). REFERENCE: NASA LETTER SA21/88/308 AND ROCKETDYNE LETTER 88R09761.		

OPERATIONAL USE: NOT APPLICABLE.

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