

**SSME FMEA/CIL**  
**REDUNDANCY SCREEN**

Component Group: Actuators  
CIL Item: E701-01  
Part Number: RES1008-3003  
Component: Hydraulic Filter  
FMEA Item: E701  
Failure Mode: Fails to pass hydraulic fluid (blocked).

Prepared: P. Lowrimore  
Approved: T. Nguyen  
Approval Date: 6/9/00  
Change #: 1  
Directive #: CCBD ME3-01-5624

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Phase	Failure / Effect Description	Criticality Hazard Reference
M 4.1	Decrease of hydraulic pressure and flow to the actuators; loss of actuator control; controller switches to channel B (servo valve No. 2) all actuators; failure continues, controller initiates hydraulic lockup of all actuators Mission abort may result when hydraulic lockup occurs during Max Q throttling.	1R ME-G4M
Redundancy Screens: SINGLE POINT FAILURE: N/A		

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**SSME EA/CIL  
DESIGN**

Component Group: Actuators  
CIL Item: E701-01  
Part Number: RES1008-3003  
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FMEA Item: E701  
Failure Mode: Fails to pass hydraulic fluid (blocked).

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Design / Document Reference

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FAILURE CAUSE: A: Gross contamination of filter element.

THE HYDRAULIC LINES AND ACTUATOR DETAILS ARE CLEANED FOR HYDRAULIC SERVICE PRIOR TO ACTUATOR ASSEMBLY (1). THE HYDRAULIC FLUID USED FOR ASSEMBLY AND TEST IS IN ACCORDANCE WITH JSC SPECIFICATION REQUIREMENTS. THE HYDRAULIC FLUID CLEANLINESS IS CONTROLLED (1). THE FILTER RATING IS VERIFIED ON EACH UNIT BY BUBBLE POINT TEST. THE FILTER CAPACITY IS 6-GRAMS COURSE TEST DUST WITH A PRESSURE LOSS NOT TO EXCEED 55 PSID. THE PRESSURE LOSS IS ALSO NOT TO EXCEED 55 PSID WITH 25 PERCENT OF THE SURFACE AREA SEALED OFF. THE FILTER COLLAPSE PRESSURE IS 880 PSID MINIMUM (1). HYDRAULIC FLUID SUPPLY FROM THE ORBITER IS FILTERED TO 100-MICRONS AND QUANTITIES OF PARTICLES BELOW 100 MICRONS IS CONTROLLED (2). THE HIGH CYCLE AND LOW CYCLE FATIGUE LIFE OF THE FILTER MEET CEI REQUIREMENTS (3). THE MINIMUM FACTORS OF SAFETY FOR THE FILTER MEET CEI REQUIREMENTS (4). THE FILTER WAS CLEARED FOR FRACTURE MECHANICS/NDE FLAW GROWTH, SINCE IT CONTAINS NO FRACTURE CRITICAL PARTS (5). THE FILTER HAS COMPLETED DESIGN VERIFICATION TESTING INCLUDING MEDIA MIGRATION, DIRT CAPACITY, AND FILTER ELEMENT COLLAPSE PRESSURE (6). DVS TEST RESULTS ARE DOCUMENTED (7).

(1) RC1008; (2) ICD 13M15000; (3) RL00532, CP320R0003B; (4) RSS-8546, CP320R0003B; (5) NASA TASK 117; (6) DVS-SSME-512; (7) RSS-512-52

**SSME FMEA/CIL**  
**INSPECTION AND TEST**

Component Group: Actuators  
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Failure Causes	Significant Characteristics	Inspection(s) / Test(s)	Document Reference
A	ELEMENT ASSEMBLY		101-1161
	FLOW CAPACITY	FLOW RATE AND PRESSURE DROP ARE VERIFIED AS ACCEPTABLE PER SPECIFICATION REQUIREMENTS.	RC1008
	BUBBLE POINT	EACH FILTER RATING IS VERIFIED AS ACCEPTABLE PER SPECIFICATION REQUIREMENTS.	RC1008
	COMPONENT CLEANLINESS	CLEANLINESS TEST AND CLEANLINESS LEVEL ARE VERIFIED TO BE WITHIN RL10012 SPECIFICATION REQUIREMENTS.	RC1008 RL10012
		ACTUATOR CHECKOUT MODULE, FLIGHT READINESS TEST MODULE, AND HYDRAULIC SYSTEM CONDITIONING VERIFY HYDRAULIC FLOW THOROUGH THE FILTER. (LAST TESTS)	OMRSD V41AS0.010 OMRSD V41AS0.030 OMRSD S00FA0.211

Failure History: Comprehensive failure history data is maintained in the Problem Reporting database (PRAMS/PRACA)  
 Reference: NASA letter SA21/88/308 and Rocketdyne letter 88RC09761.

Operational Use: FAILURE MODE CAN BE DETECTED IN REALTIME BY THE FLIGHT CONTROL TEAM WHO WILL EVALUATE EFFECTS UPON VEHICLE PERFORMANCE AND ABORT CAPABILITY. BASED ON THIS EVALUATION THE APPROPRIATE ABORT MODE OR SYSTEM CONFIGURATION WILL BE SELECTED. FAILURE DETECTION CUES AND ASSOCIATED SSME PERFORMANCE DATA HAVE BEEN COORDINATED BETWEEN THE ENGINEERING AND FLIGHT OPERATIONS ORGANIZATIONS WITH THE RESPONSES DOCUMENTED IN MISSION FLIGHT RULES.

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