

**SSME ME/EA/CIL
REDUNDANCY SCREEN**

Component Group: Igniters and Sensors
 CIL Item: G100-03
 Component: Spark Igniter
 Part Number: R5003685/R0013000
 Failure Mode: Internal leakage.

Prepared: M. Oliver
 Approved: T. Nguyen
 Approval Date: 3/30/99
 Change #: 2
 Directive #: CCBD ME3-D1-4984
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Phase	Failure / Effect Description	Criticality Hazard Reference
M 4.2	Leakage through one or more igniter internal seals into spark exciter electronics on both channel A and channel D will result in damage to internal components. This may cause hybrid case deformation, shorting of the 26 VDC power supply in both controller channels and de-energizing all actuator failsafe switches. Controller initiates hydraulic lockup and an MCF indication. Mission abort may result when hydraulic lockup occurs during Max Q throttling.	1R ME-FG4M
<p>Redundancy Screens: IGNITER 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 items is detectable during flight. C: Pass - Loss of redundant hardware items could not result from a single credible event.</p>		

**SSME FMEA/CIL
DESIGN**

Component Group: Igniters and Sensors
CIL Item: G100-D3
Component: Spark Igniter
Part Number: RS003685/RD013000
Failure Mode: Internal leakage.

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Approved: T. Nguyen
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Design / Document Reference

FAILURE CAUSE: A: Cracked primary ceramic.

PRIMARY INSULATION MATERIAL IS ALUMINA CERAMIC AND HAS GRADE INDEXES IN ACCORDANCE WITH GOVERNMENT STANDARDS (1). THE MATERIAL HAS HIGH FLEXURAL STRENGTH AND HIGH ELECTRICAL INSULATION PROPERTIES. CERTAIN CRACKS IN THE PRIMARY CERAMIC ARE ACCEPTABLE PER SPECIFICATION (2)

(1) RD014010 / RD014013, (2) RL00296

FAILURE CAUSE: B: Parent material or braze failure.

THE SPARK TIP HOUSINGS ARE MANUFACTURED FROM INCONEL 625 THIS MATERIAL WAS SELECTED FOR ITS STRENGTH, TENSION MODULUS, WELDABILITY, CORROSION RESISTANCE, AND RESISTANCE TO STRESS CORROSION CRACKING (1). THE INNER AND OUTER SEALS ARE MANUFACTURED FROM IRON-NICKEL-COBALT ALLOY. THE MATERIAL WAS SELECTED FOR ITS LOW EXPANSION PROPERTIES AND SUITABILITY FOR SEALING IN ELEVATED AND CRYOGENIC APPLICATIONS (2). THE INNER AND OUTER SEAL BRAZE JOINTS UTILIZE ROCKETDYNE CONTROLLED ALLOYS SELECTED WITH UNIQUE MELTING POINTS TO PERMIT SEPARATE FURNACE BRAZE CYCLES (3). HARDWARE IS SUBJECTED TO PROOF PRESSURE AND LEAK TESTING TO VERIFY INTEGRITY THE DESIGN CRITERIA FOR THE SPARK PLUG TIP REQUIRES THE UNIT TO BE CAPABLE OF WITHSTANDING 1.5 TIMES FULL SCALE PRESSURE WITHOUT COMPONENT DAMAGE (4).

(1) RSS-8582; (2) RB0170-193, RD014014 / RD014015; (3) RB0170-020 / RB0170-064, (4) CP320RD003B / RD014014

**SSME FN /CIL
INSPECTION AND TEST**

Component Group: Igniters and Sensors
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Failure Causes	Significant Characteristics	Inspection(s) / Test(s)	Document Reference
A	SPARK PLUG	THE FOLLOWING TESTS ARE PERFORMED PRIOR TO CASE INSTALLATION: - PROOF PRESSURE TESTS ARE PERFORMED ON THE SPARK PLUG TO CHECK FOR UNACCEPTABLE CERAMIC DEFECTS. - FUNCTIONAL TEST IS PERFORMED AFTER FINAL ASSEMBLY (SAME AS PRE-ENCAPSULATION TESTS) (SECOND ASSEMBLY TEST). PROOF PRESSURE TEST IS PERFORMED ON THE SPARK PLUG PRIOR TO FINAL ASSEMBLY FUNCTIONAL TESTING TO CHECK FOR UNACCEPTABLE CERAMIC DEFECTS THE CERAMIC INSULATOR IS VISUALLY INSPECTED FOR CRACKS OR CHIPS AND VERIFIED TO BE WITHIN SPECIFICATION.	R0014010
	PRIMARY INSULATOR		R0014013-3
	ASSEMBLY TESTING		R0014010 RL00761
			R0013000 RL00761
B	SPARK PLUG	PROOF PRESSURE TESTS ARE PERFORMED ON THE SPARK PLUG PRIOR TO CASE INSTALLATION AND PRIOR TO FINAL ASSEMBLY FUNCTIONAL TESTING TO CHECK FOR DEFECTS IN HOUSING, INNER AND OUTER SEALS AND BRAZE JOINTS. THE INNER SEAL IS BRAZED TO THE PRIMARY ELECTRODE AND PRIMARY CERAMIC AND THE OUTER SEAL IS BRAZED TO THE HOUSING AND PRIMARY CERAMIC PER DRAWING REQUIREMENT. SPARK IGNITER OPERATION IS VERIFIED EVERY MISSION FLOW BY SUCCESSFUL COMPLETION OF THE SPARK IGNITER ELECTRICAL CHECKOUT. (LAST TEST).	R0014010
	OUTER SEAL		R0014013-3
	INNER SEAL		R0014015-3
	ASSEMBLY INTEGRITY		R0014010 / R0013000 RL00761
			R0014010
			OMRSD V41AQ0.010

Failure History: Comprehensive failure history data is maintained in the Problem Reporting database (PRAMS/PRACA)
 Reference: NASA letter SA21/88/308 and Rockaldyne letter BRRC09751.
 Operational Use: Not Applicable.