

CRaTER FMEA Worksheet 32-04009.01

Revision	Date	Description
0.01	06/06/06	Crater I-CDR Initial release

Component	Mission Phase	Failure Mode Number	Identification of Item or Function	Failure	Failure Effects	Severity Category	Remarks
				a. Mode b. Cause	a. Local or Subsystem b. Next Higher Level - System c. End Effect - Mission	NC=Not Credible	a. Failure Detection Method b. Compensating Features/Actions c. Other
01.01.01 01.01.02 Electronics and Telescope Housing	I&T Launch Orbit	01-01-01-01	MLI Blankets that provide radiative thermal isolation between the CRaTER instrument and it's view of space, lunar surface, sun and spacecraft	a. Loss of thermal radiative properties b. Severe degradation of blanket properties or total loss of blanket	a. Change in temperature and emissivity of blanket b. Instrument parts may see out of temperature range conditions. May permanently damage parts or result in degraded science data	3	a. Monitor temperature Housekeeping b. Operate instrument at times allowed by orbital conditional c. The MLI blankets have multiple attach points so some external event would have to account for the blanket loss scenario
01.01.01 Electronics Housing	I&T Launch	01-01-01-02	Fasteners that secure instrument to spacecraft	a. Failure of a single structural mounting screw b. Bolt breaks or backs out	b. Remaining bolts will see larger loads, but still have sufficient margin. c. Remaining propulsion model inserts will see higher loads c. Bolt could be a debris hazard if not contained by MLI blanket	4	a. Visually inspectable at I&T, not detectable after launch b. Design maintains margin even with loss of a single fastener c. For a fastener to come out, there would need to be atleast two failures. The first would be application of improper torque and the second the failure of the spot bond c. Note that these particular fasteners are provided by the spacecraft and installed during I&T by NASA
01.01.01 Electronics Housing	I&T Launch	01-01-01-03	External Spacecraft Electrical Connectors	a. Connector becomes unplugged b. FMEA guidelines state that this is the only connector failure mode to be considered			
		01-01-01-03.1	Input/Survival Power from Spacecraft (J1)	*	a. No power input to instrument DC/DC converters b. No science or housekeeping data produced c. No power dissipated in instrument, survival heaters active during cold cases	3	a. After Launch , during activation, the instrument will not be able to send any diagnostic information. Spacecraft diagnostics of power line will need to be used. b. There is no way to compensate, as the power input to the instrument is single string.
		01-01-01-03.2	1 Hertz Timing Pulse/PRT (J2)	*	See 01-01-02-02 Timing Pulse fault a & b. Instrument does not use information from PRT c. Mission would not have direct access to instrument electronic box wall temperature	3	a. See 01-01-02-02 for Timing Pulse b. When instrument is turned on, mission would have access to internal temperatures read out in instrument housekeeping
		01-01-01-03.3	1553 Interfaces (J3 & J4)	*	No detrimental effects for a-c as there are redundant cables/connectors for the 1553 interface	4	a. On the ground, detection of disconnected cable is visual. Cannot detect during launch and on orbit.
01.01.01 01.01.02 Electronics and Telescope Housing	Launch	01-01-01-04	Externally exposed fasteners	a. Failure of a single non-structural external fastener b. Fastener breaks or backs out	b. None c. None c. Fastener could be a debris hazard if not contained by MLI blanket	4	a. Visually inspectable at I&T, not detectable after launch b. Design maintains margin even with loss of a single fastener c. For a fastener to come out, there would need to be atleast two failures. The first would be application of improper torque and the second the failure of the spot bond
01.01.01 01.01.02 Electronics and Telescope Housing	I&T Launch Orbit	01-01-01-05	Instrument Housing Panels	a. Penetration by instrument wall by foreign object b. Dropped screwdriver, micrometeorite, etc	It is not readily predictable what would happen with an energetic enough micrometeorite hit, but worse has is the instrument becomes non-functional and is powered off by the spacecraft, resulting in loss of science data.	NC	The thinnest wall section of the instrument is 0.030" and is not considered readily susceptible to damage of this sort. Note this does not imply that a full micrometeorite susceptibility study was done, just that the "telescope" apertures, which are the thinnest wall sections, have a minimum of 0.030" of Al which provides significant protection.