SHUTTLE CRITICAL ITEMS LIST - MSBLS GROUND STATION

SUBSYSTEM: GROUND STATION - MSBLS
ASSEMBLY : Field Monitor Pole
P/N : 513207
:
QUANTITY : 1
:

FMEA NO.: 05-2MO-00014 REV: 11 Jul 89
ABORT:
CRIT. FUNC: 1
CRIT. HDW: 1

VEHICLE	102	103	104	105
EFFECTIVITY:	X	X	X	X
PHASE(S) PL	LO	OO	DO X	LS

REDUNDANCY SCREEN: A- B- C-

PREPARED BY:
DES: [signature]
REL: [signature]
QE:

APPROVED BY:
DES: [signature]
REL: [signature]
QE: [signature]

APPROVED BY (NASA):
DES: [signature]
REL: [signature]
QE: [signature]

ITEM: Field Monitor Pole

FUNCTION: Monitors AZ/DME/EL radiated RF output signals. Generates DME Interrogations as part of this task.

FAILURE MODE: The DME Interrogate oscillator on the FM Pole begins unmodulated radiation; output is CW or high duty cycle. This desensitizes the DME Receiver in the Shelter. As a result, the DME Interrogate video signals are lost because video output pulses are now below detection threshold.

Therefore, the DME FM alarms, and causes shutdown of the MSBLS-MO Shelter, and all radiation is inhibited.

CAUSE(s): Modulation Control from the Azimuth Field Monitor Assembly (LRU 550, P/N 502332-1) is lost at the DME Interrogate Oscillator on the Field Monitor Pole (In LRU 810, P/N 502154), due to a short, open, or piece part failure. As a result, the oscillator radiates (at normal power) in the CW mode, or at a high duty cycle. This desensitizes the DME Receiver (in the Shelter) by about 10 DB, which produces video outputs too low to trigger the threshold detector.

SUBSYSTEM: GROUND STATION - MSBLS FMEA NO.: 05-2MD-00014 REV: 11 Jul 89

EFFECT(S): (A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE

(A/B) All RF output from the MSBLS-MD ceases. (AZ, DME and EL).

(C) No effect.

(D) Possible loss of crew/vehicle due to degradation of the terminal area approach and landing functions.

DISPOSITION AND RATIONALE:
(A) DESIGN (B) TEST (C) INSPECTION (D) FAILURE HISTORY (E) OPERATIONAL USE

(A) - DESIGN

The MSBLS design was structured from existing/proven ground-based landing systems and upgraded to meet MIL-E-4158, MIL-STD-454 and all subsidiary specifications in effect at the time of manufacture. Military and standard NASA approved parts, materials and processes were used.

The design evolved from a timely and in-depth internal design review process culminating in an optimum reliability/maintainability/performance end-item product. The design review process included studies such as FMEA, electrical and thermal analysis, sneak circuit analysis, worst case studies, tolerance analysis, etc. which resulted in direct impact of the design.

The design was approved via the formal NASA-Eaton PDR, CDR, PCA, FCA and certification process.

(B) - TEST

The MSBLS program consists of an equipment confidence build-up approach starting from 100% screening of components (burn-in and environmental test). Environmental testing of SRU's and 100% temperature/vibration tests at the LRU and equipment rack-level.

In plant ATP for functional performance verification and workmanship will be performed and witnessed by Eaton, NASA and AFPRO on all LRU's and again at system level.

Site testing and certification will be performed on each system after installation. Annual flight tests are conducted to demonstrate continued system compatibility.

Ground Turnaround Test - Verify operation of the MSBLS Ground Station prior to each Orbiter landing.

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(C) - INSPECTION

Receiving Inspection

Receiving inspection verifies all incoming parts and materials, including the performance of visual and dimensional examinations. All electrical, mechanical and raw material records that certify materials and physical properties per drawing/specification requirements are retained by receiving inspection as required by contract.

Assembly/Installation

All detailed inspections are planned out by the methodization department for all new builds, spares and repairs for the MSBLS Programs. Inspection points are designated to permit inspection before the applicable portions of the assembly become inaccessible and prior to the next assembly operation.

Critical Processes

All processes and certifications are monitored and verified by inspection. The critical processes are soldering, conformal coating, torquing and boresiting, application of adhesives/sealants and application of chemical film.

Testing

All parts of the ATP are observed and verified by QA.

Handling/Packaging

All parts and assemblies are protected from damage or contamination from the point of receiving inspection to final shipment, through methods detailed in a documented procedure. This handling procedure is in effect for all newly built hardware as well as for repair units. QA audits conformance to this procedure in accordance with its internal audit schedule, and all areas are considered under continuous audit by QA with respect to material handling. The maintenance of electrostatic discharge prevention methods is verified by QA through periodic audits. All hardware items are packaged and protected according to contract requirements and are verified by inspection. Evidence of inspection of packaging is recorded on the applicable shipping document.

(D) - Failure History

All field and flight failures were reviewed. One failure was identified, which occurred in circuitry similar to the MSBLS-MD hardware configuration. This failure occurred at system power up. A field monitor pole C/W output failure of this type would typically be detected during system power up and generally would not occur during system operation. Since the MSBLS Ground Stations at all Shuttle landing sites are powered up daily beginning 4 or 5 days prior to a mission, and again 4 hours before landing, a loss of output failure most likely would be detected and corrected before a Shuttle landing.

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(E) - OPERATIONAL USE

For lower ceilings (8,000 to 10,000 feet) or night operations, redundant MSBLS (single-fault tolerance) is required for landing on a concrete runway. MSBLS is also mandatory for daylight landings on the lakebed with reduced ceilings, but is not required to be redundant. Deorbit is not attempted if the ceiling is less than 8,000 feet to ensure good visibility at low altitude. If radar tracking data (available at Edwards, KSC, and Northrop only) and ground communications are available, the MCC can attempt to resolve a MSBLS dilemma. Remote control operators are trained to evaluate system health and recognize probable failure modes from the Remote Control Unit Display. The Remote Control Unit Display is monitored to determine the nature of the malfunction (hard failure, intermittent, or random) and advise the chain of command on the status and the estimated time to restore operation.