SHUTTLE CRITICAL ITEMS LIST - MSBLS GROUND STATION

SUBSYSTEM: GROUND STATION - MSBLS FMEA NO.: 05-2SW-00024 Rev: 9 April 90
ASSEMBLY : PRI and B/U Shelters, and RCU ABORT: CRIT. FUNC: 1R
P/N : 517070, 517085 CRIT. HDW: 2
:
QUANTITY : 2, 1

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

REDUNDANCY SCREEN: A-pass B-fail C-pass

PREPARED BY:
DES:
REL:
QE:

APPROVED BY:
DES:
REL:
QE:

APPROVED BY (NASA):
DES:
REL:
QE:

ITEM: PRI and B/U Shelters, and RCU

FUNCTION: The Control Subsystem has (as one function) carrying out the autoswitch sequence (PRI to B/U) if called for by a PRI "System Alarm".

FAILURE MODE: The MSBLS-SW (on SYS AIM) fails so that it is unable to carry autoswitch through; specifically, it is unable to set B/U Shelter into radiation of all three RF guidance outputs.

CAUSE(S): Piece-part failure, or wire/contact loses continuity (opens), or wire/contact shorts (to +24 VDC return, or to ground). Causes may be in the RCU LRU, the PRI Shelter, or the B/U Shelter. Piece-parts are relays, latching relay, control switch (in RCU), Waveguide Switches, diodes, etc.

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

(A/B) All RF outputs from the PRI Shelter continue correct without a break, so there is no apparent effect. However, redundancy has been lost, and the next failure (if in PRI Shelter) will cause loss of good RF guidance signals to the Orbiter.

(C) Not applicable.

(D) No effect; all RF signals continue correct at the Orbiter. Possible loss of crew/vehicle after second failure (loss of PRI) due to loss of good RF guidance signal(s) at the Orbiter.

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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-CSD 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 CSD, NASA and DCAS on all LRUs 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.

This failure mode can be detected by performing "Alarm Test, Force PRI, and Forced B/U during Ground Turn Around.

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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

No data has been recorded from the field as this configuration is not in use yet. ATP and ATT has no history of this failure.

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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 night 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 Operators will verify the back-up switching transition has occurred properly or take action to force the system into back-up. The Remote Control Unit Display is monitored to determine a malfunction and advise the chain of command on the status.