SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :COMMUNICATION & TRACKING FMEA NO 05-2R -5133 -2 REV:06/27/88

ASSEMBLY :PNL A2
P/N RI :MC432-0233-0001
P/N VENDOR:
QUANTITY :1
:ONE
:

CRIT. FUNC: 1R
CRIT. HDW: 2

VEHICLE	102	103	104
EFFECTIVITY:	X	X	X

PHASE(S): PL LO OO X DO LS

REDUNDANCY SCREEN: A-PASS B-PASS C-PASS

PREPARED BY:
DES H D HADDAD
REL J Y HARADA 7-5-88
QE J T COURSEN

APPROVED BY:
DES 7/27/88
REL 7-20-88
QE 7-20-88

APPROVED BY (NASA):
SSM 7/27/88
REL 7/27/88
QE 9/16/88
DEC SSM 9/15/88
DEC REL 9/9/88

ITEM:
CROSSPOINTER DISPLAY (CROSSPOINTER INDICATOR), KU RADAR CROSSPOINTER, KU-BAND RADAR, TARGET ANGLE RATES

FUNCTION:
IN RADAR MODE, PROVIDES TARGET INERTIAL ANGLE RATES WHICH ARE ROLL RATE AND PITCH RATE. 36V73A2M1

FAILURE MODE:
SHORTS TO GROUND, INTERNAL SHORT TO CASE (GROUND)

CAUSE(S):
VIBRATION, TEMPERATURE, MECHANICAL SHOCK, CONTAMINATION, MISHANDLING, PIECE-PART STRUCTURAL FAILURE.

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

EFFECTS ON ABILITY TO CONTROL, POSITION, OR LOCK ANTENNA GIMBALS - 1R/2

(A,B) LOSS OF ABILITY TO LOCK GIMBALS, REAL-TIME DECISION REQUIRED TO PERFORM IN-FLIGHT MAINTENANCE PROCEDURES OR JETTISON THE DEPLOYED ASSEMBLY.

(C,D) POSSIBLE LOSS OF CREW/VEHICLE AFTER TWO FAILURES IF DA CANNOT BE SECURED FOR REENTRY OR JETTISONED. REENTRY WITH GIMBALS UNLOCKED MAY CAUSE DAMAGE TO THE RADIATOR.

EFFECTS ON MISSIONS REQUIRING KU-BAND SYSTEM SUPPORT - 2/2

(A,B,C) LOSS OF ALL MISSION OBJECTIVES REQUIRING KU-BAND COMM DATA PROCESSING OR RENDEZVOUS RADAR.

(D) NO EFFECT.

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EFFECTS ON PROVIDING DATA TO NSP FOR STATE VECTOR UPDATE - 1R/3

(A,B,C,D) LOSS OF ONE OF THREE REDUNDANT PATHS TO SUPPLY DATA TO NSP FOR STATE VECTOR UPDATE. UHF PROVIDES AN INDEPENDENT PATH FOR STATE VECTOR UPDATE. AFTER FOUR FAILURES POSSIBLE LOSS OF CREW/VEHICLE DUE TO LOSS OF STATE VECTOR UPDATE. NOTE- A SINGLE FAILURE OF A KU-BAND SPA DASH NUMBER -4001 CAN CAUSE THE LOSS OF POWER TO BOTH NSP'S, RESULTING IN ONLY ONE REMAINING PATH (UHF) TO UPDATE THE STATE VECTOR. THIS FAILURE CAN OCCUR DURING ANY MISSION PHASE. (KU-BAND POWERED ON OR OFF.)

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

(A) DESIGN
THE CROSSPOINTER INDICATOR DISPLAYS ELEVATIONS AND AZIMUTH VIA CLOSED LOOP SERVO SYSTEMS. THE UNIT IS HERMETICALLY SEALED AND BACKFILLED WITH INERT GAS TO PROTECT THE CIRCUITS AND COMPONENTS. THE ELECTRICAL, ELECTRONIC, AND ELECTRICAL MECHANICAL COMPONENTS ARE SELECTED FROM OR IN ACCORDANCE WITH THE ORBITER PREFERRED PARTS LIST (OPPL) REQUIREMENTS. COMPONENT APPLICATIONS ARE EVALUATED TO ASSURE COMPLIANCE WITH DERATING REQUIREMENTS.

(B) TEST
QUALIFICATION/CERTIFICATION TESTING AND ANALYSIS HAVE BEEN COMPLETED AND INCLUDES: FUNCTIONAL, VIBRATION INCLUDING QUALIFICATION/ACCEPTANCE VIBRATION (QAVT), ACCELERATION, CABIN ATMOSPHERE, THERMAL CYCLING, OPERATIONAL LIFE, ELECTROMAGNETIC INTERFERENCE (EMI), LIGHTING, VOLTAGE TRANSIENT, AND VOLTAGE EXCURSION TESTS ALONG WITH BONDING.

ALL UNITS ARE SUBJECTED TO ACCEPTANCE AND SCREENING TESTS WHICH INCLUDE FUNCTIONAL, HERMETIC SEAL (1×10^{-6} CC/SECOND), LIGHTING, VIBRATION, THERMAL, INSULATION RESISTANCE (IR), AND POWER TESTS.

GROUND TURNAROUND TEST - RADAR SELF-TEST PERFORMED EVERY FLIGHT.

(C) INSPECTION

RECEIVING INSPECTION
PERFORMS EXAMINATION OF INCOMING PARTS PER QUALITY CONTROL (QC) INSTRUCTIONS. CERTIFICATION RECORDS/TEST REPORTS ARE MAINTAINED CERTIFYING MATERIALS AND PHYSICAL PROPERTIES.

CONTAMINATION CONTROL
PRECAUTIONS ARE TAKEN TO PREVENT CONTAMINATION AS A FAILURE CAUSE. AREAS WHERE HARDWARE IS FABRICATED ARE GRADED INTO DIFFERENT LEVELS OF CLEANLINESS.

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ASSEMBLY/INSTALLATION
DETAILED INSPECTION IS PERFORMED ON ALL ASSEMBLIES AND MOST PIECE PARTS PER QC INSTRUCTIONS. ASSEMBLY BENCHES ARE EQUIPPED WITH GROUND STRAPS AND BENCH COVERS FOR USE DURING HANDLING OF STATIC SENSITIVE DEVICES. ALL TORQUING OPERATIONS ARE VERIFIED BY INSPECTION.

CRITICAL PROCESSES
OPERATORS ARE CERTIFIED FOR CRITICAL PROCESSES (SOLDERING, CRIMPING) INVOLVED IN THE ASSEMBLY OF THE KU-BAND CROSSPOINTER INDICATOR.

TESTING
ATP IS OBSERVED AND VERIFIED BY QC, INCLUDING AVT, ATT, AND INSULATION RESISTANCE (IR) TESTS.

HANDLING/PACKAGING
PARTS PACKAGING IS INSPECTED AT RANDOM ON A DAILY BASIS PER PROCEDURE INSTRUCTIONS.

(D) FAILURE HISTORY
THERE HAVE BEEN FOUR CORRECTIVE ACTION RECORDS (CAR'S) WRITTEN AGAINST THE CROSSPOINTER INDICATOR. FIRST FAILURE, AB7931, WAS A MINOR PARAMETER OUT-OF-TOLERANCE CONDITION CREATED BY TECHNICIAN NOT FOLLOWING THE CALIBRATION PROCEDURES.

THE SECOND FAILURE, AB8183, WAS EXPERIENCED FOLLOWING QUALIFICATION VIBRATION TEST. THIS FAILURE RESULTED IN DESIGN CHANGES (CHANGING OF BEARING FROM ALUMINUM TO JEWEL AND REDUCTION OF FLAG WEIGHT) WHICH WAS INCORPORATED INTO ALL PRODUCTION UNITS.

THE THIRD FAILURE, AC5447, FOUND THE UNITS ELEVATION AND AZIMUTH RATE DISPLAY INPUT SIGNALS WERE MISWIRED (CROSSWIRED). CONDITION WAS CAUSED BY WIRING ERROR NOT DETECTED BY THE ACCEPTANCE TEST. THE ACCEPTANCE TEST PROCEDURE WAS REVISED TO ASSURE THAT CONDITIONS OF THE NATURE WOULD BE DETECTED. ALL UNITS HAVE BEEN TESTED TO VERIFY PROPER OPERATION.

THE FOURTH FAILURE, AD1830, WAS ONE WHERE THE "OFF" FLAG WAS NOT VISIBLE. CONDITION WAS CAUSED BY FLAG MOVEMENT INTERFERENCE. DRAWINGS HAVE BEEN CHANGED TO INCREASE CLEARANCE. THIS BEGAN WITH S/N 008. UNITS FABRICATED PRIOR TO THESE CHANGES ARE CONSIDERED SATISFACTORY FOR THEIR INTENDED USAGE, SINCE STICKY "OFF" FLAG CONDITION DOES NOT AFFECT THE FUNCTIONAL OPERATION OF THE CROSSPOINTER INDICATOR.

(E) OPERATIONAL USE

WORKAROUND TO REGAIN ABILITY TO CONTROL, POSITION, OR LOCK ANTENNA GIMBALS
REAL-TIME DECISION TO PERFORM EA-1 ALTERNATE POWER IN-FLIGHT MAINTENANCE PROCEDURE TO LOCK THE GIMBALS AND STOW THE DA OR TO JETTISON THE DA.

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WORKAROUND TO REGAIN SUPPORT OF MISSION OBJECTIVES
COMM: NONE. RADAR: ATTEMPT RENDEZVOUS WITH ALTERNATE SENSORS. USE BACK-UP RENDEZVOUS PROCEDURES.

WORKAROUND TO PROVIDE THE STATE VECTOR UPDATE
THE STATE VECTOR CAN BE UPDATED VIA THE NORMAL S-BAND COMMUNICATIONS LINK OR VIA UHF/AUDIO.