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ASTP

FLIGHT READINESS REVIEW BOARD

JUNE 5, 1975

VOL. II SPACECRAFT-ROCKWELL

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APOLLO-SOYUZ TEST PROJECT
CSM 111/DM-2/DS 5/SLA 18
FLIGHT READINESS REVIEW
PREBOARD REPORT
JSC

4 JUNE 1975

Contract NAS9-13100

Rockwell International
Space Division

ASTP CSM III
FLIGHT READINESS REVIEW
BOARD REPORT

ASTP CSM III FRR
AGENDA

- CONFIGURATION DIFFERENCES
- SKYLAB FLIGHT ANOMALIES
- SPACECRAFT ISSUE
- FRRID RESOLUTIONS
- GENERAL STATUS
- KSC HISTORY AND OPEN WORK

SIGNIFICANT CONFIGURATION DIFFERENCES

APOLLO BLOCK II VS. J-MISSION VS. SKYLAB VS.

APOLLO SOYUZ TEST PROJECT SPACECRAFT

ASTP CSM III FRR
SIGNIFICANT CONFIGURATION DIFFERENCES

DIFFERENCES		SPACECRAFT 110	111	114	118	REMARKS
COMMAND MODULE						
EPS	- LEM UMBILICALS	X		X		
	- SKYLAB TUNNEL W/H				X	
	- DM UMBILICALS		X			
	- DRAG THRU UMBILICAL		X		X	
EXPERIMENTS	- STOWABLE	X	X	X	X	
	- COLDPLATE MOUNTED		X			
TV	- GFE CAMERAS	X	X	X	X	
	- AUGMENTED/VTR		X			ATS-6 LINK
COMM	- SPEAKER BOX		X		X	SKYLAB TYPE SPEAKER BOX
	- ATS-6 COMPONENTS		X			
	- DSE	X			X	
	- DRR		X	X		
ECS	- AFT BKHD COLDPLATE		X			FOR EXPERIMENT COOLING
	- EVA CAPABILITY			X	X	
D&C	-DM		X			MISSION UNIQUE PROVISIONS
	- DS		X			
	- EXPERIMENTS		X	X	X	
	- ATS-6 CONTROLS		X			

ASTP CSM III FRR
SIGNIFICANT CONFIGURATION DIFFERENCES

DIFFERENCES		SPACECRAFT 110	111	114	118	REMARKS
COMMAND MODULE (CON'T)						
STOWAGE	- BLK II	X	X	X		
	- SKYLAB				X	
	- MOD SKYLAB		X			MISSION UNIQUE DIFFERENCES
SERVICE MODULE						
EXPERIMENTS	- SCIENTIFIC INSTR. MODULE			X		SECTOR I
	- LUNAR SOUNDER			X		
	- DOPPLER		X			EXTERNAL ANTENNA
	- REMOTE CTR DOORS		X			MA048/MA083/MA088
	- EVA CAPABILITY			X	X	EXP. RETRIEVAL ON J-MISSION

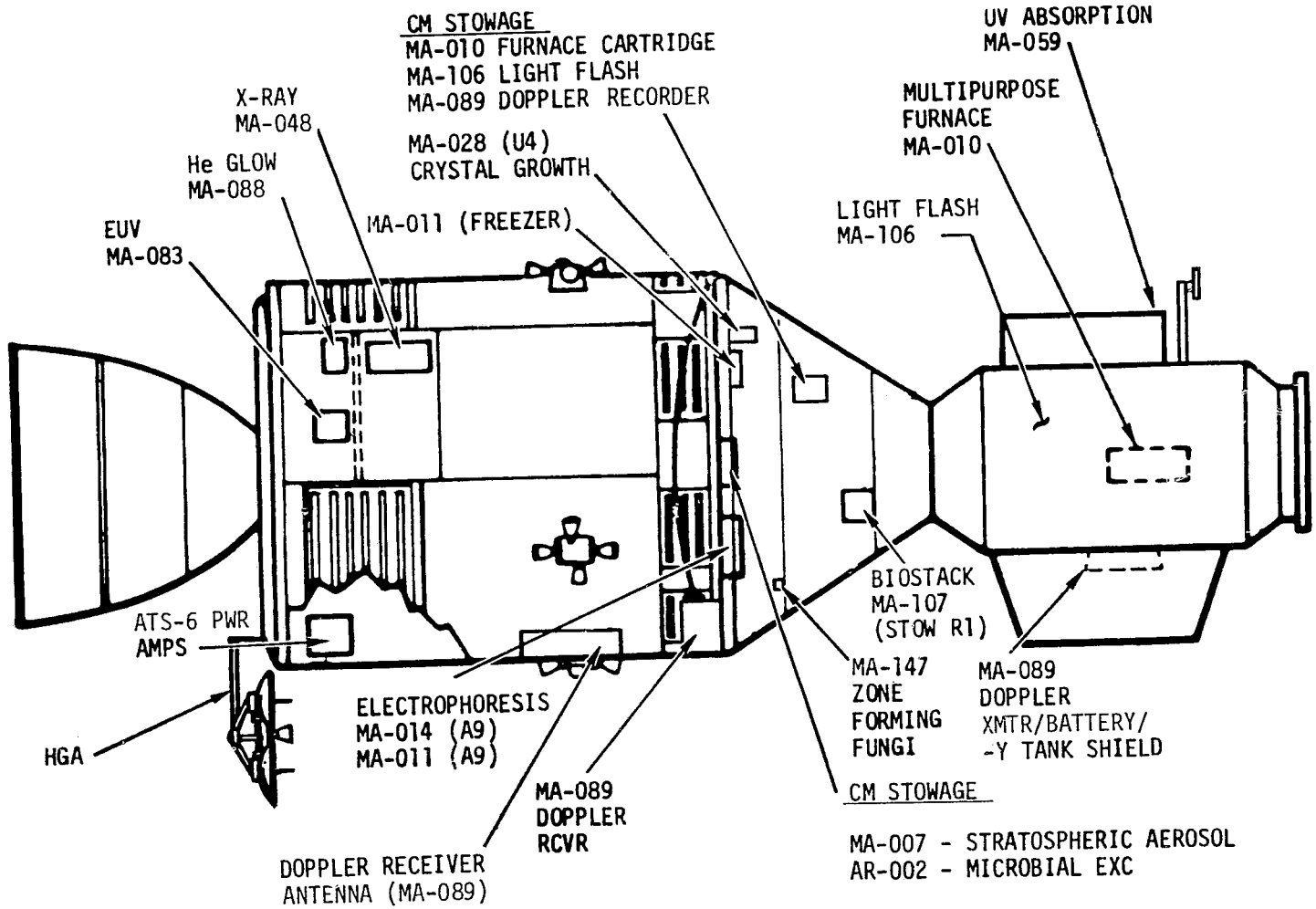
ASTP CSM III FRR
SIGNIFICANT CONFIGURATION DIFFERENCES

DIFFERENCES	SPACECRAFT 110	111	114	118	REMARKS
SERVICE MODULE (CON'T)					
SPS - PUGS - FLT	X		X		
- PUGS - GRD USE		X		X	
- 4 PROP/2 He TANKS	X		X		
- 2 PROP/1 He TANK		X		X	
ECS - HEATERS DEACTIVATED		X		X	
- COLDPLATES - EXP		X			
- COLDPLATES - ATS-6		X			
RCS - PSM		X		X	
- QUAD HEATERS		X		X	
- INCREASED CORK		X		X	QUADS AND SM
- ADDITIONAL CORK		X			
COMM - RRT	X		X		
- ATS-6 POWER AMP SYSTEM		X			
- HGA	X	X	X		
EPS - 2 FUEL CELLS				X	SKYLAB UNIQUE
- DESCENT BATTERIES				X	
- 3 FUEL CELLS	X	X	X		
-WATER TANK				X	
- 3rd CRYO SHELF	X		X		J-MISSION ADDED 3rd H_2 TANK
- RTN ENHAN. BATTERIES	X		X		

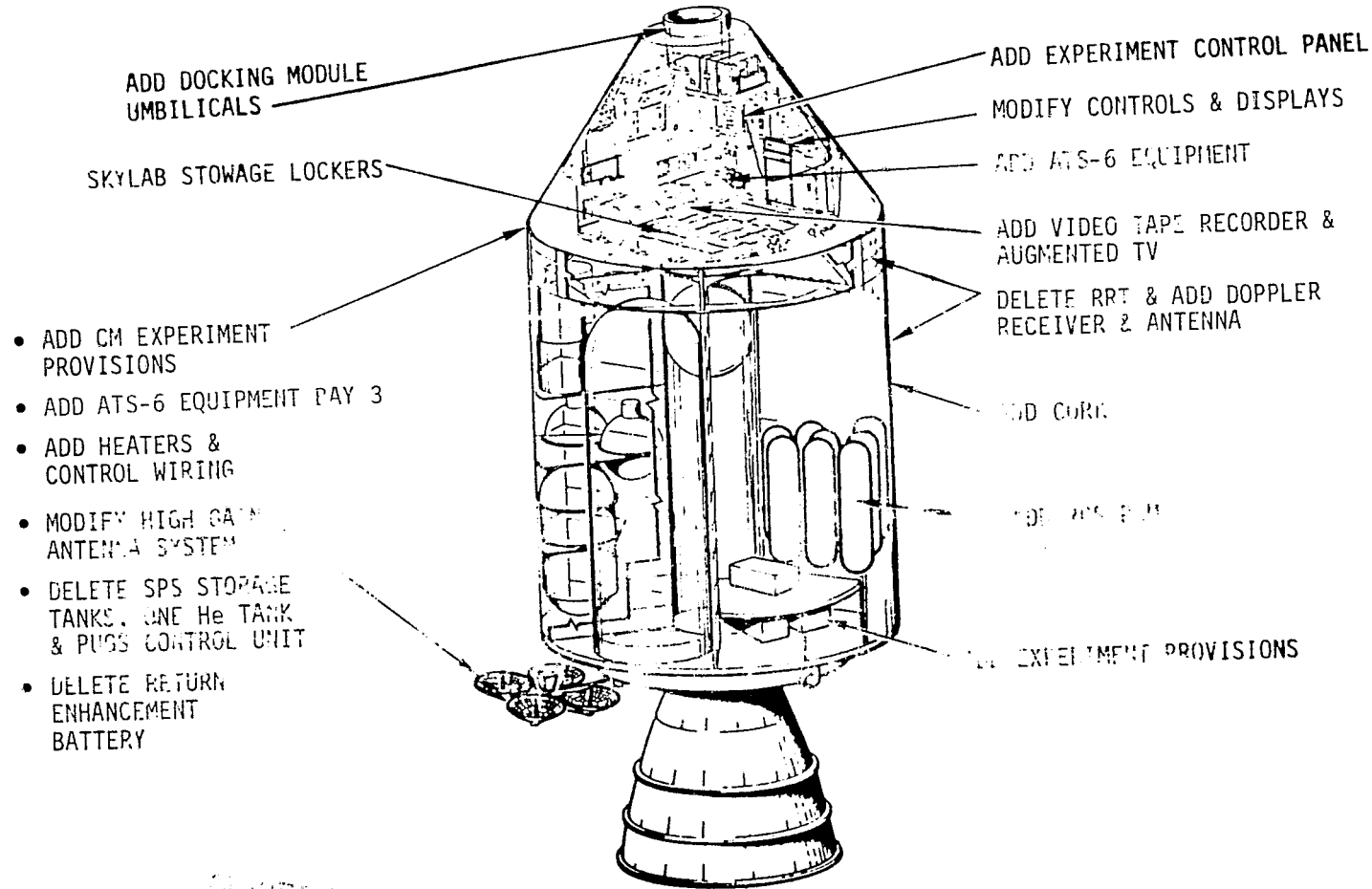
ASTP CSM III FRR
SIGNIFICANT CONFIGURATION DIFFERENCES

DIFFERENCES	SPACECRAFT 110	111	114	118	REMARKS
SPACECRAFT ADAPTER (SLA)					
PANELS - JETTISONABLE	X	X	X		
- DEPLOYABLE				X	
- LEM	X		X		
TRUSS - STABILIZER				X	
- DM/DS		X			
DOCKING SPACECRAFT					
DOCKING MODULE COMPLETE		X			
INTERNATIONAL DOCKING SYSTEM		X			
SINCE ASTP DCR					
PYRO BUS TIE C/B		X			
SM ADDITIONAL CORK		X			

ASTP CSM 111 FRR
EXPERIMENTS/ATS-6 LOCATIONS



ASTP CSM 111 FRR
MAJOR MODIFICATIONS TO CM/SM



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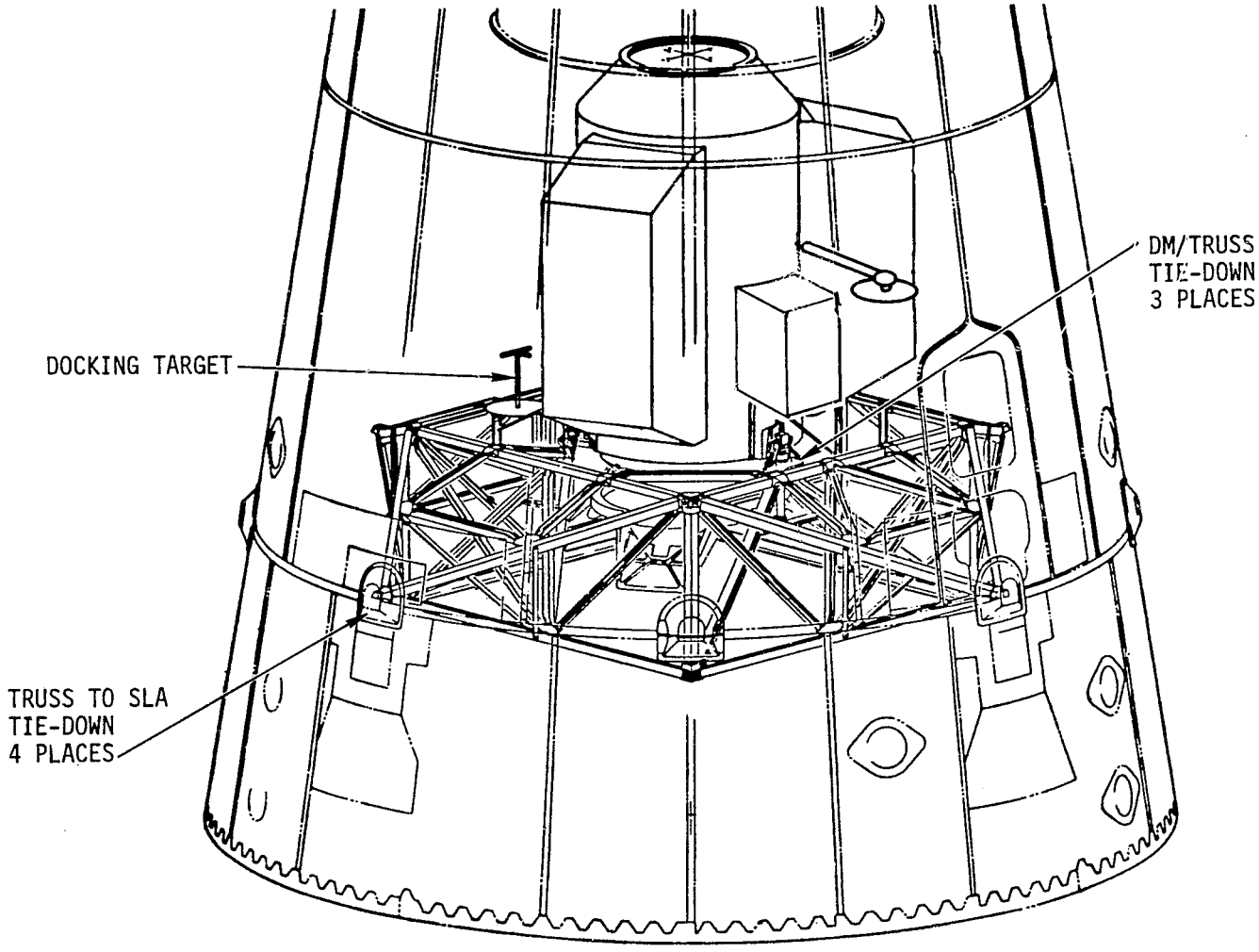
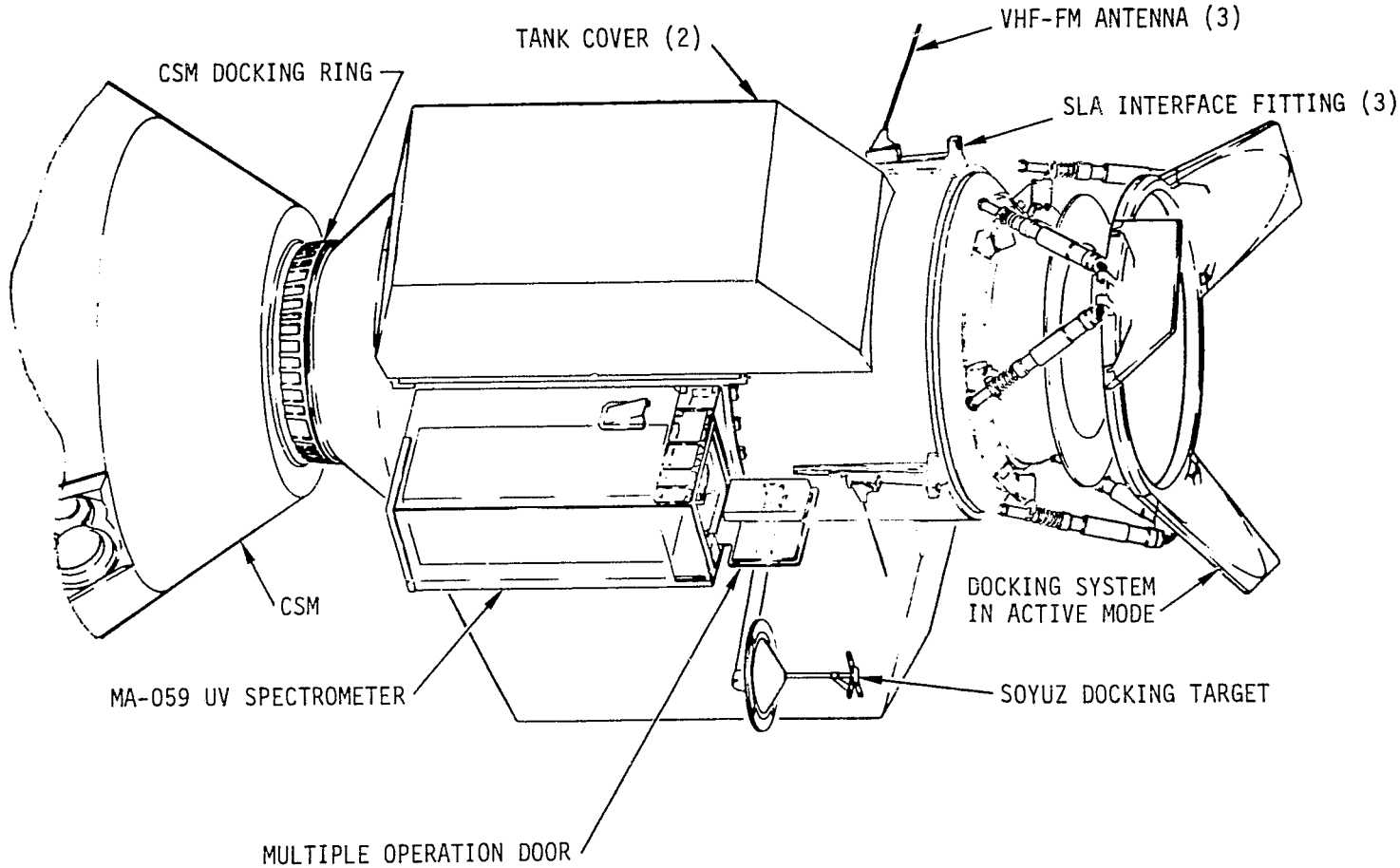
ASTP CSM 111 FRR
DM ON TRUSS IN SLA

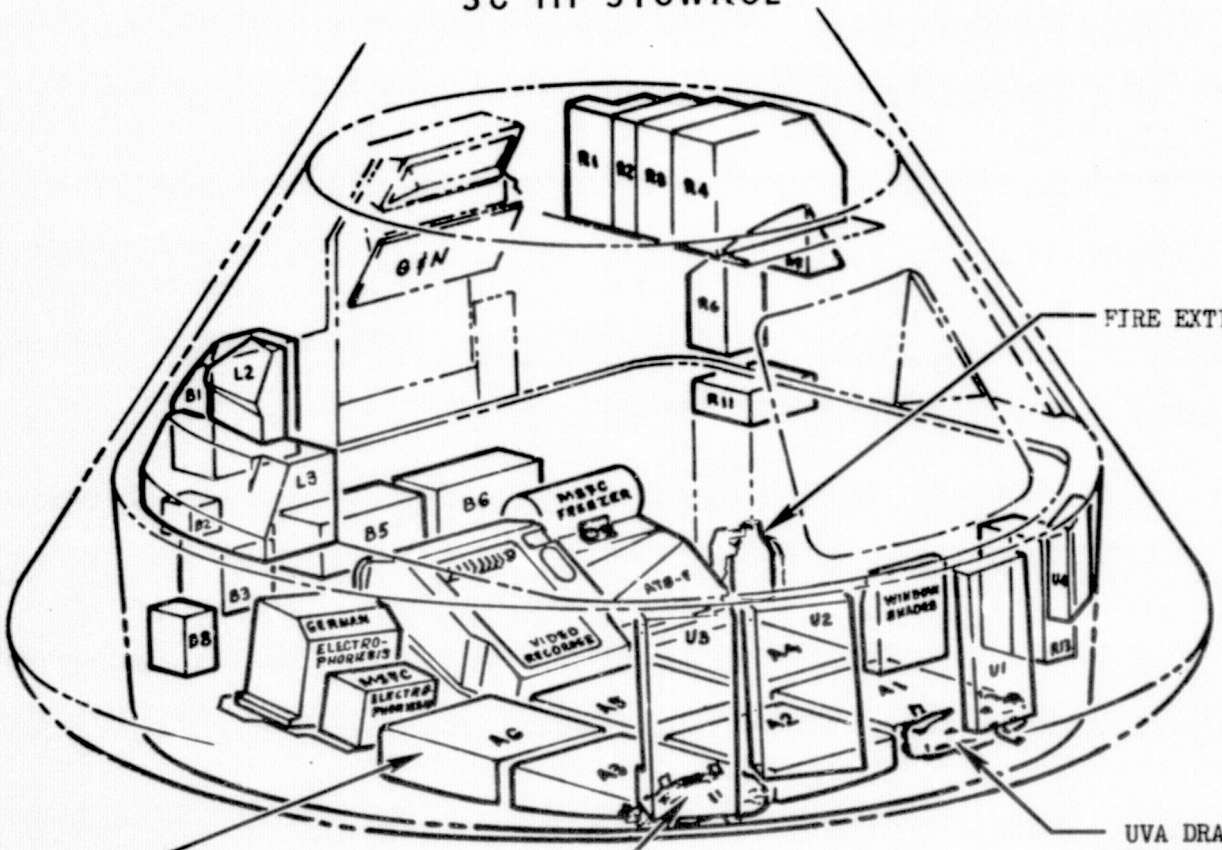


ASTP CSM 111 FRF
DM EXTERIOR ARRANGEMENT



ASTP CSM III FRR
SIGNIFICANT CONFIGURATION DIFFERENCES

SC III STOWAGE



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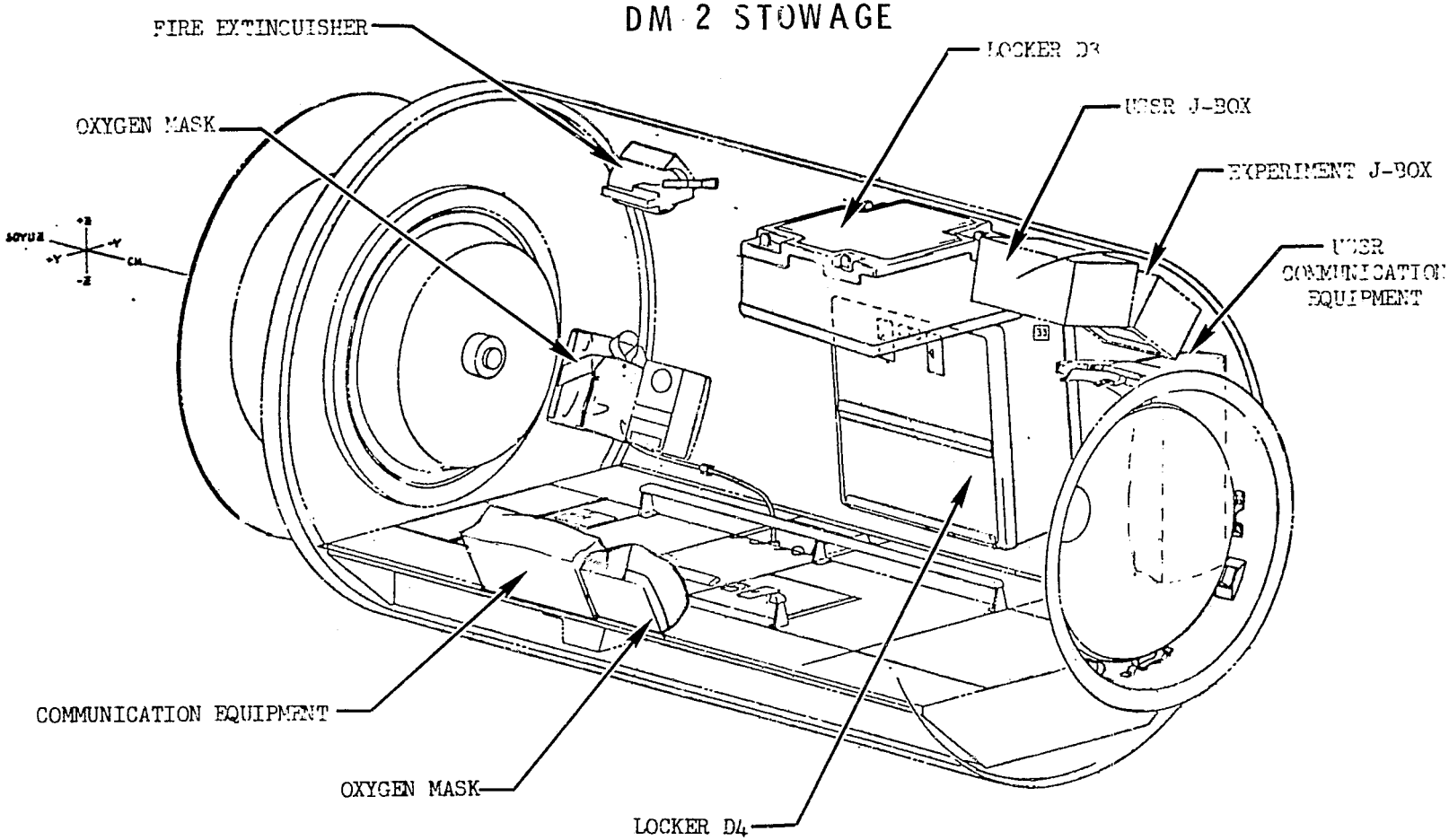
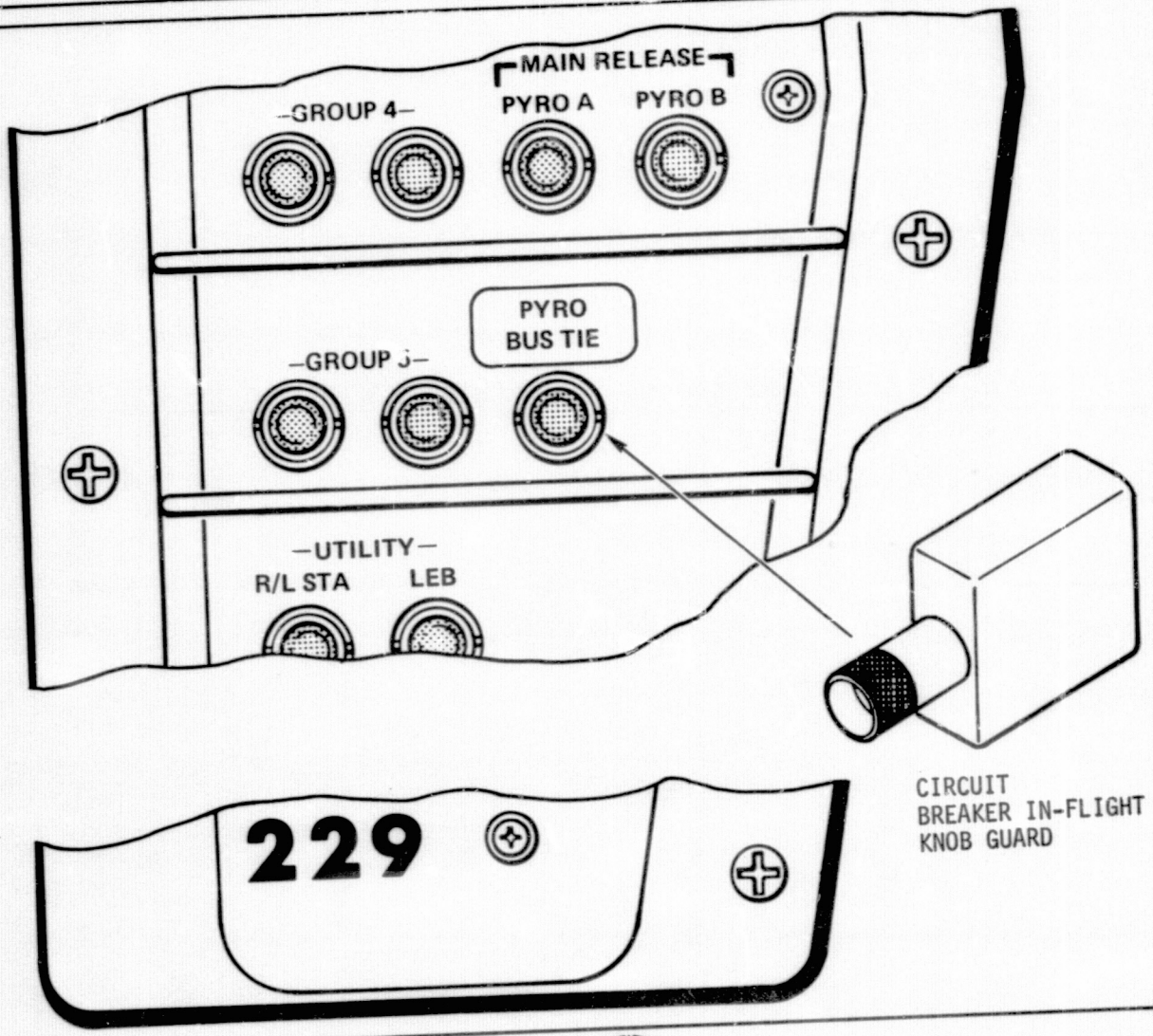
SIGNIFICANT CONFIGURATION DIFFERENCES

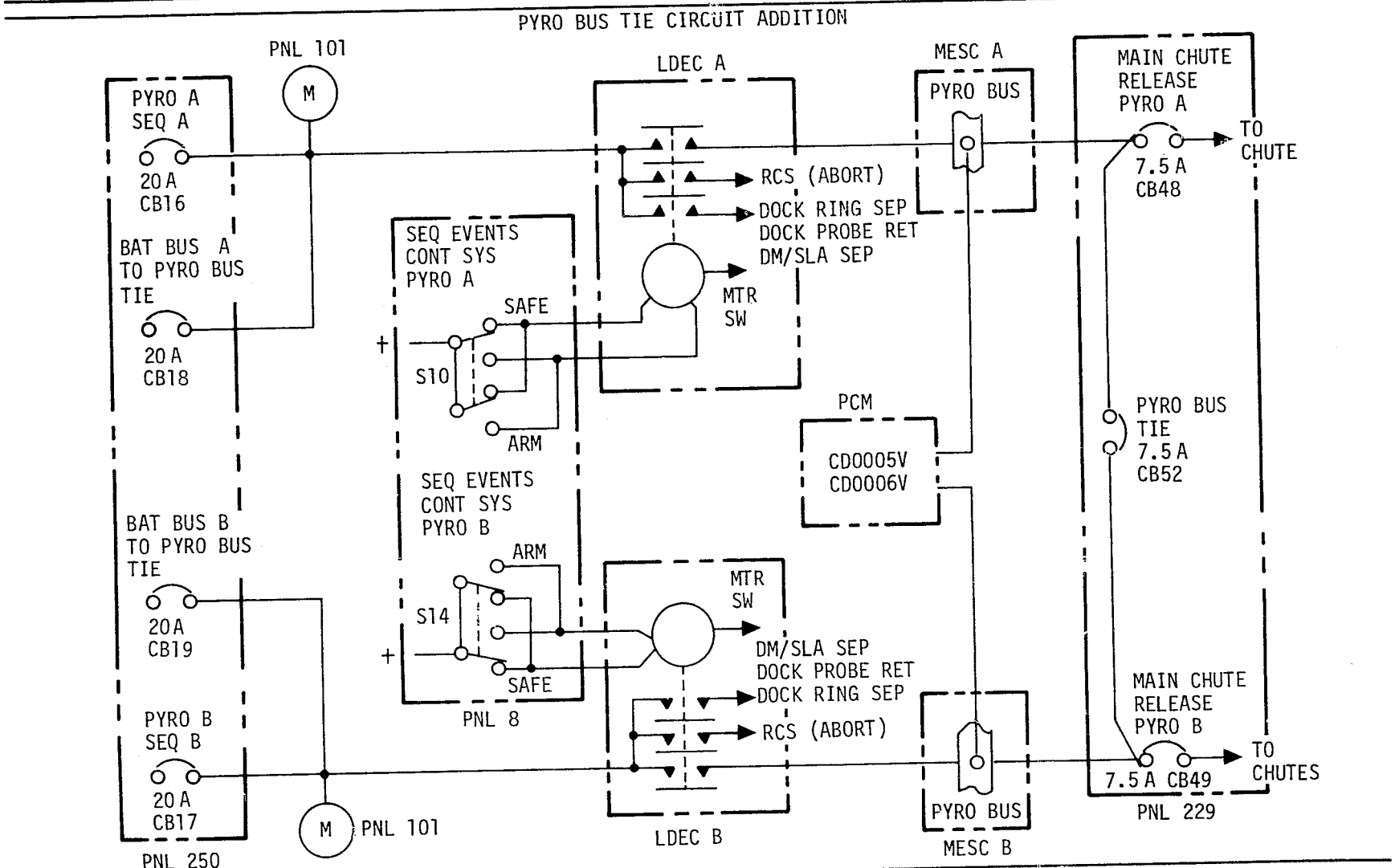
DM 2 STOWAGE



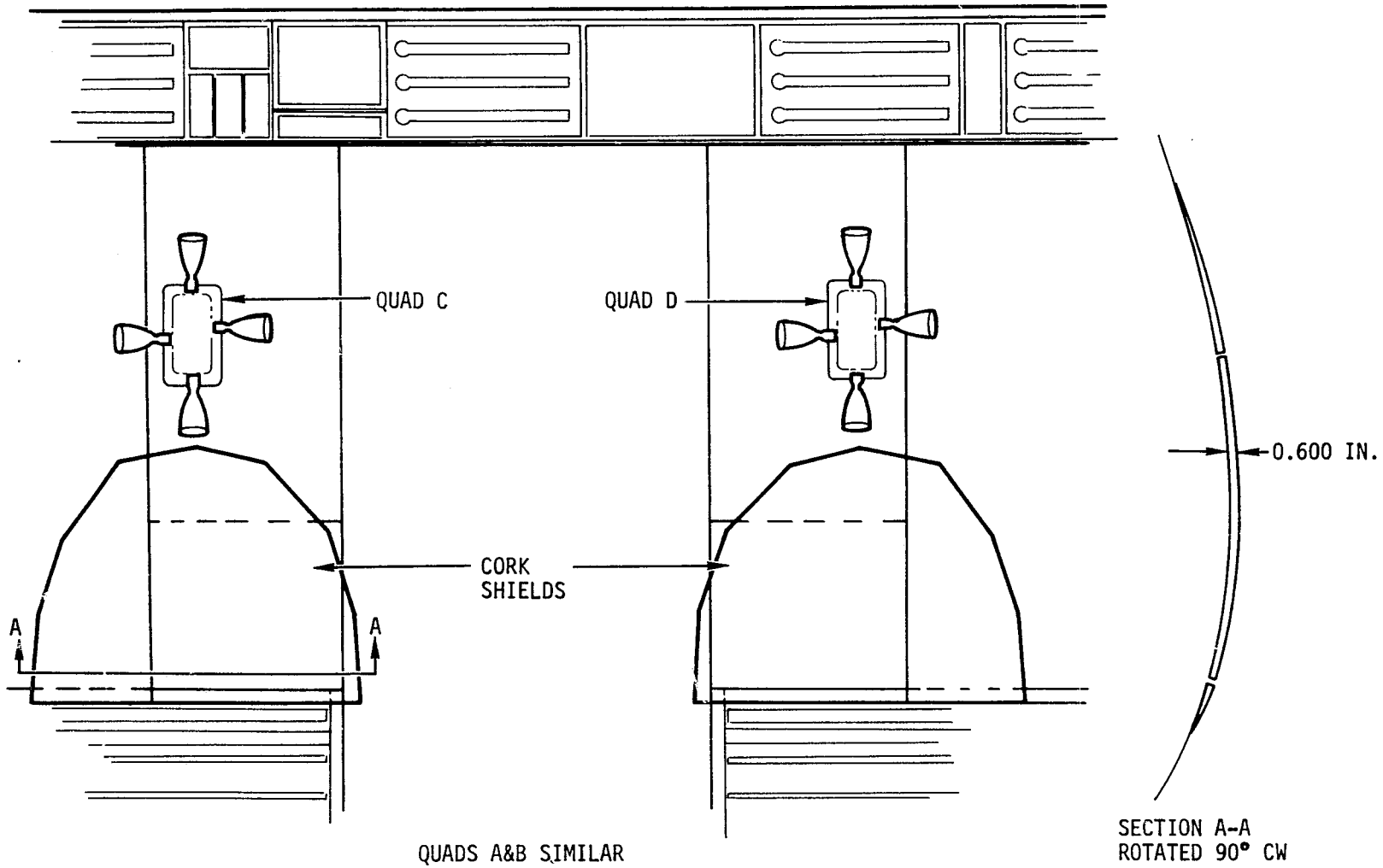
PYRO BUS TIE CIRCUIT BREAKER



PYRO BUS TIE CIRCUIT



SM CORK PROTECTION FOR 600-SECOND +X SM RCS BURN



ASTP CSM 111 FRR
MASS PROPERTIES SUMMARY

S/C AT ORBIT INSERTION, LEV & CM PREDICTED WEIGHT/CG

	WEIGHT (LB)	X_A (IN.)	Y (IN.)	Z (IN.)	LIMIT CONDITION
CSM 111 LEV AT LAUNCH	22,337	1148.1	-0.08	3.75	Z_{CG} = 3.74 TO 3.76 IN.
CSM 111 LEV AT MOTOR B/O (HIGH ALTITUDE ABORT)	19,154	1123.7	-0.02	4.12	X_{CG} = 1121.0 IN. (MINIMUM)
CSM 111 CM AT LAUNCH	13,122	1040.9	-0.18	5.72	13,500 LB
CSM 111/DM-2/SLA-18 AT ORBIT INSERTION	37,400	–	–	–	37,400 LB

SKYLAB FLIGHT ANOMALIES

CSM 116 SUMMARY

- DOCKING PROBE CAPTURE ANOMALY
- UP DATA LINK ERRONEOUS COMMANDS
- RCS PROPELLANT QUANTITY SENSOR FAILURES (TWO)
- QUAD B ENGINE PACKAGE TEMPERATURE SENSOR FAILURE
- SECONDARY EVAPORATOR OUTLET TEMPERATURE MEASUREMENT FAILURE
- SECONDARY RADIATOR HEATER SHORT
- SUIT TO CABIN NEGATIVE DELTA PRESSURE
- CM RCS FUEL TANK BLADDER LEAKAGE

CSM 117 SUMMARY

- RCS QUAD B LEAKAGE
- RCS QUAD D LEAKAGE
- PSM OXIDIZER MANIFOLD PRESSURE DROP
- CO_2 SENSOR MASTER ALARMS
- H_2 CRYOGENIC TANKS CONTROL REVERSAL
- UP DATA LINK INOPERATIVE COMMAND
- ECS WATER GLYCOL LEAKAGE

CSM 118 SUMMARY

- SPS OXIDIZER SUMP TANK MEASUREMENT ANOMALY
- QUAD B FUEL ISOLATION VALVE INTERNAL LEAK
- CM RCS HELIUM PRESSURE DECAY
- ENTRY BATTERY A TO BATTERY BUS A INTERMITTENT CIRCUIT BREAKER

SKYLAB FLIGHT ANOMALIES - CSM 116
DOCKING PROBE CAPTURE ANOMALY

ANOMALY:

- UNABLE TO CAPTURE AFTER INITIAL SOFT DOCK AND SEPARATION
- HARD DOCK ACHIEVED BY CONTINGENCY JUMPER (BYPASS CAPTURE)

ANALYSIS:

- INFLIGHT INSPECTION SHOWED ONE HOOK OPERATION STICKY IN RETRACT POSITION
- CAUSED BY EITHER CONTAMINATION OR INTERFERRNCE BETWEEN HOOK AND COVER

CORRECTIVE ACTION:

- INCREASED HOOK TO COVER CLEARANCE
- ADDED DETAILED LATCH FUNCTIONAL C/O SUBSEQUENT TO ATP - 27 INSPECTION POINTS
- MODIFIED PYRO COVER AND RELEASE HANDLE TO ALLOW CONTINGENCY DOCKING WITHOUT CSM DEPRESSURIZATION

SKYLAB FLIGHT ANOMALIES - CSM 116
UDL ERRONEOUS COMMAND ANOMALY

ANOMALY:

- UPLINK COMMAND "DSE START" RESULTED IN A DSE START PLUS AN FM TRANSMITTER OFF

ANALYSIS:

- POST FLIGHT TESTS REVEALED SHORTED DIODE

CORRECTIVE ACTION:

- KSC CHECKOUT OPERATIONS MODIFIED TO DETECT OFF-NOMINAL RELAY RESPONSES
- DIODE X-RAYS REVIEWED FOR ASSEMBLY QUALITY
- CSM III UDL HAS ONE QUESTIONABLE DIODE IN REGISTER/PROGRAMMER NO. 20
    - DATA REGISTER LOSS WOULD CAUSE LOSS OF ABILITY TO UPDATE CTE

SKYLAB FLIGHT ANOMALIES - CSM 116
RCS PROPELLANT QUANTITY SENSOR FAILURES

ANOMALY:

- QUAD A AND PSM QUANTITY MEASUREMENTS INDICATED OFF SCALE HIGH

ANALYSIS:

- SENSORS SUBJECT TO DAMAGE FROM LIGHTNING STRIKE
- MOST PROBABLE CAUSE OF FAILURE IS LIGHTNING STRIKE ONE DAY PRIOR TO LAUNCH
- MEASUREMENT FAILURE UNDETECTED FOLLOWING LIGHTNING STRIKE DUE TO FULL RCS TANK LOADS

CORRECTIVE ACTION:

- NONE REQUIRED - GROUND CALCULATIONS ARE PRIME MODE OF DETERMINING PROPELLANT QUANTITY ON BOARD
- LIGHTNING PROTECTION HAS BEEN ADDED AT KSC

SKYLAB FLIGHT ANOMALIES - CSM 116
QUAD B ENGINE PACKAGE TEMPERATURE SENSOR FAILURE

ANOMALY:

- QUAD B ENGINE PACKAGE TEMPERATURE MEASUREMENT INDICATED OFF SCALE HIGH

ANALYSIS:

- MOST PROBABLE FAILURE MODES
  - OPEN IN SENSING ELEMENT
  - SHORT TO GROUND IN ANY OF THREE INTERCONNECTING WIRES

CORRECTIVE ACTION:

- NONE REQUIRED - ENGINE QUAD HEATER THERMOSTATICALLY CONTROLLED TO ASSURE ADEQUATE ENGINE TEMPERATURE FOR SAFE FIRING

SECONDARY EVAPORATOR OUTLET TEMPERATURE MEASUREMENT FAILURE

ANOMALY:

- SECONDARY EVAPORATOR OUTLET TEMPERATURE INDICATED LOWER LIMIT

ANALYSIS:

- POST FLIGHT TEST FOUND A SHORTED ZENER DIODE
- SHORT WAS CAUSED BY SILICON CONTAMINANT WITHIN THE DIODE GLASS BODY

CORRECTIVE ACTION:

- NONE REQUIRED - SECONDARY COOLANT LOOP PERFORMANCE CAN BE MONITORED USING OTHER MEASUREMENTS

SKYLAB FLIGHT ANOMALIES - CSM 116
ECS SECONDARY RADIATOR HEATER

ANOMALY:

- ECS RADIATOR SECONDARY HEATER CYCLED ON WITH CONTROL SWITCH OFF
- SECONDARY RADIATOR INLET/OUTLET TEMPERATURES OPERATIONAL WITH POWER OFF

DISCUSSION:

- 28 VOLT SHORT REQUIRED TO GET CONDITION NOTED
- CONTROLLER RELAY WIRING CONFIGURATION MAKES A TERMINAL TO TERMINAL SHORT HIGHLY PROBABLE

CORRECTIVE ACTION:

- SKYLAB ECS RADIATOR HEATER CIRCUITS DEACTIVATED
- CSM III ECS RADIATOR HEATER MOTOR SWITCHES PLACED IN THE OPEN POSITION PRIOR TO LAUNCH

SKYLAB FLIGHT ANOMALIES - CSM 116
SUIT TO CABIN NEGATIVE DELTA PRESSURE

ANOMALY:

- NEGATIVE SUIT CIRCUIT PRESSURE DURING CREW INSERTION

ANALYSIS:

- POST FLIGHT TESTING REVEALED
  - SUIT LEAKAGE UNCHANGED FROM PRE-FLIGHT LEAKAGE
  - SUIT CIRCUIT WITH OR WITHOUT SUITS WAS WITHIN ALLOWABLE LIMITS
- HISTORICAL TEST DATA REVEALS
  - SUIT TO CABIN DELTA PRESSURE BELOW 2 IN H_2O INCREASES SYSTEM LEAKAGE
  - THE RETURN AIR CHECK VALVE SEALING CAPABILITY IS REDUCED AT LOW DELTA PRESSURES, RESULTS IN INCREASED SYSTEM LEAKAGE
  - RETURN AIR CHECK VALVE CAN BE SEATED BY CYCLING THE RETURN AIR S/O VALVE

CORRECTIVE ACTION:

- NONE REQUIRED - ANOMALY CAUSED BY SMALL LOW PRESSURE LEAK. DOES NOT AFFECT SUIT CIRCUIT INTEGRITY FOR OPERATION AT HIGHER DELTA PRESSURES

CM RCS FUEL TANK - BLADDER LEAKAGE

ANOMALY:

- BLADDER LEAKAGE DURING DECONTAMINATION OPERATIONS

ANALYSIS:

- HARDWARE EVALUATION INDICATED:
  - NO EVIDENCE OF BLADDER LEAKAGE PRIOR TO EXPULSION OF PROPELLANT
  - BLADDER STILL CAPABLE OF EXPELLING ALL OF THE PROPELLANT
- ANALYTICAL EVALUATION INDICATED:
  - LEAKAGE CAUSED BY ROLLING OF A BUCKLED FOLD IN THE BLADDER
  - SPLASHDOWN IMPACT SLOSHING PROBABLY CAUSED BLADDER DAMAGE
  - SYSTEM PERFORMANCE OR RECOVERY OPERATIONS WERE NOT AFFECTED

CORRECTIVE ACTION:

- NONE REQUIRED

SKYLAB FLIGHT ANOMALIES - CSM 117
RCS QUAD B PROPELLANT LEAKAGE

ANOMALY:

- QUAD B INDICATED EXCESSIVE PROPELLANT "USE" THREE HOURS AFTER LAUNCH

ANALYSIS:

- MALFUNCTION ANALYSIS DETERMINED THAT OXIDIZER WAS LEAKING DOWNSTREAM OF PROPELLANT ISOLATION VALVES
- MOST PROBABLE CAUSE OF LEAK WAS ENGINE VALVE SEAT CONTAMINANT
- LEAKAGE INDICATED VALVE OPEN 25% - REQUIRES .005 PARTICLE
  - 5-15 MICRON FILTERS 2 FEET UPSTREAM OF ENGINE VALVES
  - 165 MICRON FILTERS AT ENGINE VALVE - CAN PASS .005 PARTICLE

CORRECTIVE ACTION:

- ADDED RCS PURGE BURN PROCEDURE TO FLIGHT PLAN

SKYLAB FLIGHT ANOMALIES - CSM 117
RCS QUAD D OXIDIZER LEAKAGE

ANOMALY:

- QUAD D ENGINE PACKAGE TEMPERATURE INDICATED DECREASE ON MISSION DAY SIX

ANALYSIS:

- MALFUNCTION ANALYSIS DETERMINED THAT OXIDIZER WAS LEAKING DOWNSTREAM OF PROPELLANT ISOLATION VALVES
- ANALYSIS OF RCS AND SPS TEMPERATURES AND PRESSURES INDICATED OXIDIZER WAS VENTING WITHIN THE ENGINE MOUNTING STRUCTURE, MOVING THROUGH BAY 5 INTO THE TUNNEL AREA AND EXITING THROUGH THE LOWER BULKHEAD NEAR THE SPS ENGINE
- HARDWARE EVALUATION AND ANALYSIS SUMMARY
  - IMPROPERLY TORQUED DYNATUBE FITTING FITS FAILURE MODE
  - BUTYL RUBBER O-RING DEGRADES IN OXIDIZER AT ELEVATED TEMPERATURE
  - O-RING DEGRADATION TIMELINE AND LEAKAGE RATES REPRODUCED BY TEST
  - FINGER-TIGHT DYNATUBE FITTING WILL PASS HELIUM LEAK TESTS

CORRECTIVE ACTION:

- CSM 111, 119, AND SPARE QUAD FITTINGS WERE TORQUE CHECKED

CM III ISSUE:

- CM B RCS NEGATIVE ROLL ENGINE FUEL DYNATUBE FITTING MOVEMENT

BACKGROUND:

- WHILE WORKING IN ACCESS DOOR CM 8 THE TECHNICIAN INADVERTENTLY EXERTED "CONSIDERABLE FORCE" ON THE FLEX LINE TO THE ENGINE
- DURING THIS OPERATION THE LINE WAS NOTED TO MOVE INBOARD, IN THE NUT TIGHTENING DIRECTION ABOUT 1/2 INCH
- THE NUT WAS TORQUED TO 30 FT/LB WITH NO MOVEMENT OF THE B-NUT NOTED
- BREAKAWAY TORQUE WAS MEASURED AT 28.3 FT-LB
- THE UNIT WAS DEMATED AND INSPECTED WITH NO MECHANICAL ANOMALIES NOTED
- THE UNIT WAS RECONNECTED AND SUCCESSFULLY LEAK TESTED WITH HELIUM AT 40 PSIG
- SUBSEQUENT LEAK CHECK AT 300 PSIG WAS WITHIN SPEC

SKYLAB FLIGHT ANOMALIES
DYNATUBE FITTING MOVEMENT (CON'T)

CONCLUSIONS:

- IT IS POSSIBLE TO ROTATE THE FITTING IN THE NUT WHEN PROPERLY TORQUED
- SOME SLIGHT ROTATION WILL NOT IMPAIR THE CONNECTORS CAPABILITY TO EFFECT A GOOD SEAL

SKYLAB FLIGHT ANOMALIES - CSM 117
PSM OXIDIZER MANIFOLD PRESSURE DROP

ANOMALY:

- PSM OXIDIZER MANIFOLD PRESSURE EXPERIENCED AN UNEXPECTED 12 PSI PRESSURE DECREASE DURING RECONFIGURATION OF THE QUAD A, QUAD C, AND PSM PROPELLANT ISOLATION VALVES

ANALYSIS:

- MOST PROBABLE CAUSE IS REVERSE LEAKAGE OF ONE OF THE QUAD C OXIDIZER ISOLATION VALVES
  - VALVE SEAT DESIGNED TO SEAL IN NORMAL FLOW DIRECTION ONLY
  - LEAKAGE RATE EXTREMELY SMALL
- SMALL REVERSE LEAKAGE HAD NO DETRIMENTAL EFFECT ON THE SM RCS DURING REMAINDER OF MISSION

CORRECTIVE ACTION:

- NONE REQUIRED - SYSTEM NEVER PLACED IN QUIESCENT MODE

SKYLAB FLIGHT ANOMALIES - CSM 117
CO_2 SENSOR MASTER ALARMS

ANOMALY:

- UNEXPLAINED MASTER ALARMS FROM CO_2 SENSOR

ANALYSIS:

- HISTORICAL DATA INDICATES PROBABLE MALFUNCTION CAUSED AS THE RESULT OF MOISTURE COLLECTING IN OPTICS CHAMBER

CORRECTIVE ACTION:

- NO KNOWN METHOD FOR ELIMINATING 100% MOISTURE COLLECTION IN OPTICS CHAMBER
- ELIMINATION OF NUISANCE MASTER ALARM CAN BE ACHIEVED BY OPENING CIRCUIT BREAKER TO CO_2 INSTRUMENTATION SIGNAL

SKYLAB FLIGHT ANOMALIES - CSM 117
HYDROGEN TANKS - CONTROL REVERSAL

ANOMALY:

- SYSTEM OPERATION (AFTER LAUNCH) SHOWED TANK NO. 1 FAN AND HEATER CONTROLS OPERATED TANK NO. 2 AND VICE VERSA
- INSTRUMENTATION FOR BOTH TANK, TEMP, PRESS AND QUANTITY WAS NORMAL

ANALYSIS:

- HYDROGEN TANKS INCORRECTLY IDENTIFIED DURING INITIAL SHELF BUILDUP RESULTING IN INCORRECT WIRING
- NORMAL CHECKOUT PROCEDURES WERE INADEQUATE TO DISCLOSE WIRING REVERSAL

CORRECTIVE ACTION: (CSM 111, 118, 119)

- END TO END WIRING CONTINUITY CHECK AT SHELF BUILDUP (D/659)
- CONTINUITY CHECK IN D/289 TEST CELL PRIOR TO POWER APPLICATION
- REPEAT CONTINUITY CHECK DURING INTEGRATED TESTS
- TANK NO. 1 AND NO. 2 CHECKED INDEPENDENTLY FOR PRESSURE RISE DURING CDDT ("MANUAL" AND "AUTO" MODE)

SKYLAB FLIGHT ANOMALIES - CSM 117
UDL INOPERATIVE COMMAND ANOMALY

ANOMALY:

- NO "DSE STOP" COMMAND UPLINK CONTROL

ANALYSIS:

- DISSECTION OF SUSPECT K32 RELAY REVEALED A LOOSE METALLIC CONTAMINANT (RTC 76)

CORRECTIVE ACTION:

- SPECIAL ADDED RTC TESTS AT KSC

SKYLAB FLIGHT ANOMALIES - CSM 117
WATER GLYCOL LEAKAGE

ANOMALY:

- WATER GLYCOL LEAK FROM SUIT HEAT EXCHANGE VALVE (ITEM 1.46)

ANALYSIS:

- POST FLIGHT INSPECTION REVEALED LEAKAGE CAUSED BY A FIBER UNDER THE O-RINGS

CORRECTIVE ACTION:

- VALVE REMOVED FROM CSM 111; NOT REQUIRED FOR THE ASTP MISSION

SKYLAB FLIGHT ANOMALIES - CSM118
SPS OXIDIZER SUMP TANK MEASUREMENT ANOMALY

ANOMALY:

- SPS OXIDIZER SUMP TEMPERATURE INDICATED LOWER LIMIT (255°K)

ANALYSIS:

- REDUNDANT MEASUREMENT REMAINED AT 290° K
- MOST PROBABLE CAUSE IS IC FAILURE (μA 709)
  - SIMILAR IC'S HAVE HISTORY OF DEFECTS WHICH COULD CAUSE INDICATED FAILURE
  - IC'S ARE UNSCREENED COMMERCIAL DEVICES
- FOURTEEN MEASUREMENTS CONTAIN μA 709 IC'S - ALL ARE CRITICALITY III

CORRECTIVE ACTION:

- NONE REQUIRED

SKYLAB FLIGHT ANOMALIES - CSM 118
QUAD B FUEL ISOLATION VALVE INTERNAL LEAKAGE

ANOMALY:

- ONE OR BOTH OF THE QUAD B FUEL ISOLATION VALVES INDICATED LEAKAGE IN BOTH DIRECTIONS

ANALYSIS:

- MOST PROBABLE CAUSE WAS CONTAMINATION BETWEEN VALVE POPPET AND SEAT ALLOWING VALVE LEAKAGE

CORRECTIVE ACTION:

- PROCESS SPECS REVISED TO MINIMIZE ACTUATION OF VALVES AND CONFIRM VALVES ARE MAINTAINED OPEN DURING DORMANT PERIODS

SKYLAB FLIGHT ANOMALIES - CSM 118
CM RCS HELIUM PRESSURE DECAY

ANOMALY:

- CM RCS SYSTEM 2 HELIUM INDICATED RAPID PRESSURE DECAY

ANALYSIS:

- POST FLIGHT CHECKS REVEALED HELIUM LEAKAGE ON THE HIGH PRESSURE OUTLET SIDE OF ONE SYSTEM 2 SQUIB-ACTUATED HELIUM ISOLATION VALVE
- LEAK WAS THROUGH AN EXTERNAL BRAZE JOINT OF THE ISOLATION VALVE

CORRECTIVE ACTION:

- SPECIAL INSPECTION AND PRESSURE TEST OF CM 111, 115, 115A, 119 AND SPARE VALVES

SKYLAB FLIGHT ANOMALIES - CSM 118
INTERMITTENT CIRCUIT BREAKER

ANOMALY:

- CLOSURE OF CIRCUIT BREAKER FAILED TO COMPLETE ENTRY BATTERY A TO BATTERY BUS A CIRCUIT

ANALYSIS:

- CIRCUIT BREAKER MANUFACTURED WITH ONE CONTACT IN A TILTED POSITION (DETERMINED BY POST FLIGHT X-RAY)
- TILT PREVENTED NORMAL WIPING OF CONTACTS REQUIRED TO BREAKDOWN FILM DEPOSITED DURING LONG PERIOD IN OPEN POSITION
- NO INDIVIDUAL CIRCUIT BREAKER WOULD AFFECT CREW SAFETY OR MISSION SUCCESS

CORRECTIVE ACTION:

- NONE REQUIRED - SC III MISSION DURATION WILL NOT REQUIRE CIRCUIT BREAKERS OPEN FOR A LONG PERIOD OF TIME

SPACECRAFT ISSUE

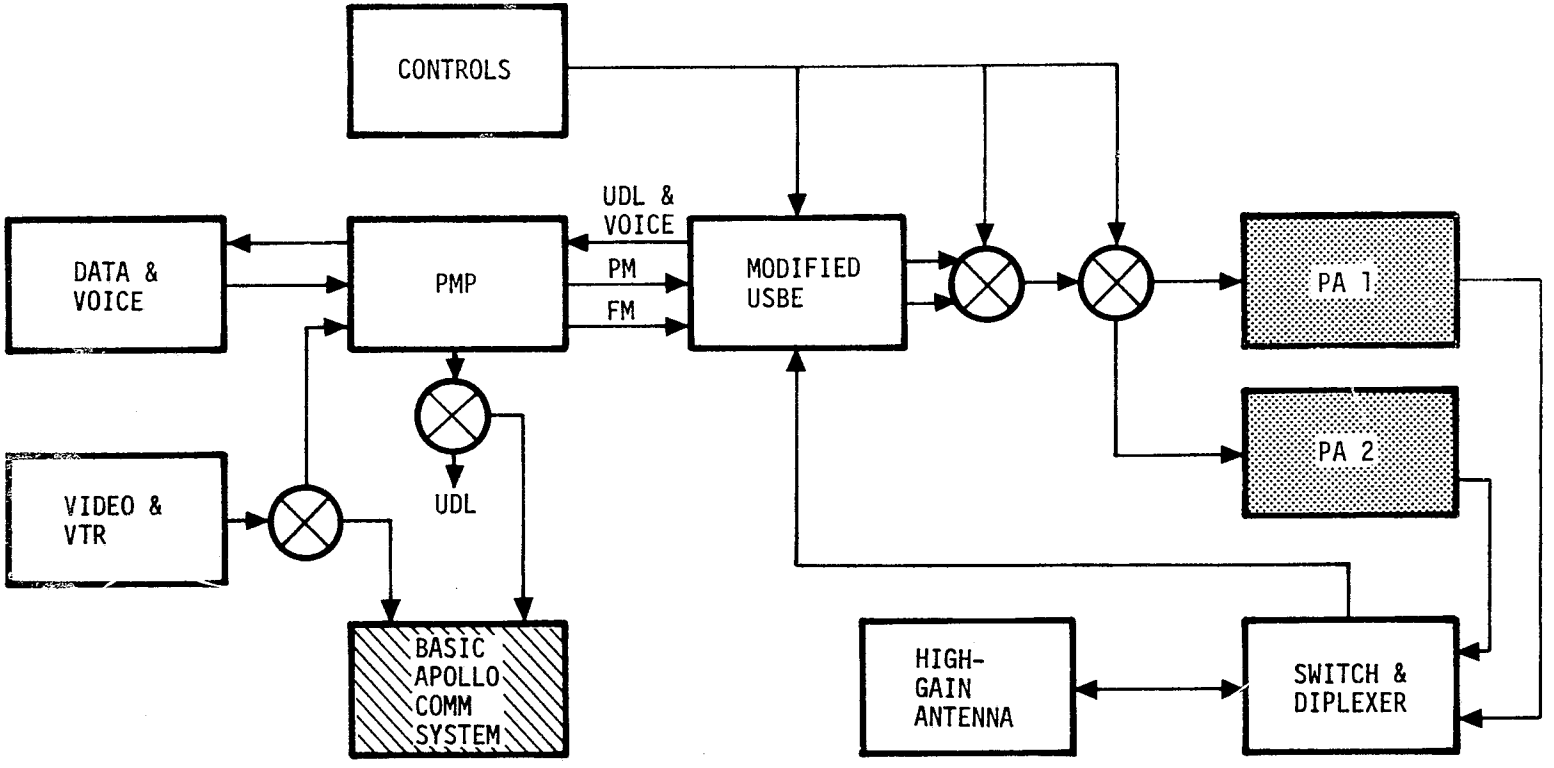
ATS-6 POWER AMPLIFIER

ASTP CSM III FRR
ATS-6 POWER AMPLIFIER

ISSUE:

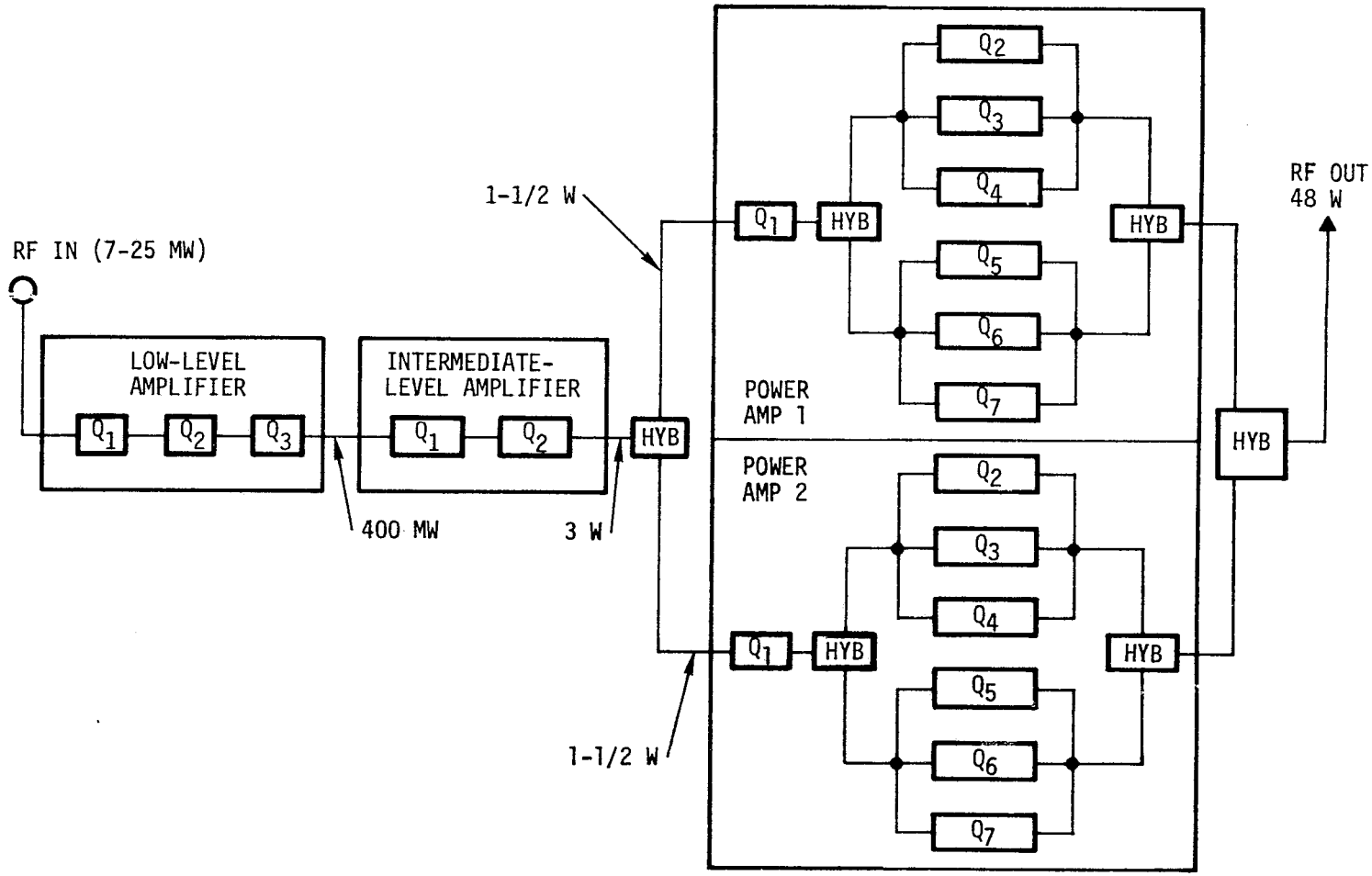
- RESOLUTION OF PROBLEMS ENCOUNTERED IN DEVELOPMENT OF ATS-6 POWER AMPLIFIER

ASTP CSM 111 FRR
ATS SYSTEM

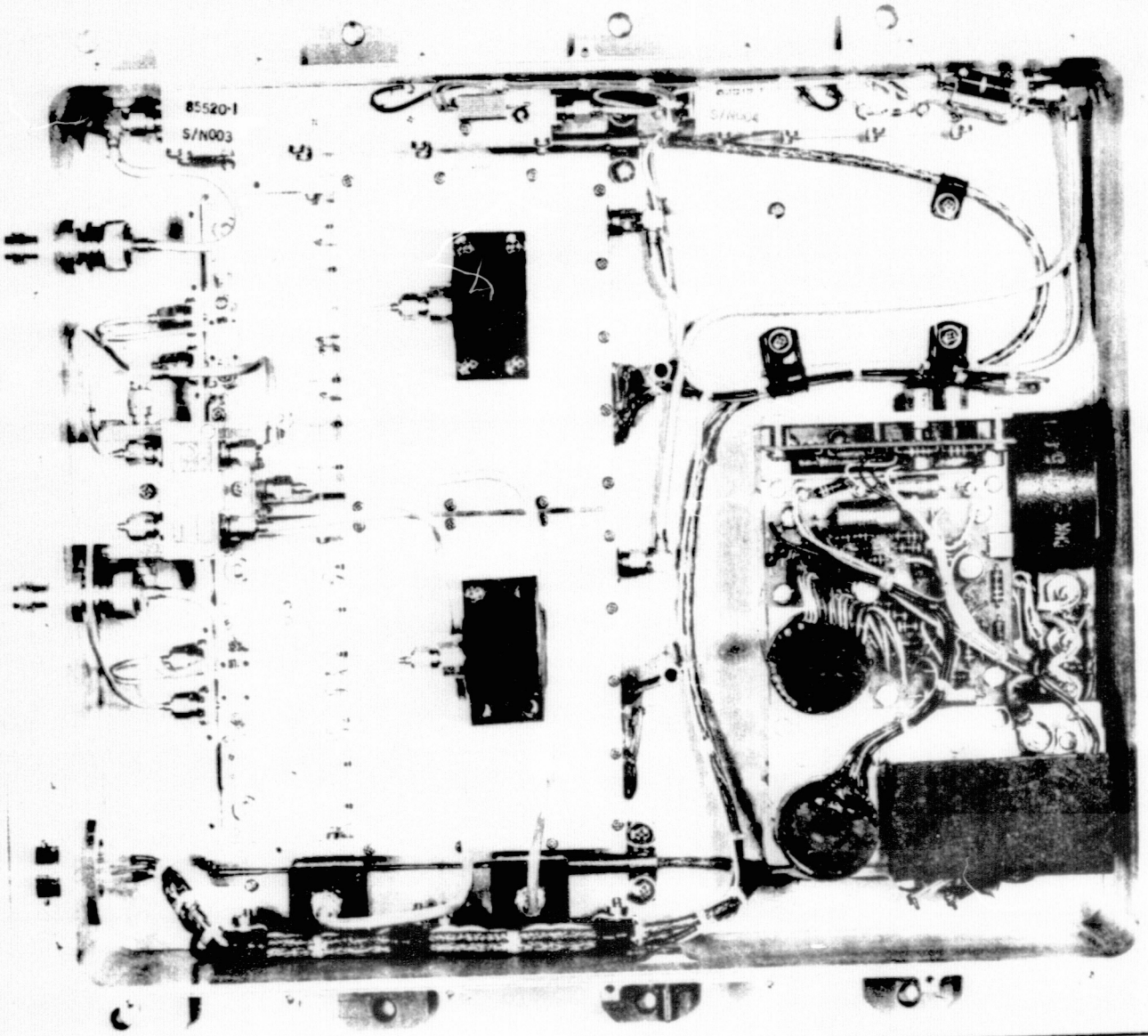


CONTROLS: APOLLO DESIGN COMPONENTS
PMP: APOLLO REUSE
USBE: APOLLO, MODIFIED FOR ATS-6 & IMPROVED VIDEO RESPONSE
COAXIAL SWITCH: NEW PURCHASE
POWER AMPLIFIERS: NEW DEVELOPMENT PURCHASE
DIPLEXER: NEW DEVELOPMENT PURCHASE
HIGH-GAIN ANTENNA: APOLLO, MODIFIED FOR ATS-6 FREQUENCY, HIGH POWER, & INHIBITED ZONE

ATS-6 POWER AMPLIFIER
BLOCK DIAGRAM



ATS-6 POWER AMPLIFIER



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ASTP CSM III FRR
ATS-6 POWER AMPLIFIER SIGNIFICANT PROBLEM SUMMARY

SN	EVENT DESCRIPTION	PROBLEM CAUSE	RESOLUTION
001 002	ATEE LAB ENGINEERING TESTS BASIC AMP TRANSISTOR FAILURE	VOLTAGE SURGE SENSITIVITY	REDESIGN TO ADD VOLTAGE SUPPRESSION NETWORK TO PWR SUPPLY PLUS LOG RESISTOR ASSEMBLIES
	VENDOR PWR SUPPLY FAILED ISOLATION TEST	RESISTOR SHORTED TO BRACKET SCREW	ROCKWELL/NASA/RESDEL REINSPECTION AND REWORK OF FLIGHT PWR SUPPLIES
004 005	SLOW TURN-ON ANOMALY AT KSC	PS & PA SUSPECT	RESDEL, ROCKWELL & NASA FAILURE ANALYSIS & TESTING
004	CSM BUS GLITCH	PS SUSPECT	ANALYSIS & INSPECTION EXCHANGE PS 003 WITH SN 004

ATS-6 POWER AMPLIFIER SIGNIFICANT PROBLEM SUMMARY (CON'T)

SN	EVENT DESCRIPTION	PROBLEM CAUSE	RESOLUTION
003	QUAL VIBRATION FAILURE - 3 BROKEN B+ WIRES	LOOSE TERMINAL LOAD, B+ WIRE FATIGUE FAILURE, & PWR SUPPLY COMPONENTS LOOSE	CORRECTIVE STAKING POTTED POWER SUPPLY
003	QUAL VIBRATION FAILURE - RESISTOR MOUNTING BLOCK FAILURE	LACK OF STAKING & MARGINAL DESIGN	REDESIGN SUBSTITUTE DELRIN FOR TEFLON
001	PS DYNAMIC FAILURE OUTPUT VOLTAGES ERRATIC (LOST VOLTAGE REGULATION)	LOOSE TERMINAL (IMPROPERLY STAKED)	REPAIRED PWR SUPPLY & CONCLUDED QUAL DYNAMIC TEST

ATS-6 POWER AMPLIFIER SIGNIFICANT PROBLEM SUMMARY (CON'T)

SN	EVENT DESCRIPTION	PROBLEM CAUSE	RESOLUTION
003	QUAL THERMAL - VAC FAILURE - PARTIAL LOSS OF RF OUTPUT	BROKEN SOLDER JOINT	RESOLDER TO NEW LOW STRESS SOLDER PROCEDURE
003	QUAL THERMAL-VAC FAILURE - LOSS OF RF OUTPUT & RECOVERY	PWR SUPPLY TRACE SHORT	ANALYSIS & TEST CONCLUDES TEST ENVIRONMENT OF UNGROUNDED INPUT CABLE
005	QUAL THERMAL-VAC FAILURE - INCREASE INPUT CURRENT WITH NOISE	SHORTED TRANSISTOR COLLECTOR TO CHASSIS	ANALYSIS & TEST CONCLUDES KAPTON INSULATOR SHORT THRU HOLE

ATS-6 POWER AMPLIFIER
BASIC AMPLIFIER MODULE

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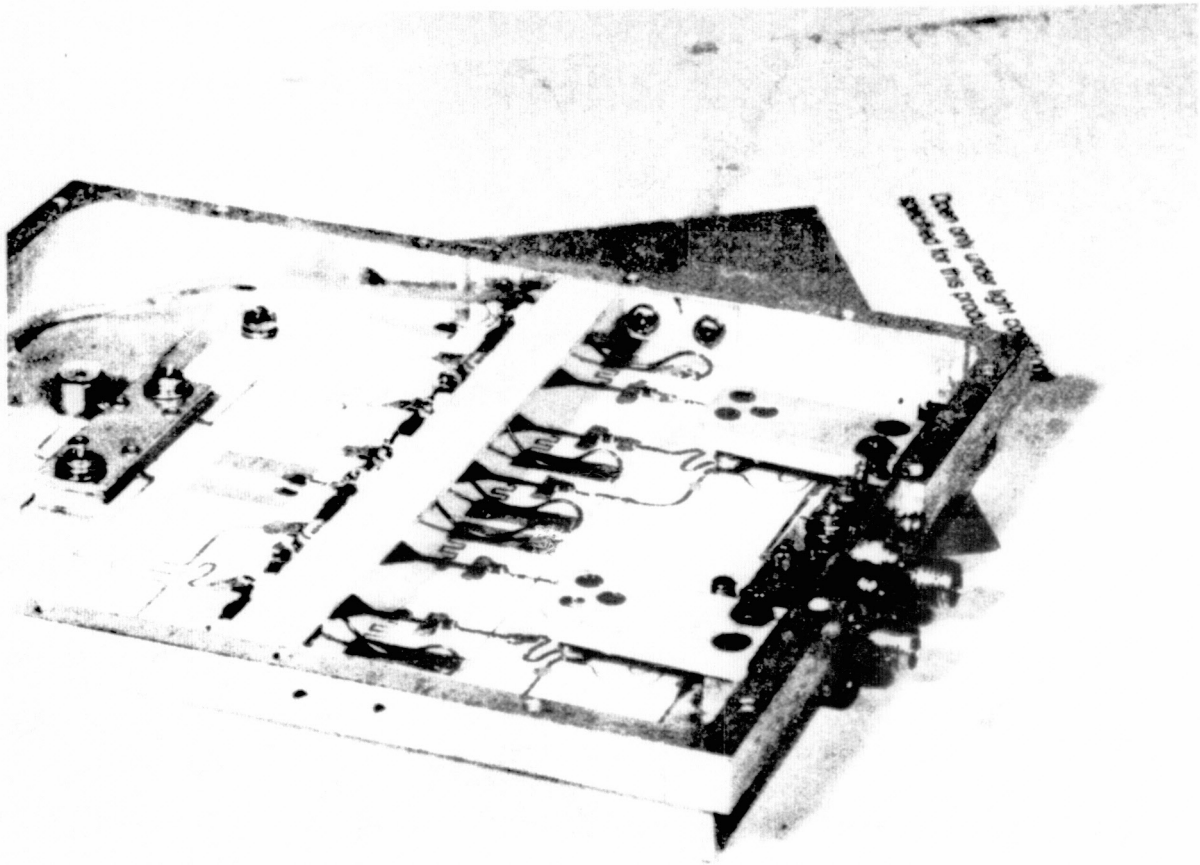
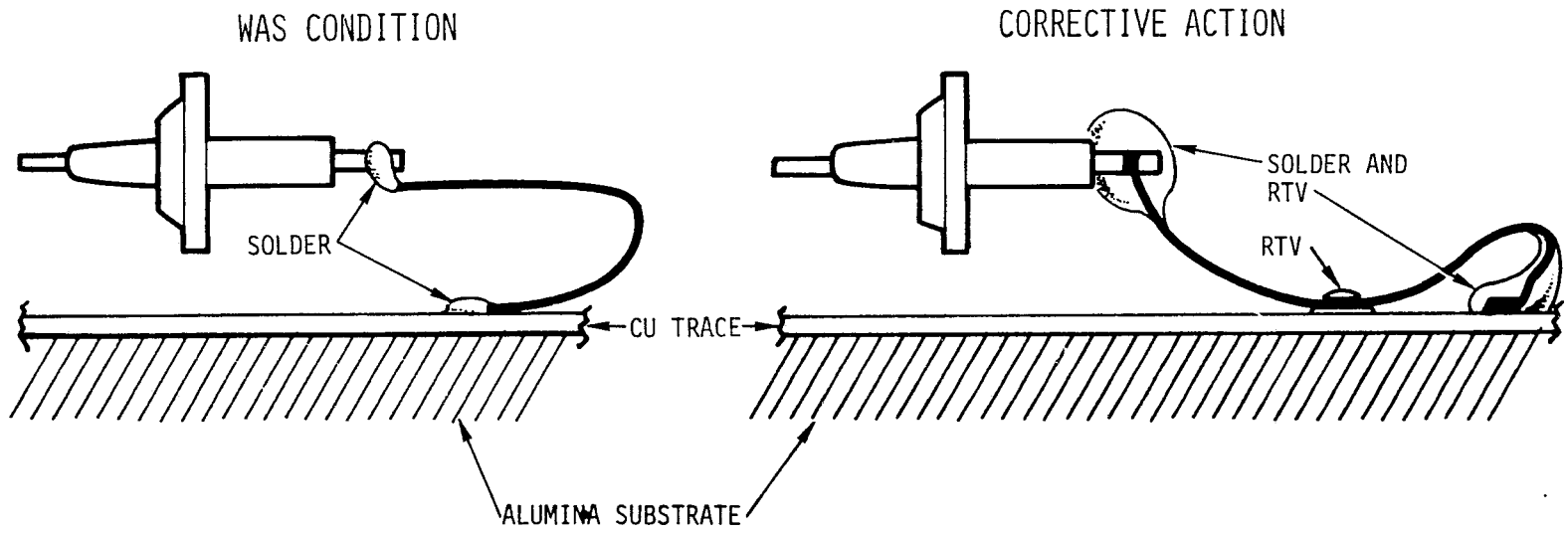


B+ LEAD INSTALLATION

- POT FINAL AMPLIFIER B+ TERMINATIONS WITH RTV & RTV LEAD CENTER TO SUBSTRATE BASE

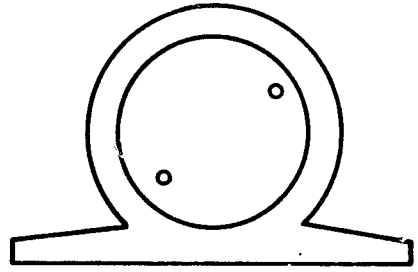


LOOSE COMPONENTS

CORRECTIVE ACTIONS

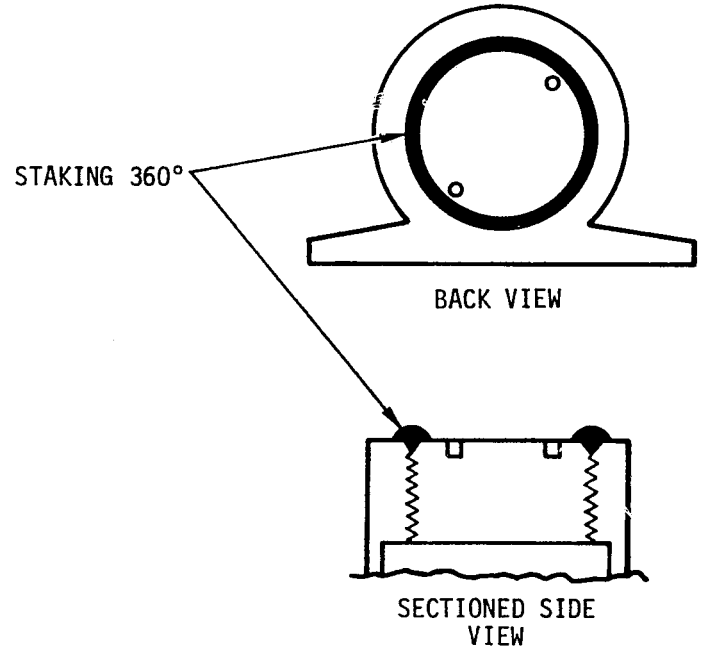
- RE-REVIEW POWER AMP SOLDER JOINTS & COMPONENTS FOR VIBRATION SENSITIVITY
- STAKE BOTH RF TERMINAL LOAD INSERTS

WAS CONDITION



BACK VIEW

CORRECTIVE ACTION



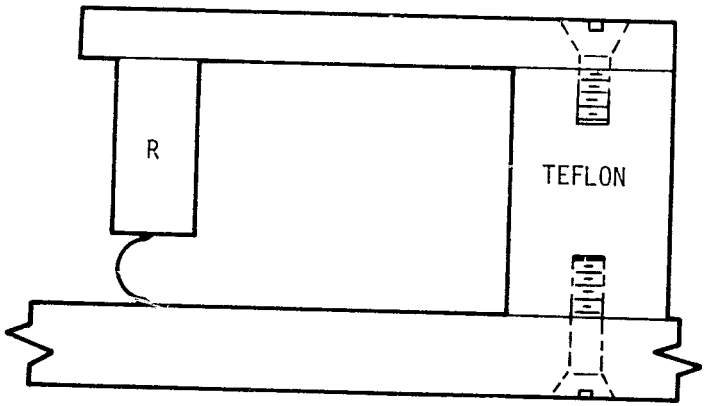
BACK VIEW

SECTIONED SIDE VIEW

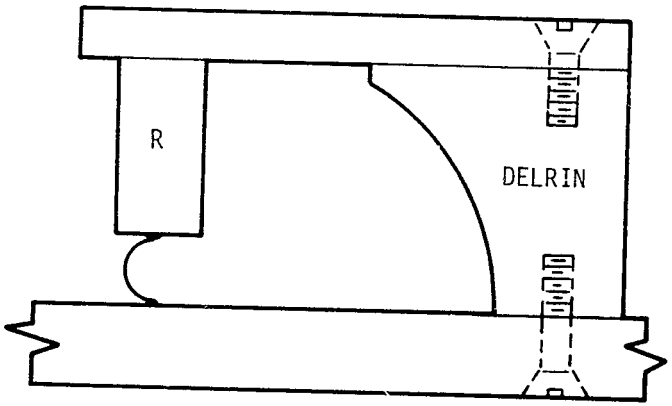
ATS-6 POWER AMPLIFIER
VIBRATION TEST FAILURES

RESISTOR TERMINATION BLOCK

WAS



NOW



CORRECTIVE ACTIONS

- USE DELRIN WITH IMPROVED CROSS SECTION
- DIMENSIONALLY CONTROL HELICOIL INSERT
- STAKE MOUNTING SCREWS
- VERIFY BY OFF-LIMIT VIBRATION TESTING

ATS-6 POWER AMPLIFIER

FIRST THERMAL VACUUM ANOMALY

- RF POWER DROPPED 2.2 dB

ANOMALY ASSESSMENT:

- TEARDOWN INSPECTION REVEALED BROKEN SOLDER CONNECTION AT ONE BASIC AMPLIFIER MODULE (OUTPUT HYBRID)
- SOLDER JOINT 20 POWER INSPECTION REVEALED SEVERAL CRACKED JOINTS
- FLIGHT UNITS 20 POWER INSPECTED AND CRACKED JOINTS IDENTIFIED
- SOLDER JOINT STRESS ANALYSIS REVEALED MARGINAL JOINT CONFIGURATION WITH SAFETY FACTOR <1.0

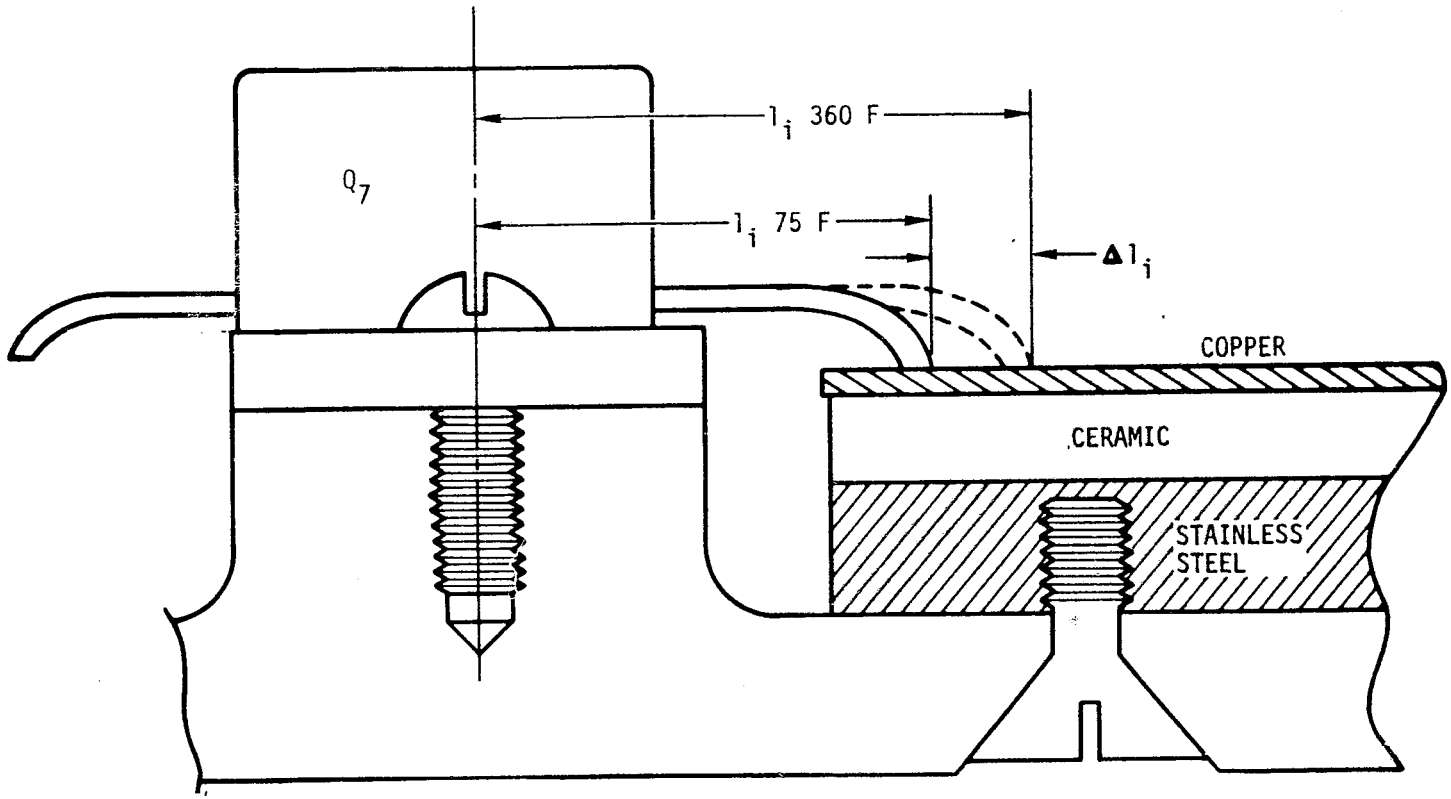
CORRECTIVE ACTIONS:

- DEFINED NEW LOW STRESS SOLDERING PROCESS
- VERIFIED BY COMPARISON TESTING OF OLD AND NEW PROCEDURES
- POWER SUPPLY JOINTS FOUND ADEQUATE
- REVIEWED ALL SOLDER JOINTS
  - DESIGN ACCEPTABLE (LOW LEVEL AMPLIFIER & POWER SUPPLY)
  - RESOLDER (BASIC & INTERMEDIATE AMPLIFIER)

LOW STRESS SOLDERING PROCEDURE

- TRIM, FORM, PRETIN, AND INSPECT COMPONENT LEADS FOR POSITIVE CONTACT TO TRACE
- FORM LEADS TO PROVIDE STRESS RELIEF
- INSTALL COMPONENTS WITH LOCATING PINS TO CENTER
- SOLDER ONE SIDE, AFTER COOLING LOOSEN MOUNTING SCREW AND ALLOW BUILT-IN STRESS TO RELIEVE TO ZERO
- TIGHTEN SCREW AND SOLDER OTHER SIDE - LOOSEN SCREW AND PERMIT LEAD STRESS TO EVENLY DISTRIBUTE TO BOTH LEADS
- TORQUE MOUNTING SCREW AFTER COOL DOWN
- ADDED HIGH TEMPERATURE STRESS RELIEF BY SOLDERING AT ELEVATED TEMPERATURE OF 43 DEG C

ATS-6 POWER AMPLIFIER
BASIC TRANSISTOR INSTALLATION

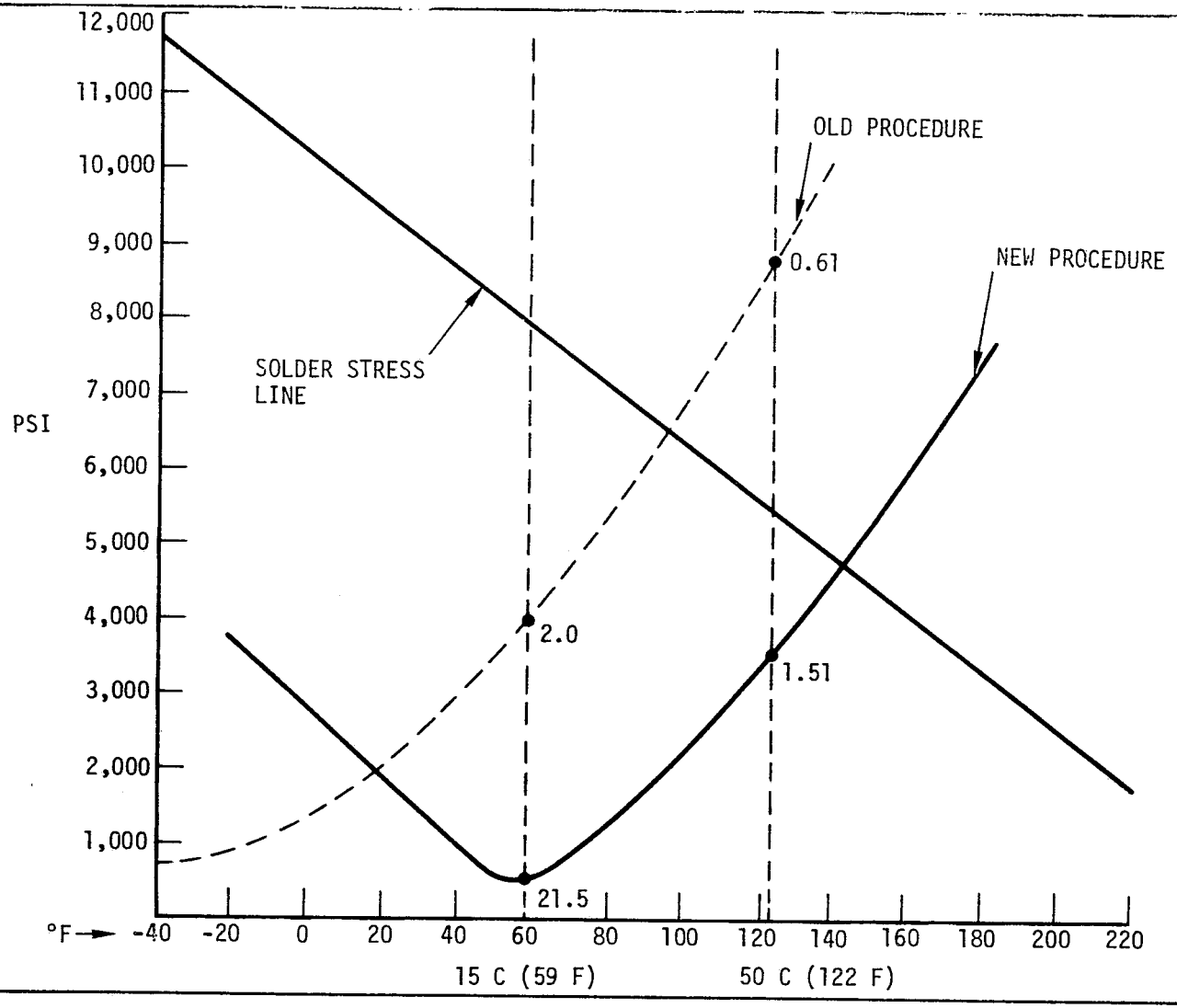


ATS-6 POWER AMPLIFIER
ANALYTICALLY DERIVED SAFETY FACTORS OF SOLDER JOINTS

COMPONENT	BASELINE			
	AT 15C		AT 50C	
	OLD	NEW	OLD	NEW
BASIC AMPLIFIER				
Q_7, Q_2 COLLECTOR LEADS	2.0	21.5	0.61	1.51
Q_7, Q_2 EMITTER LEADS	2.3*	1.48*	0.69	2.30
HYBRID LEADS	2.2*	3.9*	0.66	1.87
INTERMEDIATE-LEVEL AMPLIFIER				
COLLECTOR LEADS	3.8*	4.1*	0.94	2.8
LOW-LEVEL AMPLIFIER				
CONNECTOR LEADS	4.0	9.3	2.3	3.86
TRANSISTOR LEADS	12.8	-	5.4	-

* COMPRESSIVE STRESS

ATS-6 PA BASIC AMPLIFIER
TRANSISTOR LEAD - COLLECTOR (NARROW LEAD)
LEAD STRENGTH VERSUS SOLDER STRENGTH UNDER THERMAL STRESS



ATS POWER SUPPLY
QUAL TEST - TRACE SHORT

ANOMALY DESCRIPTION:

- RF POWER OUTPUT DROPPED FROM 40 WATTS TO ZERO AND INTERNAL POWER SUPPLY VOLTAGE SENSOR INDICATED NO POWER SUPPLY VOLTAGE
- AFTER SEVERAL CYCLINGS OF OFF/ON SWITCHES, UNIT STARTED OPERATING
- TEARDOWN DISCLOSED EVIDENCE OF SHORT BETWEEN TRACES ON PRINTED CIRCUIT BOARD

ATS POWER SUPPLY
QUAL TEST - TRACE SHORT (CON'T)

CIRCUIT ANALYSIS AND BENCH TESTS:

- NORMAL OPERATION WITH INTRA-TRACE RESISTANCE REDUCED TO ≤100 OHMS
- REDUCTION OF INTRA-TRACE RESISTANCE TO 8 OHMS REDUCED NEGATIVE 5 VOLT BIAS TO ZERO, STOPPED OSCILLATOR OPERATION - OUTPUT VOLTAGE DROPPED TO ZERO
- NO SIGNIFICANT INTERNAL TRANSIENTS
- 3 MIL WIRE ACROSS TRACES PRODUCED MOMENTARY SHORT AND WIRE BURN-THRU WITHOUT PCB CHAR
- PENCIL MARK ACROSS TRACE GAP RESULTED IN ARCING AND PCB IGNITION

ASTP POWER SUPPLY
QUAL TEST - TRACE SHORT(CON'T)

TEST AND HISTORY REVIEW:

- TEST SETUP USED GROUND ISOLATED POWER SUPPLY. INPUT POWER CABLE TO TEST SPECIMEN ELECTRICALLY ISOLATED
- TEST VACUUM CHAMBER VAC-ION PUMP WAS OPERATED AT 10^{-3} TORR WITH RESULTANT IONIZED GLOW AND ARC SHORTS TO CHAMBER WALL AND CABLES
- IONIZED GAS ARC-OVER VERIFIED IN SUBSEQUENT TESTS AND PRODUCED 300 VDC TRANSIENTS IN ISOLATED INPUT POWER CABLE
- SIMILAR FAULT WOULD BE EVIDENT EITHER AT KSC OR SUPPLIER - POWER SOURCE GROUNDED
- CSM TRANSIENT LEVEL JUDGED LESS THAN 50 VOLTS
- CSM INSTALLATION AND SUPPLIER OPERATION OF 158 HOURS FOR SN 002 WITHOUT INDICATION OF THIS ANOMALY. TOTAL KSC AND SUPPLIER FOR FOUR UNITS OPERATION TIME WAS 610 HOURS

ATS POWER SUPPLY

QUAL TEST - TRACE SHORT (CONT)

CONCLUSION:

- TRACE SHORTING CAUSED BY ARC-OVER POTENTIAL CAUSED BY INITIAL VAC-ION PUMP OPERATION AND SUBSEQUENT CHARGE POTENTIAL ON ELECTRICALLY ISOLATED INPUT POWER LINES COUPLED WITH PROBABLE LOCAL CONTAMINATION
- ARC-OVER POTENTIAL UNIQUE TO TEST SETUP
- CSM INSTALLATION ELECTRICALLY GROUNDED - THEREFORE SATISFACTORY

ATS POWER SUPPLY
Q_6 SHORT

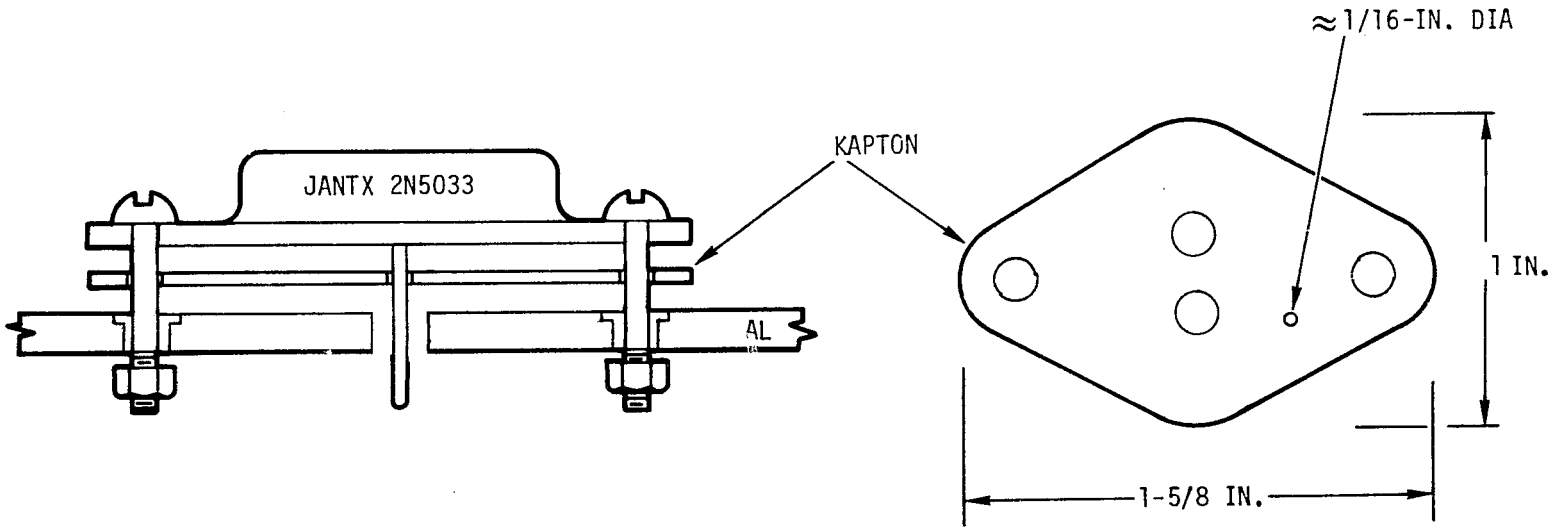
ANOMALY DESCRIPTION:

- POWER AMPLIFIER INPUT CURRENT INCREASED TO 15 AMPS; VOLTAGE, CURRENT AND INTERNAL TEMPERATURE DATA DISPLAYS WERE NOISY
- TROUBLESHOOTING REVEALED THAT THE POWER AMPLIFIER 28 VDC INPUT PIN WAS 0.687 OHMS TO CHASSIS GROUND RATHER THAN 1 MEGOHM MIN

DISASSEMBLY, ANALYSIS AND TEST:

- FAULT IN THE POWER SUPPLY - THE POWER SWITCHING TRANSISTOR Q_6 COLLECTOR (CASE) WAS FOUND SHORTED TO CHASSIS WITH A CHARRED HOLE IN THE KAPTON 2 MIL INSULATOR AND ARC PITTING ON BOTH TRANSISTOR AND MOUNTING BRACKET SURFACES

ATS POWER SUPPLY:
KAPTON HOLE



ATS POWER SUPPLY
Q_6 SHORT (CON'T)

TEST AND HISTORY REVIEW:

- THERMAL QUAL TEST SETUP VERIFIED TO HAVE ISOLATED POWER SUPPLY WITHOUT GROUND RETURN
- VAC-ION PUMP WAS OPERATED DURING PUMP DOWN - NO IONIZATION OF GASES IDENTIFIED AND NO EVIDENCE OF GAS ARCS
- NO SIGNIFICANT TRANSIENT ON INPUT POWER SUPPLY LINE BY FACILITY TRANSIENTS
- TEST SETUP USED GROUND ISOLATED POWER SUPPLY - INPUT POWER CABLE TO TEST SPECIMEN ELECTRICALLY ISOLATED
- SIMILAR FAULT WOULD BE EVIDENT AT EITHER KSC OR SUPPLIER - FAULT INITIATED AT TEST AREA
- KAPTON RATED AT 7000 V/MIL
- KAPTON WITH HOLE WITH ARC-OVER WITH 420 RMS OR ~450 VDC TRANSIENT
- ARC-OVER SUSTAINED BY CURRENT DOWN TO 11 VOLTS
- NO SIGNIFICANT TURN-ON OR TURN-OFF TRANSIENTS (SN 001) - KAPTON INSULATION ISOLATION TESTED TO 300 VDC AT ASSEMBLY - NOT ADEQUATE TO DETECT HOLE
- Q_6 SWITCHING VOLTAGE ON COLLECTOR RANGE FROM 55 TO 64 VOLTS AT 22.8 K Hz FREQUENCY
- CSM TRANSIENT LEVEL JUDGED LESS THAN 50 VDC
- CSM INSTAL. & SUPPLIER OPERATION OF 160 HR WITHOUT INDICATION OF THIS ANOMALY

ATS POWER SUPPLY
Q_6 SHORT (CON'T)

CONCLUSION:

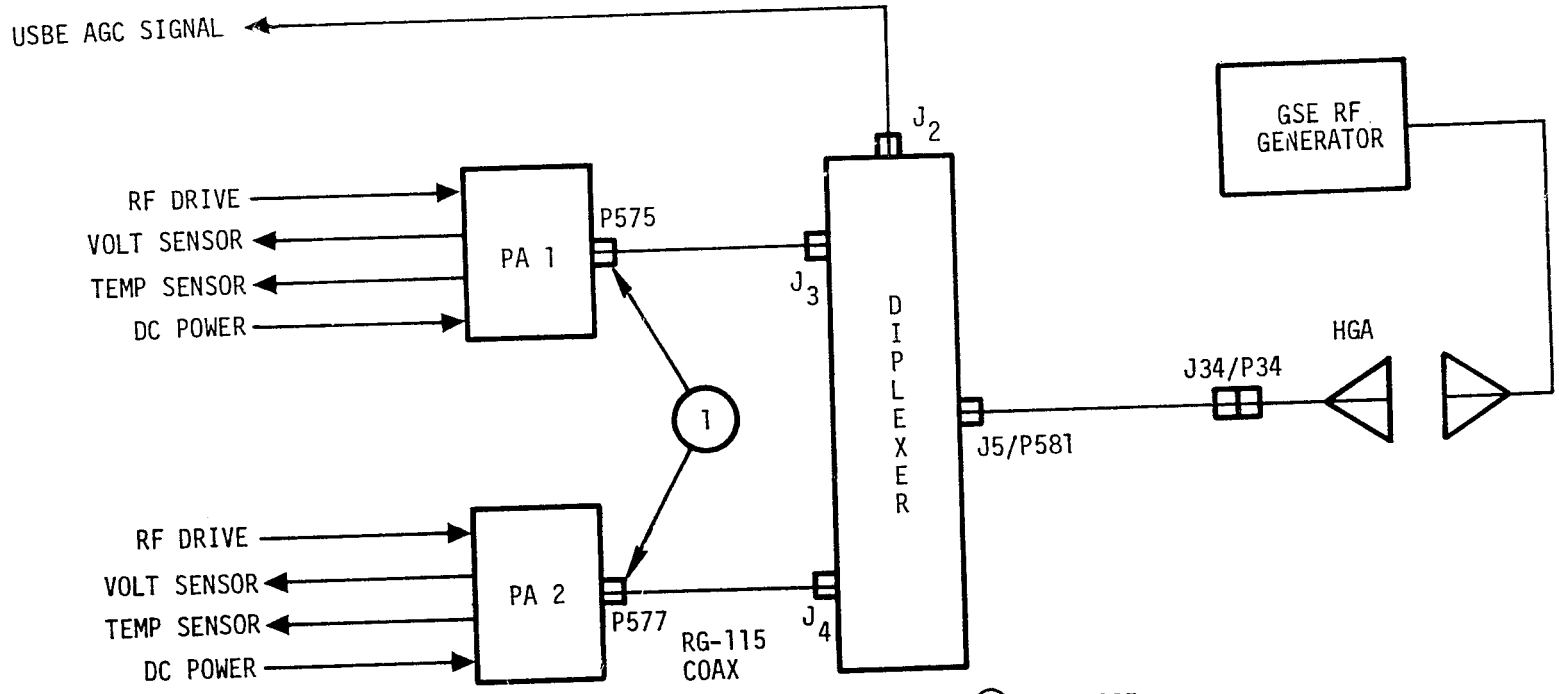
- KAPTON SHORT CAUSED BY ARCING POTENTIAL DUE TO CHARGE POTENTIAL ON INPUT POWER LINES ACROSS HOLE IN KAPTON
- ARCING UNIQUE TO QUAL TEST SETUP
- CSM INSTALLATION GROUNDED - THEREFORE SATISFACTORY

ATS-6 EQUIPMENT SUMMARY

OVERALL POWER SUPPLY STATUS:

- DESIGN FUNCTIONALLY ADEQUATE AND CONSERVATIVE
- DESIGN DEFICIENCIES CORRECTED
  - OUTPUT VOLTAGE TRANSIENT AT TURN-ON
  - MECHANICAL SENSITIVITY TO VIBRATION
- CONFIDENCE INCREASED BY POWER SUPPLY REBUILD PROGRAM
  - REBUILD THREE FLIGHT POWER SUPPLIES
  - REUSE ONLY INDUCTORS, TRANSFORMERS, AND INPUT FILTER AND BRACKET HARDWARE
  - ALL ELECTRONIC PARTS IDENTICAL TO INITIAL BUILD

ATS-6 POWER AMPLIFIER
KSC RETEST FOLLOWING REINSTALLATION IN CSM 111



- POWER AMPLIFIERS WILL BE VERIFIED AT POINT (1) WITH GSE EQUIPMENT BEFORE THE COAXIAL CABLES FROM THE DIPLEXER ARE MATED AT P575 & P577
- USBE AGC DATA TO BE RECORDED FOR BASELINE BEFORE DISCONNECTING J5
- DISCONNECT J5 & VERIFY PA1 & PA2 RF OUTPUT
- RECONNECT J5 & VERIFY BY COMPARISON WITH BASELINE AGC READING (±0.5 dB PLUS TEST EQUIPMENT VARIANCE)

CONCLUSION:

- POWER AMPLIFIERS WILL SUPPORT MISSION REQUIREMENTS

FLIGHT READINESS REVIEW ITEM DISPOSITION

(FRRID)

RESOLUTIONS

FRRID'S

● GFE-01	GFE AND EXPERIMENT SHORTAGE	CLOSED BY PREBOARD
● 111-2.5.4	PGA O_2 FLOW RATE	CLOSED BY PREBOARD
● 111-2.8.2 *	MAIN BUS A & B CURRENT GLITCHES	CLOSED BY PREBOARD
● 111-2.8.3	MA-014 ELECTROPHORESIS EXPERIMENT LIGHT	CLOSED BY PREBOARD
● 111-2.11.1	VIDEO TAPE RECORDER	CLOSED BY PREBOARD
● 111-2.11.2 *	ATS-6 POWER AMPLIFIER POWER OUTPUT	CLOSED BY PREBOARD
● 111-2.14.4 *	C & W (CREW ALERT) LIGHT	CLOSED BY PREBOARD
● 111-2.14.5 *	PANEL 1 DET FAILED TO RESET	CLOSED BY PREBOARD
● 111-4.34.4	LOST AND FOUND	CLOSED BY PREBOARD
● 111-5.23.3	GSE (C14-626) ELECTRICAL POWER SUPPLY	CLOSED BY PREBOARD
● 111-5.23.4	GSE (S14-121) W/C REFRIGERATION UNIT	CLOSED BY PREBOARD
● 111-5.29.1	SPARE FIRE EXTINGUISHERS	CLOSED BY PREBOARD

FRRID III.2.5.4
PGA 0_2 FLOW RATE

PROBLEM:

- PGA 0_2 FLOW RATE HIGH DURING SUIT CIRCUIT VERIFICATION CHECK (UNEXPLAINED ANOMALY)

DISCUSSION:

- 0_2 FLOW RATE REMAINED GREATER THAN 0.8 LB/HR FOR APPROXIMATELY SIX MINUTES
- CORRECTED APPARENTLY BY CREW MOVEMENT DURING TROUBLESHOOTING
- CHECK REPEATED AND RESULTS WERE NORMAL
- ALL THREE SUITS AND UNMANNED SUIT CIRCUIT CHECKED AND NO LEAK DETECTED
- BACKUP CREW CHECKS DURING SECOND CHAMBER RUN WERE NORMAL
- MOST PROBABLE SOURCE IS EITHER SUIT, SUIT CONNECTOR OR SUIT CIRCUIT RETURN AIR CHECK VALVES IMPROPERLY SEATED

CONCLUSION:

- LEAKAGE CORRECTED--SUITS AND SUIT CIRCUIT VERIFIED AND WILL BE REVERIFIED PRIOR TO LAUNCH
- IF SIMILAR LEAK OCCURRED DURING FLIGHT IT WOULD HAVE NO EFFECT ON THE CONTINUATION OF MISSION

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FLIGHT READINESS REVIEW ITEM DISPOSITION (FRRID)

Customer's Review Item Definition Sheet

S/C	SYSTEM	SYSTEM NUMBER	FRRID NUMBER
CSM-111	Environmental Control	2.5	111.2.5.4

INITIATOR	ORGANIZATION	DATE
D. Greenly/K.E.S.	SR&QA	5/20/75

REFERENCE DOCUMENTATION	PART NUMBER
DR S/C 111-SC-0141	V36-610001

PROBLEM

(TITLE) PGA O_2 Flow Rate (Unexplained Anomaly)

During PGA verification checks prior to cabin decompression, the O_2 flow rate did not stabilize below 0.8 lbs/hr. as required. The flow rate continued at upper limits for a period of approximately 6 minutes after suit circuit pressure stabilization. Cause of condition could not be determined.

RECOMMENDED ACTION/JUSTIFICATION

Information only.

FLIGHT READINESS REVIEW ITEM DISPOSITION (FRRID)

Contractor's Review Item Resolution Sheet

S/C	SYSTEM	SYSTEM NUMBER	FRRID NUMBER
CSM 111	Environmental Control	2.5	111.2.5.4

ORIGINATOR	ORG.	DATE
J. M. Ross/SD	695/389	5-23-75

REFERENCE DOCUMENTATION

S/C DR 0141

PROBLEM TITLE

PGA O_2 Flow Rate (Unexplained Anomaly)

RESOLUTION/ACTION TO BE TAKEN (Use continuation sheets as required)

During the PGA verification check prior to decompressing the cabin, the O_2 flow rate did not stabilize below 0.8 lb/hour as required. The flow rate continued at upper limits for a period of approx. 6 min. after suit circuit pressure stabilization. This was considered an abnormal length of time based on prior PGA verifications. Real time troubleshooting consisted of isolation of individual crewmembers from the suit circuit. As "CP" stood up to isolate "AC" (at Panel 301) the O_2 flow rate dropped from upper limits to 0.7 lb/hr and upon positioning the suit flow valve to "OFF" the flow rate went to upper limits (as expected) and 23 seconds later the O_2 flow rate began dropping from upper limits. Upon positioning the suit flow valve to "Full Flow" the flow rate had dropped to 0.5 lb/hr and continued to lower limits ($< .21$ lb/hr). The flow rate remained below 0.4 lb/hr for the next 7 minutes at which time the suit loop was depressurized.

FLIGHT READINESS REVIEW ITEM DISPOSITION (FRRID)

Continuation Sheet

PROBLEM TITLE

PGA O_2 Flow Rate (Unexplained Anomaly)

The PGA verification was immediately repeated for comparison of results. The O_2 flow rate dropped from upper limits upon suit pressure stabilization and remained below 0.8 lb/hr for the next 3 minutes at which time the suit circuit was depressurized and the altitude test was continued.

Spacecraft suit loop integrity tests (including umbilicals) both before and after the altitude chamber run were completely satisfactory. Post-run tests were performed with the manual suit circuit return valve both open and closed and with a base flow level separately established within the range of the O_2 flow meter. Flow increase during this last test indicated a leakage rate of only 0.03 lb/hr. An additional test which included wiggling the umbilicals at the panel connections also failed to discover any leakage. Leak checks of the suits were also performed with the following results for the initial tests after the chamber run:

Crewman	Suit SN	Leakage
Commander	801	170 sccm
CM Pilot	806	50 sccm
DM Pilot	803	140 sccm

Although the commander's suit leakage was slightly out of specification (150 sccm max.), the indicated leakages were insufficient to have caused the problem. Additional test results were within specification and manned suit tests also failed to identify any excessive leakage.

Other possible leakage sources, the redundant flappers in the suit circuit return check valves, were also considered, since these valves on previous spacecraft have occasionally exhibited leakage at low delta pressures. The history of the flapper valves on CSM 111 has shown no tendency for leakage and the results of the several tests (including those where the manual valve was not cycled) would seem to discount the possibility of this item as the cause. The suit circuit integrity check during the backup crew's altitude chamber run was satisfactory and was accomplished without cycling the suit circuit air return valve. With an apparently greater opening of the direct O_2 valve to assist the pressurization, the time from start to automatic decrease in the O_2 flow was less than 3-1/2 minutes.

Although the source of the problem was not identified, the most likely cause is believed to be a leak in the suit(s) or connectors or return check valve flappers which corrected itself and was not repeatable. Suit leakage will be checked again prior to launch and reseating of the flappers can be accomplished by cycling the valve at an imposed delta pressure. The present suits and spacecraft suit loop were judged to be acceptable for flight and the discrepancy was closed as an unexplained anomaly.

AUTHORIZED NAA REPRESENTATIVE	DATE
Original Signed by: J. M. Ross	5-30-75

MSC FORM 2089B (AUG 67) NASA — MSC

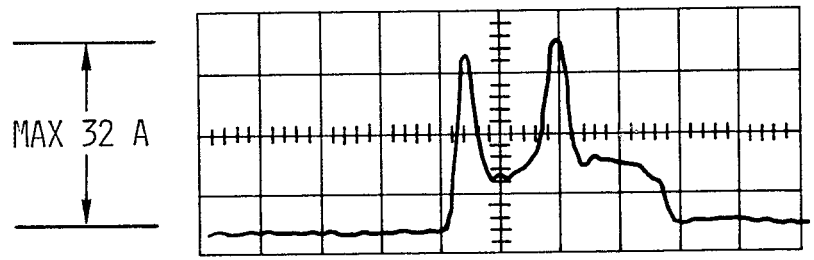
MAIN BUS A AND B CURRENT GLITCHES

PROBLEM:

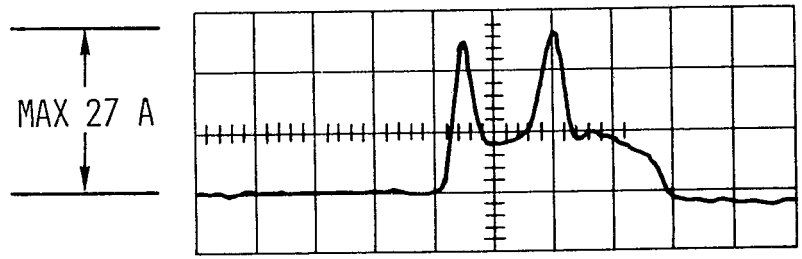
- SIMULTANEOUS CURRENT TRANSIENTS WERE RECORDED ON BOTH MAIN BUSES A & B DURING K-0070 TESTING (UNEXPLAINED ANOMALY)
  - OSCILLOSCOPE READINGS OF MAGNETIC TAPES SHOWED CURRENT TO BE 32 AMPS ON BUS A & 27 AMPS ON BUS B
  - OSCILLOSCOPE READINGS SHOWED MAIN BUS VOLTAGES DROPPED 1.8 VOLTS
  - SLOW-SPEED BRUSH RECORDER SHOWED TRANSIENT IN ATS-6 RECEIVED SIGNAL STRENGTH (APPROX. 1 dB)

FRRID 111.2.8.2 (CONT)
MAIN BUS A AND B CURRENT GLITCHES

IRIG 16 PS A AMPS
10 AMPS/DIV
5 MS/DIV

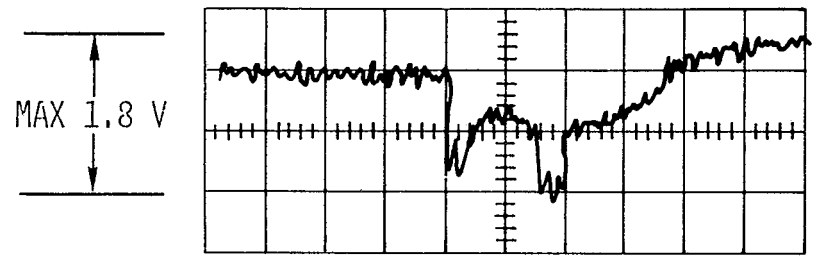


IRIG 15 PS B AMPS
10 AMPS/DIV
5 MS/DIV

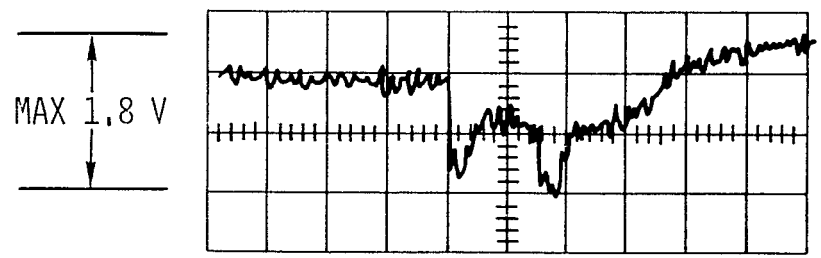


VOLTAGE

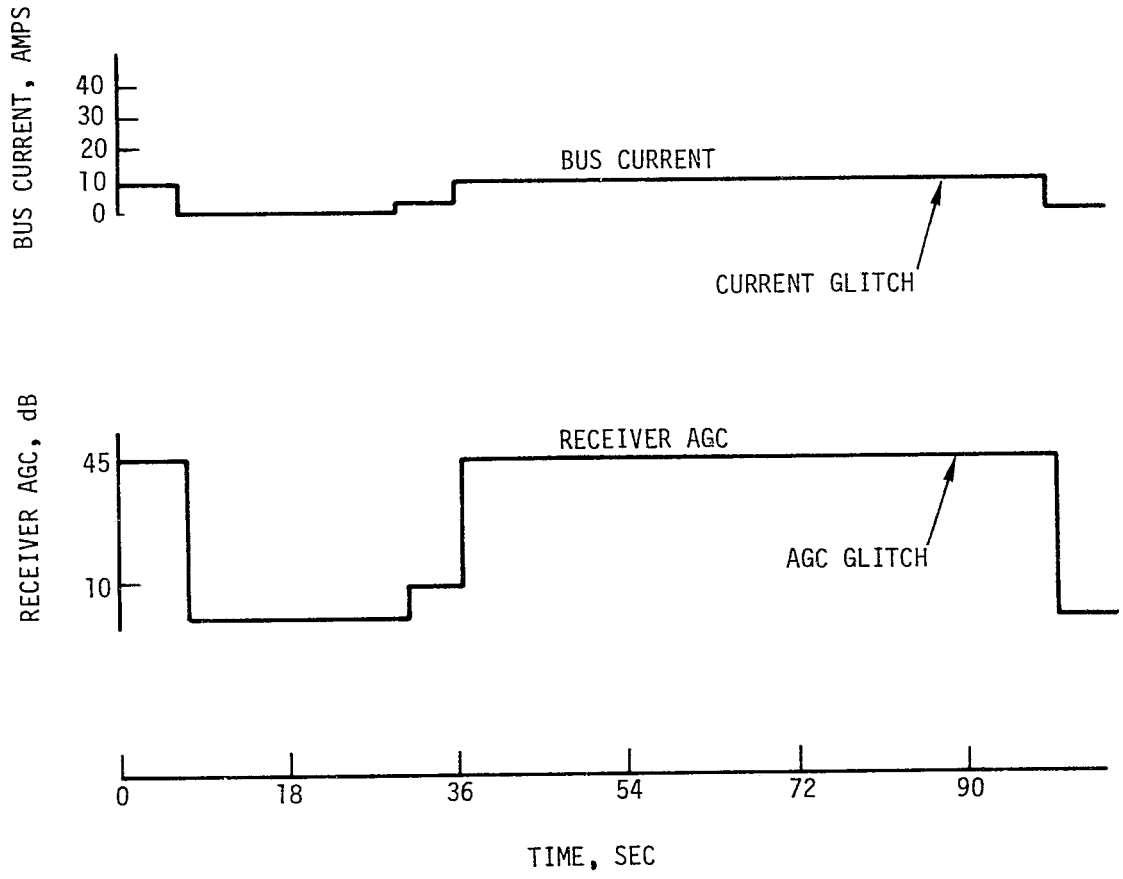
IRIG 19 MN BUS A VOLTS
0.9 VOLTS/DIV
5 MS/DIV



IRIG 20 MN BUS B VOLTS
0.9 VOLTS/DIV
5 MS/DIV



FRRID 111.2.8.2 (CONT)
MAIN BUS A AND B CURRENT GLITCHES

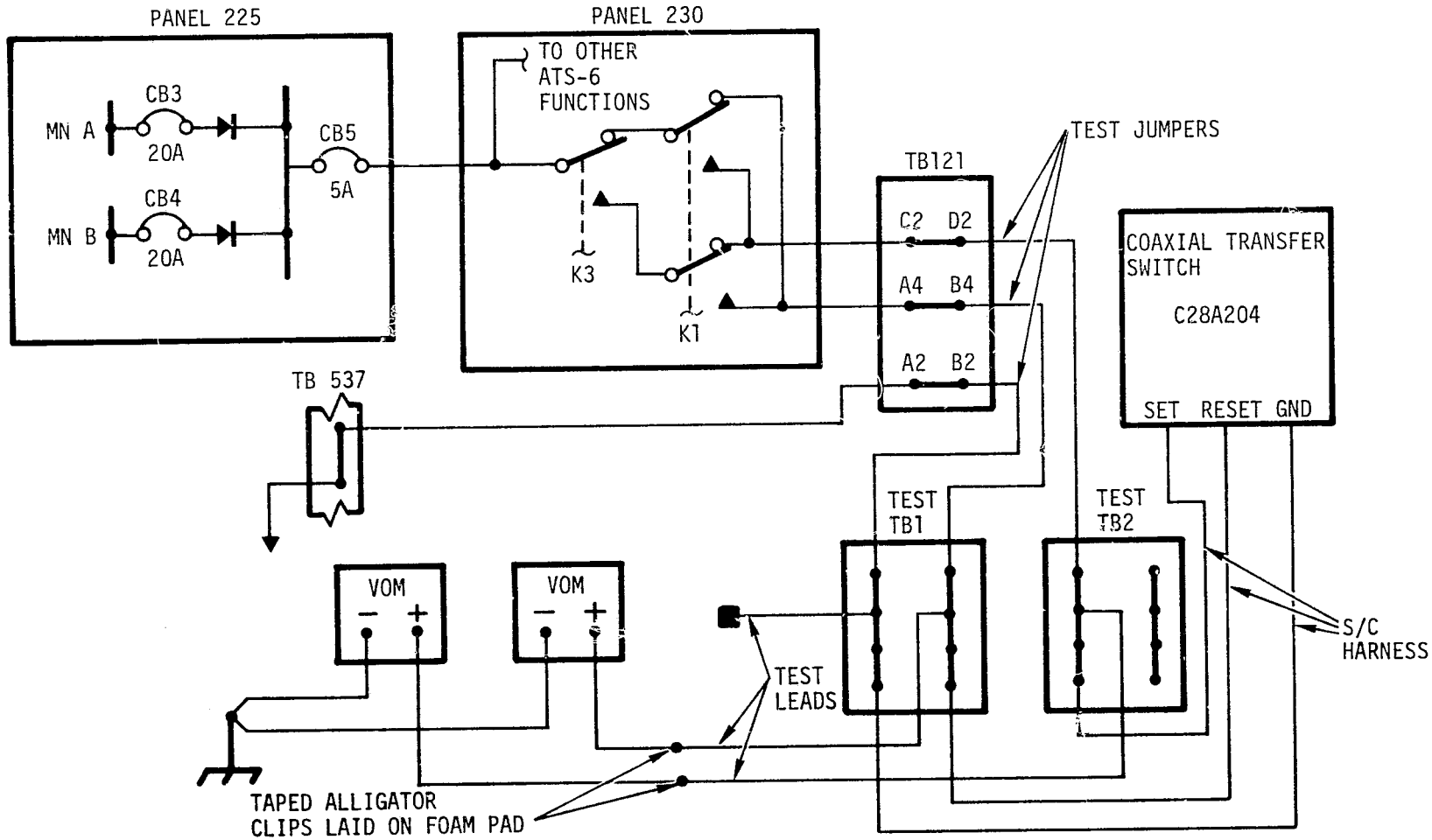


DISCUSSION:

- SPACECRAFT CONFIGURATION
  - NORMAL EXCEPT THAT PANEL 230 WAS MECHANICALLY DISCONNECTED AND SITTING ON RH COUCH FOR CAUTION AND WARNING TROUBLESHOOTING
  - TWO TERMINAL BOARDS IN COAXIAL SWITCH CIRCUIT TO MONITOR TRANSFERS WITH VOM'S AS PART OF ATS-6 PA TURN-ON ANOMALY TROUBLESHOOTING
- SPACECRAFT ACTIVITY
  - NO PHYSICAL ACTIVITY OR SWITCHING ACTION TOOK PLACE IN COMMAND MODULE
  - POSSIBLE ACTIVITY IN PREPARATION FOR OPENING QUAD C
  - ATS-6 PA NO. 1 HAD BEEN ON FOR ABOUT ONE MINUTE

DISCUSSION: (CON'T)

- IMMEDIATE ACTIONS
  - POLLED ALL SYSTEMS - NO ACTIVITY
  - STATUSED SWITCHES AND CB'S - NORMAL
  - VISUALLY VERIFIED ISOLATION OF PANEL 230 AND INTEGRITY OF WIRING TO PANEL
- PERFORMED VISUAL INSPECTION OF TEMPORARY TEST SETUP AT TB 121
  - TECHNICIAN FOUND NO ACTIVITY IN AREA OF TEST SETUP LEAD WIRES
  - LEAD WIRES WERE IN THEIR ORIGINAL SEPARATED POSITIONS WITH NO EVIDENCE OF HAVING BEEN DISTURBED
  - INTEGRITY OF TAPED ALLIGATOR CLIPS ALSO VERIFIED



TB121 TEST CONFIGURATION

KSC TROUBLESHOOTING AND ANALYSIS:

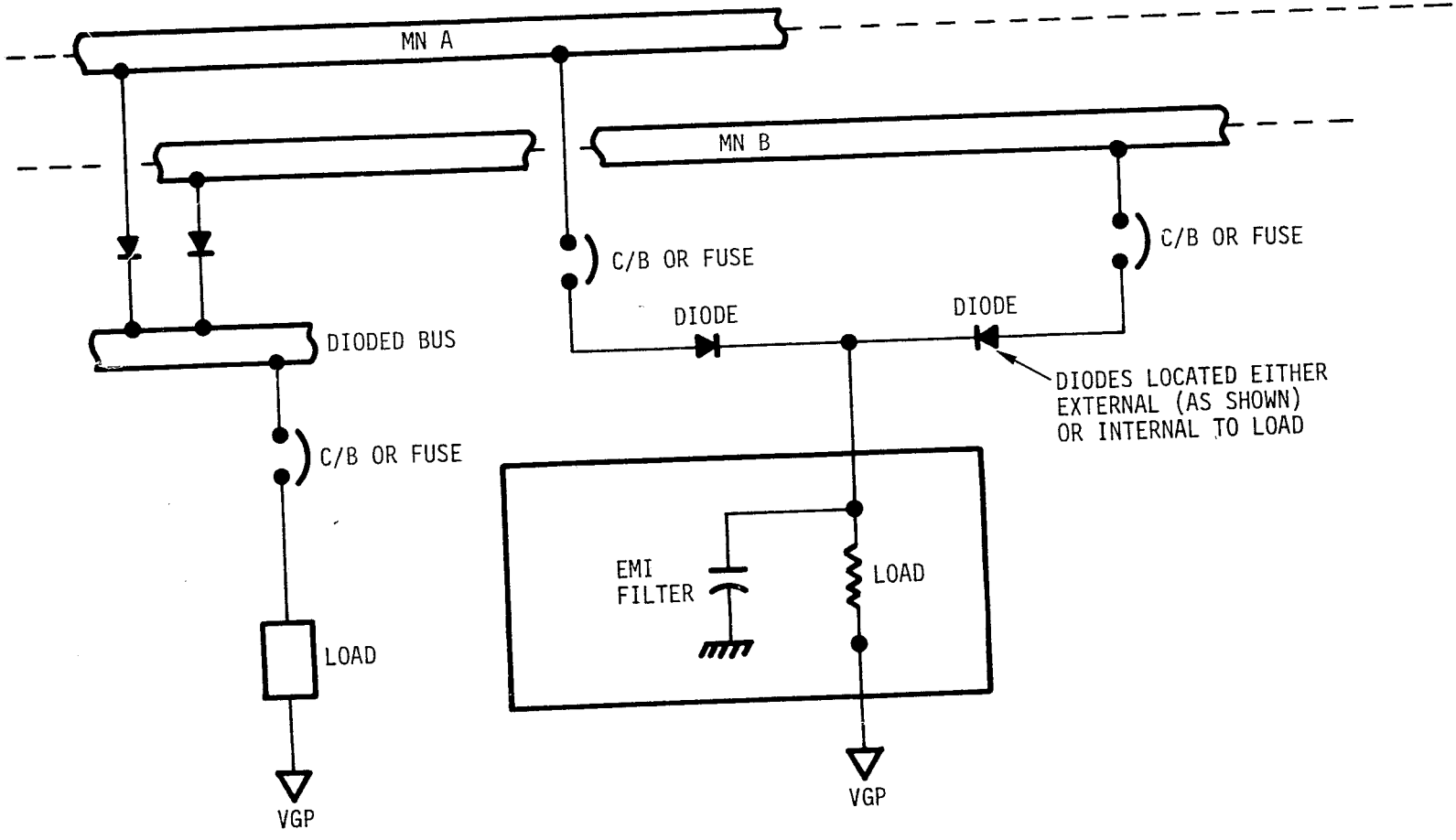
- DATA PLAYBACK OF BUS CURRENTS AND VOLTAGES
- DATA DUMPS OF ALL SPACECRAFT MEASUREMENTS
- REVIEWED AND IDENTIFIED CIRCUIT BREAKER AND SWITCH STATUS
- OBTAINED COPY OF SIGNAL STRENGTH RECORD FROM NASA S-BAND RECEIVER
- REVIEWED POWERED-UP MEASUREMENTS AND MADE LIST OF RETEST CANDIDATES
- CHECKED PATHS FOR CAPABILITY TO CARRY GLITCH CURRENT (INDEPENDENT OF DOWNEY ANALYSIS)
- SCHEDULED AND PERFORMED RETEST OF MEASUREMENT SYSTEMS
- REMOVED AND INTERNALLY INSPECTED VOM'S USED IN SPECIAL TEST SETUP - RESULTS NEGATIVE
- VISUALLY INSPECTED POWER AND CONTROL WIRING TO PA NO. 1 - RESULTS NEGATIVE
- INSPECTED GSE WIRING FROM SERVICE MODULE TO C14-484 (H_2 & O_2 TANK PRESSURE INDICATIONS)
    - RAN MEGGER CHECKS ON GSE CABLING

KSC TROUBLESHOOTING AND ANALYSIS: (CON'T)

- VERIFIED DIODES IN SERVICE MODULE (CRYO CONTROL BOX)
- VERIFIED DIODES IN TRANSMITTER SELECTOR BOX
- PERFORMED BUS FAILURE CHECK TO VERIFY ALL DIODES
- PANEL 230 WIRING INSPECTED AND FLEXED WHILE MONITORING ISOLATION
- PUT 1.8 VOLT STEP FUNCTION ON BUS AND VERIFIED NO OBSERVABLE CHANGE IN PA SIGNAL STRENGTH

DOWNEY ANALYSIS:

- ANALYZED CURRENT AND VOLTAGE DATA TRACES
  - INDICATED SHORT WAS IN DIODED LOAD
- IDENTIFIED AND ANALYZED ALL ACTIVATED DIODED LOADS FOR POTENTIAL CAUSE
- ESTABLISHED FAILURE CONDITIONS FOR ANALYSIS
  - SEPARATE WIRES FROM MN A & MN B MOMENTARILY & SIMULTANEOUSLY SHORTING TO STRUCTURE OR NEGATIVE
    - REJECTED AS TOO REMOTE A POSSIBILITY
  - SINGLE WIRE IN DIODED CIRCUIT MOMENTARILY SHORTING TO STRUCTURE OR NEGATIVE
    - REMOTE POSSIBILITY - DIFFICULT TO VISUALIZE A SHORT MECHANISM THAT WOULD PRODUCE TWO 59 AMP SPIKES AND RETURN TO APPROX. 20 AMPS AFTER EACH SPIKE
    - PAST EXPERIENCE HAS BEEN THAT WIRE SHORT IS LOW-IMPEDANCE SHORT THAT CAUSES CIRCUIT PROTECTIVE DEVICE TO OPEN



TYPICAL DIODED LOADS

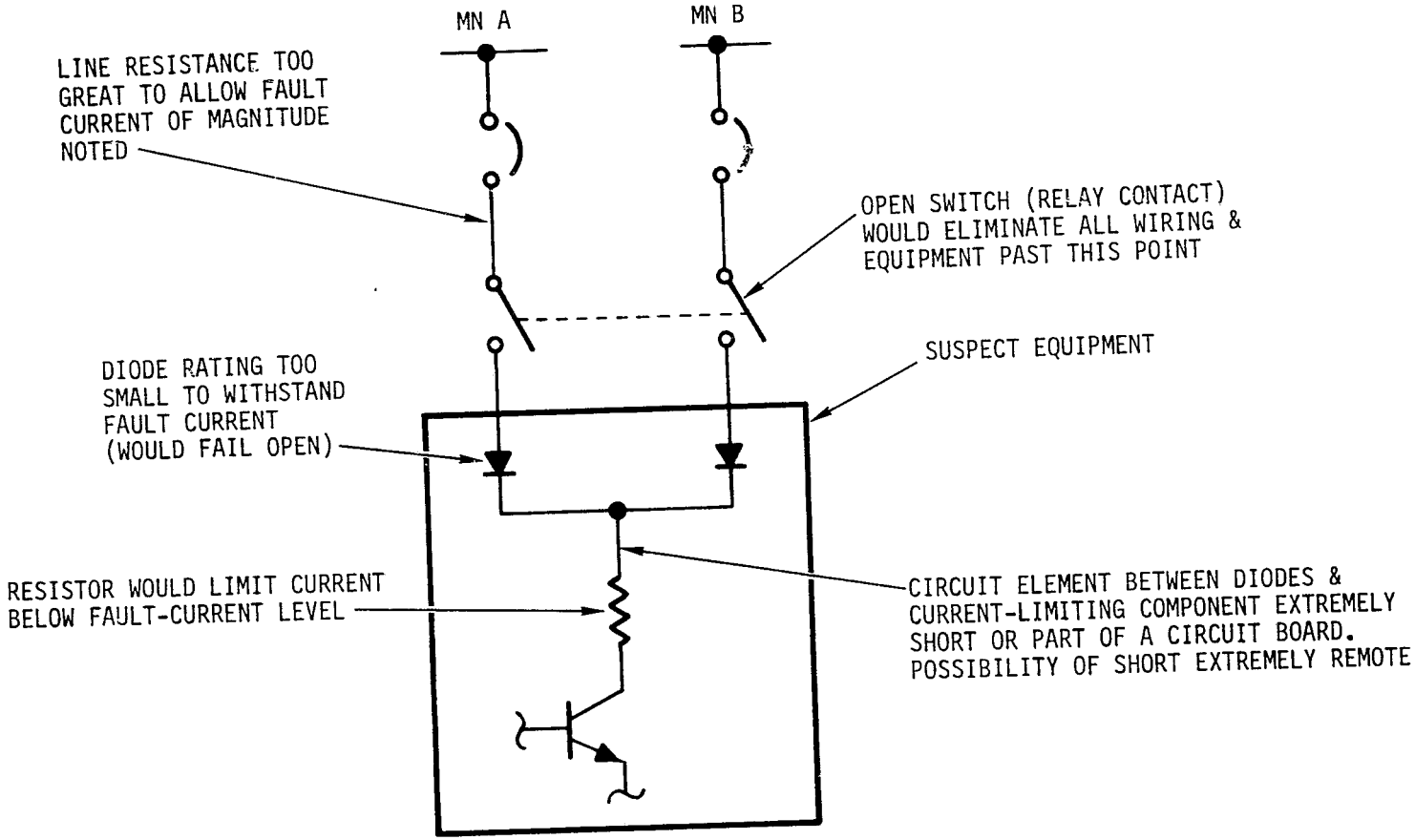
DOWNEY ANALYSIS

- ESTABLISHED FAILURE CONDITIONS FOR ANALYSIS (CON'T)
  - LOAD FAILURE IN DIODED CIRCUIT
    - NOT A POSSIBLE CAUSE - ALL LOADS ENERGIZED DURING ANOMALY HAVE BEEN VERIFIED TO PERFORM SATISFACTORILY DURING AND SUBSEQUENT TO ANOMALY
  - COMPONENT FAILURE IN DIODED LOAD
    - POSSIBLE - FAILURE OF A FILTER CAPACITOR COULD HAVE CAUSED ANOMALY
    - EXACT MECHANISM OF CAPACITOR FAILURE THAT COULD PRODUCE SUBJECT GLITCH IS UNKNOWN
  - SHORT IN GSE CIRCUITS
    - GSE SPACECRAFT POWER CIRCUITS ELIMINATED SINCE LOCATION OF CURRENT MEASUREMENTS VERIFIES THAT FAULT CURRENT OCCURRED IN SPACECRAFT
    - OUTPUT TO GSE FROM DIODED LOADS LIMITED TO CRYO PRESSURE LOW INDICATION
      - GSE WIRING INSPECTED AND MEGGERED
      - NO SUSCEPTIBLE COMPONENTS IN CIRCUITS - FIRST COMPONENT IS 100K RESISTOR

ANALYSIS SUMMARY:

- ALL NON-DIODED LOADS WERE ELIMINATED
- ANALYZED INPUT CIRCUITS TO REMAINING LOADS
  - ELIMINATED ALL LOADS WITH CURRENT-LIMITING DEVICES AT INPUT
- CIRCUIT LINE RESISTANCE CALCULATIONS PERFORMED ON REMAINING CIRCUITS
  - ELIMINATED ALL LOADS WITH CIRCUIT LINE RESISTANCE TOO GREAT TO ALLOW OBSERVED SHORT
- REMAINING LOADS ANALYZED TO DETERMINE COMPONENT(S) THAT COULD FAIL WITHOUT CAUSING LOSS OF LOAD (FILTERS)

FRRID 111.2.8.2 (CONT)
MAIN BUS A AND B CURRENT GLITCHES



ITEMS CONSIDERED IN ELIMINATING SUSPECT COMPONENTS

FRRID III.2.8.2 (CON'T)
MAIN BUS A AND B CURRENT GLITCHES

SUSPECT EQUIPMENT

EQUIPMENT	FAILURE	EFFECT	CRITICALITY
SUIT COMPRESSOR DIFFERENTIAL PRESS. TRANSDUCER	0.1 -μf MYLAR FILM FILTER CAPACITOR	POSSIBILITY OF SOME NOISE ON MEASUREMENT, BUT WOULD NOT AFFECT READABILITY	III
TEMP TRANSDUCER POWER SUPPLY	0.22 -μf METALIZED PAPER FILTER CAPACITOR	NONE - A SMALL AMOUNT OF NOISE AT INPUT OF POWER SUPPLY WOULD NOT AFFECT TEMP TRANSDUCERS	III
0_2 FLOW TRANSDUCER	0.37 -μf CERAMIC FILTER CAPACITOR	POSSIBILITY OF SOME NOISE ON MEASUREMENTS, BUT WOULD NOT AFFECT READABILITY	III
ATS-6 POWER AMP	0.1 -μf CERAMIC (3) OR 82 -μf WET SLUG TANTALUM (3) FILTER CAPACITOR	LOSS OF ONE CAPACITOR WOULD HAVE NEGLIGIBLE EFFECT ON OVER-ALL FILTER CAPABILITY	III
USBE POWER AMP	1000-pF CERAMIC FILTER CAPACITOR	NONE - 28 VDC POWER USED TO OPERATE RELAYS WITHIN PA, WHICH WOULD NOT BE AFFECTED BY SMALL AMOUNT OF NOISE	II (MS)
ATS-6 USBE	1000-pF CERAMIC FILTER	NONE - 28 VDC USED TO OPERATE RE-LAYS WITHIN USBE, WHICH WOULD NOT BE AFFECTED BY SMALL AMOUNT OF NOISE	III

FRRID III.2.8.2 (CON'T)
MAIN BUS A AND B CURRENT GLITCHES

CONCLUSION:

- UNABLE TO DETERMINE EXACT CAUSE OF CURRENT GLITCH
- MOST PROBABLE CAUSE IS FAILURE OF FILTER CAPACITOR IN ONE OF LOADS PREVIOUSLY IDENTIFIED
  - MOST LIKELY UNIT IS ATS-6 PA, SINCE GLITCH IN RECEIVER SIGNAL STRENGTH WAS NOTED AT SAME TIME AS CURRENT GLITCH
  - ANALYSIS OF PA SHOWED THAT MOST LIKELY FAILURE WAS FILTER CAPACITOR IN PA POWER SUPPLY
    - POWER SUPPLY CAPACITOR INSPECTION AND DISSECTION DID NOT SHOW EVIDENCE OF SHORT
  - IF PROBLEM WOULD OCCUR IN FLIGHT, SWITCH TO REDUNDANT PA

RESOLUTION:

- ALL POWER SUPPLIES FOR FLIGHT PA'S WILL BE REPLACED WITH REBUILT UNITS

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FLIGHT READINESS REVIEW ITEM DISPOSITION (FRRID)

Customer's Review Item Definition Sheet

CSM-111	Electrical Power	2.8	111.2.8.2
INITIATOR: D. Greenly/K.E.S.	ORGANIZATION: SR&QA	DATE: 5/20/75	
REFERENCE DOCUMENTATION: IDR 033 vs TCP K-0070, DR S/C-111-SC-0071		PART NUMBER: V36-440001	

PROBLEM

TITLE: Main Bus A&B Current Glitches (Unexplained Anomaly)

On 11/6/74 at 19:50:47Z simultaneous glitches were observed on main bus "A" and "B" currents. Glitches were 32 and 29 amps in magnitude on Bus "A" and "B", respectively. Subsequent investigations failed to determine cause of anomaly.

RECOMMENDED ACTION JUSTIFICATION

Submitted for information only.

RECOMMENDED CONSTRAINT

None.

PRE BOARD COMMENTS REMARKS DIRECTION ☐ REFER TO BOARD ☐ DISPOSITIONED See Decision Summary

ACTION REQUIRED TO CLOSE FRRID

BOARD COMMENTS REMARKS DIRECTION

ACTION REQUIRED TO CLOSE FRRID

DECISION SUMMARY *(To be filled in by the Board or Pre-Board)*

☐ ACTION ☐ CONTRACTOR ☐ NASA

Approved

☐ MANDATORY THIS S/C	CAT I
☐ MANDATORY S/C SERIES	CAT II
☐ STUDY & SUBMIT ECP	CAT III
☐ CLOSED - NO ACTION REQ'D	CAT IV
☐ DISAPPROVED	CAT V
☐ OTHER *Specify*	CAT VI

☐ HARDWARE ☐ SOFTWARE

☐ Constraint ☐ Yes ☐ No

☐ COST
☐ FAT
☐ SCHEDULE
☐ MISSION
☐ OTHER

SIGNATURE OF NASA BOARD CHAIRMAN | DATE

MSC FORM 2089A (REV JAN 68)

FLIGHT READINESS REVIEW ITEM DISPOSITION (FRRID)

Contractor's Review Item Resolution Sheet

CSM 111	Electrical Power	2.8	111.2.8.2
R. H. Buch / SD			5-23-75

S/C DR 0071

Main Bus A and B Current Glitches (Unexplained Anomaly)

On 11-6-74 at 19:50:47Z simultaneous glitches 32 amps Bus A and 27 Bus B amps magnitude and 20 millisec duration were observed on main Bus A and B currents.

Systems that were active at the time were polled to determine if any activity in their system could have caused the observed load. The answer was negative. The SCO in the CM was asked if any activity in the CM could have activiated any switches or if any other activity, not being monitored on OIS, took place. His answer was negative. The SCO was asked to check the condition of the test TB setup as a possible cause. The SCO reported the setup was adequately insulated.

The S/C CB's were statused and the CB status was normal.

Specific conditions at the time of the glitch were:

1. Panel 230 was mechanically removed from structure, and resting on a right-hand couch. The panel was electrically connected.
2. Two VOM's,two test TB's were installed in the CM interior to monitor the voltage on the transfer switch set/reset contact voltages. The test TB's were connected to TB 121 of the CM.
3. ATS-F PA #1 was powered-up; it had been turned on by UDL CMD prior to the glitch.

The two meters (VOM's) were disassembled and inspected for any conditions that could cause the glitch; the inspection eliminated the meters as suspects.

SM wiring, power and control, to PA's was inspected visually and no evidence of damage was noted.

Diodes in the transmitter selector box were verified as being still functional.

AUTHORIZED NAA REPRESENTATIVE: Original Signed by: R. H. Buch | DATE: 5-30-75

MSC FORM 2089B (AUG 67) NASA — MSC

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FLIGHT READINESS REVIEW ITEM DISPOSITION (FRRID)
Continuation Sheet

CSM 111	Electrical Power	2.8	111.2.8.2
☐ NASA ☒ SD			5-23-75

PROBLEM TITLE
Main Bus A and B Current Glitches (Unexplained Anomaly)

GSE and S/C wiring associated with meas SC0092X and SC0094X, O_2 and H_2 TKS press low were inspected (GSE Megered). Results: No indication of a discrepancy. Since the time of the glitch, SC0092X and SC0094X appear normal.

With Panel 230 removed from mounting structure but electrically connected, and while checking bus isolation, the SC harness to Panel 230 was wiggled and meter monitored. There was no change in the reading. The wiring of Panel 230 was visually inspected and no damage was noted.

A step function of 1.8 VDC drop was applied at the input to the PA with the PA powered up. This function did not affect the recording of received signal strength as did the original glitch of 11-6-74.

The cause of the problem was not located positively through trouble-shooting or analysis. Since circuit protection devices and stringent non-flammability requirements preclude jeopardizing crew safety, no further troubleshooting was done. Close scrutiny was maintained during the remaining testing for recurrence of the anomaly (never duplicated).

Analysis of the current and voltage traces indicated that the short was in a dioded load. Possible failure mechanisms were studied, including various types of wire shorts, load failures, malfunction of a component within a load and failures in output GSE connected to the vehicle. Analysis of these failure conditions indicated the most probable cause was the failure of a component inside a load, specifically a filter capacitor since all loads operated normally after the incident.

In addition to non-dioded loads, the analysis eliminated all loads with current-limiting devices at the input. Circuit line resistance calculations were performed on the remaining circuits and all loads with a line resistance too great to permit the observed magnitude of the short were eliminated. The remaining loads were analyzed for suspect components that could fail without causing loss or malfunction of the load (i.e., filters). This resulted in identification of 6 potential loads, including the ATS-6 power amplifier.

MSC FORM 2089C (AUG 67)

FLIGHT READINESS REVIEW ITEM DISPOSITION (FRRID)
Continuation Sheet

CSM 111	Electrical Power	2.8	111.2.8.2
☐ NASA ☒ SD			5-23-75

PROBLEM TITLE
Main Bus A and B Current Glitches (Unexplained Anomaly)

A glitch in the RF output of the ATS-6 power amplifier was noted coincident with the bus glitch. Subsequent vehicle and subcontractor testing could not duplicate the anomaly.

Vehicle troubleshooting and analysis, while unable to determine the exact cause of the current glitch, identified the most probable cause of the anomaly to be failure of a filter capacitor in one of 6 loads. These are:
- Suit Compressor Diff Press Transducer
- Temp Transducer Power Supply
- O_2 Flow Transducer
- ATS-6 Power Amplifier
- USBE Power Amplifier
- ATS-6 USBE Power Amplifier

The RF output glitch in the ATS-6 power amplifier coincident with the bus glitch indicates this load as the most likely cause of the anomaly. The power supplies in all flight PA's have been rebuilt and replaced.

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MSC FORM 2089C (AUG 67)

FRRID III.2.8.3
MA-014 ELECTROPHORESIS EXPERIMENT LIGHT

PROBLEM:

- EXPERIMENT NO-GO LIGHT DID NOT TURN ON DURING PREPARATION FOR ALTITUDE RUN NO. 2 (UNEXPLAINED ANOMALY)
- ALL PRIOR AND SUBSEQUENT OPERATIONS NORMAL
- EXPERIMENT WAS A TEST UNIT (QUAL TEST)

DISCUSSION:

- TROUBLESHOOTING INCLUDED:
  - INSPECTION OF EXPERIMENT INTERNAL CIRCUITRY AND REPEATED TESTS IN NASA LAB
  - SUBSEQUENT EXAMINATION OF SPACECRAFT/EXPERIMENT INTERFACE CONNECTORS, INSPECTION OF ACCESSIBLE WIRING, AND MOVEMENT OF VEHICLE WIRING WHILE CONNECTED TO POWERED-UP EXPERIMENT
- ANOMALY COULD NOT BE FOUND OR DUPLICATED IN LAB OR VEHICLE
- FAILURE MECHANISMS WERE CONSIDERED TO BE:
  - INADVERTENT ACTUATION OF WRONG SWITCH (OCCURRED DURING TROUBLESHOOTING)
  - INTERMITTENT FAILURE OF VEHICLE WIRING
  - INTERMITTENT IN FREEZER CIRCUITRY OR AN ISOLATED FAILURE OF THE FREEZER POWER SWITCH OPERATION

CONCLUSION:

- MOST PROBABLE CAUSES ARE EITHER AN ISOLATED FAILURE OF THE FREEZER POWER SWITCH TO ACTUATE PROPERLY OR FAILURE TO BE PLACED OVER-CENTER POSITIVELY IN THE "ON" POSITION

C-2

FLIGHT READINESS REVIEW ITEM DISPOSITION (FRRID)

Customer's Review Item Definition Sheet

S/C	SYSTEM	SYSTEM NUMBER	FRRID NUMBER
CSM-111	Electrical Power	2.8	111.2.8.3

INITIATOR	ORGANIZATION	DATE
D. Greenly/K.E.S.	SR&QA	5/21/75

REFERENCE DOCUMENTATION	PART NUMBER
IDR 023 vs TCP-K-0034, DR MA014-4/74-011 & DR S/C 111-SC-0142	MA-014 V36-440001

PROBLEM

TITLE: MA-014, Electrophoresis Experiment Light (Unexplained Anomaly)

During Altitude Chamber Run #1, the MA-014 (Qual. Unit) "No-Go" light failed to illuminate as expected when the experiment's freezer power switch was placed in the "on" position. The light operated properly during Chamber Run #2. Subsequent troubleshooting of the experiment and related CSM wiring failed to disclose a cause for the subject one-time condition.

RECOMMENDED ACTION JUSTIFICATION

Submitted for information only.

RECOMMENDED CONSTRAINT

None.

PRE BOARD COMMENTS/REMARKS DIRECTION ☐ REFER TO BOARD ☐ DISPOSITIONED (See Decision Summary)

ACTION REQUIRED TO CLOSE FRRID

BOARD COMMENTS REMARKS DIRECTION

ACTION REQUIRED TO CLOSE FRRID

DECISION SUMMARY *(To be filled in by the Board or Pre-Board)*

☐ ACTION ☐ CONTRACTOR ☐ NASA

Approved:
- ☐ MANDATORY THIS S/C — CAT. I
- ☐ MANDATORY S/C SUBS — CAT. II
- ☐ STUDY & SUBMIT ECP — CAT. III
- ☐ CLOSED - NO ACTION REQ'D — CAT. IV
- ☐ DISAPPROVED — CAT. V
- ☐ OTHER (Specify) — CAT. VI

☐ HARDWARE ☐ SOFTWARE

Constraint:
- ☐ CDDT
- ☐ PRT
- ☐ LAUNCH
- ☐ MISSION
- ☐ OTHER

☐ Yes ☐ No

SIGNATURE OF NASA BOARD CHAIRMAN | DATE

MSC FORM 2089A (REV JAN 68)

FLIGHT READINESS REVIEW ITEM DISPOSITION (FRRID)

Contractor's Review Item Resolution Sheet

CSM 111	Electrical Power	2.8	111.2.8.3
R. Buch/SD			5-30-75
S/C DR 0142			

MA-014, Electrophoresis Experiment Light (Unexplained Anomaly)

The experiment No-GO light did not turn on during preparations for altitude Run No. 2. The freezer switch was cycled and the light came on. It did operate properly in Run No. 2. Following completion of the altitude runs, the experiment was removed from the S/C and delivered to the experiment lab for troubleshooting.

Troubleshooting conducted in the NASA lab on the experiment consisting of inspection of the freezer power circuitry and repeated cycling of the freezer power switch failed to disclose any hardware discrepancies. Subsequent inspection of the S/C experiment interface connectors and flexing of the S/C wiring with the freezer powered-up also failed to indicate any possible intermittents. During T.S. in the S/C the SCO inadvertently actuated the experiment power switch instead of the experiment freezer power switch (adjacent to each other on the experiment). Inquiry into the possibility of this having occurred at the time of the anomaly was made and a comparison of the Bus B current data at the time of the anomaly and the time of inadvertent switching was conducted. The data indicated no evidence of inadvertent switching at the time of the anomaly. However, with MNB only on (major portion of experiment power comes from MNA), the current drain is relatively negligible and positive indication of proper or inadvertent switching would probably not be seen.

The possible failure mechanisms are: (1) inadvertent operation of the wrong switch, (2) intermittent failure of vehicle wiring and (3) intermittent failure in the freezer circuitry or an isolated failure of the freezer power switch.

The most probable causes are considered to be an isolated failure of the freezer power switch to actuate properly, or, to be placed positively overcenter in the ON position.

AUTHORIZED NAA REPRESENTATIVE: Original Signed by: R. H. Buch | DATE: 5-30-5

MSC FORM 2089B (AUG 67) NASA — MSC

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FLIGHT READINESS REVIEW ITEM DISPOSITION (FRRID)

Customer's Review Item Definition Sheet

S/C	SYSTEM	SYSTEM NUMBER	FRRID NUMBER
CSM-111	Communications	2.11	111.2.11.1

INITIATOR	ORGANIZATION	DATE
D. Greenly/K.F.S.	SR&QA	5/20/75

REFERENCE DOCUMENTATION	PART NUMBER
IDR 017 vs TCP-K-0005, DR S/C 111-SC-0186	8371676-501

PROBLEM

TITLE: Video Tape Recorder (VTR) (Unexplained Anomaly)

During integrated systems testing per TCP-K-0005, good "dumped video" from the VTR could not be verified. Subsequent troubleshooting failed to disclose a cause for the reported condition.

RECOMMENDED ACTION/JUSTIFICATION

Submitted for information only.

RECOMMENDED CONSTRAINT

None.

PRE BOARD COMMENTS/REMARKS/DIRECTION ☐ REFER TO BOARD ☐ DISPOSITIONED (See Decision Summary)

ACTION REQUIRED TO CLOSE FRRID

BOARD COMMENTS/REMARKS/DIRECTION

ACTION REQUIRED TO CLOSE FRRID

DECISION SUMMARY *(To be filled in by the Board or Pre-Board)*

☐ ACTION ☐ CONTRACTOR ☐ NASA

Approved:

- ☐ MANDATORY THIS S/C — CAT. I
- ☐ MANDATORY S/C SERIES — CAT. II
- ☐ STUDY & SUBMIT ECP — CAT. III
- ☐ CLOSED - NO ACTION REQ'D — CAT. IV
- ☐ DISAPPROVED — CAT. V
- ☐ OTHER (Specify) — CAT. VI

☐ HARDWARE ☐ SOFTWARE

Constraint:

- ☐ COST
- ☐ FBT
- ☐ LAUNCH
- ☐ MISSION
- ☐ OTHER

☐ Yes ☐ No

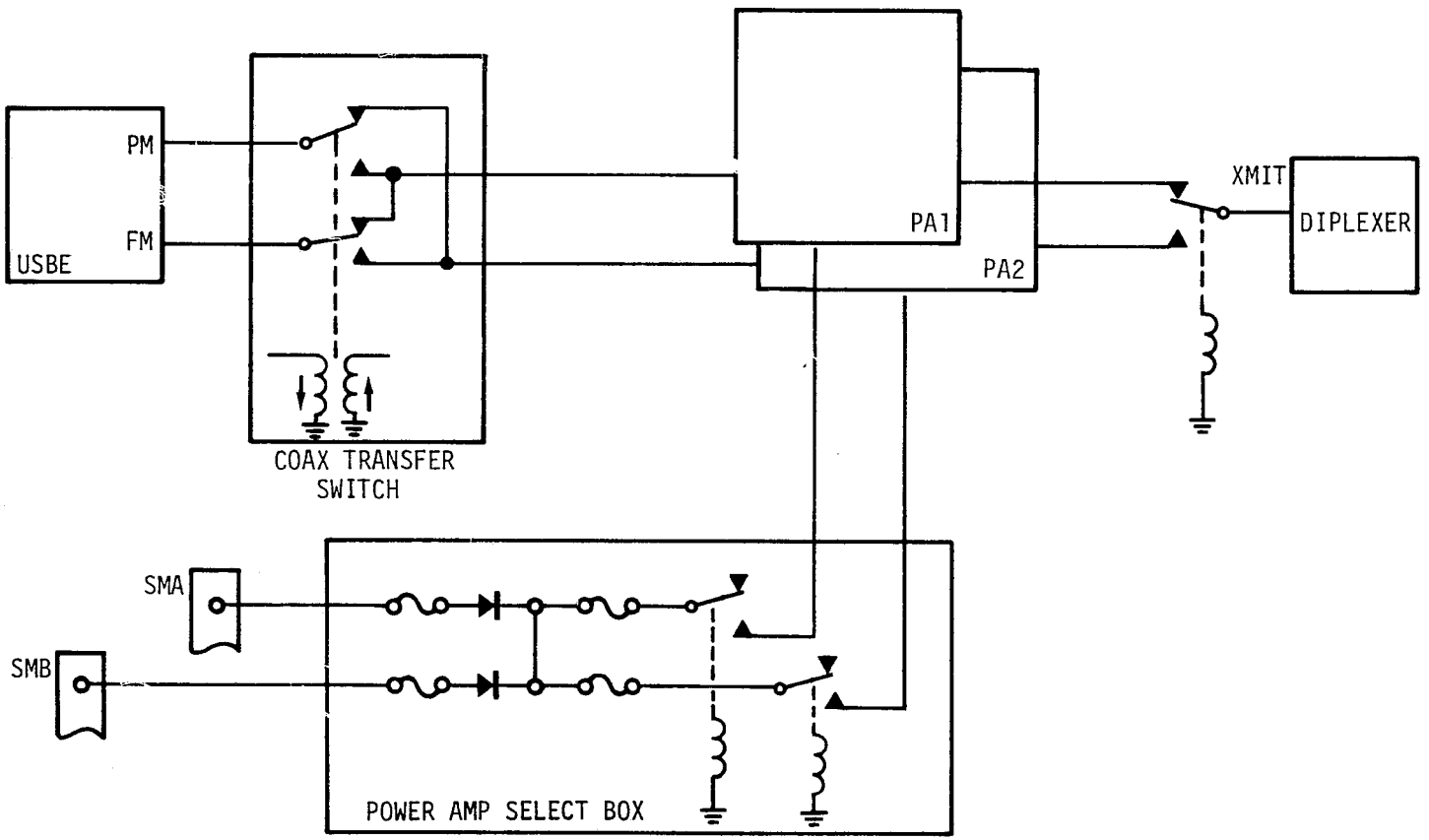
SIGNATURE OF NASA BOARD CHAIRMAN	DATE

MSC FORM 2089A (REV JAN 68)

FRRID III.2.II.2
ATS-6 POWER AMPLIFIER POWER OUTPUT

PROBLEM:

- ATS-6 S-BAND POWER AMPLIFIER DELAY IN COMING ON FOLLOWING APPLICATION OF DC POWER AND RF DRIVE (UNEXPLAINED ANOMALY)
  - BOTH PA'S EXPERIENCED PROBLEM
    - 8 IDENTIFIED OCCURRENCES, PA NO. 1
    - 3 IDENTIFIED OCCURRENCES, PA NO. 2
  - RF OUTPUT APPROX. 35 dB BELOW NORMAL AND DC CURRENT 1 TO 2 AMPS VS 10 AMPS NORMAL
  - PROBLEM OCCURRED IN PM MODE ONLY
  - SELF-CLEARED, WITHIN APPROX. ONE MINUTE, OR WAS CLEARED BY SWITCHING TO OTHER AMPLIFIER (OR OFF) MOMENTARILY OR BY SWITCHING TO FM DRIVE


PM
FM
USBE
COAX TRANSFER
SWITCH
PA1
PA2
XMIT
DIPLEXER
SMA
SMB
POWER AMP SELECT BOX

SPACECRAFT TROUBLESHOOTING:

- INITIAL CIRCUIT ANALYSIS AND DATA REVIEW SUGGESTED THE FOLLOWING POSSIBLE CAUSES:
  - HANGUP IN COAX TRANSFER SWITCH
  - HANGUP IN RELAY K-I IN PANEL 230
  - FAULTY POWER CONTROL RELAYS IN TRANSMITTER SELECT BOX
  - PROBLEM WITHIN THE POWER AMP ITSELF
- COAX TRANSFER SWITCH REPLACED
  - PROBLEM RECURRED WITH NEW TRANSFER SWITCH
- INSTALLED VOM'S TO MONITOR COMMANDS TO COAX TRANSFER SWITCH
  - PROBLEM RECURRED WITH NORMAL COMMANDS
- INSTRUMENTED INPUT DC POWER, INPUT AND OUTPUT RF POWER OF EACH PA
  - PROBLEM RECURRED WITH INPUT DC OK, INPUT RF POWER OK
- INTERMITTENT COAX CONNECTOR FOUND AND REPAIRED (PM RF TRANSFER SWITCH COAX CABLE)
  - HANGUP NEVER AGAIN OCCURRED
  - COAX WOULD NOT EXPLAIN PROBLEM SINCE HANGUP OCCURRED WITH PROPER RF DRIVE

FAILURE INVESTIGATION, VENDOR AND JSC:

- HANGUP CAUSES AND MECHANISMS POSTULATED AND ELIMINATED BY TEST
  - EMI INDUCED POWER AMP POWER SUPPLY HANGUP IN LOW OUTPUT VOLTAGE MODE
    - AC VOLTAGES COUPLED INTO SPACECRAFT INTERFACE WIRING - NO HANGUP OCCURRED
  - INDUCTANCE IN DC SUPPLY WIRING MAY HAVE CAUSED POWER AMP POWER SUPPLY OSCILLATION AND REDUCED DC OUTPUT
    - CALCULATIONS SHOW ABOUT 12 MICROHENRY EACH IN SUPPLY AND RETURN WIRES AND BETWEEN CASE AND VGP
    - TESTS WITH 20 AND 100 MICROHENRY IN EACH CAUSED NO OSCILLATION OR REDUCED RF OUTPUT
- ANALYSIS BY POWER SUPPLY CONSULTANT FAILED TO IDENTIFY POSSIBLE HANGUP MECHANISM
- NO HANGUPS OBSERVED DURING EXTENSIVE TESTING OF FLIGHT AND ENGINEERING MODEL POWER AMPLIFIERS

ATS-6 POWER AMPLIFIER POWER OUTPUT

SUMMARY:

- NO POSTULATED HANGUP MECHANISMS COULD BE VERIFIED BY TEST
- NO POTENTIAL HANGUP MODES IDENTIFIED BY ANALYSIS OR BENCH TESTS
- HANGUP ALWAYS SELF-CLEARED OR WAS CLEARED BY CYCLING DC POWER OR SWITCHING TO FM DRIVE
- NO RECENT OCCURENCES OF ANOMALY

CONCLUSIONS:

- IF TURN-ON ANOMALY SHOULD OCCUR DURING MISSION CLEARANCE CAN POTENTIALLY BE ATTAINED BY CYCLING DC POWER. AS AN ALTERNATIVE, THE OTHER AMPLIFIER CAN BE SELECTED
- POWER AMPLIFIERS ARE ACCEPTABLE FOR FLIGHT

FLIGHT READINESS REVIEW ITEM DISPOSITION (FRRID)

Customer's Review Item Definition Sheet

S/C	SYSTEM	SYSTEM NUMBER	FRRID NUMBER
CSM-111	Communications	2.11	111.2.11.2

INITIATOR	ORGANIZATION	DATE
D. Greenly/K.E.S.	SR&QA	5/20/75

REFERENCE DOCUMENTATION	PART NUMBER
IDR 020 vs TCP-K-0070, DR S/C 111-SC-0055	V36-444061

PROBLEM

TITLE: ATS-6 Power Amplifier Power Output (Unexplained Anomaly)

During combined systems testing per TCP-K-0070 it was observed that the ATSF power amplifier RF outputs did not always indicate full power when switched on. The condition progressively improved with time until it no longer could be made to repeat. The cause of the condition could not be determined.

RECOMMENDED ACTION JUSTIFICATION

Submitted for information purposes only.

RECOMMENDED CONSTRAINT

None.

PRE BOARD COMMENTS/REMARKS/DIRECTION ☐ RETURN TO BOARD ☐ DISPOSITIONED (See Decision Summary)

ACTION REQUIRED TO CLOSE FRRID

BOARD COMMENTS/REMARKS/DIRECTION

ACTION REQUIRED TO CLOSE FRRID

DECISION SUMMARY *(To be filled in by the Board or Pre-Board)*

☐ ACTION ☐ CONTRACTOR ☐ NASA

Approved:

- ☐ MANDATORY THIS S/C — CAT. I
- ☐ MANDATORY S/C SERIES — CAT. II
- ☐ STUDY & SUBMIT ECP — CAT. III
- ☐ CLOSED - NO ACTION REQ'D — CAT. IV
- ☐ DISAPPROVED — CAT. V
- ☐ OTHER *Specify* — CAT. VI

☐ HARDWARE ☐ SOFTWARE

Constraint: ☐ Yes ☐ No

- ☐ COST
- ☐ FET
- ☐ LAUNCH
- ☐ MISSION
- ☐ OTHER

SIGNATURE OF NASA BOARD CHAIRMAN | DATE

MSC FORM 2089A (REV JAN 68)

FLIGHT READINESS REVIEW ITEM DISPOSITION (FRRID)

Contractor's Review Item Resolution Sheet

CSM 111	Communications	2.11	111.2.11.2

W. H. McQuerry/SD		5/25/75

S/C DR 0055

ATS-6 Power Amplifier Power Output

ATS-6 power amplifier testing at KSC indicated that power amplifier RF outputs did not always indicate proper full power when switched on. Time delay from turn-on to full power out ranged from a few seconds to over one minute. The problem was detected on both PA No. 1 and PA No. 2. In all cases, the problem either cured itself or was cured by switching mode or recycling power switch. The condition appeared to progressively improve with time, i.e., it became more difficult to make the anomaly occur.

Initial circuit analysis and data review suggested the following possible causes:

a. Hangup in coax transfer switch
b. Hangup in relay K-1 in panel 230
c. Faulty power control relays in transmitter select box
d. Problem within the power amp itself

The coax transfer switch was changed out. The problem recurred, although at a lesser frequency. Instrumentation was installed to monitor commands to coax transfer switch and problem recurred with normal commands.

Instrumentation was installed to monitor input DC power and RF drive as well as RF output. The turn-on anomaly was observed twice with normal DC power and RF drive inputs.

Both power amplifiers were removed from S/C and returned to vendor. Extensive analysis and testing was performed at vendor and at JSC on the units removed from the S/C and on engineering models. The problem could not be duplicated and analysis did not disclose any design features that could explain the anomaly.

An engineering unit and flight power amplifier SN 005 were sent to KSC and installed in the S/C. Extensive testing could not duplicate the problem.

Flight power amplifiers SN 006 and SN 004 were received at KSC, installed for flight and satisfactorily tested during TCP K-8241. The anomaly did not repeat.

Following this testing in K-8241, the power amplifiers were returned to the vendor a second time for resolder modification and retest.

It is concluded that the ATS-6 power amplifiers are acceptable for flight. In event the turn-on problem should occur during the mission, it can be cleared by cycling the DC power switch or by switching to the other amp.

AUTHORIZED NAA REPRESENTATIVE	DATE
Original Signed by: W. H. McQuerry	5-30-75

MSC FORM 2089B (AUG 67) NASA — MSC

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OF POOR QUALITY

FRRID III.2.14.4
CREW ALERT LIGHT ANOMALY

PROBLEM:

- CREW ALERT LIGHT HAD BEEN DEACTIVATED BY CUTTING AND STOWING GROUND RETURN WIRE
- SCO REPORTED LIGHT ON DURING POWER-UP (TOGETHER WITH OTHER LIGHTS)

DISCUSSION:

- BLANK DECAL HAD BEEN INSTALLED OVER LIGHT BUT ONE EDGE WAS TURNED UP (BACK SURFACE OF DECAL IS HIGHLY REFLECTIVE)
  - ALL LIGHTS EXTINGUISHED WHEN SWITCH POSITIONED FROM NORMAL TO ACKNOWLEDGE
  - CREW ALERT LIGHT DID NOT COME ON WHEN SWITCHED TO NORMAL
- CONDITION WAS NEVER DUPLICATED
- TROUBLESHOOTING INCLUDED:
  - INSPECTION OF WIRING
  - MEGGER TESTS ON GSE WIRING
- C&W MATRIX ON PANEL 2 REMOVED AND TESTED
  - INSULATION RESISTANCE TESTS WELL OVER 100 MEGOHM REQUIREMENT

- CAPACITOR BOARD FROM C34-695 GSE UNIT REMOVED AND TESTED
  - NO ANOMALY OR DISCREPANCY COULD BE FOUND
- ACTION TO PREVENT RECURRENCE
  - INVOLVED WIRING WAS REMOVED FROM SPACECRAFT
  - PANEL 2 MATRIX HAS BEEN REPLACED
  - CDU CREW ALERT CHANNEL DISABLED TO PRECLUDE NUISANCE MASTER ALARMS DUE TO SPURIOUS VOLTAGE PICKUP

CONCLUSION:

- ANOMALY CANNOT RECUR IN FLIGHT DUE TO REMOVAL OF WIRING AND REPLACEMENT OF MATRIX

FLIGHT READINESS REVIEW ITEM DISPOSITION (FRRID)

Customer's Review Item Definition Sheet

S/C	SYSTEM	SYSTEM NUMBER	FRRID NUMBER
CSM-111	Displays & Controls	2.14	111.2.14.4

INITIATOR	ORGANIZATION	DATE
D. Greenly/K.E.S.	SR&QA	5/20/75

REFERENCE DOCUMENTATION	PART NUMBER
IDR 030 vs TCP-K-0070, DR S/C-111-SC-0070	V36-440001

PROBLEM

TITLE: C&W (Crew Alert) Light (Unexplained Anomaly)

Caution and warning matrix light "crew alert" came on during combined systems testing on 10/31/74 - C&W system was powered-down at the time of the anomaly. It was later postulated that the condition was caused by an intermittent short circuit in the S/C or GSE electrical systems; however, troubleshooting failed to positively verify this conclusion.

RECOMMENDED ACTION/JUSTIFICATION

Submitted for information only.

RECOMMENDED CONSTRAINT

None.

PRE-BOARD COMMENTS/REMARKS/DIRECTION ☐ REFER TO BOARD ☐ DISAPPROVED (See Rejection Summary)

ACTION REQUIRED TO CLOSE FRRID

BOARD COMMENTS/REMARKS/DIRECTION

ACTION REQUIRED TO CLOSE FRRID

DECISION SUMMARY *(To be filled in by the Board or Pre-Board)*

☐ ACTION ☐ CONTRACTOR ☐ NASA

Approved:

- ☐ MANDATORY THIS S/C — CAT. I
- ☐ MANDATORY S/C SUBS — CAT. II
- ☐ STUDY & SUBMIT ECP — CAT. III
- ☐ CLOSED - NO ACTION REQ'D — CAT. IV
- ☐ DISAPPROVED — CAT. V
- ☐ OTHER (Specify) — CAT. VI

☐ HARDWARE ☐ SOFTWARE

Constraint:

☐ Yes ☐ No

- ☐ COST
- ☐ PET
- ☐ LAUNCH
- ☐ MISSION
- ☐ OTHER

SIGNATURE OF NASA BOARD CHAIRMAN | DATE

MSC FORM 2089A (REV JAN 68)

FLIGHT READINESS REVIEW ITEM DISPOSITION (FRRID)

Contractor's Review Item Resolution Sheet

PROBLEM TITLE

C&W (Crew Alert) Light (Unexplained Anomaly)

DETAIL SPECIFICATION TO BE TAKEN (Use continuation sheets as required)

The "Crew Alert" light in the Panel 2 C&W matrix had been deactivated by cutting and stowing the ground return wire.

However, the "Crew Alert" light was reported on during C&W status following C&W system activation on 10-31-74. Prior to this time, C&W was powered down because the CM was cleared for pressure operations. Although the light had been covered with a blank decal, one corner of the decal was inadvertently turned up exposing a small area of the light.

After consulting with the SCO involved, on 11-1-74, an IDR was initiated on 11-5-74. The OIS tape was monitored on 11-4 and it indicated that the identification of the light being on was very positive.

Initial troubleshooting consisted of monitoring the C&W system periodically to determine if the light would again illuminate. The light did not illuminate again. Therefore, the nature of the problem was one of an intermittent ground either in the SC or the C34-695 GSE (including cabling to the C34-695).

The cabling to the GSE was Megger checked and showed no shorts. The crew alert circuit was functionally checked by applying a ground on the line going to the C34-695. During this procedure, the SC and the C34-695 GSE performed satisfactorily, indicating that the intermittent short, if it was in the SC or GSE electronics, did not permanently affect the electronic components involved.

SC panels were removed and the wire and wire harness involved in the circuit from Panel 2 over to the GSE breakout cable was inspected. This was accomplished on TPS SC 111-SC-029. Additionally, the Panel 5 and Panel 3 area was inspected (after Panel 3, 4, 5, 6, and 16 removal) throughout the wire run from the origin of the crew alert light source (Panel 230) over to the caution and warning detection unit. No evidence of damage to the wiring was found anywhere in the circuit. The crew alert wire was then terminated at the caution and warning detection unit on TPS SC 111-SC-025. This removed the wire connected to the crew alert light contact.

Since no source of the problem could be found in the SC wiring or GSE cables, it was decided to remove the C&W matrix assy from Panel 2 for analysis. Additionally, the event card in the C34-695 GSE was removed for analysis. No discrepancies were found in either the GSE event card or the C&W matrix assy.

Finally, the C&W crew alert channel into the C&W detection unit was connected to VGP on TPS SC 111-SC-032 to preclude any possible master alarms due to stray voltage pickup.

AUTHORIZED NAA REPRESENTATIVE: Original Signed by: R. H. Buch | DATE: 5/30/75

MSC FORM 2089B (AUG 67)

NASA — MSC

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FRRID III.2.14.5
PANEL I DET ABORT RESET ANOMALY

ANOMALY:

- DURING INITIAL RETEST AFTER REINSTALLATION OF PANEL I, THE DET FAILED TO RESET WHEN AN ABORT SIGNAL WAS INITIATED

DISCUSSION:

- THE DET HAD OPERATED NORMALLY FOR TWO PREVIOUS LIFT-OFF SIGNALS
- TIMER FAILED TO RESET AS REQUIRED WHEN ABORT A SIGNAL ONLY WAS SENT - GSE INDICATE PROPER CLOSURE OF MESC RELAY CONTACTS
  - NORMALLY REDUNDANT ABORT SIGNALS (A & B) ARE SENT IN FLIGHT
- ABORT B SIGNAL SENT - TIMER RESET
- ABORT A SIGNAL REPEATED - TIMER RESET
- ANOMALY NEVER REPEATED
  - TROUBLESHOOTING INCLUDED 10 CYCLES ON ABORT A AND 10 ON ABORT B
- CONNECTOR ON PANEL I FOUND COCKED
  - BENCH TESTS ON SIMILAR CONNECTOR VERIFIED OVER 3/32 CONTACT ENGAGEMENT
- CONNECTOR DEMATED AND INSPECTED
  - TESTS VERIFIED PINS AND SOCKETS DID NOT RECESS ON MATING
- DET REMOVED AND REPLACED
  - UNIT CURRENTLY INSTALLED PASSED FUNCTIONAL TEST PRIOR TO INSTALLATION

CONCLUSION:

- SYSTEM ACCEPTABLE FOR FLIGHT
  - A VERIFIED TIMER HAS BEEN INSTALLED
  - ANOMALY OCCURRED ONLY ONCE ON ONE SYSTEM
    - REDUNDANT SIGNALS ARE SENT
  - UNIT HAS PASSED VEHICLE RETEST

FLIGHT READINESS REVIEW ITEM DISPOSITION (FRRID)

Customer's Review Item Definition Sheet

S/C	SYSTEM	SYSTEM NUMBER	FRRID NUMBER
CSM 111	Displays & Control	2.14	111.2.14.5

INITIATOR	ORGANIZATION	DATE
J. Lowe/NASA/JSC	JSC/PF	6-2-75

REFERENCE DOCUMENTATION

PART NUMBER

PROBLEM

Panel 1 DET Failed to Reset (Unexplained Anomaly)

During Panel 1 retest on 5-6-75, the DET failed to reset one time when an Abort A command was sent from the MESC. Subsequent commands resulted in satisfactory reset. Investigation revealed a harness to Panel 1 connector cocked approximately 6.040 and improperly torqued. The panel was removed and the DET was removed and replaced.

RECOMMENDED ACTION/JUSTIFICATION – Submitted for information only.

FLIGHT READINESS REVIEW ITEM DISPOSITION (FRRID)

Contractor's Review Item Resolution Sheet

S/C	SYSTEM	SYSTEM NUMBER	FRRID NUMBER
CSM 111	Electrical Power	2.14	111.2.14.5

ORIGINATOR	DEPT.	DATE
R.H. Buch/SD		6-2-75

REFERENCE DOCUMENTATION

PROBLEM TITLE

Panel 1 DET Failed to Reset (Unexplained Anomaly)

RESOLUTION/ACTION TAKEN (Use continuation sheets as required)

Panel 1 had been removed to replace the altitude set panel. During initial retest after reinstallation of Panel 1, the DET failed to reset as required when an abort signal from the MESC Logic Circuit A was initiated. The reported discrepancy was never duplicated or isolated.

Previously in the test sequence, the timer had reset as required with initiation of the Lift-Off signal on two separate occasions. An abort signal from the MESC Logic Circuit A was enabled; however, the timer failed to reset as required but instead continued to count. Verification that the MESC had operated properly and sent the signal was obtained from the GSE Event Lamp for Measurement CD0044X. An abort signal from the MESC Logic Circuit B was sent and the timer functioned properly (reset and counted up). The abort A signal was then repeated and the timer functioned properly. Therefore, the timer failed to operate properly only once and this when only an abort A signal was sent (redundant signals A & B are sent in flight).

FLIGHT READINESS REVIEW ITEM DISPOSITION (FRRID)

Continuation Sheet

S/C	SYSTEM	SYSTEM NUMBER	FRRID NUMBER
CSM 111	Electrical Power	2.14	111.2.14.5

☐ NASA ☒ SD CONTINUATION — DATE 6-2-75

PROBLEM TITLE

Panel 1 DET Failed to Reset (Unexplained Anomaly)

Troubleshooting included timer operation with 10 cycles of abort A signals and 10 of abort B. The timer functioned properly each time. The anomaly could never be duplicated. The Panel 1 connector was found to be slightly cocked in the mated condition. One screw was torqued 1.5 turns (≈.05 inch) and one .25 turns. Bench tests on a similar connector showed over .09 inches of contact engagement with this condition.

The Panel 1 connector was demated and inspected for evidence of damage. None was found. Tests verified that the pins and sockets in both connector halves were firmly seated and did not recess on mating. No other discrepancies were noted.

Since no discrepancy or explanation for the anomaly could be found, the timer was removed from Panel 1 and another timer installed. The timer currently installed passed a functional test prior to installation and will be tested in the vehicle.

The timer is Criticality III. The failure of the timer to reset with the initiation of an abort signal has no significant effect on the mission. The timer is normally operating in a countdown mode during prelaunch and is then reset to all zeros and counts up when a lift-off signal is received. The initiation of an abort provides an overriding command to the timer to reset to all zeros and count up. Should a lift-off and an abort signal be received very close together, it is possible that the crew would not detect which signal reset the timer. However, the crew would probably detect the resetting of the timer if an abort signal was initiated some time after lift-off. Seven to nine seconds after LES motor fire or three seconds after canard deploy the crew is to actuate an ELS switch. If this switch is actuated early (which is most probable if the timer has failed to reset) there is no effect unless there is a failure in the ELS. Ground communication will also provide crew assistance in pacing their actions.

The timer system is considered acceptable for flight.

This is based on:

1. The timer currently installed has passed a functional test.
2. The timer will be verified after installation in the vehicle.
3. Vehicle wiring has performed satisfactorily during all subsequent testing.
4. The anomaly occurred only once on one system (Abort A). Redundant abort signals are sent in flight.

AUTHORIZED NAA REPRESENTATIVE	DATE
Original Signed by: R. H. Buch	6-2-75

MSC FORM 2089B (AUG 67) NASA — MSC

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FRRID 114.4.34.4
LOST AND FOUND

- THERE HAS BEEN NO LOST HARDWARE AT KSC

- THERE HAVE BEEN FOUR ITEMS (3 WASHERS AND 1 SCREW) FOUND IN THE SPACECRAFT AT KSC. A PROBABLE SOURCE FOR THESE ITEMS HAS BEEN ESTABLISHED.

FLIGHT READINESS REVIEW ITEM DISPOSITION (FRRID)

Customer's Review Item Definition Sheet

S/C	SYSTEM	SYSTEM NUMBER	ITEM NUMBER
CSM 111	Lost and Found	4.34	111.4.34.4

INITIATOR	ORGANIZATION	DATE
D. Greenly (DX7)	SP&QA	5/21/75

REFERENCE DOCUMENTATION	PART NUMBER
DR 0067, DR 0099	N/A

PROBLEM

TITLE: Lost and Found

Three washers (Part numbers LD153-0014-0011, LD153-0014-0012, and LD153-0002-2203, and one NAS 1100-CE3 screw were found in S/C 111. It was concluded from the inspection of the area where these part numbers are used that the proper hardware is installed on S/C 111. SSAP data review indicates no lost items in CSM 111 and DM2 as of this review (5/21/75).

RECOMMENDED ACTION/JUSTIFICATION

Information only.

RECOMMENDED CONSTRAINT

None.

PRE BOARD COMMENTS/REMARKS, DIRECTION ☐ REFER TO BOARD ☐ DISPOSITIONED (See Signature Block)

ACTION REQUIRED TO CLOSE FRRID

BOARD COMMENTS/REMARKS, DIRECTION

ACTION REQUIRED TO CLOSE FRRID

DECISION SUMMARY *(To be filled in by the Board or Pre-Board)*

☐ ACTION ☐ CONTRACTOR ☐ NASA

Approved
- ☐ MANDATORY THIS S/C — CAT I
- ☐ MANDATORY S/C SUBS — CAT II
- ☐ STUDY & SUBMIT ECP — CAT III
- ☐ CLOSED - NO ACTION REQ'D — CAT IV
- ☐ DISAPPROVED — CAT V
- ☐ OTHER (Specify) — CAT VI

☐ HARDWARE ☐ SOFTWARE

Constraint
- ☐ COST
- ☐ FOT
- ☐ LAUNCH
- ☐ MISSION
- ☐ OTHER

SIGNATURE OF NASA BOARD CHAIRMAN	DATE

MSC FORM 2089A (REV JAN 68)

FLIGHT READINESS REVIEW ITEM DISPOSITION (FRRID)

Contractor's Review Item Resolution Sheet

111	Lost and Found	4.34	111.4.34.4
J. C. Newborn	814	05-22-75	

DR's 0067 and 0069

Lost and Found Hardware

(Use continuation sheets as required)

ID	DATE	ITEM	REMARKS
SC-0067	11-20-74	Washers LD153-0014-0011 LD153-0014-0012	Found trapped in cavities under scuff shield in back of Panel 3. All installations on the spacecraft requiring this hardware were examined and none found missing. Examination of pre-installation Photo 2031-08 111/C.I.-22/PNL #3 shows washers identical to those found (one alodined and one bright) being used to mount the panel to the handling fixture prior to installation in the spacecraft. This is believed to be the origin of these washers.
SC-0099	1-2-75	Screw NAS1100CE3-8 Washer LD153-0002-2203	Found laying on C281A104 coax connector. Lack of marks and scuffs on the screw thread and washer indicated the items had never been installed. Since the hardware is common to cable and line clamp installations, an examination of all accessible clamps were made and none were found missing. Total time expended on search was one hour.

AUTHORIZED REPRESENTATIVE	DATE
	5-23-75

MSC FORM 2089B (A.G 67)

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FRRID III.5.23.3
GSE (CI4-626) ELECTRICAL POWER SUPPLY

PROBLEM:

- UNIT FAILED TO COME ON IN RESPONSE TO AC START SIGNAL FROM ACE CONTROL ROOM PROBLEM RECURRED FOR TEN ATTEMPTS TO START (UNEXPLAINED ANOMALY)
- ON THE ELEVENTH COMMAND (APPROX. 24 MINUTES LATER) THE UNIT REACTED PROPERLY AND PROBLEM HAS NOT BEEN DUPLICATED SINCE

TROUBLESHOOTING:

- COMMAND DID GET TO LC39 AND AT LEAST AS FAR AS THE CI4-481
- FACILITY POWER CIRCUITRY WAS NOT AT FAULT
- NO INTERMITTENT CIRCUITRY COULD BE FOUND IN CABLING AND PATCHING ASSOCIATED WITH THE START COMMAND
- PROBLEM DEFINITELY ISOLATED TO GSE AND ONLY WITH POWER-UP SEQUENCE

CONCLUSION:

- PROBLEM ISOLATED TO GSE, NOT IN SC III
- IF PROBLEM RECURS, IT IS ASSOCIATED ONLY WITH POWER-UP SEQUENCE. POSSIBLE IMPACT TO LAUNCH MINIMAL SINCE FINAL POWER-UP OCCURS APPROXIMATELY ONE WEEK PRIOR TO LAUNCH.
- MOST PROBABLE CAUSE IS CONTACT FILM ON RELAY(S) A3K3, A3K5, A3K8 IN THE CI4-481

FLIGHT READINESS REVIEW ITEM DISPOSITION (FRRID)

Customer's Review Item Definition Sheet

S/C	SYSTEM	SYSTEM NUMBER	FRRID NUMBER
CSM-111	Ground Support Equipment	5.23	111.5.23.3

INITIATOR	ORGANIZATION	DATE
D. Greenly/J.J.F.	SR&QA	5/22/75

REFERENCE DOCUMENTATION: IDR 041 vs TCP-K-0005, DR LUT-1-0041

PART NUMBER: C14-626

PROBLEM

(TITLE) GSE (C14-626) Electrical Power Supply (Unexplained Anomaly)

C14-626, Electrical Power Distribution Rack, Power Supply No. 3 (P.S.#3) failed to start when commanded "on" by ACE Control Room R-start during integrated systems testing (TCP-0005). Troubleshooting failed to isolate cause of the subject condition.

RECOMMENDED ACTION/JUSTIFICATION

Submitted for information only.

RECOMMENDED CONSTRAINT

None.

PRE-BOARD COMMENTS/REMARKS/DIRECTION ☐ REFER TO BOARD ☐ DISPOSITIONED (See Disposition Summary)

ACTION REQUIRED TO CLOSE FRRID

BOARD COMMENTS/REMARKS/DIRECTION

ACTION REQUIRED TO CLOSE FRRID

DECISION SUMMARY *(To be filled in by the Board or Pre-Board)*

☐ ACTION ☐ CONTRACTOR ☐ NASA

Approved:

- ☐ MANDATORY THIS S/C — CAT. I
- ☐ MANDATORY S/C SUBS — CAT. II
- ☐ STUDY & SUBMIT ECP — CAT. III
- ☐ CLOSED - NO ACTION REQ'D — CAT. IV
- ☐ DISAPPROVED — CAT. V
- ☐ OTHER (Specify) — CAT. VI

☐ HARDWARE ☐ SOFTWARE

Constraint: ☐ Yes ☐ No

- ☐ CDDT
- ☐ FDT
- ☐ LAUNCH
- ☐ MISSION
- ☐ OTHER

SIGNATURE OF NASA BOARD CHAIRMAN | DATE

MSC FORM 2089A (REV JAN 68)

FLIGHT READINESS REVIEW ITEM DISPOSITION (FRRID)

Contractor's Review Item Resolution Sheet

S/C	SYSTEM	SYSTEM NUMBER	FRRID NUMBER
CSM 111	Ground Support Equipment	5.23	111.5.23.3

ORIGINATOR	DEPT.	DATE
S. Taylor		5-23-75

REFERENCE DOCUMENTATION: LUT DR 1-0041

PROBLEM TITLE: GSE (C14-626) Electrical Power Supply (Unexplained Anomaly)

RESOLUTION/ACTION TO BE TAKEN (Use continuation sheets as required)

Initial discrepancy occurred at 08:58:31 E on 4-7-75 during power-up for TCP K-0005. At this time, the AC start command for Power Supply No. 3 was executed from the ACE Control Room. The power supply failed to come on.

Immediate troubleshooting disclosed that signal did get to LC39 at least as far as to energize the fan circuits in the C14-481.

A facility power switching action had occurred in the same time frame but was verified to have been completed approximately 20 minutes before the anomaly.

The AC start circuitry was instrumented with VOM's and was monitored from 4-10-75 thru 4-21-75 during all S/C power-up exercised. The discrepancy did not repeat.

Additional troubleshooting investigated all cabling and patches in the suspect circuitry but disclosed no intermittent operation.

Circuit review and troubleshooting data indicate the following:

1. The problem is definitely isolated to GSE and is in no way associated with SC 111 wiring or equipment.
2. The problem if it recurs is associated only with power-up sequence. Once the system is activated, possible impact to launch is negligible since final power-up occurs approximately one week before launch.
3. Most probable cause is contact film on relay(s) A3K3, A3K5, A3K8 in the C14-481.

AUTHORIZED NAA REPRESENTATIVE: Original Signed by: S. Taylor | DATE: 5-30-75

MSC FORM 2089B (AUG 67) NASA — MSC

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FRRID 111.5.23.4
GSE (S14-121) W/G REFRIGERATION UNIT

PROBLEM:

- S14-121 REFRIGERATION UNIT PRESSURE CYCLING BETWEEN 150 TO 200 PSIG
- AFTER PURGING THE REGULATOR THE PROBLEM COULD NOT BE DUPLICATED (UNEXPLAINED ANOMALY)

TROUBLESHOOTING:

- PROBLEM ISOLATED TO REGULATOR (R4) ON S14-121
- AFTER MONITORING REGULATOR FOR THREE WEEKS REGULATOR CYCLING HAD NOT RECURRED

DISCUSSION:

- IF REGULATOR CYCLING RECURS, DOWNSTREAM REGULATORS WILL MAINTAIN PROPER SYSTEM PRESSURES
- SYSTEM IS PROTECTED WITH A RELIEF VALVE

CONCLUSION:

- PROBLEM ISOLATED TO GSE
- MOST PROBABLE CAUSE WAS CONTAMINATION ON REGULATOR SEATS
- PRIMARY AND BACKUP REFRIGERATION UNITS SUPPORT LAUNCH OPERATIONS

FRRID III.5.29.1
SPARE FIRE EXTINGUISHERS

PROBLEM:

- LACK OF LAUNCH READY SPARE FIRE EXTINGUISHER FOR CSM III/DM-2

DISCUSSION:

- INSTALLATION/SPARE REQUIREMENTS
  - CM UNIT IS INSTALLED 48 HR PRIOR TO LAUNCH
  - THE DM UNIT IS INSTALLED 48 HR PRIOR TO DM CLOSEOUT; I.E., DM STOW FOR LAUNCH 6-24-75
  - CHARGED SPARES ARE NOT AVAILABLE AT KSC IF DAMAGE OCCURS TO THE FIRE EXTINGUISHER DURING THE TRANSFER TO THE PAD OR DURING INSTALLATION
  - CSM 118 DID NOT HAVE BACKUP UNIT PROVIDED AT KSC
- DM SPARE
  - TWO UNCHARGED SPARES ARE AVAILABLE AT SWRI
  - INSTALLATION DATE (6-24-75) ALLOWS SUFFICIENT RECYCLE TIME FOR CHARGE AND SHIPMENT OF SPARE UNIT FROM SWRI TO KSC
  - CHARGE AND SHIP TIME 5 DAYS

DISCUSSION (CON'T)

CM SPARE

- ONE UNCHARGED SPARE AVAILABLE AT SWRI (ASSIGNED TO CSM 119) (LAST CSM UNIT IN INVENTORY)
- INSUFFICIENT RECYCLE TIME FOR CHARGE AND SHIPMENT DUE TO INSTALLATION SCHEDULE

CHARGED CSM 119 LIGHTNING TEST UNIT PRESENTLY AT KSC

- AGE LIFE EXPIRES 7-22-75 AT ONE YEAR
- SWRI/NASA TEST DATA SHOWS ADEQUATE FOAM VOLUME/DENSITY AFTER SHAKING INDICATING EMULSION RESTORATION
- INFLIGHT TEST DATA (SL-OWS EXTINGUISHER) SHOWS THAT MISSION STORAGE UNDER ZERO G DOES NOT DISRUPT EMULSIFICATION

SPARE FIRE EXTINGUISHERS

CONCLUSION:

- DM SPARE NOT REQUIRED AT KSC
  - SUFFICIENT RECYCLE TIME FOR CHARGE AND SHIPMENT OF SPARE UNIT FROM SWRI TO KSC
- CSM III SPARE
  - UTILIZE CSM 119 LIGHTNING TEST UNIT FOR JULY LAUNCH OPPORTUNITIES (JULY 15-19) BASED ON:
    - SHORT EXTENSION OF AGE LIFE (AFTER LAUNCH)
    - TEST DATA SHOWS:
      - ADEQUATE FOAM DENSITY AND VOLUME AFTER SHAKING (SPEC REQUIREMENT TO SHAKE WITHIN 48 HR OF LAUNCH)
      - EMULSION STABLE IN ZERO G

FLIGHT READINESS REVIEW ITEM DISPOSITION (FRRID)

Customer's Review Item Definition Sheet

S/C	SYSTEM	SYSTEM NUMBER	FRRID NUMBER
CM/DM	Fire Extinguisher	5.29	111.5.29.1

INITIATOR	ORGANIZATION	DATE
O. Lindsey/JSC	Safety	5/22/75

REFERENCE DOCUMENTATION

PART NUMBER

PROBLEM

TITLE: Lack of Launch Ready Spare Fire Extinguishers

Present information indicates that the two extinguishers presently on order for charging will satisfy flight requirements, with no spares.

NOTE: Age life for existing "old" fire extinguisher (1 total) expires on July 22, 1975.

RECOMMENDED ACTION/JUSTIFICATION

Provide flight spares (-0005/-0006)

RECOMMENDED CONSTRAINT

Launch closeout.

PRE BOARD COMMENTS/REMARKS DIRECTION ☐ REFER TO BOARD ☐ DISPOSITIONED (See Decision Summary)

ACTION REQUIRED TO CLOSE FRRID

BOARD COMMENTS/REMARKS DIRECTION

ACTION REQUIRED TO CLOSE FRRID

DECISION SUMMARY *(To be filled in by the Board or Pre-Board)*

☐ ACTION ☐ CONTRACTOR ☐ NASA

Approved:

- ☐ MANDATORY THIS S/C — CAT. I
- ☐ MANDATORY S/C SUBS — CAT. II
- ☐ STUDY & SUBMIT ECP — CAT. III
- ☐ CLOSED - NO ACTION REQ'D — CAT. IV
- ☐ DISAPPROVED — CAT. V
- ☐ OTHER -Specify — CAT. VI

☐ HARDWARE ☐ SOFTWARE

Controlled:

- ☐ CDR
- ☐ PCR
- ☐ LAUNCH
- ☐ MISSION
- ☐ OTHER

☐ Yes ☐ No

SIGNATURE OF NASA BOARD CHAIRMAN

DATE

MSC FORM 2089A (REV JAN 68)

FLIGHT READINESS REVIEW ITEM DISPOSITION (FRRID)

Contractor's Review Item Resolution Sheet

TITLE:

Lack of Launch Ready Spare Fire Extinguishers

(Continue on additional sheets as required)

Presently two flight fire extinguishers (one each for DM and CM) are at KSC in support of the ASTP Mission.

The CSM fire extinguisher is installed in the spacecraft 48 hours prior to launch and the DM extinguisher 48 hours prior to DM closeout, i.e., DM stow for launch. No spares have been assigned to support the ASTP Mission in the event damage occurs to the flight extinguishers during transfer to the Pad or during installation in the spacecraft.

Spares have been available at KSC on previous missions because the assets of the next spacecraft in line supported as a backup. It should be noted, however, that Spacecraft 118 did not have a backup fire extinguisher due to the nature of the CSM 119 mission, which was rescue, and charging of the unit was withheld pending identification of a rescue mission.

With respect to a DM spare, there are presently two uncharged units at Southwest Research Institute (SWRI). The installation schedule for the DM fire extinguisher (6-24-75) allows sufficient recycle time for charge and shipment of a spare unit from SWRI to KSC in the event damage should occur. Charge and shipment time would be approximately five days. Based on this turnaround time, a spare is not required at KSC for DM-2.

With respect to a CM spare, only one uncharged unit is left in the inventory at SWRI. Due to the installation schedule of the CM unit, sufficient recycle time is not available to charge and ship an extinguisher from SWRI to KSC.

A second charged CM unit is presently at KSC. That extinguisher was charged to support the CSM 119 lightning test and has a birth date of 7-22-74. Due to extinguisher age life of one year, the unit's service life will expire prior to completion of the mission.

Emulsion stability is the major criterion in establishing extinguisher age life at one year. SWRI and NASA test data have shown that, after shaking, adequate foam density and volume were evident for post flight and extended shelf aged units, indicating emulsion stability. SWRI test data also indicates that mission storage under Zero G does not degrade emulsion stability to the extent encountered in one G.

To support the SWRI test data inflight testing of the Skylab OWS extinguisher established that the emulsification was not distributed.

Based on the short extension of age life and prelaunch shake requirement to restore emulsification, plus the fact that the age life of the 119 extinguisher expires in zero gravity for a July ASTP Mission, it is recommended that the CSM 119 fire extinguisher be allocated to CSM 111 as a backup unit.

AUTHORIZED NASA REPRESENTATIVE: W. F. Fleming

DATE: 6-2-75

MSC FORM 2089B (AUG 67)

NASA — MSC

ORIGINAL PAGE IS OF POOR QUALITY

GENERAL STATUS

ASTP CSM III FRR
GENERAL STATUS

- OPEN PROGRAM FAILURES & UNSATISFACTORY CONDITIONS - ONE NEW ITEM
- OPEN LAUNCH IMPACT GSE PROBLEMS - NONE
- LIMITED LIFE SUMMARY - NO OPEN ISSUES
- REUSE HARDWARE SUMMARY - 209 ITEMS
- CRITICAL SINGLE FAILURE POINT SUMMARY - 2 NEW ITEMS
- CERTIFICATION STATUS - COMPLETE
- STRESS CORROSION SURVEY - COMPLETE
- CONTRACTOR SAFETY ASSESSMENT - FLIGHT READY
- OPERATIONAL DATA BOOK, HANDBOOK & FLIGHT DATA FILE STATUS - ON SCHEDULE
- ICD/SCN STATUS - COMPLETE
- WAIVER/DEVIATION SUMMARY - 5 WAIVERS
- TRSD WAIVER SUMMARY - 13 WAIVERS
- LAUNCH CRITICAL SPARES SUMMARY - ON SITE

ASTP CSM III FRR
OPEN PROGRAM FAILURES & SIGNIFICANT UNSATISFACTORY CONDITIONS

- OPEN PROBLEMS APPLICABLE TO ASTP - 1
  - FAILURES OCCURRING ON ASTP - 1
  - OPEN SIGNIFICANT UNSATISFACTORY CONDITION PROBLEMS - 0

ASTP CSM III FRR
OPEN LAUNCH IMPACT GSE PROBLEMS

THERE ARE NO OPEN
LAUNCH IMPACT GSE PROBLEMS

MA0201-5695 - AGE LIFE

NO AGE CONTROLLED / TIME ACTION ITEMS EXCEED SPEC REQ'MTS

ALL ACTIVITIES COMPLETED

MA0201-0077 - OPERATING TIME/CYCLE

NO TIME OR CYCLE LIMITED ITEMS EXCEED SPEC REQUIREMENTS

THRU MISSION COMPLETION

ASTP CSM III FRR
AGE CONFIDENCE

- CSM III HARDWARE AGE IS WITHIN ALAS STUDY LIMITS - 10 YRS OR PER SPEC
- ASTP UNIQUE HARDWARE IS WITHIN DESIGN CRITERIA - 5 YRS OR PER SPEC
- AGE LIMITED HARDWARE IS WITHIN SPEC LIMITS - SUMMARY FOLLOWS

ITEM	LIMITING ITEM	MARGIN*
PARACHUTES	PACK LIFE	14 MO
SPS/RCS VALVES	RESISTAZINE 88	11 MO
LES MOTORS	PROPELLANT	15 MO
ORDNANCE	EXPLOSIVE	15 MO OR MORE (SLA 8 MO)
BATTERIES	DRY/CHARGED LIFE	PRELAUNCH CHARGE
FIRE EXTINGUISHER	FOAM EMULSION	10 MO
ELECTRONIC BOXES	POLYESTER POLYURETHANES	8 MO OR MORE
CHLORINE/BUFFER AMPULES	CHEMICAL DEGRADATION	PRELAUNCH CHARGE
FECAL COLLECTORS	ADHESIVE	8 MO

* LAUNCH DATE VS SPEC LIMIT BASED ON EVALUATION DOCUMENTED BY ALAS

AGE LIFE ANALYSIS

ALL NON-METALLICS & MOVING METALLIC MATERIALS

- AGE LIFE ANALYSIS CONSIDERED
  - MATERIALS INVOLVED
  - FUNCTION OF PART
  - ENVIRONMENT
  - STRESS/LOAD
  - CRITICALITY & FAILURE MODE
  - FAILURE HISTORY

AGE LIFE SUBSTANTIATING DATA FROM:

- INDUSTRY USAGE/TESTS
- CHEMICAL COMPOSITION
- SD & JSC CONDUCTED TESTS ON NATURALLY AGED PARTS & ON ACCELERATED AGED PARTS

RESULTS

- ANALYSIS COMPLETED ON APOLLO/SKYLAB PARTS OVER THREE YEARS OLD
- PARTS WITH AGE LIFE < 10 YEARS SPEC CONTROLLED
- REDUCED QUANTITY OF AGE-CONTROLLED PARTS

ASTP CSM III FRR
HARDWARE REUSE SUMMARY

	COMMAND MODULE	SERVICE MODULE	DOCKING MODULE	TOTAL
STRUCTURE	0	12	12	24
MECHANICAL	1	0	11	12
ENVIRONMENTAL CONTROL	4	2	16	22
REACTION CONTROL	0	28	—	28
INSTRUMENTATION	1	0	2	3
ELECTRICAL POWER	6	4	0	10
STABILIZATION CONTROL	3	—	—	3
COMMUNICATIONS	6	0	4	10
CREW EQUIPMENT	55	—	8	63
DISPLAY/CONTROLS	24	—	9	33
SERVICE PROPULSION	—	1	—	1
TOTAL	100	47	62	209

TYPICAL REFURBISHMENT REQUIREMENTS

- ELECTRICAL/ELECTRONIC COMPONENTS
  - PHYSICAL INSPECTION
  - NON-ENVIRONMENTAL FUNCTIONAL
- MECHANISMS
  - INSPECTION
  - CLEANING
  - REPLACEMENTS - IF REQUIRED
  - FUNCTIONAL
- STATIC
  - INSPECTION (X-RAY, DYE PEN, ETC)
  - RE-PROOF - IF APPLICABLE

SUMMARY

CSM 111 REUSE FLIGHT HARDWARE LIST

Item	HRE	ASHUR	Part Number	Serial Number	Nomenclature	System	CSM Flown
1.	NR1598	112565	40849-306-1	063594580BBA	Relay Assembly	3.08	112
2.	NR1599	112565	40849-306-1	063594581BBA	Relay Assembly	3.08	112
3.	NR1607	112565	40849-306-1	063594844BBA	Relay Assembly	3.08	112
4.	NR1608	112565	40849-306-1	063594848BBA	Relay Assembly	3.08	112
5.	NR1426	110555	ME284-0147-0071	004000048104	Valve	8.05	110
6.	NR1575	110555	ME284-0147-0071	004000118113	Valve	8.05	113
7.	NR1431	110555	ME284-0147-0071	004000118121	Valve	8.05	113
8.	NR1576	110555	ME284-0147-0071	004000118123	Valve	8.05	113
9.	NR1499	112554	ME284-0150-0031	004000048107	Metering Valve	8.05	112
10.	NR1583	112560	ME284-0191-0051	004000078182	Valve	8.05	113
11.	NR1582	110573	ME284-0306-0001	004000036114	Valve	8.05	110
12.	NR1714	104516	ME284-0360-0001	103020000002	Valve	8.05	2TV1
13.	NR1588	104516	ME284-0360-0001	103020000003	Valve	8.05	2TV1
14.	NR1590	104516	ME284-0360-0001	103020000022	Valve	8.05	109
15.	NR1591	104516	ME284-0360-0001	103020000041	Valve	8.05	113

SUMMARY

DATE 5-5-75

SECTION 40

CSM 111 REUSE FLIGHT HARDWARE LIST

Item	HRE	ASHUR	Part Number	Serial Number	Nomenclature	System	CSM Flown
16.	NR1687	112552	ME286-0034-0002	066002007605	Filter	8.05	113
17.	NR1688	112552	ME286-0034-0002	066002007655	Filter	8.05	113
18.	NR1381	108077	ME286-0047-0001	004000049102	Separator, H20, Hyd	2.05	114
19.	NR1862	A0013	ME361-0003-0002	06362YCC0587	Tube Assembly	8.03	105
20.	NR1863	A0013	ME361-0003-0002	06362YCC0592	Tube Assembly	8.03	098
21.	NR1807	110553	ME430-0006-0006	063595405AYA	Caution Detection	8.14	116
22.	NR1720	109534	ME432-0170-0145	097602245103	Meter	8.14	112
23.	NR1721	109534	ME432-0170-0145	097602245104	Meter	8.14	110
24.	NR1734	112145	ME432-0170-0148	097607948102	Indicating Meter	8.14	110
25.	NR1263	112079	ME435-0043-0003	053338060024	Data Rec. Recorder	2.07	112
26.	NR1373	110556	ME449-0045-0041	004000050013	Transducer	2.05	112
27.	NR1549	112556	ME449-0129-0004	004000000039	Transducer	8.05	113
28.	NR1901	113545	ME452-0102-4101	057750035904	Switch, Toggle	2.14	117
29.	NR1900	113545	ME452-0102-4101	057750035890	Switch, Toggle	2.14	117

SUMMARY

DATE 5-5-75

CSM 111 REUSE FLIGHT HARDWARE LIST

SECTION 40

Item	HRE	ASHUR	Part Number	Serial Number	Nomenclature	System	CSM Flown
30.	NR1896	113545	ME452-0102-4101	057750016855	Switch, Toggle	2.14	117
31.	NR1898	113545	ME452-0102-4101	057750035869	Switch, Toggle	2.14	117
32.	NR1895	113545	ME452-0102-4101	057759272765	Switch, Toggle	2.14	117
33.	NR1899	113545	ME452-0102-4101	057750035886	Switch, Toggle	2.14	117
34.	NR1902	113545	ME452-0102-4101	057750262933	Switch, Toggle	2.14	117
35.	NR1894	113545	ME452-0102-4101	057759153745	Switch, Toggle	2.14	117
36.	NR1903	113545	ME452-0102-4101	057759098713	Switch, Toggle	2.14	117
37.	NR1927	113545	ME452-0102-4101	057750016863	Switch, Toggle	2.14	117
38.	NR1905	113545	ME452-0102-4201	057759297057	Switch, Toggle	2.14	117
39.	NR1784	113545	ME452-0102-5101	057750016861	Switch, Toggle	2.14	112
40.	NR1786	113545	ME452-0102-5101	057759272775	Switch, Toggle	2.14	112
41.	NR1789	113545	ME452-0102-5201	057759298102	Switch, Toggle	2.14	113
42.	NR1783	113545	ME452-0102-5101	057750016846	Switch	8.14	113
43.	NR1781	113545	ME452-0102-5101	057750016822	Switch	8.14	113

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SUMMARY

CSM 111 REUSE FLIGHT HARDWARE LIST

Item	HRE	ASHUR	Part Number	Serial Number	Nomenclature	System	CSM Flown
44.	NR1782	113545	ME452-0102-5101	057750016838	Switch	8.14	113
45.	NR1785	113545	ME452-0102-5101	057750016862	Switch	8.14	112
46.	NR1780	113545	ME452-0102-5101	057750016810	Switch	8.14	112
47.	NR1946	116525	ME455-0005-0034	013980000010	Relay	2.14	117
48.	NR1945	116525	ME455-0005-0034	013980000013	Relay	2.14	116
49.	NR1944	116525	ME455-0005-0034	013980000004	Relay	2.14	117
50.	NR1639	112134	ME478-0067-0014	071368030008	VHF/AM Equipment	2.11	113
51.	NR1724	112551	ME492-0010-0031	004000046143	Fan	8.05	110
52.	NR2132	117507	ME493-0010-0402	10028AAB1041	Gyro, B-MAG	2.10	113
53.	NR2134	117507	ME493-0010-0402	10028BAB1033	Gyro, B-MAG	2.10	116
54.	NR1377	110109	ME901-0706-0402	10028BAF1017	Reaction Controller	2.10	112
55.	NR1382	100010	ST2730001ME0001	073800003925	Fitting, Dynatube	3.06	100
56.	NR1383	100010	ST2730001ME0001	073800003926	Fitting, Dynatube	3.06	100
57.	NR1348	100010	ST2730001ME0004	073800003819	Fitting, Dynatube	3.06	100

SUMMARY

CSM 111 REUSE FLIGHT HARDWARE LIST

Item	HRE	ASHUR	Part Number	Serial Number	Nomenclature	System	CSM Flown
58.	NR1350	100010	ST2730001ME0004	073800003821	Fitting, Dynatube	3.06	100
59.	NR1351	100010	ST2730001ME0004	073800003822	Fitting, Dynatube	3.06	100
60.	NR1356	100010	ST2730001ME0008	073800003827	Fitting, Dynatube	3.06	100
61.	NR1357	100010	ST2730001ME0008	073800003828	Fitting, Dynatube	3.06	100
62.	NR1358	100010	ST2730001ME0008	073800003829	Fitting, Dynatube	3.06	100
63.	NR1359	100010	ST2730001ME0008	073800003830	Fitting, Dynatube	3.06	100
64.	NR1674	3RC2-003	ST2840021ME0005	102320270013	Valve, Solenoid	3.06	100
65.	NR1675	3RC2-003	ST2840021ME0005	102320470023	Valve, Solenoid	3.06	100
66.	NR1676	3RC2-003	ST2840021ME0005	102320470030	Valve, Solenoid	3.06	100
67.	NR1677	3RC2-003	ST2840021ME0005	102320470033	Valve, Solenoid	3.06	100
68.	NR1829	3RC2-003	ST2840021ME0006	102320270004	Valve, Solenoid	3.06	100
69.	NR1339	3RC2-003	ST2840021ME0006	102320270008	Valve, Solenoid	3.06	100
70.	NR1340	3RC2-003	ST2840021ME0006	102320270009	Valve, Solenoid	3.06	100
71.	NR1378	3RC2-003	ST2840021ME0006	102320470032	Valve, Solenoid	3.06	100

SUMMARY

CSM 111 REUSE FLIGHT HARDWARE LIST

Item	HRE	ASHUR	Part Number	Serial Number	Nomenclature	System	CSM Flown
72.	NR1678	3RC2-003	ST2840021ME0006	102320570035	Valve, Solenoid	3.06	100
73.	NR1717	109533	V36-331435	06362YCC0879	Bracket	8.13	110
74.	NR1725	109533	V36-331443	06362YCC0881	Strap	8.13	109
75.	NR1795	A0011	V36-326637	06362YCC1160	Ring	8.03	117
76.	NR1796	A0011	V36-326642	06362YCC1169	Handle	8.03	117
77.	NR2065	110052	V36-421457-11	06361A024060	Cable, Vac. Cleaner	2.08	114
78.	NR1729	114514	V36-421649-21	06362AAJ1374	Cable	2.08	114
79.	NR1857	116516	V36-441352-31	06362YCC0903	Cover	2.13	116
80.	NR2008	2TV1518	V36-444226-81	06362YCC1387	Wire Clamp	2.08	098
81.	NR2009	2TV1518	V36-444280-31	06362YCC1388	Clip	2.08	098
82.	NR1798	A0011	V36-553740	06362YCC1149	Guide Assembly	8.03	117
83.	NR1794	A0011	V36-553759-11	06362YCC1147	Ring Assembly	8.03	117
84.	NR1775	110091	V36-575101-841	06361A014178	Docking Probe	2.03	110
85.	NR1587	116511	V36-601015-401	06362AAJ9077	Containers	8.13	116
86.	NR1826	116520	V36-601207-71	06362AAJ8046	Umbilical - Oxygen	2.13	116

SUMMARY

CSM 111 REUSE FLIGHT HARDWARE LIST

Item	HRE	ASHUR	Part Number	Serial Number	Nomenclature	System	CSM Flown
87.	NR1732	116523	V36-601519	06362AAJ9976	Hex Socket	2.13	116
88.	NR2066	114503	V36-601520-101	06362AAJ5416	Container	2.13	114
89.	NR1454	114503	V36-601522-101	06362AAJ5415	Container	2.13	114
90.	NR1555	116500	V36-601596	06362AAJ8936	Mount - COAS	2.13	116
91.	NR2077	114501	V36-601632-211	06362AAJ9882	Container	2.13	116
92.	NR2078	114501	V36-601632-211	06362AAJ9887	Container	2.13	117
93.	NR2074	114501	V36-601632-211	06362AAK1395	Container	2.13	118
94.	NR2075	114501	V36-601632-211	06362AAK1396	Container	2.13	118
95.	NR2076	114501	V36-601632-211	06362AAK1397	Container	2.13	118
96.	NR2060	116523	V36-601400-11	06362AAH7926	Emergency Wrench	8.13	113
97.	NR1872	110579	V36-610041-101	06362AAH5916	Coldplate	3.05	117
98.	NR1871	110579	V36-610041-101 (Reworked into -301)	06362AAG9510	Coldplate	3.05	113
99.	NR2062	110578	V36-610109-21	06362AAJ6276	Coldplate	2.05	117
100.	NR1527	110571	V36-613305-17	06362AAK2865	Temp. Controller	2.05	112

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SUMMARY

CSM 111 REUSE FLIGHT HARDWARE LIST

Item	HRE	ASHUR	Part Number	Serial Number	Nomenclature	System	CSM Flown
101.	NR1557	112546	V36-715100-41 (Reworked to -71)	06362AAJ4976	CCU Head	8.11	114
102.	NR1594	112546	V36-715100-41 (Reworked to -71)	06362AAJ3079	CCU Head	8.11	114
103.	NR1420	112545	V36-715104-71 (Reworked to -121)	06362AAH6036	CCU Cable	8.11	114
104.	NR2046	112135	V36-715501	06362AAK4942	Pre-Mod Processor	2.11	116
105.	NR2038	112590	V36-756146	06362AAJ6745	Camera Mount	2.13	113
106.	NR1833	110552	V36-759529	06362AAH9713	Current Limiter	8.07	113
107.	NR1736	110552	V36-759533	06362AAG6182	Current Limiter	8.07	110
108.	NR2131	113538	V36-761111-861	06362AAH5422	Panel No. 1	2.14	113
109.	NR1809	113536	V36-761117-41	06362AAJ0016	Panel No. 7	2.14	113
110.	NR2127	113543	V36-761201	06362AAH6665	Panel No. 2	2.14	113
111.	NR1840-R1	113539	V36-761203-831	06362AAH6675	Panel No. 3	2.14	113
112.	NR1343	113535	V36-762290-31	06362AAJ8981	Panel No. 277	2.14	113
113.	NR1642	108524	V36-784013-231	06362AAJ7175	Container	2.13	110

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SUMMARY

CSM 111 REUSE FLIGHT HARDWARE LIST

Item	HRE	ASHUR	Part Number	Serial Number	Nomenclature	System	CSM Flown
114.	NR1953	109538	V36-784013-281	06362AAJ7200	Container	2.13	110
115.	NR1892	109538	V36-784013-321	06362AAK2716	Container	2.13	116
116.	NR1638	108524	V36-787344	06362AAJ8436	Container	2.13	114
117.	NR1854	108524	V36-787800	06362AAJ8392	Container	2.13	112
118.	NR1865	109538	V36-787803-71	06362AAJ7172	Container	2.13	110
119.	NR1643	108524	V36-787803-71	06362AAJ6480	Container	2.13	110
120.	NR1851	108524	V36-787806-41	06362AAJ5666	Container	2.13	114
121.	NR1686	108524	V36-787808	06362AAJ6376	Container	2.13	112
122.	NR1852	108524	V36-787829	06362AAJ5715	Container	2.13	112
123.	NR1853	108524	V36-787830 (Reworked into -11)	06362AAJ6460	Container	2.13	112
124.	NR1838	A0011	V52-314001-21 (Reworked into -31)	06362AAK4011	Hatch	8.03	104
125.	NR1837	A0011	V52-314001-11 (Reworked into -41)	06362AAK4009	Hatch	8.03	117
126.	NR2025	A0013	V52-550300-11 (Reworked into -31)	06362AAK2735	Control Assembly	8.03	110

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SUMMARY

CSM 111 REUSE FLIGHT HARDWARE LIST

Item	HRE	ASHUR	Part Number	Serial Number	Nomenclature	System	CSM Flown
127.	NR2026	A0013	V52-550300-21 (Reworked into -41)	06362AAK2737	Control Assembly	8.03	113
128.	NR2052	117526	V52-782023-11 (Reworked into -11)	06362AAK1406	Locker D3	8.13	117
129.	NR2016	116514	V56-317565-5	06362YCC1348	Pin	8.01	118
130.	NR2017	116514	V56-317565-5	06362YCC1349	Pin	8.01	118
131.	NR2018	116514	V56-317565-5	06362YCC1350	Pin	8.01	118
132.	NR2019	116514	V56-317565-7	06362YCC1351	Pin	8.01	118
133.	NR2020	116514	V56-317565-7	06362YCC1352	Pin	8.01	118
134.	NR2021	116514	V56-317565-7	06362YCC1353	Pin	8.01	118
135.	NR2022	116514	V56-317565-9	06362YCC1354	Pin	8.01	118
136.	NR2023	116514	V56-317565-9	06362YCC1355	Pin	8.01	118
137.	NR2024	116514	V56-317565-9	06362YCC1356	Pin	8.01	118
138.	NR2045	119500	V56-331706-501	06362AAJ9334	Locker	2.13	Mock-Up
139.	NR1859	116516	V56-441353	06362YCC0904	Cover	2.13	116

FORM 3916-E REV. 2-70

SPACE DIVISION
NORTH AMERICAN ROCKWELL CORPORATION

SUMMARY

DATE 5-5-75
SECTION 40

CSM 111 REUSE FLIGHT HARDWARE LIST

Item	HRE	ASHUR	Part Number	Serial Number	Nomenclature	System	CSM Flown
140.	NR1860	116516	V56-441425-1	06362YCC0905	Cover	2.13	116
141.	NR1861	116516	V56-441425-2	06362YCC0906	Cover	2.13	116
142.	NR1841	116515	V56-442260	06362AAJ5350	SCS J-Box	2.08	116
143.	NR1646	116514	V56-532001-11	06362YCC0909	Latch Assembly	2.13	116
144.	NR1647	116514	V56-532001-11	06362YCC0910	Latch Assembly	2.13	116
145.	NR1648	116514	V56-532001-11	06362YCC0911	Latch Assembly	2.13	116
146.	NR1649	116514	V56-532001-11	06362YCC0934	Latch Assembly	2.13	116
147.	NR1650	116514	V56-532001-11	06362YCC0935	Latch Assembly	2.13	116
148.	NR1651	116514	V56-532001-11	06362YCC0936	Latch Assembly	2.13	116
149.	NR1652	116514	V56-532001-11	06362YCC0940	Latch Assembly	2.13	116
150.	NR1653	116514	V56-532001-11	06362YCC0965	Latch Assembly	2.13	116
151.	NR2056	116514	V56-532001-11	06362YCC1357	Latch Assembly	8.01	118
152.	NR2057	116514	V56-532001-11	06362YCC1358	Latch Assembly	8.01	118
153.	NR2058	116514	V56-532001-11	06362YCC1359	Latch Assembly	8.01	118

FORM 3916-E REV. 2-70

SUMMARY

CSM 111 REUSE FLIGHT HARDWARE LIST

Item	HRE	ASHUR	Part Number	Serial Number	Nomenclature	System	CSM Flown
154.	NR1458	114501	V56-601029	06362AAJ8082	Container	2.13	114
155.	NR2055	114501	V56-601029	06362AAK0304	Container	2.13	117
156.	NR1884	109538	V56-601061	06362AAK0130	Strap	2.13	116
157.	NR1885	109538	V56-601061	06362AAK0131	Strap	2.13	116
158.	NR1886	109538	V56-601061	06362AAK0132	Strap	2.13	116
159.	NR1887	109538	V56-601061	06362AAK0133	Strap	2.13	116
160.	NR1888	109538	V56-601061	06362AAK0134	Strap	2.13	116
161.	NR1889	109538	V56-601061	06362AAK0135	Strap	2.13	116
162.	NR1890	109538	V56-601061-11	06362AAK0136	Strap	2.13	117
163.	NR1891	109538	V56-601061-11	06362AAK0137	Strap	2.13	117
164.	NR1749	116501	V56-715500-21	06362AAJ5552	Speaker Box	2.11	116
165.	NR2054	108524	V56-786573-151	06362AAK1145	Container	2.13	117
166.	NR1880	105541	V57-321602	06362YCC1296	Shelf	3.01	105
167.	NR1371	105533	V57-326455	06362YCC0416	Pin	3.01	105

SUMMARY

CSM 111 REUSE FLIGHT HARDWARE LIST

Item	HRE	ASHUR	Part Number	Serial Number	Nomenclature	System	CSM Flown
168.	NR1370	105533	V57-326455	06362YCC0419	Pin	3.01	105
169.	NR1363	105533	V57-326456	06362YCC0417	Angle	3.01	105
170.	NR1364	105533	V57-326456	06362YCC0420	Angle	3.01	105
171.	NR1365	105533	V57-339815	06362YCC0407	Support	3.01	105
172.	NR1366	105533	V57-339817	06362YCC0408	Fitting	3.01	105
173.	NR1367	105533	V57-339818	06362YCC0413	Fitting	3.01	105
174.	NR1368	105533	V57-339824	06362YCC0409	Fitting	3.01	105
175.	NR1360	105533	V57-339829	06362YCC0410	Fitting	3.01	105
176.	NR1361	105533	V57-339862	06362YCC0411	Fitting	3.01	105
177.	NR1362	105533	V57-339866	06362YCC0412	Brace	3.01	105
178.	NR1752	100011	V57-400106-11	06362AAJ4961	PSM	3.06	105
179.	NR1690	100012	V57-400160-41	06362AAK1729	RCS Prop. Manifold	3.06	100
180.	NR1655	100012	V57-400160-41	06362AAK1730	RCS Prop. Manifold	3.06	100
181.	NR1644	100012	V57-400160-42	06362AAK1740	RCS Prop. Manifold	3.06	100
182.	NR1637	100012	V57-400160-42	06362AAK1741	RCS Prop. Manifold	3.06	100

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SUMMARY

CSM 111 REUSE FLIGHT HARDWARE LIST

Item	HRE	ASHUR	Part Number	Serial Number	Nomenclature	System	CSM Flown
183.	NR1488	3RC2-002	V57-460106	06362AAJ4101	Helium Tank Assy.	3.06	100
184.	NR1489	3RC2-002	V57-460106	06362AAJ4102	Helium Tank Assy.	3.06	100
185.	NR1490	3RC2-002	V57-460106	06362AAJ4103	Helium Tank Assy.	3.06	100
186.	NR1372	105532	V57-460218	06362YCC0418	Support	3.18	105
187.	NR1744	100009	V57-470143	06362YCC0898	Clamp Set	3.06	100
188.	NR1745	100009	V57-470143	06362YCC0899	Clamp Set	3.06	100
189.	NR1503	112555	828510-5-1 (ME284-0370-0001)	004000087138	Regulator, EMG 02	8.05	112
190.	NR2067	112139	ME478-0070-0007	061418020018	S-Band	2.11	118
191.	NR2107	112139	ME478-0070-0009	061418020022	S-Band	2.11	117
192.	NR2053	112535	V36-715501	06362AAK4943	PMP	2.11	117
193.	NR1797	A0011	V36-553730	06362YCC1148	Handle Rel. Assy.	8.03	117

SUMMARY

CSM 111 REUSE FLIGHT HARDWARE LIST

(Hardware Assigned/Installed After 5-5-75)

Item	HRE	ASHUR	Part Number	Serial Number	Nomenclature	System	CSM Flown
194.	NR1338	112041	V36-421851	06362AAJ8469	Cable	2.08	114
195.	NR2068	108524	V36-601015-401	06362AAJ9075	Stowage Bag	2.13	116
196.	NR1463	113085	V36-601170-31	06362AAJ2242	Snap Assy.	2.13	113
197.	NR1753	116523	V36-601311-31	06362YCC1156	Tether	2.13	116
198.	NR1730	116523	V36-601511	06362AAJ6764	Tool W	2.13	116
199.	NR1731	116523	V36-601515	06362AAJ7165	Tool 4	8.13	116
200.	NR1418	113503	V36-762035	10166FCA0166	Actuator	2.14	114
201.	NR1609	108524	V36-780022-11	06362YCC0841	Strap	2.13	110
202.	NR1616	108524	V36-780022-31	06362YCC0848	Strap	2.13	109
203.	NR1848	108524	V36-780901-71	06362YCC0856	Strap	8.13	113
204.	NR1864	109538	V36-787803-71	06362AAJ3206	Mag	2.13	109
205.	NR2086	108524	V36-788020-11	06362AAJ0670	Strap	8.13	113
206.	NR2040	119500	V56-331704-301	06362AAJ9332	Locker	2.13	Mockup
207.	NR1779	116501	V56-715500-31	06362AAK1077	Box Assy.	8.11	117

FORM 3916-E REV. 2-70

SUMMARY

CSM 111 REUSE FLIGHT HARDWARE LIST

(Hardware Assigned/Installed After 5-5-75)

Item	HRE	ASHUR	Part Number	Serial Number	Nomenclature	System	CSM Flown
208.	(1)	110594	V56-786517-61	06362AAJ8555	Container	2.13	116
209.	(2)	117533	ME456-0044-0003	10098DET3036	Digital Event Timer	2.14	118

(1) HRE package submitted to NASA 5-23-75

(2) HRE package in preparation

ASTP SINGLE FAILURE POINT SUMMARY
CSM 111/SLA 18/DM 2/DS 5

- TOTAL CRITICALITY I SFP'S — 270
  - CRITICALITY I SFP'S ASSOCIATED WITH NEW HARDWARE (DM) — 5

    $2N_2$ TANKS ON DM 2 (BURST) .... ADEQUATE DESIGN
    PROOF PRESSURE CHECK
    $2\ O_2$ TANKS ON DM 2 (BURST) .... NO INTERNAL SOURCES OF PRESSURE INCREASE

    *DOCKING TARGET (STRUCTURAL FAILURE/IMPACT WITH SIVB DOME)

- TOTAL CRITICALITY II SFP'S — 1645
  - CRITICALITY II SFP'S ASSOCIATED WITH NEW HARDWARE (DM/DS) — 117

    *ECS W/G SHUT-OFF VALVE

*NEW ITEMS SINCE ASTP SFP'S BASELINE RELEASE

CRITICAL SINGLE FAILURE POINT SUMMARY (SFPS)

- SINCE ASTP SFPS RELEASE (BASELINE, FEB. 1974)
- NEW CRITICALITY I
  - ONE NEW ITEM
    - DOCKING TARGET INSTALLATION ON DOCKING MODULE
      - POSSIBLE IMPACT OF TARGET ON DOME OF SIVB LH_2 PROPELLANT TANK DURING LAUNCH
      - HAZARD TO SPACECRAFT/CREW IF FIRE OR EXPLOSION OCCURS
      - ADEQUATE STRENGTH MARGINS VERIFIED BY ANALYSIS - FACTOR OF SAFETY IS 2.2
- NEW CRITICALITY II (CREW SAFETY)
  - ONE NEW ITEM
    - ECS W/G SHUT-OFF (DIVERTER) VALVE (ITEM 2.36C) ADDED FOR ELECTROPHORESIS EXPERIMENT (MA-014)
    - EXTERNAL W/G LEAKAGE
      - LOSS OF W/G INTO CM

ASTP CSM III FRR
OPEN CERTIFICATION STATUS

ALL CERTIFICATION TESTS

AND

ANALYSES ARE COMPLETE

ASTP - CSM III FRR
CONTRACTOR SAFETY ASSESSMENT

- ALL ACCIDENT/INCIDENTS INVESTIGATED AND CLOSED
- SAFETY REVIEW OF TEST DOCUMENTS COMPLETED
- ALL CSM III AND DM-2 WAIVERS CONCURRED WITH BY SAFETY
- ALL FMEA'S CONCURRED WITH BY SAFETY
- CLOSEOUT CREW INCAPACITATED EGRESS TRAINING COMPLETED
- HYPERGOLICS, CRYOGENICS AND HI-PRESSURE GROUND CREW CERTIFICATION PROGRAM UP TO DATE

SD SAFETY CONCURS IN CSM III/DM-2 FLIGHT READINESS

SPACE DIVISION CERTIFIES THAT ALL DATA AND PROCEDURES NECESSARY TO SUPPORT THE CSM III MISSION HAVE BEEN IDENTIFIED AND WILL BE AVAILABLE TO SUPPORT THE MISSION.

ASTP CSM III FRR
ICD/SCN STATUS

ALL CSM III ICD/IRN'S

AND

SCN'S HAVE BEEN SUBMITTED TO NASA

ASTP CSM 111 FRR
ICD/IRN STATUS

- INTERCENTER 3
  - No Hardware items Open
  - Three Documentation IRN's in Work
- INTRACENTER 1
  - One IRN to UVA Experiment ICD to Reflect Adapter Plug - In Work

ASTP CSM III FRR
WAIVER/DEVIATION SUMMARY

WAIVER NO.	SUBJECT	REMARKS/RATIONALE
CSM 0163	H_2 PRESSURE SWITCH EXCEEDED UPPER LIMIT ACTUATION PRESSURES (261 PSIA SHOULD BE 260 PSIA MAX)	VALVE MODULE PRESSURE SWITCH DEMONSTRATED REPEATABILITY AT 261 PSIA FOR 10 CONSECUTIVE CYCLES.
CSM 0246	WAIVER POWER REDUNDANCY OF THE CF0073P SECONDARY DUCT PRESSURE TRANSDUCER (ITEM 8.17)	MEASUREMENT PERFORMS SATISFACTORILY ON MAIN "A" BUS PWR. MEASUREMENT PROVIDES INFO ONLY, DOES NOT AFFECT THE FUNCTION OF THE W/G EVAPORATOR OPERATION AND IS NOT MANDATORY FOR FLIGHT.
CSM 0247	FLIGHT DOCKING PROBE NOT AVAILABLE FOR TEST (DCS 0131)	DOCKING PROBE C/O PERFORMED UTILIZING PROBE ASSIGNED TO CSM 119. THIS TEST VERIFIED THE CM DOCKING SYSTEM PERFORMANCE REQUIREMENTS.

ASTP CSM III FRR
WAIVER/DEVIATION SUMMARY

WAIVER NO.	SUBJECT	REMARKS/RATIONALE
DM 006	WEIGHT AND BALANCE OF FLIGHT CONFIGURATION DM	DS-3 UTILIZED IN PLACE OF DS-5 DUE TO AVAILABILITY AND SAME MASS DISTRIBUTION.
DS 007	DIMENSIONAL NONCONFORMANCE WITH IED 50004.5 REQUIREMENTS	DIMENSIONAL / FORCES MARGINALLY OUT OF IED TOLERANCES DO NOT AFFECT THE FUNCTIONAL PERFORMANCE OF DS.

ASTP CSM III FRR
TRSD WAIVER SUMMARY

WAIVER NO.	OUT OF SPEC CONDITION	RATIONALE FOR ACCEPTANCE
LO-PO-III-01	WINTEC PSM GAS CHECKOUT FILTER/ QD ASSEMBLIES REQUIRED TO BE RECERTIFIED AFTER USE ON THREE SPACECRAFT.	SINCE UNITS ARE WELDED ASSEMBLIES NEW FILTERS WOULD BE REQUIRED. COST WOULD BE EXCESSIVE FOR ONE-TIME USE. ALL FILTER/QD ASSEMBLIES ARE FLUSHED AND VERIFIED CLEAN TO LEVEL I OF MA0610-017 AFTER EACH S/C USE.
LO-PO-III-02	HYDROGEN TANK NO. I PRESSURE SWITCH ACTUATION OCCURS AT 269 PSIA. MAX OPERATING POINT SHOULD BE 265 PSIA.	MAX OPERATING POINT IS SPECIFIED TO MAINTAIN A MIN 5 PSI DIFFERENTIAL WITH MIN C&W TRIP POINT OF 270 PSIA. ACTUAL C&W TRIP POINT IS 280 PSIA SO DIFFERENTIAL IS MAINTAINED.
LO-PO-III-03	HAND HELD DM PRESSURE GAGE CALIBRATION OUT OF TOLERANCE (HIGH) BY 0.5 MM AT 450 MM TEST PRESSURE.	OUT OF TOLERANCE POINT IS NOT IN THE PROGRAMMED UTILIZATION RANGE OF THE GAGE.

ASTP CSM III FRR
TRSD WAIVER SUMMARY

WAIVER NO.	OUT OF SPEC CONDITION	RATIONALE FOR ACCEPTANCE
LO-PO-III-04	DS-5 LATCH NO. 1 REQUIRED RELEASE LOAD OF 21.4 LB WITH SYSTEM A AND 16.5 LB WITH SYSTEM B. MAX LOAD SHOULD BE 12.3 LB WITH LOAD APPLIED PARALLEL TO LATCH HOUSING.	TOOL AND LOAD CONFIGURATION CONDITIONS EXISTING WHEN APPLYING LOAD PARALLEL TO LATCH HOUSING RESULT IN INCONSISTENT AND INACCURATE TEST RESULTS. TESTS USING QUAL TEST TOOLING TO APPLY LOAD PARALLEL TO X-AXIS MORE CLOSELY SIMULATES FLIGHT CONDITIONS AND PROVIDES MORE ACCURATE RESULTS. RELEASE LOAD WITH BOTH SYSTEMS WAS 9.3 LB; SHOULD BE 8.8 LB PER MA0208-3511. THIS RELEASE FORCE IS NOT DETRIMENTAL TO SYSTEM OPERATION.
LO-PO-III-05	MA-010 FURNACE EXPERIMENT SYSTEM LEAKAGE WAS 1.54×10^{-6} SCC He/SEC MAX. ALLOWABLE IS 1×10^{-7} SCC He/SEC. ELECTRICAL CONN - 5.28×10^{-7} BOLTED FLANGE - 9.0×10^{-7}	THIS AMOUNT OF LEAKAGE IS NOT DETRIMENTAL TO EXPERIMENT PERFORMANCE.

ASTP CSM III FRR
TRSD WAIVER SUMMARY

WAIVER NO.	OUT OF SPEC CONDITION	RATIONALE FOR ACCEPTANCE
LO-PO-III-06	NOISE INTERFERENCE NOTED ON TV VIDEO WHEN PROCESSING AMPLIFIER WAS SWITCHED TO BYPASS MODE.	INTERFERENCE EXISTS ONLY IN BYPASS MODE WHICH IS A FAILURE MODE AND THEN CAN BE ELIMINATED BY TURNING OFF THE SYNCH STRIPPER BOX IN THE DM. THIS PERFORMANCE IS ACCEPTABLE FOR THE ASTP MISSION. FILTERS HAVE BEEN ADDED TO TV CAMERAS.
LO-PO-III-07	INVERTER AND SPS CONTROL BOX MOTOR SWITCHES EXCEEDED 70 MS TRANSFER TIME.	FAILURE MODE ANALYSIS INDICATES THAT PERFORMANCE IS ACCEPTABLE FOR FLIGHT. ALL SWITCHES RETURNED TO SPEC REQUIREMENT AFTER ADDITIONAL CYCLING.
LO-PO-III-08	CM RCS HELIUM TANK TEMPERATURES WENT BELOW 40 DEG F DURING VENTING. (CM A TANK 31 DEG, CM B TANK 33 DEG)	IMMEDIATE INVESTIGATION SHOWED NO EVIDENCE OF CONDENSATION ON HARDWARE.
LO-PO-III-09	QUAD D PRIMARY NO. 2 OUTLET PRESSURE WAS 176 PSIG; SHOULD BE 177 MIN.	DISCREPANCY DOES NOT COMPROMISE SYSTEM PERFORMANCE AND DOES NOT WARRANT HARDWARE REPLACEMENT.

ASTP CSM III FRR
TRSD WAIVER SUMMARY

WAIVER NO.	OUT OF SPEC CONDITION	RATIONALE FOR ACCEPTANCE
LO-PO-III-10	QUAD A PROPELLANT ISOLATION VALVES LEAKED 50 SCC/15 MIN; SHOULD BE 25 SCC/15 MIN MAX.	VALVES WERE CYCLED SIX TIMES AND LEAKAGE DECREASED TO 18 SCC/15 MIN.
LO-PO-III-11	QUAD A He ISOLATION VALVE LEAKAGE WAS 90 SCC/30 MIN. QUAD B He ISOLATION VALVE LEAKAGE WAS 55 SCC/30 MIN. LEAKAGE SHOULD BE 60 SCC/HR MAX.	VALVES ARE ONLY USED AS EMERGENCY SHUT-OFF DURING MISSION. IN THIS EVENT THE PRESSURE INCREASE RESULTING FROM LEAKAGE IS TOLERABLE BECAUSE OF CONTINUOUS USE OF RCS FOR ATTITUDE CONTROL DURING MISSION.
LO-PO-III-12	CM RCS SYSTEM 2 TEST PORT TP18 LEAKAGE WAS 1.7×10^{-6} SCC/SEC (IND.); SHOULD BE 1×10^{-7} MAX (IND.).	FITTING DOES NOT SEE PRESSURE UNTIL LAST HOUR OF FLIGHT. POSSIBLE LEAKAGE WILL NOT BE DETRIMENTAL TO SYSTEM PERFORMANCE AND IS BELOW LIQUID LEAKAGE THRESHOLD.

ASTP CSM III FRR
TRSD WAIVER SUMMARY

WAIVER NO.	OUT OF SPEC CONDITION	RATIONALE FOR ACCEPTANCE
LO-PO-III-13	CM RCS BURST DISC HOUSING LEAKAGE WAS: SYS. 1 - 1.05×10^{-6} SCC/SEC (IND.) SYS. 2 - 2.25×10^{-7} SCC/SEC (IND.) SHOULD BE: 1×10^{-7} SCC/SEC MAX (IND.)	FITTING DOES NOT SEE PRESSURE UNTIL LAST HOUR OF FLIGHT. POSSIBLE LEAKAGE WILL NOT BE DETRIMENTAL TO SYSTEM PERFORMANCE AND IS BELOW LIQUID LEAKAGE THRESHOLD.

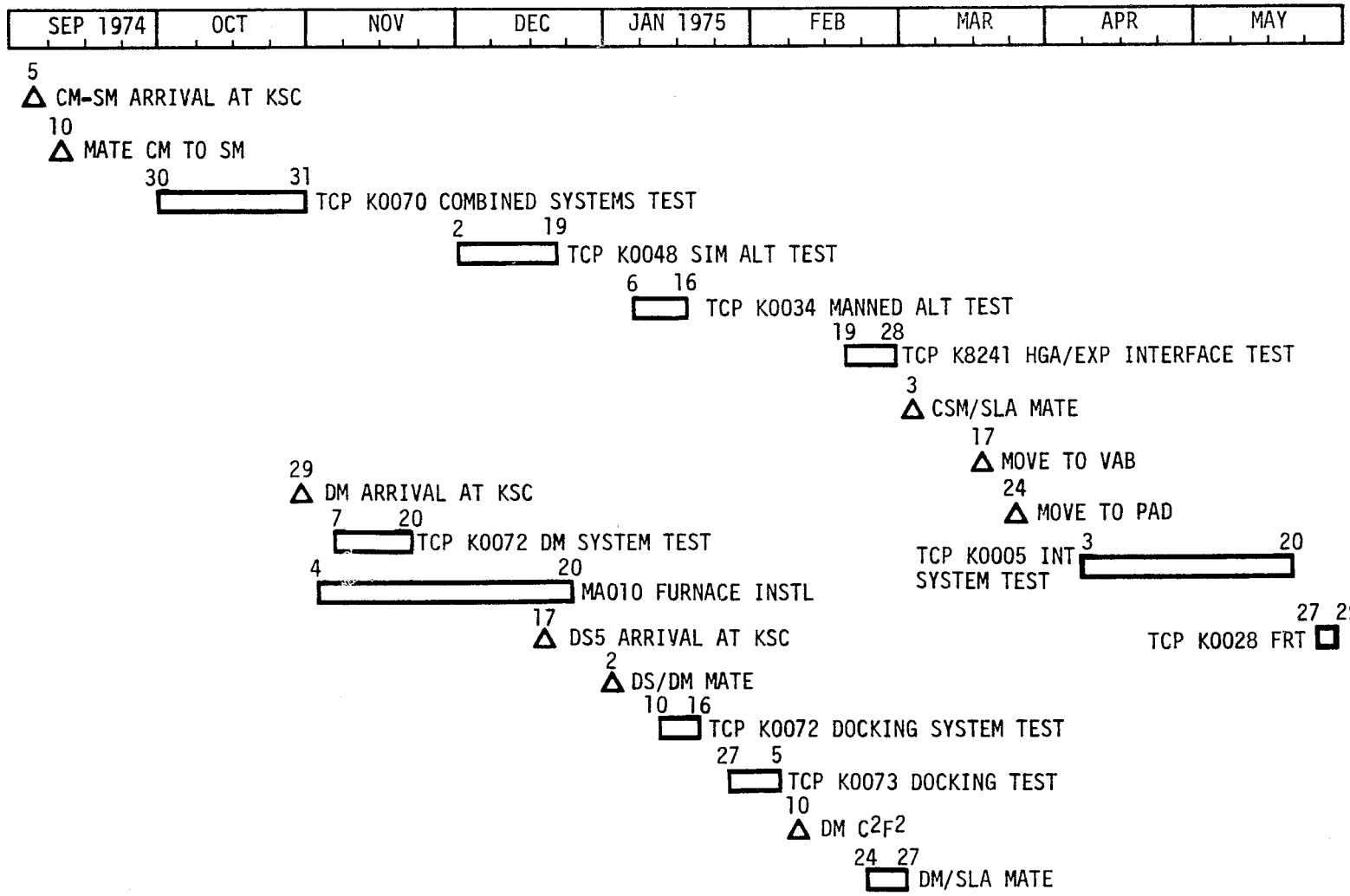
ASTP CSM III FRR
LAUNCH CRITICAL SPARES SUMMARY

ALL CSM & GSE LAUNCH

CRITICAL SPARES ARE AVAILABLE AT KSC

KSC HISTORY AND OPEN WORK

ASTP CSM 111 FRR
KSC CHECKOUT HISTORY



ASTP CSM III FRR
SIGNIFICANT HARDWARE MODIFICATIONS AT KSC

DATE COMPLETED	MODIFICATION
11-5-74	CORRECT WIRING IN IRIG TIMING FOR X-RAY EXPERIMENT
11-11-74	UDL CONTROL OF ATS-6/ASTP POWER AMPLIFIERS
1-6-75	INSPECT AND CHANGE SELECTED THREADED FASTENERS TO PROVIDE PROPER ENGAGEMENT IN NUT LOCKING FEATURE
1-13-75	DS STRIKER PLATE CHANGE TO PROVIDE INCREASED RAMP SLOPE
1-28-75	ADD SUIT TO CABIN DELTA-P TRANSDUCER TO REPLACE ORIGINAL
2-11-75	RELOCATE DOPPLER ANTENNA TO OPPOSITE SIDE OF DM. ADD CORK RAMP AND RTV SEAL TO INSTALL BOLTS ON SM DOPPLER ANTENNA
2-12-75	MA-010 FURNACE INSTALLATION • VENT LINE • MOUNTING INSERTS • CABLE RELOCATION • HERMETICALLY SEALED VENT AND ISOLATION VALVES
2-17-75	TEST FUSIBLE LINKS AND INSPECT SWIVEL BEARINGS IN EXP. DOORS
2-24-75	ADD RF FILTER BETWEEN VHF-FM TRANSCEIVER AND ANTENNA

ASTP CSM III FRR
SIGNIFICANT HARDWARE MODIFICATIONS AT KSC

DATE COMPLETED	MODIFICATION
3-11-75	ADD BLOCKING DIODE TO ELIMINATE OMNI A SNEAK CIRCUIT
3-11-75	ISOLATE GROUNDING OF VIDEO COAX SHIELD SYSTEM IN DM • LIFT JUMPER WIRE ON TB 102 • ISOLATE SAFETY WIRE ON ADJACENT COAX CONNECTORS
3-12-75	FLOODLIGHT RELOCATION FOR IMPROVED TV LIGHTING
3-25-75	PROVIDE SLA 18 MODIFICATIONS TO ACCOMMODATE DM INSTALLATION • PROVIDE TRUSS SUPPORTING STRUCTURE AND TIEDOWNS • PROVIDE MECHANICAL AND ORDNANCE RETENTION AND SEPARATION SYSTEMS • PROVIDE SEPARATION SEQUENCING CIRCUITRY • PROVIDE DOCKING TARGET INSTALLATION • DELETE LM FLYAWAY UMBILICAL ASSEMBLY
5-27-75	ADD CORK TO SM
5-27-75	ADD PYRO BUS TIE CIRCUIT BREAKER TO PANEL 229

ASTP CSM III FRR
SIGNIFICANT HARDWARE REPLACEMENTS

DATE	ITEM	FAILURE	DOCUMENTATION
9-20-74	QD 64	LEAKAGE	DR S/C 0029
9-23-74	QD 65	LEAKAGE	DR S/C 0030
10-23-74	O_2 SURGE TANK ISOLATION VALVE	LEAKAGE THRU SEAT	DR S/C 0049
11-20-74	MAIN O_2 REGULATOR ASSEMBLY	LEAKAGE THRU SHUT-OFF VALVE SEAT	DR DM 0019
11-21-74	C&W MATRIX ASSY	SUSPECTED SHORT TO GROUND	DR S/C 0070
12-11-74	VALVE ASSY, MA-010 EXPERIMENT	LEAKAGE THRU ISOLATION VALVE SEAT	DR DM 0026
12-19-74	USBE	INTERNAL FASTENER PROBLEM	S/C TPS 19, SAR 276
1-9-75	SUIT/CABIN ΔP TRANSDUCER	INCORRECT PRESSURE INDICATION DURING CABIN PRESSURE TRANSIENTS	DR S/C 0104
	ATS POWER AMPLIFIER	UNIT SUBJECTED TO OVERTEMPERATURE	DR S/C 0130

ASTP CSM III FRR
SIGNIFICANT HARDWARE REPLACEMENTS

DATE	ITEM	FAILURE	DOCUMENTATION
1-10-75	QUAD A FUEL PRESSURE TRANSDUCER	LEAK IN REFERENCE BELLOWS	DR S/C 0103
1-22-75	VIDEO TAPE RECORDER	TAPE INDICATOR	DR S/C 0059
2-5-75	FLOODLIGHT ASSY	DIM FILAMENT	DR DM 0052
2-6-75	HGA REED SWITCH	DALMO VICTOR MOD	S/C TPS 62, SAR 291
2-14-75	DM INTERIOR WIRE HARNESS	INTERMITTENT CONNECTION ON P6 COAX SHIELD	DR DM 0061
2-24-75	CONTROL UNIT	RESOLVER WIRE BROKEN	DR S/C 0150
3-5-75	THERMAL CONTROL TAPE	COVER FILM ADHESION	DR S/C 0037
	BMAG	STICTION TEST	DR S/C 0039, TPS 8, SAR 246, 292
3-10-75	COAX TRANSFER SWITCH	SUSPECTED FAULTY TRANSFER	DR S/C 0055

ASTP CSM III FRR
SIGNIFICANT HARDWARE REPLACEMENTS

DATE	ITEM	FAILURE	DOCUMENTATION
5-3-75	GYRO DATA COUPLER	YAW ATTITUDE ERROR OUT OF TOLERANCE (LOW)	DR S/C 0162
	ATTITUDE SET CONTROL PANEL	HIGH RESISTANCE IN YAW RESOLVER	DR S/C 0162
5-7-75	PANEL 306 DIGITAL EVENT TIMER	TIMING ERROR OF ONE MINUTE IN 2 HOURS	DR S/C 0163
	INTERCOM VOLUME CONTROL	CONTROL SHAFT BINDING	DR S/C 0164
5-14-75	PANEL I DIGITAL EVENT TIMER	DID NOT RESET FROM ABORT SIGNAL	DR S/C 180
5-20-75	PANEL 306 DIGITAL EVENT TIMER	PAINT MISSING FROM 4 DIGIT IN TENTHS MINUTES WINDOW	DR S/C 185
5-30-75	PANEL I DIGITAL EVENT TIMER	TIMING ERROR 20 MINUTES; SHOULD BE 18 MINUTES	DR S/C 197

ASTP CSM III FRR
KSC OPEN MODIFICATIONS

FINAL STOWAGE MODS - EQUIP, LABEL, VELCRO CHANGES

COMPLETE BY 6-5-75

ASTP CSM 111 FRR
OPEN TESTING