PAGE: 1 PRINT DATE: 03/02/90

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: MO-AA4-610-X

SUBSYSTEM NAME: STABILIZED PAYLOAD DEPLOYMENT SYSTEM
REVISION : 2 03/01/90

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
■ SRU :	THRUSTER ASSEMBLY	MC297-0047

PART DATA

■ EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
THRUSTER ASSEMBLY - STABILIZED PAYLOAD DEPLOYMENT SYSTEM
THERE ARE THREE MAJOR PARTS TO THIS DEVICE: THRUSTER, WITH MOVEABLE BUT SHEAR PIN FIXED PISTON (CFE) AND DUAL PRESSURE CARTRIDGE (CFE)/NSI (GFE) ASSEMBLIES.

■ REFERENCE DESIGNATORS: V54X0864E
: V54X0844E
: V54X0812E
: V54X0822E
: V54X0845E
: V54X0866E
: V54X0841E
: V54X0823E

■ QUANTITY OF LIKE ITEMS: 2
ONE PER PEDESTAL

■ FUNCTION:
THIS ITEM IS A STANDBY DEVICE WHOSE PURPOSE IS TO ACTUATE THE COUPLER (V790-544005) AND CAUSE THE PRIMARY/SECONDARY ROTARY ACTUATORS TO DECOUPLE/COUPLE AND THUS CHANGE THE DRIVING PEDESTAL WHEN REQUIRED. THE DEVICE OPERATES WITH PISTON MOVEMENT RESPONSE TO PYROTECHNICALLY GENERATED GAS PRESSURE, REACTING AGAINST THE COUPLER; SEE MO-AA4-605. THE THRUSTER IS FITTED WITH DUAL NSI/PRESSURE CARTRIDGE ASSEMBLIES TO ACTUATE A SINGLE PISTON. WHEN THE DEVICE IS SELECTED AND FIRED BY ELECTRIAL IMPULSE THE SEQUENCE OF EVENTS IS: NSI FIRES, PRESSURE CARTRIDGE IGNITES, GAS PRESSURE ACCUMULATES, PISTON MOVEMENT IS INITIATED, PISTON SHEAR PIN IS FRACTURED, PISTON MOVEMENT CONTINUES FULL STROKE. AT THE END OF TRAVEL, GAS PRESSURE FORCES CAUSE THE PISTON FLANGE TO DEFORM AND 'LOCK' THE PISTON IN PLACE. THE SPECIFICATION FOR THE NSI, NASA SLB 26100052/SKB 26100066, INCLUDES A "NO FIRE" CONDITION OF ONE AMP AND ONE WATT THROUGH ITS BRIDGEWIRE FOR FIVE MINUTES OVER THE TEMPERATURE RANGE -265F TO + 165F. NOTE: FOR INADVERTENT OPERATION DUE TO A STRAY ELECTRICAL IMPULSE TO OCCUR, A SERIES OF EARLIER

FAILURES WOULD BE NECESSARY. TYPICAL OF THESE IS THE NON-CREDIBLE EVENT OF A CIRCUIT BREAKER SHORTING CLOSED FROM AN INTENTIONALLY OPEN CONDITION.

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: MO-AA4-610-01

REVISION# 2 03/01/90

SUBSYSTEM: STABILIZED PAYLOAD DEPLOYMENT SYSTEM

ITEM NAME: THRUSTER ASSEMBLY

CRITICALITY OF THIS FAILURE MODE:1/1

■ FAILURE MODE:
PREMATURE OPERATION

MISSION PHASE:

PL	PRELAUNCH
LO	LIFT-OFF
RTLS	RETURN TO LAUNCH SITE
TAL	TRANS ATLANTIC ABORT
AOA	ABORT ONCE AROUND
ATO	ABORT TO ORBIT
OO	ON-ORBIT
DO	DE-ORBIT

■ VEHICLE/PAYLOAD/KIT EFFECTIVITY: 102 COLUMBIA
: 103 DISCOVERY
: 104 ATLANTIS
: 105 ENDEAVOUR

■ CAUSE:
INADVERTENT OPERATION (OR IGNITION) OF THE NSI OR OF THE PRESSURE CARTRIDGE BY AN UNKNOWN SOURCE.

■ CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

■ REDUNDANCY SCREEN A) N/A
■ B) N/A
■ C) N/A

PASS/FAIL RATIONALE:
■ A)
SCREEN A IS N/A BECAUSE THE ITEM IS A PYROTECHNIC DEVICE.

■ B)
SCREEN B IS N/A BECAUSE THE ITEM IS A PYROTECHNIC DEVICE.

■ C)
SCREEN C IS N/A BECAUSE THE ITEM IS A PYROTECHNIC DEVICE.

■ MASTER MEAS. LIST NUMBERS: V54X0845E
: V54X0865E

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: MO-AA4-610-01

: V54X0841E
: V54X0823E
: V54X0844E
: V54X0864E
: V54X0812E
: V54X0822E

- FAILURE EFFECTS -

■ (A) SUBSYSTEM:
PREMATURE OR INADVERTENT OPERATION OF A THRUSTER WOULD CAUSE EITHER:
(1) THE PRIMARY PEDESTAL ROTARY DRIVE UNIT TO BE DECOUPLED WHICH WOULD STOP MOVEMENT OF THE PEDESTALS FOR LOSS OF DRIVE POWER, OR
(2) THE SECONDARY PEDESTAL ROTARY DRIVE UNIT TO BE COUPLED WHICH WOULD STOP MOVEMENT OF THE PEDESTALS BY THE PRESSURE OF THE BRAKES IN THE SECONDARY PEDESTAL ACTUATOR MOTORS.

■ (B) INTERFACING SUBSYSTEM(S):
INADVERTENT OR PREMATURE OPERATION OF ONE OF THE THRUSTERS WOULD CAUSE:
(1) THE PAYLOAD TO BE HALTED IN MID-DEPLOYMENT, OR
(2) REPOSITIONING OF THE DISCONNECT ASSEMBLY TO STOP, OR
(3) LOSS OF NORMAL COMMAND PROCEDURES AND THE NECESSITY TO USE ALTERNATIVE ACTIONS.

■ (C) MISSION:
POTENTIAL MISSION LOSS IF A PAYLOAD IN MID-DEPLOYMENT CANNOT BE DEPLOYED OR MUST BE EITHER REBERTHED OR JETTISONED.

■ (D) CREW, VEHICLE, AND ELEMENT(S):
POTENTIAL FOR EXTRANEOUS WORKLOAD ON THE OPERATORS TO DETERMINE THE EXTENT OF THE NEW CONDITIONS AND INITIATE WORKAROUND PROCEDURES DEPENDENT ON THE POSITION OF THE PAYLOAD WHEN THE FAILURE OCCURS. OCCURRENCE OF THIS FAILURE MODE DURING DEPLOYMENT COULD LEAVE THE PAYLOAD IN MID-POSITION WITH THE POTENTIAL OF BEING UNABLE TO CLOSE THE PAYLOAD BAY DOORS. OCCURRENCE DURING REPOSITIONING OF THE DISCONNECT ASSEMBLIES COULD REQUIRE ADDITIONAL CREW ACTIVITY TO ASSESS CONDITIONS AND IMPOSE ALTERNATIVE ACTIONS.

■ (E) FUNCTIONAL CRITICALITY EFFECTS:
THE INABILITY TO SELECTIVELY MOVE THE PAYLOAD THROUGH COMMANDS TO THE PEDESTAL(S). PREMATURE ACTION OF THE THRUSTER RESULTS IN AN INDETERMINATE POSITION OF THE PAYLOAD WITH THE POTENTIAL OF BEING UNABLE TO CLOSE THE PAYLOAD BAY DOORS.

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- DISPOSITION RATIONALE -

■ (A) DESIGN:
THE THRUSTER ASSEMBLY IS MADE OF HIGH STRENGTH CORROSION RESISTANT MATERIAL FOR SPACE ENVIRONMENT USE. THE DESIGN SHOWS POSITIVE STRUCTURAL MARGIN BY ANALYSIS AND MEETS 1.4 MINIMUM FACTOR OF SAFETY.

■ (B) TEST:
QUALIFICATION TESTS BY THE SUPPLIER HAVE BEEN SUCCESSFULLY COMPLETED. DETAILS OF THESE TESTS ARE DOCUMENTED IN SPACE ORDNANCE SYSTEMS REPORT QTR 9212, REV. B, QUALIFICATION TEST REPORT FOR THRUSTER ASSEMBLY, DATED 30 MAY 1989.
OMRSD: GROUND TURNAROUND-FREQUENCY OF CHECKOUT IS MISSION DEPENDENT.
PEDESTAL DRIVE TRANSFER INDICATIONS
S0790A.130

■ (C) INSPECTION:
ALL DIMENSIONAL CHARACTERISTICS ARE VERIFIED BY INSPECTION. PROCESSES ARE VERIFIED BY INSPECTION EITHER AT ROCKWELL OR AT SUPPLIER FACILITIES. CLEANLINESS AND MATERIAL CERTIFICATION ARE VERIFICATION BY INSPECTION.

■ (D) FAILURE HISTORY:
AD5858-010.- During the tests for qualification of the MC325-0047-0003 Thruster, the attached Coupler, V790-544005-002, failed to engage mechanically when the Thruster was fired. Testing was being conducted at the Supplier's (Space Ordnance Systems) facilities and in accordance with the Supplier's document QTP 9151, paragraph 6.4.1 (MC325-0047 paragraph 4.2.4.1.14). When required by the test, Thruster actuation occurred as planned without the accompanying mechanical engagement of the Coupler. SubCAR AD5858-012 was prepared to direct evaluation of the Coupler. Testing revealed that the Coupler required excessive force and its linear movement was too short. X-ray photographs, physical measurements, manual operations, and other evidence suggests that the anomaly resides in the Coupler. Corrective Action Report AD5957-010 includes detail discussion of the findings of an examination of the V790-544005-002 Coupler.

■ (E) OPERATIONAL USE:
NONE

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- APPROVALS -

RELIABILITY ENGINEERING	W. R. MARLOWE	3-6-90
DESIGN ENGINEERING	G. CAMPBELL	3/7/90
QUALITY ENGINEERING	M. F. MERGEN	
NASA RELIABILITY	G. E	3/7/90
NASA SUBSYSTEM MANAGER		9/25/90
NASA QUALITY ASSURANCE		9/4/90 9/4/90