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PRINT DATE: 09/12/88

FAILURE MODES EFFECTS ANALYSIS (FMEA) NUMBER: P7-2B-CRW6-X

SUBSYSTEM NAME: SIDE HATCH JETTISON

REVISION : 09/12/88

CLASSIFICATION	NAME	PART NUMBER
LRU	THRUSTER ASSEMBLY	MC325-0041-0001
SRU	CARTRIDGE ASSEMBLY, THRUSTER	MC325-0041-0002

QUANTITY OF LIKE ITEMS: 6

DESCRIPTION/FUNCTION:

EACH CARTRIDGE ASSEMBLY, TWO PER THRUSTER ASSEMBLY, CONTAINS MOUNTING PROVISIONS FOR SINGLE SMDC INPUT AND INCORPORATES DUAL FIRING PINS AND PERCUSSION PRIMERS. UPON INITIATION OF THE INPUT SMDC THE REGION BEHIND THE CARTRIDGE PISTON IS PRESSURIZED AND THE PISTON IS DRIVEN FORWARD WHERE IT IMPACTS THE FIRING PINS AND THEY IN TURN STRIKE THE PERCUSSION PRIMERS. THE PRIMER OUTPUT IGNITES THE CARTRIDGE IGNITION CHARGE WHICH IN TURN IGNITES THE CARTRIDGE OUTPUT CHARGE. THE OUTPUT CHARGE FORMS THE SUSTAINED PRESSURE NECESSARY FOR PROPER THRUSTER ASSEMBLY OPERATION

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SUMMARY

SUBSYSTEM NAME: SIDE HATCH JETTISON  
LRU :THRUSTER ASSEMBLY  
LRU PART #: MC325-0041-0001  
ITEM NAME: CARTRIDGE ASSEMBLY, THRUSTER

FMEA NUMBER	ABBREVIATED FAILURE MODE DESCRIPTION	CIL FLG	CRIT	HE FL
P7-2B-CRW6-01	NO OUTPUT OR FAILS OFF	X	1R2	

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FAILURE MODES EFFECTS ANALYSIS (FMEA) NUMBER: P7-2B-CRW6-01

REVISION: 09/12/88

SUBSYSTEM: SIDE HATCH JETTISON  
LRU :THRUSTER ASSEMBLY  
ITEM NAME: CARTRIDGE ASSEMBLY, THRUSTER

CRITICALITY OF THIS  
FAILURE MODE: 1R2

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FAILURE MODE:  
LOW/NO OUTPUT

MISSION PHASE:

RTLS RETURN TO LAUNCH SITE  
TAL TRANS ATLANTIC ABORT  
AOA ABORT ONCE AROUND  
DO DE-ORBIT  
LS LANDING SEQUENCE

VEHICLE/PAYLOAD/KIT EFFECTIVITY: 102 COLUMBIA  
: 103 DISCOVERY  
: 104 ATLANTIS  
: 105 NEW ORBITER

CAUSE:

CONTAMINATED PYRO MIX, STRUCTURAL FAILURE, OVERSTRENGTH SHEAR PIN, LOSS OF ETS INPUT.

CRITICALITY 1/1 DURING ANY MISSION PHASE OR ABORT? NO

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

PASS/FAIL RATIONALE:

A)  
NOT APPLICABLE TO PYRO/MECHANICAL SYSTEM

B)  
NOT APPLICABLE TO PYRO/MECHANICAL SYSTEM

C)  
PROXIMITY OF ETS LINES OR T-HANDLE FAILURE ALLOWS FOR POSSIBLE LOSS OF REDUNDANCY DUE TO ONE EVENT.

METHOD OF FAULT DETECTION:  
NONE

CORRECTING ACTION: NONE  
NO CORRECTIVE ACTION POSSIBLE.

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- FAILURE EFFECTS -

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(A) SUBSYSTEM:  
LOSS OF REDUNDANCY FOR INDIVIDUAL THRUSTER.

(B) INTERFACING SUBSYSTEM(S):  
HATCH JETTISON SYSTEM DESIGNED TO OPERATE WITH THE LOSS OF ONE  
CARTRIDGE.

(C) MISSION:  
NONE

(D) CREW, VEHICLE, AND ELEMENT(S):  
LOSS OF MORE THAN ONE CARTRIDGE WOULD AFFECT TRAJECTORY OF JETTISONED  
HATCH RESULTING IN A POSSIBLE COLLISION WITH THE ORBITER. ERRATIC  
ORBITER DYNAMICS COULD RESULT IN LOSS OF CREW.

Criticality/  
Required Fault Tolerance/Achieved Fault Tolerance: 1R/1/1

RATIONALE FOR CRITICALITY:  
EFFECT REQUIRES LOSS OF TWO OR MORE CARTRIDGES.

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TIME FROM FAILURE TO CRITICAL EFFECT: IMMEDIATE

TIME FROM FAILURE OCCURRENCE TO DETECTION: IMMEDIATE

TIME FROM DETECTION TO COMPLETED CORRECTIVE ACTION: N/A

TIME REQUIRED TO IMPLEMENT CORRECTIVE ACTION LESS THAN TIME  
TO EFFECT? N/A  
NO CORRECTIVE ACTION POSSIBLE.

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- DISPOSITION RATIONALE -  
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(A) DESIGN:  
DESIGN CAPABLE OF FUNCTIONING UNDER WORST CASE CONDITIONS: CASE ONE - 2  
THRUSTERS EACH WITH 2 CARTRIDGES AT 115% AND ONE THRUSTER WITH ONE INERT  
CARTRIDGE AND ONE CARTRIDGE AT 85%; CASE TWO - 3 THRUSTERS EACH WITH TWO  
85% CARTRIDGES.

(B) TEST:  
PRIOR TO STS-26

QUALIFICATION TEST: HUMIDITY, SHOCK, RANDOM VIBRATION, THERMAL

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CYCLING, PRESSURE CYCLING, X-RAY, N-RAY, TWO (2) CLOSED BOMB FIRING TESTS AT +35 DEGREES F.

ACCEPTANCE TEST: TENSILE TEST THREE (3) COUPONS FROM CARTRIDGE HOUSING HEAT LOT, HOUSING PROOF PRESSURE TEST. SHEAR PIN STRENGTH TEST (100% OF LOT), X-RAY, N-RAY, LEAK TEST.

SYSTEM TEST: ONE (1) INTEGRATED SYSTEM TEST (NOTE: SYSTEM TEST USES SIX (6) CARTRIDGES).

LONG TERM

QUALIFICATION TEST: HUMIDITY, SHOCK, RANDOM VIBRATION, THERMAL CYCLING, PRESSURE CYCLING, X-RAY, N-RAY, CLOSED BOMB FIRINGS (3 AT +35 DEGREES F, 3 AT AMBIENT, 3 AT +120 DEGREES F), AUTOIGNITION TEST. 8 FOOT DROP TEST.

SYSTEM TEST: FIVE (5) ADDITIONAL INTEGRATED SYSTEM TESTS, THRUSTER COMPONENT QUALIFICATION TESTS (49 CARTRIDGES) WILL DEMONSTRATE MARGIN CAPABILITY.

(C) INSPECTION:

RECEIVING INSPECTION

RAW MATERIAL IS VERIFIED BY INSPECTION TO ASSURE SPECIFIC SHUTTLE REQUIREMENTS ARE SATISFIED.

CONTAMINATION CONTROL

CONTAMINATION CONTROL AND CORROSION PROTECTION PROCESSES VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

OPERATIONS VERIFIED BY MIPS ON SHOP TRAVELLER.

NONDESTRUCTIVE EVALUATION

PARTS ARE X-RAYED AND N-RAYED TO VERIFY CORRECT ASSEMBLY AND PRESENCE OF ALL DETAIL PARTS AND EXPLOSIVES. X-RAYS AND N-RAYS ARE REVIEWED BY VENDOR, DCAS, NASA QUALITY AND ENGINEERING.

TEST

ATP IS VERIFIED BY INSPECTION.

CRITICAL PROCESSES

CRITICAL PROCESSES SUCH AS WELDING, PLATING, HEAT TREATING, PASSIVATION AND ANODIZING ARE VERIFIED BY INSPECTION.

STORAGE

STORAGE ENVIRONMENT VERIFIED BY INSPECTION.

HANDLING AND PACKAGING

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HANDLING AND PACKAGING IS VERIFIED BY INSPECTION PER THE REQUIREMENTS OF APPLICABLE SPECIFICATIONS.

(D) FAILURE HISTORY:  
NO FAILURE HISTORY.(E) OPERATIONAL USE:  
ON GROUND, OVERHEAD WINDOW COULD BE UTILIZED AS AN ALTERNATE MEANS OF ESCAPE.

## REMARKS:

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- APPROVALS -  
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RELIABILITY ENGINEERING: C. FERRARELLA  
 DESIGN ENGINEERING : R. YEP  
 QUALITY ENGINEERING : E. GUTIERREZ  
 NASA RELIABILITY :  
 NASA DESIGN :  
 NASA QUALITY ASSURANCE :

: C.F. Ferrarella 4/13/00  
 : R. Yeh 9/15/00  
 : E. Gutierrez  
 : Thomas Schnader 9-27-00  
 : [Signature]