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PRINT DATE: 12/13/89

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 03-2A-211120-X

SUBSYSTEM NAME: AFT REACTION CONTROL SYSTEM (RCS)

REVISION : 2 12/12/89

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
SRU :	CONNECTOR, FLEXIBLE	73P550015-1006 1008099-101,102

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
CONNECTOR FLEXIBLE, GIMBAL JOINT.

QUANTITY OF LIKE ITEMS: 12
3 PER PROP TANK

FUNCTION:

AN EXTERNALLY CONSTRAINED BELLOWS (UNIVERSAL SOCKET JOINT ASS'Y) IS PROVIDED FOR THE PROPELLANT TANK OUTLET LINES TO ALLOW MOVEMENT DURING PRESSURE SURGES. CONNECTING TUBES ARE WELDED TO THE BELLOWS AND TO THE PROP LINES.

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SUBSYSTEM: ATT REACTION CONTROL SYSTEM (RCS) REVISION# 2 12/12/89

ITEM NAME: CONNECTOR, FLEXIBLE

CRITICALITY OF THIS
FAILURE MODE:1/1

FAILURE MODE:
STRUCTURAL FAILURE, EXTERNAL LEAKAGE

MISSION PHASE:
PL PRELAUNCH
LO LIFT-OFF
OO ON-ORBIT
DO DE-ORBIT
LS LANDING SAFING

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

CAUSE:

FATIGUE, SHOCK, HANDLING INADEQ WELD PENET, INCOMP FUSION, POROSITY,
CORROSION RESULTING IN PIN HOLE LEAK THRU CONVOLUTE, PROP & BI-PROP
EXPOSURE PRESS SURGE, FLOW INDUCED VIB, FLT, VIB. INSTALLATION DAMAGE.

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

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

PASS/FAIL RATIONALE:

A)

B)

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:
SUBSYSTEM DEGRADATION - LOSS OF PROPELLANT.

(B) INTERFACING SUBSYSTEM(S):
DEGRADATION OF INTERFACE FUNCTION - POSS CORROS DAMAGE WITHIN POD AND

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ADVERSE AFFECT ON TPS (MOLECULAR VENTING). LEAKAGE OF PROPELLANT INTO POD.

(C) MISSION:
LAUNCH DELAY OR ABORT DECISION.

(D) CREW, VEHICLE, AND ELEMENT(S):
POSSIBLE LOSS OF CREW/VEHICLE IF LEAK RESULTS IN EXCESSIVE LOSS OF PROPELLANT OR EXPLOSIVE HAZARD. OVERPRESSURIZATION OF POD MAY OCCUR. LOSS OF PROPELLANT FOR ET SEP/ENTRY.

(E) FUNCTIONAL CRITICALITY EFFECTS:

- DISPOSITION RATIONALE -

(A) DESIGN:
QUAL PLY 304L BELLOWS EXTERNALLY CONSTRAINED BY GAMBLED INCONEL 730 HOUSING IS USED WHEN A SINGLE PLY WOULD BE ADEQUATE FOR THE PRESSURE LOAD, MECHANICAL STOPS LIMIT MOVEMENT, FLOW INDUCED VIBRATION ANALYSIS AND STRESS ANALYSIS ARE CONDUCTED TO VERIFY ACCEPTABLE DESIGN. THE EXTERNAL CONSTRAINT (UNIVERSAL SOCKET JOINT ASS'Y) WOULD TEND TO LIMIT ANY GROSS PROPELLANT LEAK IN EVENT OF BELLOWS FAILURE. F/S IS 1.5.

■ (B) TEST:
ITEM WAS USED DURING SYSTEM EVALUATION TESTS DURING WSTF HOT FIRING TESTS AND JSC VIBRO-ACOUSTIC TESTING ALLOWING EVALUATION UNDER SIMULATED MISSION USAGE CONDITION.

QUAL TESTS INCLUDE HIGH & LOW TEMP TESTS, VIBRATION AT ANTICIPATED MISSION CONDITIONS OPERATING LIFE UNDER FLOW, PRESSURE, REQ'D CONDITIONS OF ANGULATION AND TEMP/ AND A BURST TEST, ATP TESTS INCLUDE PROOF PRESSURE, LEAKAGE, AND FUNCTIONAL TESTS, MANUF-IN-PROCESS INSPECTIONS ARE ALSO CONDUCTED. FLOW INDUCED VIBRATION ANALYSIS IS ALSO CONDUCTED.

OMRSD PERFORMS THE FOLLOWING: PROPELLANT SAMPLING THE SECOND FLIGHT AND ON A CONTINGENCY BASIS. STATIC AIR SAMPLE FOR THE MOD/POD EVERY FLIGHT AND ON A CONTINGENCY BASIS. TOXIC VAPOR LEAK CHECK OF THE PROPELLANT TANKS FOR THE FIRST FLIGHT AND ON A CONTINGENCY BASIS. AN EXTERNAL LEAKAGE VERIFICATION OF THE SYSTEM FOR THE FIRST FLIGHT AND ON A CONTINGENCY BASIS. PROPELLANT LOADING EVERY FLIGHT. A SUBSYSTEM INSPECTION.

(C) INSPECTION:
RECEIVING INSPECTION
INSPECTION VERIFIES MATERIAL AND PHYSICAL PROPERTIES.

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CONTAMINATION CONTROL

CORROSION PROTECTION IS VERIFIED BY INSPECTION. CLEANLINESS TO LEVEL 100 FOR MMH AND 100A FOR NTO IS VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

DIMENSIONAL AND VISUAL INSPECTIONS ARE VERIFIED BY INSPECTION. PARTS PROTECTION, COATING, AND PLATING PROCEDURES VERIFIED BY INSPECTION. MANUFACTURING, ASSEMBLY, INSTALLATION PER SHOP TRAVELER VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

PENETRANT AND X-RAY INSPECTION OF WELDS ARE VERIFIED BY INSPECTION.

CRITICAL PROCESSES

WELDING IS VERIFIED BY INSPECTION.

TESTING

ATP IS WITNESSED AND VERIFIED BY INSPECTION.

HANDLING/PACKAGING

HANDLING AND STORAGE ENVIRONMENT VERIFIED BY INSPECTION. PACKAGING FOR SHIPMENT VERIFIED BY INSPECTION.

(D) FAILURE HISTORY:

NO FAILURE HISTORY TO DATE.

(E) OPERATIONAL USE:

IF A FAILURE OCCURS PRIOR TO ET SEP USE CROSSFEED. FOR NOTICEABLE LEAKS RATES ON-ORBIT, DUMP ONBOARD PROPELLANT.

USE CROSSFEED FOR ENTRY. THIS WOULD NOT BE SUFFICIENT FOR NOMINAL ENTRY. IF A LEAK OCCURS DURING ENTRY USE FAILED SYS DOWN TO ZERO PVT AND SWITCH TO CROSSFEED FOR REMAINDER OF ENTRY.

- APPROVALS -

RELIABILITY ENGINEERING: F.E. BARCENAS
DESIGN ENGINEERING : B. DIPONTI
QUALITY ENGINEERING : M. SAVALA
NASA RELIABILITY :
NASA SUBSYSTEM MANAGER :
NASA QUALITY ASSURANCE :

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