

PAGE: 1

PRINT DATE: 11/07/88

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 06-1B1-0304-X

SUBSYSTEM NAME: ARS COOLING

REVISION : 11/07/88

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CLASSIFICATION	NAME	PART NUMBER
LEU :	CABIN FAN & DEBRIS TRAP	MC621-0008-0311
SRU :	VALVE, CHECK, FAN OUTLET	SV755546

QUANTITY OF LIKE ITEMS: 2  
ONE IN EACH OF TWO FAN FLOW PATHS

DESCRIPTION/FUNCTION:  
TWO VALVES, ONE EACH IN THE FLOW PATH OF EACH CABIN AIR CIRCULATION FAN TO PERMIT FLOW THROUGH AN OPERATING FAN AND PREVENT BACK-FLOW THROUGH NON-OPERATING FAN.

PAGE: 3

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NUMBER: 06-1B1-0304-01

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SUBSYSTEM: ARS COOLING  
LEU : CABIN FAN & DEBRIS TRAP  
ITEM NAME: VALVE, CHECK, FAN OUTLET

CRITICALITY OF THIS  
FAILURE MODE: 1R2

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FAILURE MODE:  
OPEN

MISSION PHASE:

LO           LIFT-OFF  
OO           ON-ORBIT  
DO           DE-ORBIT

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

CAUSE:  
PHYSICAL BINDING/JAMMING, CONTAMINATION, MECHANICAL SHOCK, VIBRATION,  
CORROSION

CRITICALITY 1/2 DURING ANY MISSION PHASE OR ABORT? N

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REUNDANCY SCREEN A) PASS  
B) N/A  
C) PASS

A)

B)  
SCREEN B IS N/A BECAUSE CHECK VALVE IS IN STANDBY; NOT REQUIRED TO  
FUNCTION UNTIL REDUNDANT FAN IS NEEDED.

C)

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## - FAILURE EFFECTS -

## (A) SUBSYSTEM:

FUNCTIONAL DEGRADATION - BACK FLOW CANNOT BE PREVENTED BY THIS CHECK VALVE. USE OF REDUNDANT FLOW PATH FAN DEGRADED (AIR FLOW "SHORT-CIRCUITED" THROUGH THE OPEN CHECK VALVE). DECREASED AIR FLOW.

## (B) INTERFACING SUBSYSTEM(S):

DECREASE IN AIR FLOW AND FLIGHT DECK AVIONICS COOLING.

## (C) MISSION:

POSSIBLE EARLY MISSION TERMINATION FOR FIRST FAILURE.

## (D) CREW, VEHICLE, AND ELEMENT(S):

NO EFFECT.

## RATIONALE FOR CRITICALITY:

FUNCTIONAL CRITICALITY EFFECT - FAILURE OF ASSOCIATED FAN STOPS NORMAL AIR FLOW. POTENTIAL LOSS OF CREW/VEHICLE DUE TO LOSS OF FLIGHT DECK AVIONICS COOLING IF CORRECTING ACTION IS UNSUCCESSFUL.

## - DISPOSITION RATIONALE -

## (A) DESIGN:

VALVE HOUSING IS CONSTRUCTED OF ALUMINUM WITH STAINLESS STEEL BIFILER SPRING AND FIBERGLASS FLAPPERS. THE CHECK VALVE IS NORMALLY CLOSED UNDER NO FLOW CONDITIONS IN ANY ATTITUDE. MULTIVANE FLAPPER, DUAL STAINLESS STEEL SPRING LOADED CLOSED, UPSTREAM 40/70 MICRON FILTER, FLAPPER HINGES AND MOUNTS DRILLED AT ASSEMBLY, FLAPPER MATERIAL - GLASS REINFORCED POLYMER, METALLIC PARTS - SCREW. DESIGN OPERATING LIFE OF THE CHECK VALVE IS A MINIMUM OF 50,000 CYCLES. DESIGN INTERNAL LEAKAGE IN THE REVERSE FLOW DIRECTION IS 0.01 LB/MIN MAX AT 70 DEG F AND 12 INCHES OF WATER DELTA PRESSURE.

## (B) TEST:

ACCEPTANCE TEST - EXAMINATION OF PRODUCT, CHECK VALVE LEAKAGE TESTED AT 10 INH20 CM2 PRESSURE, TOTAL LEAKAGE 0.1 LB/MIN MAX.

QUALIFICATION TEST - CHECK VALVES ARE SUBJECTED TO THE FOLLOWING AS PART OF THE CABIN FAN ASSEMBLY - VIBRATION SPECTRUM OF 20 TO 150 HZ INCREASING AT 6 DB/OCTAVE TO 0.09 G\*\*2/HZ, CONSTANT AT 0.09 G\*\*2/HZ FROM 150 TO 900 HZ, DECREASING AT 9 DB/OCTAVE FROM 900 TO 2000 HZ FOR

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48 MIN/AXIS IN 3 ORTHOGONAL AXES. SHOCK - THREE TERMINAL SAWTOOTH PULSES OF 20G PEAK AMPLITUDE AND 11 MS DURATION APPLIED IN BOTH DIRECTIONS ALONG EACH OF THREE ORTHOGONAL AXES. TEMPERATURE/HUMIDITY TESTS AT 100% HUMIDITY AND TEMPERATURE CYCLED BETWEEN 60 AND 120F FOR 120 HOURS.

IN-VEHICLE TESTING - CABIN FAN DELTA-P IS CONTINUOUSLY MONITORED WHILE VEHICLE IS POWERED UP.

OMRSD - VALVES ARE CYCLED EACH TIME THE CABIN FANS ARE TURNED ON AND OFF IN SUPPORT OF VEHICLE COOLING. PERFORMANCE OF THE CABIN FANS IS VERIFIED DURING EACH TURNAROUND. CABIN FAN DELTA-P IS CONTINUOUSLY MONITORED AND SERVES AS AN INDICATION OF VALVE FAILURE. ALSO VERIFIED AS A CONTINGENCY UPON LRU REPLACEMENT.

(C) INSPECTION:

RECEIVING INSPECTION

INCOMING PARTS ARE VISUALLY INSPECTED FOR MATERIAL AND PROCESS CERTIFICATION.

CONTAMINATION CONTROL

PART CLEANLINESS IS MAINTAINED AND VERIFIED TO H.S. REQUIREMENTS.

ASSEMBLY/INSTALLATION

TORQUE APPLICATION IS VERIFIED BY INSPECTION PER H.S. PROCEDURES. EPOXY APPLIED TO SHAFT POSTS PROVIDING A REDUNDANT LOCKING INSURANCE ALIGNMENT OF CENTER LINE OF SHAFT HOLES IN POST IS CHECKED. PROOF PRESSURE TEST OF THE OUTLET HEADER AND CHECK VALVES ARE VERIFIED BY INSPECTION. INSPECTION VERIFIES LEAK TEST PER REQUIREMENT.

CRITICAL PROCESSES

ANODIZING VERIFIED BY INSPECTION.

TESTING

ATP TEST IS VERIFIED BY INSPECTION.

HANDLING/PACKAGING

PACKAGING PROCEDURES AND REQUIREMENT FOR SHIPMENT IS VERIFIED BY

(D) FAILURE HISTORY:

NO FAILURE HISTORY APPLICABLE TO OPEN FAILURE MODE. THE FAN CHECK VALVE HAS SUCCESSFULLY PERFORMED WITHOUT FAILURE THROUGH THE DURATION OF THE SHUTTLE PROGRAM.

(E) OPERATIONAL USE:

TBS.

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- APPROVALS -

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RELIABILITY ENGINEERING: N. L. STEISLINGER: <sup>YLS</sup> [Signature]  
 DESIGN ENGINEERING : N. K. DUONG <sup>WLD</sup> : [Signature]  
 QUALITY ENGINEERING : D. R. STOICA <sup>OTIS</sup> : [Signature]  
 NASA RELIABILITY : : [Signature] 4/11/88  
 NASA DESIGN : : [Signature]  
 NASA QUALITY ASSURANCE : : [Signature]