

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : FLIGHT CONTROL MECH FM2A NO 02-2B -A01-FB-14 REV:12/04/87

ASSEMBLY : TVC ACTUATOR		CRIT. FUNC:	1	
P/N RI : MC621-0015		CRIT. HDW:	1	
P/N VENDOR: MOOG	VEHICLE	102	103	104
QUANTITY : 6	EFFECTIVITY:	X	X	X
: ONE PER ACTUATOR	PHASE(S):	PL	LO X OO	CO X LS

PREPARED BY:		REDUNDANCY SCREEN:	A-N/A	B-N/A	C-N/A
DES	N LEVERT	APPROVED BY:	APPROVED BY (NASA)		
REL	C NELSON	DESIGN	<i>N. Levert</i>		
QE	M SAVALA	REL C-N	<i>1/7/88</i>		
		QE	<i>[Signature]</i>		

ITEM:
POSITION FEEDBACK MECHANISM

FUNCTION:
PROVIDES MECHANICAL FEEDBACK OF PISTON POSITION TO THE SERVOVALVES.

FAILURE MODE:
NO POSITION FEEDBACK

CAUSE(S):
SEIZED/SEPARATED BEARINGS; UNRETAINED CAM; FRACTURED LINK, CAGES OR BELLCRANK; BROKEN SPRINGS

EFFECT(S) ON:
(A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE

(A) LOSS OF ONE ACTUATOR FUNCTION.

(B) POSSIBLE LOSS OF ONE ENGINE POSITION CONTROL WHICH MAY CAUSE ENGINE COLLISION. DURING ENTRY, POSSIBLE INTERFERENCE WITH BODY FLAP FUNCTION.

(C,D) POSSIBLE LOSS OF MISSION, CREW/VEHICLE. LOSS OF FUNCTION CAN RESULT IN LOSS OF VEHICLE CONTROL.

DISPOSITION & RATIONALE:
(A) DESIGN (B) TEST (C) INSPECTION (D) FAILURE HISTORY (E) OPERATIONAL USE

(A) DESIGN
MECHANISM LIGHTLY LOADED, RESULTING IN LOW STRESS LEVELS. HIGH DRIVING FORCE MINIMIZES JAMMING POSSIBILITY. PRELOADED PRECISION BALL BEARINGS ARE USED AT CAM AND CRITICAL PIVOTS. ADJUSTMENT PARTS ARE LOCKED, AND TRIPLE REDUNDANT CAM FOLLOWER SPRINGS ARE USED. ENTIRE MECHANISM ENCLOSED FOR PROTECTION AND FRACTURE MECHANICS APPLIED.

(B) TEST
QUALIFICATION-ENDURANCE CYCLING-400 MISSION DUTY CYCLES UNDER LOAD AT MAXIMUM TEMPERATURE OF 275 DEGREES F. ACTUATOR WAS VIBRATED AT FLIGHT LEVELS AND WAS TESTED AT -65 AND 275 DEGREES F. SPECIAL TESTS VERIFIED ACCEPTABLE STRESS LEVELS OF EACH COMPONENT IN FEEDBACK TRAIN DURING

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VIBRATION TESTING. VERIFIED THAT ALL PARTS WERE WITHIN ACCEPTABLE LIMITS DURING DISASSEMBLY AND INSPECTION AT COMPLETION OF QUALIFICATION.

ACCEPTANCE-PERFORMANCE TESTS VERIFY FEEDBACK MECHANISM IS OPERATIONAL.

CMRSD-MPS ENGINE POSITIONING TEST, PERFORMED PRIOR TO EACH MISSION.

(C) INSPECTION

RECEIVING INSPECTION

COMPONENT RAW MATERIAL CERTIFICATIONS ARE VERIFIED BY INSPECTION AND ANALYSIS. SPECIAL MATERIAL REQUIREMENTS ARE IDENTIFIED IN CERTIFICATIONS. SPRING MATERIAL IS VERIFIED BY SAMPLE TESTING. SPRING CHARACTERISTICS ARE VERIFIED TO COMPLY WITH DESIGN REQUIREMENTS. BEARINGS ARE VERIFIED TO COMPLY WITH DESIGN REQUIREMENTS.

NDE

PIECE PARTS EVALUATED BY SELECTED PENETRANT, MAGNETIC PARTICLE, ULTRASONIC, AND RADIOGRAPHIC INSPECTIONS.

SPECIAL PROCESSES

CRITICAL/CLOSE TOLERANCE DIMENSIONS AND FINISHES ARE 100 PERCENT INSPECTED FOLLOWING MACHINING. STAKING OF BEARINGS IS 100 PERCENT INSPECTED FOR RETENTION, ALIGNMENT AND FREEDOM OF MOTION. SWAGING OF CAM IS INSPECTED FOR PROPER SEATING, RETENTION AND FREEDOM OF MOTION.

ASSEMBLY/INSTALLATION

CLOSE TOLERANCE FITS AND ASSEMBLY TORQUES ARE VERIFIED BY INSPECTION. PERSONNEL ARE TRAINED/CERTIFIED IN THE USE OF SPECIALLY DESIGNATED TOOLS/FIXTURES WHICH ARE REQUIRED IN ASSEMBLY DOCUMENTATION. LOCKWIRING IS VERIFIED BY MANDATORY INSPECTION.

TESTING

ATP IS VERIFIED BY INSPECTION. ROCKWELL DESIGN AND QUALITY PERSONNEL, WITH NASA PARTICIPATION, CONDUCT A DETAILED ACCEPTANCE REVIEW OF THE HARDWARE AT THE VENDOR'S FACILITY, PRIOR TO THE SHIPMENT OF EACH END ITEM COVERED BY THE CONTROL PLAN.

(D) FAILURE HISTORY

THERE IS NO HISTORY OF FAILURE FOR THIS FAILURE MODE.

(E) OPERATIONAL USE

NONE