SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :LANDING/DECELERATION-LGC FMEA NO 02-1A -004 -1 REV:09/19/88

ASSEMBLY :MAIN LANDING GEAR (MLG)
P/N RI :MC621-0011
P/N VENDOR:1170103-MENASCO
QUANTITY :2
:LEFT HAND
:RIGHT HAND

CRIT. FUNC: 1
CRIT. HDW: 1

VEHICLE EFFECTIVITY:	102	103	104
	X	X	X

PHASE(S): PL LO OO DO LS X

REDUNDANCY SCREEN: A- B- C-

PREPARED BY:		APPROVED BY:		APPROVED BY (NASA):
DES	R. A. GORDON	DES	9/21/88	SSM
REL	J. S. MULLEN	REL		REL 9/27/88
QE	W. J. SMITH	QE		QE

ITEM:
MAIN LANDING GEAR TORQUE ARMS.

FUNCTION:
MAINTAINS ALIGNMENT BETWEEN AXLE/PISTON ASSEMBLY AND MLG STRUT CYLINDER.

FAILURE MODE:
STRUCTURAL FAILURE

CAUSE(S):
OVERLOAD, DEFECTIVE PART/MATERIAL.

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

(A) LOSS OF LOAD CARRYING CAPABILITY.

(B) DAMAGE TO VEHICLE STRUCTURE.

(C,D) PROBABLE LOSS OF MISSION/CREW/VEHICLE DUE TO AXLE ROTATION AND SUBSEQUENT FAILURE OF MAIN STRUT.

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

(A) DESIGN
DESIGNED TO FATIGUE LOAD SPECTRUM FOR LANDING, TAXI, AND GROUND HANDLING CONDITIONS. DESIGNED TO LANDING IMPACT LOADS (SPIN-UP AND SPRING BACK INCLUDING CROSSWIND DRIFT CONDITIONS) USING A MINIMUM FACTOR OF SAFETY O 1.0 TO YIELD STRENGTH OF MATERIAL IN ACCORDANCE WITH ESTABLISHED CRITERI FOR COMMERCIAL AND MILITARY AIRCRAFT. DESIGNED TO A MINIMUM FACTOR OF SAFETY OF 1.4 FOR TAXI AND GROUND HANDLING LOADS FOR 32K AND 65K PAYLOAD CONFIGURATIONS. MATERIAL PROCESSES-BARE PARTS ARE NOT EXPOSED TO CORROSIVE ACID ENVIRONMENT IN PLATING SHOP MORE THAN 30 DAYS AND PARTS ARE SHOT PEENED AFTER MACHINE OPERATIONS TO PREVENT STRESS CORROSION ON 300 M MATERIALS.

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(B) TEST

QUALIFICATION TESTS:
CERTIFICATION INCLUDES ULTIMATE STRENGTH TEST, SHOCK STRUT DROP TESTS, STATIC LOADS TEST, DYNAMIC TESTS AND 400 DEPLOYMENT CYCLES.
THE TORQUE ARM ASSEMBLY WAS CERTIFIED AS AN INTEGRAL PART OF THE MLG MECHANISM INSTALLATION (LANDING GEAR OPERATION) - 32 CYCLES OF THE LANDING GEAR D'RING ALT, 15 DEVELOPMENT CYCLES AND 353 QUALIFICATION L CYCLES FOR A TOTAL OF 400 CYCLES. (THE LANDING GEAR WAS CYCLED FROM U AND LOCKED TO DOWN AND LOCKED EACH TIME).
ENVIRONMENT:
HIGH TEMP TESTS; 3 CYCLES AT 140 DEG F
COLD TEMP TESTS; 3 CYCLES AT -35 DEG F TO -40 DEG F

THE TORQUE ARM ASSEMBLY WAS ALSO TESTED AS AN INTEGRAL PART OF THE MLG SHOCK STRUT ASSEMBLY DURING DROP TESTS - ELEVEN DROP TESTS WERE PERFOR TO SATISFY THE DESIGN REQUIREMENTS FOR THE SHOCK STRUT ASSEMBLY.
MAXIMUM VERTICAL LOAD WAS 179,817 LBS.
MAXIMUM SINK SPEED WAS 11.69 FPS.

FATIGUE LOAD SPECTRUM TESTS WERE CONDUCTED FOR LANDING, LANDING ROLLOU BRAKING AND TURNING LOAD CONDITIONS - THE STRUT WAS SUBJECTED TO CYCLI APPLICATION OF VERTICAL, FORE/AFT AND SIDE LOADS IN EACH CONDITION.

ACCEPTANCE TESTS: ACCEPTANCE INCLUDES VERIFICATION THAT CERTIFIED MATERIALS AND PROCESSES WERE USED. ACCEPTANCE TESTS ALSO VERIFY DIMENSIONS, WEIGHTS AND FINISHES.

OMRSD: MLG ZONAL DETAIL VISUAL INSPECTION; THE UPPER AND LOWER TORQUE ARMS ARE INSPECTED FOR CONDITION AND SECURITY.

FREQUENCY - ALL VEHICLES AT GROUND TURNAROUND.

(C) INSPECTION

RECEIVING INSPECTION
INSPECTION VERIFIES ALL RAW MATERIALS TO COMPLY WITH MATERIAL REQUIREMENTS THROUGH PERIODIC COUPON ANALYSIS.

CONTAMINATION CONTROL
ALL CLEANLINESS LEVELS VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION
ALL MATERIAL PROCESS VERIFIED BY MANDATORY INSPECTION POINTS (MIPS) PRIOR TO NEXT MANUFACTURING OPERATIONS.

NONDESTRUCTIVE EVALUATION
MATERIAL SURFACE DEFECTS ARE VERIFIED BY MAGNETIC PARTICLE, NITAL ETCH, AND FLUORESCENT PENETRANT.

CRITICAL PROCESSES
INSPECTION VERIFIES SHOT PEENING, HEAT TREATMENT, AND CD-TI PLATING.

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TESTING
TORSIONAL OVERLOADS ARE VERIFIED BY DYNAMIC AND STATIC TESTS PERFORMED DURING QUALIFICATION TESTING.

HANDLING/PACKAGING
HANDLING AND PACKAGING REQUIREMENTS ARE VERIFIED BY INSPECTION.

(D) FAILURE HISTORY
NONE

(E) OPERATIONAL USE
NONE.