B/L: 252.00
SYS: PAYLOAD GROUND HANDLING MECHANISM

JAN 2 4 1995

Critical Item: BALL SCREW ACTUATOR - 50 Ton (4 Items Total)

Find Number: 53

Criticality Category: 2

SAA No:	09FTAB31-001	**System/Area:**	UPPER CROSSHEAD ASSEMBLY / PADS A & B
NASA Part No:	NONE	**PMN/ Name:**	H70-0534 PAYLOAD GROUND HANDLING MECHANISM
Mfg/ Part No:	DUFF-NORTON M-3861-01	**Drawing Sheet No:**	79K22744 1 to 3

Function:

Provides Xo adjustment capability (raise/lower/hold) simultaneously for both Strongback Beams (using two actuators).

Critical Failure Mode/Failure Mode No:

Gears Disengage/09FTAB31-001.005

Failure Cause:

Structural Failure of the Ball Nut Assembly or Screw Column.

Failure Effect:

The actuator could backdrive resulting in a shift of the payload. This could cause loss (damage) to a vehicle system. Detection Method : Visual. Time to Effect : Seconds.

ACCEPTANCE RATIONALE

Design:

- The actuator is an off-the-shelf item manufactured by Duff-Norton Co. Inc.
- The actuator is a rotating screw type designed for daily usage.
- The Worm Gear (Helical Gear) is centrifugally cast Aluminum Bronze per ASTM B271-954 specification.

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- Actuator is designed to retain gears in place by shoulders within the confines of the gearcase. Thus, a worm gear failure would tend to lock up within the gearcase and prevent backdriving.
- Worm material is AISI 4140 Alloy Steel used for high strength applications.
- Design is based on the American Institute of Steel Construction (AISC) specification sections A2.2, B7, and E2.
- The Power-X Stopnut Adjustment provides a secondary load path for support of the payload in case of an actuator failure in the Upper Crosshead Assembly. A 1/2 inch distance (per OMI N50XX) is maintained during operation between the safety stop and the Upper Crosshead Structure. As a result, the maximum displacement of one Strongback would be approximately 1/2 inch during operation.
- With a 71,000 lb. load on the front end consisting of a 65,000 lb payload and 6,000 lbs of support equipment, the resulting induced loading on one actuator is 95,900 lbs. at maximum Y and Z positions.

  The screw column and ball nut have been identified as the critical components of the actuator assembly. The manufacturers maximum rated load for the screw column is 800,000 lbs. and the ball nut is 450,000 lbs..

  The safety factor for the actuator based on the maximum rated load of the ball nut is greater than 4.7:1 (ultimate).

Test:

The PGHM has been proof loaded to 81,250 lbs (based on a 65,000 lb. payload).

The Upper Crosshead Assembly that the actuators support are operationally checked monthly (without a load) per OMI V6F09 except during a payload flow.

Inspection:

The actuator screw is inspected and lubricated annually per OMI V6F09.

OMRSD File VI requires annual oil sample testing. The results and recommendation are returned to System Engineering for review.

Failure History:

- The PRACA database was researched and no failure data was found on this component in the critical failure mode.
- The GIDEP failure data interchange system was researched and no failure data was found on this component in the critioal failure mode.

Operational Use:

- Correcting Action: There is no action which can be taken to mitigate the failure effect.
- Timeframe: Since no correcting action is available, timeframe does not apply.