

STS88-0244

December 19, 2002

Supersceded: None

Critical Items List (CIL) Sheet

Critical Item: Worm Gear Speed Reducer

Criticality Category: 2

NASA Part No: None

Total Quantity: 4

Mfg/ Part No: Thern, Inc. / 57D

System: Aft Fuselage Horizontal Equipment Installation Set

Find No.	Qty	Area	PMN	Baseline	Drawing/Sheet
57D/G070-550490	4	OPF 1/2/3	H70-0588	700.19	G070-550422 / 1 G070-550438 / 1 G070-550490 / 1

Function:

Transmits manual power and reduces hoist motor rotational speed to hoist drum speed of the Water Spray Boiler Hoist, Davit Crane, and Tow Winch for removing and replacing aft LRUs.

Failure Mode No. Failure Mode	Failure Cause Failure Effect	Detection Method Time to Effect	Crit Cal
0244.001	Cascade of worm screw thread failures that initiate at screw thread root from wear or metal fatigue	Visual or noise from shearing worm gear or sudden movement	2
Worm bearings or gear failure	Since there is not a secondary brake, the load will swing or drop, possibly damaging flight hardware	Immediate	

ACCEPTANCE RATIONALE

Design:

- The gear reducer is a commercial, off-the-shelf type with cast iron body and modified stainless steel input and output shafts and enclosed oil bath.
- Oil impregnated bronze bearings on input and output shafts.
- Phosphor bronze gears.
- Steel 1018 worm.
- Ball thrust bearings on input shaft.
- Gear ratio 20:1
- The hoist was designed with a minimum safety factor of 4:1 and is in compliance with NSS/GO 1740.9 requirements.
- Hoist design is in accordance with ASME/ANSI B30.16 and the American Gear Manufacturers Association Standards.

Test:

- Initial proof load was performed in accordance with ML0208-0052, Proof Load, Equipment Install/Remove Aft Fuselage, Horizontal, The Water Spray Boiler Hoist, Davit Crane, and Tow Winch were originally load tested at 400 lb., 1000 lb., and 1200 lb. respectively
- OMRSD File VI requires periodic load testing be performed in accordance with NSS/GO 1740.9. Cranes, hoists, and winches used frequently for critical lifts are load tested annually. Cranes, hoists, and winches used infrequently for critical lifts are load tested before the critical lift if it has been more than a year since the last test.
- Operational testing of the hoist per OMI/TPS verifies proper operation of all hoist functions.

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Inspection:

Periodic maintenance is performed in accordance with OMI V6C03 and NSS/GO 1740.9 and includes:

- Applying grease to gears, spline shafts, and case.
- Any signs of deformation, cracks or permanent set; wire rope with, broken strands or stretching; paint separation at welds; or other signs of failure shall be cause for rejection.
- Proof test load tag is up to date for winch and cables.
- Corrosion damage or missing parts.
- Safety critical markings are legible and secure.
- Remove the cover of the reducer and inspect the gears for corrosion, tooth galling and the worm gear oil level is correct.
- Method of attaching the cable to the winch drum and number of cable wraps on the winch drum are two complete wraps minimum.
- Verify the winches work without binding on the trolley rails.

Failure History:

- The PRACA database was queried and there were no failures for this component.
- The GIDEP database was queried and there were no failures for this component.

Operational Use:

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