~~SAA09FY121-002~~

AUG 6 1997

B/L: 389.00
SYS: 10-TON BRIDGE CRANES VAB

Critical Item: Hoist Gearbox (3 Items)

Find Number: None

Criticality Category: 1

SAA No:	09FY121-002	**System/Area:**	10-Ton Overhead Bridge Cranes/VAB - Low Bay Cells 1, 2 & 4
NASA Part No:	N/A	**PMN/ Name:**	K60-0531/10-Ton Bridge Cranes
Mfg/ Part No:	Yale Engineering Co./ LE10G40FB10	**Drawing/ Sheet No:**	Yale Electric Hoists, C-E Series/NA

Function: The hoist gear box transmits power from the hoist motor to the drum.

Critical Failure Mode/Failure Mode No: Gear disengages/09FY121-002.001

Failure Cause: Structural failure of gears, shafts, mechanical load brake components and the gearbox housing.

Failure Effect: Load (Extended Duration Orbiter (EDO) cryogenic pallet, Rotating Sling or Rotating Sling and SSME) suspended from hoist will drop. Failure could cause loss of life and/or loss (damage) to a vehicle system. Failure is detectable by abnormal noises and movements up to and including dropping the load. Time to effect: seconds.

Acceptance Rationale

Design:

- The gear box is an off-the-shelf item manufactured by Yale Industries. Its design complies with Crane Manufacturers Association of America (CMAA) specification #70.
- All gearing design is based upon AGMA standards 220.02, "Rating of the Strength of Spur Gear Teeth" and 210.02, "Surface Durability (pitting) of Spur Gear Teeth."
- The gears are splined to shafts or integrally machined and are retained in place by shoulders within the confines of the gearbox.

Hoist Gearbox (Continued)

- Load bearing members, such as the gear case and shafts, have been designed so that the calculated static stress, based upon the rated load, does not exceed 20% of the average ultimate strength of the material, i.e. 5:1 factor of safety.

- The SSME rotating sling and the RG000026 interface plate weigh 8,710 lbs. yielding an operational factor of safety of 11.5:1 in Cell 1 operations.

- An SSME and rotating sling weigh 15,710 lbs. yielding an operational factor of safety of 6.36:1 in Cell 4 operations.

Test:

- Pre-operational set up (attaching and positioning sling over the load) to support lifting operations in OMI V5087 verifies proper operation of crane components and all functions.

- A load test at 100% of rated load is performed annually by OMI Q6166 in accordance with NSS/GO-1740.9 requirement.

- OMRSD File VI requires verification of current load test prior to critical lifts.

- An annual operational check of the hoist is performed under full rated load in accordance with OMI Q6166.

- Oil sample testing is performed annually by spectrographic or chemical analysis per OMI Q6166. The analysis is returned to System Engineering for review and is documented in the crane log book, to track wear trends. A copy is also furnished to Reliability Engineering for input into a data base.

- A full operational check of the hoist is performed monthly (no load) in accordance with OMI Q6166.

Inspection:

- The hoist gearbox is checked annually per OMI No. Q6166 for the following:

  a. damage, corrosion

  b. loose fasteners

  c. oil leakage

  d. oil level

Hoist Gearbox (Continued)

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 critical 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.