

APPROVAL SHEET FOR SUSPENDED LOAD OPERATIONS

SLO-KSC- 1998-006

TITLE SUPER GUPPY SUPPORT FIXTURE COVER REMOVAL

DOCUMENT NUMBER/TITLE L5001 AIRCRAFT UNLOADING/LOADING AND TRANSPORTATION

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DATE 6 NOVEMBER 1998

REQUIRED APPROVAL

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OPERATIONS

To remove the SGSF (Super Guppy Support Fixture) cover from the SGSF transporter in the SSPF Airlock or Operations and Checkout Building Highbay.

SUPPORTING DOCUMENTS - The associated operational procedure and System Assurance Analyses (SAAs) are as follows:

- L5001, Aircraft unloading/loading and Transportation
- SAA01FS027-002, 27.5 Ton Bridge Cranes - O&C
- SAA21CRS1-003, 15 Ton Bridge Crane - SSPF

GENERAL DESCRIPTION

Removal of the SGSF cover from its transporter will require the tow tug operator to pass under the suspended cover.

RATIONALE/ANALYSIS - The suspended load tasks comply with the NASA Alternate Safety Standard as follows:

Alternate Standard Requirement #1a

The limited space in the SSPF airlock, and the O&C Highbay, and the physical size of the SGSF have been evaluated and it has been determined that there are no design, operational, or procedural means to eliminate personnel exposure to a suspended load.

During the cover removal from the SGSF the cover will remain suspended from the crane. The tug will move the SGSF and during this process the tug operator will pass under the suspended cover.

Alternate Standard Requirement #1b

The possible use of a secondary support system, to catch the load in the event of a crane failure, was analyzed. It was determined that the use of a secondary support system was not feasible because of positioning of the cover over the SGSF.

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Alternate Standard Requirement #1c

The maximum number of personnel allowed under the load during transfer and removal of the SGSF cover(s) is 1.

Alternate Standard Requirement #1d

Installation or removal of the SGSF cover will be accomplished as quickly and safely as possible to minimize exposure time. The suspended load operation is estimated to take no more than 10 minutes.

Alternate Standard Requirement #4

OMI L5001 has been revised to permit only the approved number of persons under the suspended payload. The OMI is available on site for inspection during the operation.

Alternate Standard Requirement #6

Suspended load operations associated with removal of the SGSF cover involve the SSPF airlock 15 ton crane or one of the O&C 27.5 ton bridge cranes. The cranes are designed, tested, inspected, maintained, and operated in accordance with the NASA Safety Standard for Lifting Devices and Equipment, NSS/GO-1740.9.

The O&C 27.5 ton crane hoists are equipped with two magnetic holding brakes, one on the motor shaft and one on the gear reducer input shaft extension. Each brake is capable of holding the load up to the crane's rated capacity. Each brake's ability to hold the rated load is verified annually. The cranes are designed to meet a 5 to 1 safety factor based on ultimate strength for the hoist load bearing components.

The SSPF Airlock 15 ton crane hoist is equipped with two brakes, each is capable of stopping and holding 150% of the cranes rated capacity. The first brake is an electro-mechanical disc type brake which is spring engaged and disengaged by applying a current to the brake coil which creates a magnetic force and overcomes the brake spring force, releasing the brake. The second brake is a Weston type mechanical load brake located within the hoist gear reducer. This brake also acts as a load control device while a load is being lowered, not allowing the load to increase speed while descending. Each brake's ability to hold the rated load is verified annually. The crane is designed to meet a 5 to 1 safety factor based on ultimate strength for the hoist load bearing components.

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The 15 ton crane in the SSPF and 27.5 ton cranes in the O&C are load tested annually at 100% of their rated capacities. Detailed preventive maintenance is performed monthly, quarterly, semiannually, and annually on the cranes to ensure proper operation. A detailed inspection of the lifting slings is performed annually. Nondestructive testing of the crane hooks is performed annually.

Alternate Standard Requirement #7 - System Assurance Analyses (SAAs) have been completed on the 27.5 ton bridge cranes in the O&C and the 15 ton airlock crane in the SSPF. The SAAs each include a failure modes and effects analysis/critical items list (FMEA/CIL) and a hazard analysis (see supporting documents).

The SAA for the 15 ton and the 27.5 ton cranes identify one single failure point (SFP), the hoist gear reducer, which transmits power and reduces rotational speed from the hoist motor to the rope drum. A sheared key or broken teeth would cause interruption of the load path at the gearbox. This failure would result in the load dropping, which could cause loss of life.

There is no history of failure with the SFP in the critical failure mode. A detailed inspection of the gear reducer is performed monthly, and gear reducer oil samples are verified annually. The use of high quality, reliable components and a comprehensive maintenance, inspection, and test program (including preoperational checks) ensures that the crane systems operate properly.

The associated SAA CIL Sheets for the cranes identify the rationale for accepting the risk of the SFP including design information, failure history, and the operational controls in effect to minimize the risks (maintenance, inspection, test, etc.).

The SGSF cover weighs approximately 1000 lbs. The lifting slings used will have a 5 to 1 safety factor based on ultimate strength.

Alternate Standard Requirement #8 - Visual inspections for cracks or other signs of damage or anomalies are performed on the lifting slings, and crane inspections/pre-operational checks are performed before each operation per NSS/GO-1740.9.

Alternate Standard Requirement #9 - Trained and licensed crane operators shall remain at the hoist controls while personnel are under the load.

Alternate Standard Requirement #10 - Appropriate safety control areas are established before initiating operations. Only the minimum number of people (manloaded in the procedure) will be permitted in this area.

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Alternate Standard Requirement #11 - A pretask briefing and a safety walkdown of the area are conducted prior to the lift to ensure that all systems and personnel are ready to support. All participants are instructed on their specific tasks and warned of any hazards involved. Following any crew change, the new personnel are instructed by the task leader on their specific tasks and warned of any hazards involved.

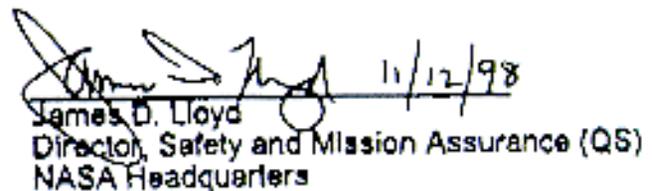
Alternate Standard Requirement #12 - Personnel beneath the suspended load will be in voice contact with the hoist operator and/or task leader. Upon loss of communication, the operation shall stop immediately, personnel shall clear the hazardous area, and the load shall be safed. Operations shall not continue until communications are restored.

Alternate Standard Requirement #13 - Personnel working beneath the load shall be in continuous sight of the hoist operator and/or task leader.

APPROVAL:

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