

APPROVAL SHEET FOR SUSPENDED LOAD OPERATIONS

SLO-KSC-2002-001

TITLE Rotating & Hoisting the Mobile Base Structure (MBS) Utilizing the MBS Lifting Frame.

DOCUMENT NUMBER/TITLE OMI E5533, Flight Hardware / GSE Multipurpose Hoisting.

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DATE 19 MARCH 02

REQUIRED APPROVAL

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**NASA SUSPENDED LOAD OPERATION
ANALYSIS/APPROVAL**

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OPERATIONS

Rotating and hoisting the Mobile Base Structure (MBS) out of the MBS rotation dolly utilizing the MBS Lift Frame located in the Space Station Processing Facility (SSPF).

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

- OMI E5533, Flight Hardware/GSE Multipurpose Hoisting

- SAA21CRS1-001, 30 Ton Highbay Bridge Cranes - Space Station Processing Facility (SSPF)

GENERAL DESCRIPTION

The MBS will be rotated and hoisted out of the rotating dolly during the prelaunch processing flow. The controlling documents are as follows:

OMI E5533 - Flight Hardware/GSE Multipurpose Hoisting

Appendix B - MDR-SS-PR-5162, MBS Lifting and Rotation in the Lifting Frame

During these operations, the following operation has been identified as possibly requiring working under a suspended load:

1. Installation of separator assembly for guide vane clearance.
2. Attachment of winch strap to separator assembly.

Just prior to rotation a separator assembly must be installed to the MBS to assure clearance between the winch strap and the payload. One (1) technician may be required to work under the suspended load (MBS and Lift Sling) to attach this hardware. The technician will also attach a winch strap to the separator assembly to provide positive control of the payload during the rotation operation. After the rotation is

complete the MBS will be transferred to a Cargo Element Workstand (CEW) for final processing.

Removal of the separator assembly and winch strap will not require personnel under the load.

The time of installation is expected to last no greater than 30 minutes.

The 30 ton SSPF crane will be used to lift and support the MBS throughout this process.

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

Alternate Standard Requirement #1a

This operation may require placing personnel under the suspended load. Based on payload processing requirements and configuration, the attach point of the separator assembly is located in a position slightly under the MBS and the Lifting Frame.

The operation identified has been evaluated for alternate methods to complete the task, and it has been determined that there are no design, operational, or procedural means to eliminate possible personnel exposure to a suspended load.

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: The MBS and rotation dolly are oriented in such a manner that no secondary support can be employed.

Alternate Standard Requirement #1c

The maximum number of personnel permitted under the suspended load (MBS and Lift Frame) for the operation is limited to the one technician necessary to complete the task.

Alternate Standard Requirement #1d

The suspended load operation will be accomplished as quickly and safely as possible to minimize exposure time. The approximate time to install the separator assembly for guide vane clearance and attach the come-along shall be limited to 30 minutes.

Alternate Standard Requirement #2:

Suspended load operations are reviewed and approved on a case-by-case/specific need basis - see General Description and Alternate Standard Requirement #1.

Alternate Standard Requirement #3:

Only those suspended load operations approved by the NASA Safety & Mission Assurance Chief will be permitted. A list of approved suspended load operations will be maintained by the NASA Safety & Mission Assurance Division.

Alternate Standard Requirement #4

OMI E5533 will be deviated to permit only the approved number of people under the suspended load. The OMI is available on site for inspection during the operation.

Alternate Standard Requirement #5:

A new suspended load operation not covered by this SLOAA, deemed necessary due to unusual or unforeseen circumstances where real time action is required, shall be documented and approved by the NASA Safety & Mission Assurance Chief.

Alternate Standard Requirement #6

The suspended load operations addressed in this analysis involve one of the 30 ton SSPF 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 SSPF 30 ton crane hoists are equipped with two magnetic holding brakes, each capable of holding the load up to the crane's rated capacity. Each brake's ability to hold the rated load (30 tons) 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 30 ton cranes 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 slings and crane hooks is performed annually.

The MBS Lifting Frame has been load tested to 5015 pounds with a Safe Working Load (SWL) of 4012 pounds. The MBS weight has been calculated to be 3490 pounds maximum.

Alternate Standard Requirement #7 - An SAA has been completed on the 30 ton bridge cranes in the SSPF. The SAA includes a Failure Modes and Effects Analysis/Critical Items List (FMEA/CIL) and a hazard analysis (see supporting documents). No critical single failure points were identified during this analysis.

Alternate Standard Requirement #8 - Visual inspections for cracks or other signs of damage or anomalies are performed on the hoist hooks, hoist beams, hoist cables, hoist rod assemblies, and hoist fittings, and crane functional 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.

Alternate Standard Requirement #11 - A pretask briefing and a safety walkdown of the area will be 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 potential hazards. Following any crew change, the new personnel are instructed by the task leader on their specific tasks and warned of any hazards involved.

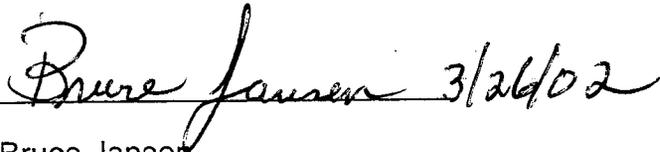
Alternate Standard Requirement #12 - The person beneath the suspended load will be in voice contact with the hoist operator and/or task leader. Upon loss of communication, the operation shall stop immediately, personnel shall clear the hazardous area, and the load shall be safed. Operations shall not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

Alternate Standard Requirement #14: The NASA Safety & Mission Assurance Division shall conduct periodic reviews to ensure the continued safety of suspended load procedures.

Alternate Standard Requirement #15: The NASA Safety & Mission Assurance Division will provide copies of approved SLOAA's, a list of approved suspended load operations, a list of cranes/hoists used for suspended load operations and copies of the associated FMEA/CIL and hazards analyses to NASA Headquarters.

APPROVAL: DATE:

 Bruce Jansen 3/26/02

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