APPROVAL SHEET FOR SUSPENDED LOAD OPERATIONS

SLO-KSC- 1996-001

TITLE CONNECTION OF H77-1201 BELT LINK UNDER SUSPENDED BEAM (NO LOAD ON BEAM).

DOCUMENT NUMBER/TITLE DM B8001, SRB DISASSEMBLY MANUAL, SEQ 01-003, STRADDLE LIFT POSITIONING AND SRB TRANSFER

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DATE 14-May-96

REQUIRED APPROVAL

CONTRACTOR _____ DESIGN _____ R & QA _____ OPERATIONS _____ SAFETY

NASA _____ DESIGN _____ R & QA _____ OPERATIONS _____ SAFETY

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NASA SUSPENDED LOAD OPERATION
ANALYSIS AND APPROVAL

NUMBER: SLO-KSC-1996-001

DESCRIPTION OF OPERATIONS:
CONNECTION OF THE H77-1201 BELT LINKS IN PREPARATION FOR LIFTING THE RETRIEVED SRB'S AT HANGAR AF.

SUPPORTING DOCUMENTS:

DM B8001	SRB DISASSEMBLY OPERATIONS
SAA09FY153-0009	H77-0838 RENNER STRADDLE LIFT SAA
SAA09FY153-021	H77-8430 ROPCO STRADDLE LIFT SAA

GENERAL DESCRIPTION:
THE FOLLOWING OPERATION REQUIRES PERSONNEL TO WORK UNDER A SUSPENDED LOAD:

CONNECT WEB BELTS THAT GO AROUND THE EMPTY SRB'S TOGETHER AT THE CENTER LINK - 3 TECHNICIANS

THIS OPERATION REQUIRES THREE TECHNICIANS TO WORK BELOW THE SUSPENDED LIFTING BEAM (DIAMOND BEAM) FOR APPROXIMATELY 30 SECONDS. LIFTING OPERATIONS ARE PERFORMED PER B8001.

RATIONAL/ANALYSIS:
THE HANGAR AF WEB BELT CONNECTION SUSPENDED LOAD OPERATION COMPLIES WITH THE NASA ALTERNATE STANDARD FOR SUSPENDED LOAD OPERATIONS AS FOLLOWS:

ALTERNATE STANDARD REQUIREMENT #1a: THIS TASK CAN NOT BE CONDUCTED WITHOUT PLACING PERSONNEL BENEATH THE SUSPENDED LOAD BECAUSE THERE IS NO OTHER ACCESS TO CONNECT THE BELT LINK PROPERLY. CONNECTING THE WEB BELTS WITHOUT BEING UNDER THE SUSPENDED LOAD REQUIRES MORE MANUAL HANDLING WITH POTENTIAL FOR PERSONNEL (BACK) INJURIES. IN ADDITION, THE WEB BELTS HAVE TO BE DRAGGED ACROSS THE GROUND AND ARE DAMAGED WHEN NOT CONNECTED UNDER THE SUSPENDED DIAMOND BEAM. MEANS TO PREVENT WEB BELT DAMAGE, EG: SUPPORT DOLLIES, SMOOTH SURFACES, BELT COVERS, HAVE BEEN ANALYZED AND/OR TRIED WITHOUT SUCCESS.

ALTERNATE STANDARD REQUIREMENT #1b: THE POSSIBLE USE OF A SECONDARY SUPPORT SYSTEM TO CATCH THE LOAD IN THE EVENT OF A STRADDLE LIFT FAILURE HAS BEEN ANALYZED. A SECONDARY SUPPORT SYSTEM IS NOT REQUIRED BECAUSE 1) THERE IS VERY LIMITED EXPOSURE, 2) THE BEAM IS SUPPORTED BY TWO INDEPENDENT HOOKS WHICH EACH HAVE A RATED LOAD OVER SIX TIMES THE WEIGHT OF THE DIAMOND BEAM. IN ADDITION; A SECONDARY SUPPORT SYSTEM WOULD CREATE MORE HANDLING: E.G.; INSTALLATION AND REMOVAL, POTENTIALLY CREATING MORE HAZARDS DUE TO THE MASS REQUIRED IN A SYSTEM TO CATCH THE DIAMOND BEAM AND DUE TO RESTRICTED ACCESS CREATED BY THE CATCH.

ALTERNATE STANDARD REQUIREMENT #1c: THE MAXIMUM NUMBER OF PERSONNEL ALLOWED UNDER THE SUSPENDED LOAD IS THREE (3).

ALTERNATE STANDARD REQUIREMENT #1d: THE CONNECTION OF THE LINK WILL BE PERFORMED AS QUICKLY AND SAFELY AS POSSIBLE. CONNECTION OF THE LINK WILL TAKE APPROXIMATELY 30 SECONDS: TO PIN THE LINK AND INSTALL A RETAINER PIN.

ALTERNATE STANDARD REQUIREMENT #4: DM B8001 WILL BE REVISED TO SPECIFICALLY PERMIT ONLY 3 PERSONNEL UNDER ANY PART OF THE SUSPENDED LOAD FOR THE MINIMUM AMOUNT OF TIME REQUIRED TO PERFORM THE LINK CONNECTION ONLY.

ALTERNATE STANDARD REQUIREMENT #6: THE SUSPENDED LOAD OPERATIONS COVERED BY THIS REPORT ARE PERFORMED AT THE HANGAR AF SRB SLIP AREA AND INVOLVE THE H77-8430 AND H77-0838 STRADDLE LIFTS AND THE H77-1201 EMPTY SRB LIFTING SLING. THE STRADDLE LIFTS AND SLINGS ARE USED TO LIFT THE SRB FROM THE SLIP. ONE SLING AND STRADDLE LIFT IS POSITIONED TO LIFT THE FORWARD END OF THE STRADDLE LIFT AND ONE SET IS POSITIONED TO LIFT THE AFT END. THE STRADDLE LIFTS AND SLINGS ARE DESIGNED, TESTED, INSPECTED, MAINTAINED, AND OPERATED IN ACCORDANCE WITH THE NASA SAFETY STANDARD FOR LIFTING DEVICES AND EQUIPMENT, NSS/GO-1740.9.

THE STRADDLE LIFTS ARE LOAD TESTED ANNUALLY AT 100 PERCENT OF RATED CAPACITY OF 105,000 LB. AND THERE IS A PREVENTATIVE MAINTENANCE PROGRAM TO ENSURE PROPER OPERATION. ALL ASPECTS OF THE STRADDLE LIFTS ARE VERIFIED BEFORE EACH USE AND LOAD HOLDING/BRAKE CAPABILITY IS TESTED ANNUALLY.

THE DIAMOND BEAMS ARE DESIGNED WITH AN ULTIMATE FACTOR OF SAFETY OF FIVES TIMES THEIR RATED CAPACITY OF 105,000 LBS.

DIAMOND BEAM WEIGHT IS APPROXIMATELY 9500 LBS. WITH THE DIAMOND BEAMS ATTACHED, THE STRADDLE LIFTS ARE AT 9% OF THEIR RATED CAPACITY.

OPERATORS OF THE STRADDLE LIFTS ARE TRAINED AND CERTIFIED PER KMI 6340.4, EXAMINATION AND LICENSING OF KSC FACILITY CRANE OPERATORS.

ALTERNATE STANDARD REQUIREMENT #7: SAAs HAVE BEEN COMPLETED FOR THE RENNER AND ROPCO STRADDLE LIFTS. THE SAA INCLUDES A FAILURE MODES AND EFFECTS ANALYSIS/CRITICAL ITEM LIST (FMEA/CIL) AND A HAZARD ANALYSIS (SEE SUPPORTING DOCUMENTS).

THE SAA FOR THE RENNER STRADDLE LIFTS IDENTIFIES NO SINGLE FAILURE POINTS (SFP).

THE SAA FOR THE ROPCO STRADDLE LIFTS IDENTIFIES ONE SINGLE FAILURE POINT, THE HOIST GEARBOX, WHICH TRANSMITS POWER FROM THE HOIST MOTOR TO THE DRUM. FAILURE OF THE GEAR BOX COULD CAUSE THE LOAD TO DROP.

THERE IS NO HISTORY OF FAILURE WITH THE SFP IN THE CRITICAL FAILURE MODE. THE USE OF HIGH QUALITY, RELIABLE COMPONENTS AND A COMPREHENSIVE MAINTENANCE, INSPECTION AND TEST PROGRAM (INCLUDING PRE-OPERATIONAL CHECKS) ENSURES THE STRADDLE LIFT SYSTEMS OPERATE PROPERLY.

THE ASSOCIATED SAA CIL SHEETS IDENTIFY ALL THE RATIONALE FOR ACCEPTING THE RISK OF THE SFP INCLUDING DESIGN INFORMATION, FAILURE HISTORY, AND OPERATIONAL CONTROLS IN EFFECT TO MINIMIZE THE RISK (MAINTENANCE,

INSPECTION, TEST, ETC.).

ALTERNATE STANDARD REQUIREMENT #8: VISUAL INSPECTIONS OF THE STRADDLE LIFT STRUCTURE, CABLING, HOOKS, SHEAVE/PULLEYS, AS WELL AS DRIVE AND LOAD HOLDING MECHANISMS AND FUNCTIONAL CHECKS ARE PERFORMED PRIOR TO USE.

ALTERNATE STANDARD REQUIREMENT #9: TRAINED AND CERTIFIED OPERATORS SHALL MAN THE STRADDLE LIFT CONTROLS AT ALL TIMES WHEN THERE MAY BY POSSIBLE EXPOSURE OF PERSONNEL TO SUSPENDED LOADS.

ALTERNATE STANDARD REQUIREMENT #10: DM B8001 ESTABLISHES APPROPRIATE SAFETY CONTROL AREAS BEFORE INITIATING OPERATIONS.

ALTERNATE STANDARD REQUIREMENT #12: PERSONNEL BENEATH THE SUSPENDED LOAD WILL BE IN VOICE CONTACT OF THE STRADDLE LIFT OPERATOR AND TASK TEAM LEADER THROUGH OUT THE OPERATION. ANY ONE CAN CALL A SAFETY HOLD IF THEY SEE A DISCREPANCY AT ANY TIME DURING THE OPERATION.

ALTERNATE STANDARD REQUIREMENT #13: PERSONNEL BENEATH THE SUSPENDED LOAD WILL BE IN PLAIN SIGHT OF THE STRADDLE LIFT OPERATOR AND TASK TEAM LEADER THROUGHOUT THE OPERATION.

APPROVAL: DATE: 5/15/96

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