

MARTIN MARIETTA AEROSPACE

DENVER AEROSPACE
POST OFFICE BOX 179
DENVER, COLORADO 80201
TELEPHONE (303) 977-3000

28 May 1982

RESEARCH LIBRARY
RL No. 123230
Cy No. 1

Refer To: SLS-82-20242
To: Headquarters
Ogden Air Logistics Center
Hill Air Force Base
Ogden, Utah 84056
Attention: MMGRW
Subject: Contract F42600-81-D-1379-0004

Submitted as enclosure are the Safety Engineering Analyses identified in attachment 1.

These analyses are submitted as a partial fulfillment of CDRL 1004 of the subject contract.

Very truly yours,

MARTIN MARIETTA CORPORATION



Richard E. Ciepiela
Program Manager
Strategic Systems

bf

ATTACHMENT 1

SEA INDEX

<u>NUMBER</u>	<u>TITLE</u>
001	Annex and Sequence Chart Review
002	Thrust Ring Removal
003	OGE/Communications Chassis Removal
004	HS-1 Shutdown
005	Propellant Umbilical Removal
006	Fuel System Purge
007	Oxidizer System Purge
008	Fuel Holding Trailer Disconnect
009	Oxidizer Holding Trailer Disconnect
010	Commercial Trailer Placement on Fuel Hardstand
011	Com'1 Trailer Placement on Oxidizer Hardstand
012	P-52 Pump Set Removal
013	P-51 Pump Set Removal
014	Unload Fuel to Commercial Transporter
015	Unload Oxidizer to Commercial Transporter

MARTIN MARIETTA CORPORATION

DENVER, COLORADO

INTERIM ENGINEERING REPORT

FOR

TITAN II DEACTIVATION

ANNEX AND SEQUENCE CHART REVIEW

CONTRACT F42600-81-D-1379-0004-001

CDRL 1004

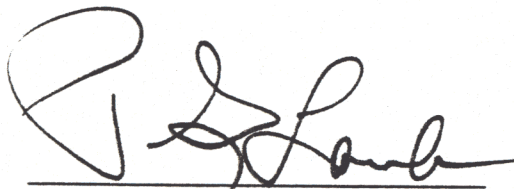
1982 MAY

PREPARED BY:

ART HALE

366 DE
366 BC
366 GS
366 LN

APPROVED BY:



P. G. LAMB
SLS SYSTEM SAFETY



RICHARD E. CIEPLALA
PROGRAM MANAGER
STRATEGIC SYSTEMS

1.0 INTRODUCTION

Titan II Weapon System deactivation has been directed. Individual working groups have been directed to prepare annexes delineating the methods by which they plan to accomplish their portion of the phase-down activities. Per direction in the referenced delivery order, a review of these annexes has been done. As a partial fulfillment of the delivery order this engineering report presents the results of this review.

In conjunction with this annex review, the Rivet Cap Sequence Chart T.O. 21M-LGM25C-1SC-3 was also reviewed. The close tie-in between these documents made a co-ordinated review a logical step. Where applicable discrepancies between annex requirements and the sequence chart are identified in the annex review. The overall sequence chart review is covered in paragraph 2.16.

2.0 DISCUSSION

The level of detail presented in these annexes varied very widely in the level of detail presented. Some of the annexes were very brief and generic in nature while others were very detailed and quite specific in their coverage. Obviously the same review criteria could not be applied to all of the annexes. Each annex has been reviewed on the same level that it was written. An editorial review was not accomplished except where a typo caused loss of meaning. Data deficiencies and incorrect references have been pointed out where applicable.

2.1 Annex A - Operations - Satisfactory as written.

2.2 Annex B - Propellants

2.2.1 Paragraph 1.5.1.2 refers to purge and flush operations. The reference to flush should be deleted to make the statement consistent with the sequence chart and program decisions. Additionally this paragraph should state that depot personnel will be present at the first three complexes to verify the purge procedures.

2.2.2 Paragraph 1.5.1.3 identifies Rocky Mountain Arsenal (RMA) as a storage location. The work necessary to bring RMA up to required standards will be both costly and time consuming. With first delivery to RMA scheduled for February 1983, it might be advisable to locate an alternate site.

2.2.3 Paragraphs 3.1.1.4 and 3.1.1.5 refer to flushing the Fixed Propellant Transfer System (FPTS). Substitute purge for flush. (Refer to paragraph 2.2.1.)

- 2.2.4 The routes shown in Appendix B-1, tabs B-1-A and B-1-B should provide greater detail so potential trouble spots will be avoided.
- 2.2.5 Paragraph 2.1.2.6 of Appendix B-3 has a TBD which needs to be filled.
- 2.2.6 The decision tree in Appendix B-3 needs reworking. It fails to provide positive direction from a given set of conditions.
- 2.3 Annex C - Booster/AVE/Data Storage
 - 2.3.1 Paragraph 3.1.1.3 directs the updating of T.O. 21M-LGM25C-1SC-1 to include: (1) Engine torque checks. (2) Internal contamination checks. (3) Flushing of engine gear boxes and (4) Installation of desiccant. The latest iteration of the sequence chart does not include these tasks.
- 2.4 Annex D - Ordnance - Satisfactory as written.
- 2.5 Annex E - Civil Engineering
 - 2.5.1 A comprehensive review of the Base CE SAC CEM data will be provided NLT 1 June 1982.
- 2.6 Annex F - Supply and Data Disposition - Satisfactory as written.
- 2.7 Annex G - Reentry Vehicle - Satisfactory as written.
- 2.8 Annex H - Security - Satisfactory as written.
- 2.9 Annex I - Manpower/Personnel/Training - Satisfactory as written.
- 2.10 Annex J - Communications/Command and Control Appendices J-3 and J-4 to be supplied.
- 2.11 Annex K - Funding - Satisfactory as written.
- 2.12 Annex L - Site Disposition - Satisfactory as written.
- 2.13 Annex M - Safety - Satisfactory as written.
- 2.14 Annex N - Public Affairs - Satisfactory as written.
- 2.15 Annex O - Environmental Assessment - Satisfactory as written.

- 2.16 Sequence Chart
- 2.16.1 See paragraph 2.3.1.
- 2.16.2 Sheet 2 of sequence chart should call out foamer, scrubber and fire water recirculation installation as a requirement for propellant download. These bubbles are dead-ended at present.
- 3.0 Summary - This review was based on data from Deactivation Management Plan dated 1 April 1982. Some of the comments in this review may not be applicable if updates have been made to the plan. The sequence chart review was based on the iteration provided at the data review at OO-ALC on 4 May.

MARTIN MARIETTA CORPORATION

DENVER, COLORADO

SAFETY ENGINEERING ANALYSIS

FOR

TITAN II RIVETCAP

THRUST RING REMOVAL

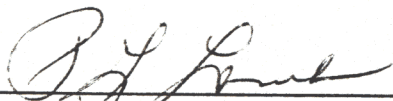
F42600-81-D-1379-0004-002

CDRL 1004

PREPARED BY:

JIM SHORT

APPROVED BY:



P. G. LAMB
SLS SYSTEM SAFETY



RICHARD E. CIEPELA
PROGRAM MANAGER
STRATEGIC SYSTEMS

1.0 SAFETY ENGINEERING ANALYSIS (SEA)

This Safety Analysis has been completed as required by parameters outlined in AFR 66-2. Engineering drawings were subjected to a detailed review; hazards and safety requirements are identified and classified in accordance with System Safety Program Requirements MIL-STD-882A.

2.0 DEFINITIONS OF HAZARD SEVERITY CATEGORIES

Category I

Catastrophic. May cause death or system loss.

Category II

Critical. May cause severe injury, severe occupational illness, or major system damage.

Category III

Marginal. May cause minor injury, minor occupational illness, or system damage.

Category IV

Negligible. Will not result in injury, occupational illness, or system damage.

NOTE: The Hoisting/Lifting tools will be rated and certified. Technical Orders and procedures have been reviewed to ensure that adequate safety precautions have been incorporated.

3.0 HAZARD ANALYSIS

SEA: 002
DATE: MAY 1982

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

- 1.0 Disconnect the 804E8000075 Shock Isolation System Cables at Level 7 Launch Duct. BAG cable connectors.
- 1.1 Personnel injury due to electrical shock. Category III
- 1.1.1 Ensure that all circuit breakers are in the OFF position per T.O. 21M-LGM25C-2-13 and DANGER tagged (AF Form 1492).
- 1.2 Personnel injury due to improper use of hand tools. Category III
- 1.2.1 Normal industrial safety practices associated with the use of common tools (wrenches, screw drivers, etc.) shall be utilized. (AFOSH STD 127-31)
- 1.3 Personnel injury and equipment damage due to personnel dropping tools. Category III
- 1.3.1 Tool, parts and equipment utilized, removed or installed in elevated position which could cause injury to personnel or damage equipment at lower levels will be secured.
- 1.4 Personnel injury, equipment damage due to personnel falling from and/or dropping tools from step ladder. Category III
- 1.4.1 Ladder must be secured or held firm by personnel standing on the floor.
- 1.4.2 Personnel must exercise caution to not drop tools.
- 1.4.3 Personnel on floor in immediate vicinity of ladder must wear hard hats.

3.0 HAZARD ANALYSIS

SEA: 002
DATE: MAY 1982

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

2.0 Remove Shock Isolation Junction Box No. 1 and No. 2 at Level 7 Launch Duct.

2.1 Personnel injury due to electrical shock. Category III

2.1.1 Ensure that circuit breaker 13 and circuit breaker 102 are in the OFF position per T.O. 21M-LGM25C-2-13 and DANGER tagged (AF Form 1492).

2.2 Personnel injury due to improper use of hand tools. Category III

2.2.1 Normal industrial safety practices associated with the use of common tools (saw, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

2.3 Personnel injury and equipment damage due to personnel dropping tools. Category III

2.3.1 Tool, parts and equipment utilized, removed or installed in elevated position which could cause injury to personnel or damage equipment at lower levels will be secured.

3.0 Remove the Thrust Mount mounted equipment. (Missile Support plates, Precision Levels and Covers, Propellant Hose Supports, Wire Rope Anchor plate, Identification Plates, Thrust Mount to Vertical and Horizontal Dampers, Horizontal Damper to Bracket assembly, Ball Screw Jacks to Thrust Mount, Ground Strap from Thrust Mount to facility, and miscellaneous hardware)

3.1 Personnel injury due to high pressure (2000 psi) from nitrogen bottles. Category III

3.1.1 Discharge nitrogen bottles per T.O. 21M-LGM25C-2-13, paragraph 2-69A.

3.0 HAZARD ANALYSIS

SEA: 002
DATE: MAY 1982

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

- 3.2 Personnel injury due to improper use of hand tools. Category III
- 3.2.1 Normal industrial safety practices associated with the use of common tools (saw, power drills, etc.) shall be utilized. (AFOSH STD 127-31)
- 3.3 Personnel injury, equipment damage due to personnel falling from and/or dropping tools from step ladder. Category III
- 3.3.1 Ladder must be secured or held firm by personnel standing on the floor.
 - 3.3.2 Personnel must exercise caution to not drop tools.
 - 3.3.3 Personnel on floor in immediate vicinity of ladder must wear hard hats.
- 3.4 Personnel injury, equipment damage due to hoisting equipment failure. Crane rated at 28,000 lbs. minimum at a boom radius of 47 feet, with 130 feet line below ground and 20 feet above ground. (Crane must have certification of proof load test) Category III
- 3.4.1 Rated hoisting equipment required for all hoisting operations.
 - 3.4.2 Ensure that personnel are not positioned under load.
 - 3.4.3 Require hard hats for all personnel involved in hoisting operations.
 - 3.4.4 Use tag lines when hoisting and positioning load.

3.0 HAZARD ANALYSIS

SEA: 002
DATE: MAY 1982

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

4.0 Remove Shock Isolation System (SIS) spring centering devices in the Launch Silo.

4.1 Personnel injury due to improper use of hand tools. Category III

4.1.1 Normal industrial safety practices associated with the use of common tools (saw, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

4.2 Personnel injury, equipment damage due to hoisting equipment failure. Crane rated at 28,000 lbs minimum at a boom radius of 47 feet, with 130 feet line below ground and 20 feet above ground. (Crane must have certification of proof load test) Category III

4.2.1 Rated hoisting equipment required for all hoisting operations.

4.2.2 Ensure that personnel are not positioned under load.

4.2.3 Require hard hats for all personnel involved in hoisting operations.

4.2.4 Use tag lines when hoisting and positioning load.

5.0 Complete removal of the Shock Isolation System (Thrust Ring).

5.1 Personnel injury due to improper use of hand tools. Category III

5.1.1 Normal industrial safety practices associated with the use of common tools (saw, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

3.0 HAZARD ANALYSIS

SEA: 002

DATE: MAY 1982

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

5.2 Personnel injury, equipment damage due to hoisting equipment failure. Crane rated at 28,000 lbs minimum at a boom radius of 47 feet, with 130 feet line below ground and 20 feet above ground. (Crane must have certification of proof load test) Category III

5.2.1 Rates hoisting equipment required for all hoisting operations.

5.2.2 Ensure that personnel are not positioned under load.

5.2.3 Require hard hats for all personnel involved in hoisting operations.

5.2.4 Use tag lines when hoisting and positioning load.

6.0 Disassemble the Thrust Mount (topside).

6.1 Personnel injury due to improper use of hand tools. Category III

6.1.1 Normal industrial safety practices associated with the use of common tools (saw, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

3.0 HAZARD ANALYSIS

SEA: 002
DATE: MAY 1982

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

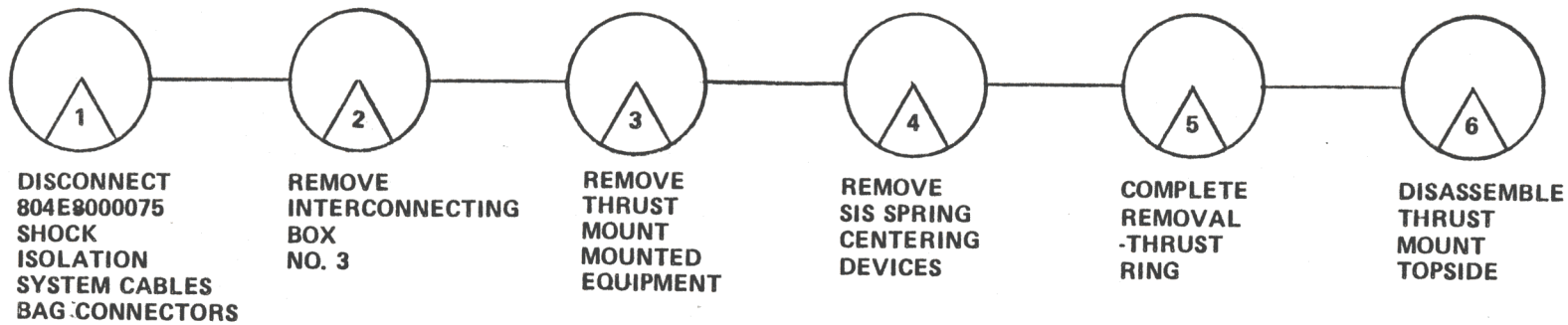
6.2 Personnel injury, equipment damage due to hoisting equipment failure. Crane rated at 28,000 lbs minimum at a boom radius of 47 feet, with 130 feet line below ground and 20 feet above ground. (Crane must have certification of proof load test) Category III

6.2.1 Rated hoisting equipment required for all hoisting operations.

6.2.2 Ensure that personnel are not positioned under load.

6.2.3 Require hard hats for all personnel involved in hoisting operations.

6.2.4 Use tag lines when hoisting and positioning load.



Thrust Ring Removal Sequence Chart

MARTIN MARIETTA CORPORATION

DENVER, COLORADO

SAFETY ENGINEERING ANALYSIS

FOR

TITAN II RIVETCAP

OGE AND COMMUNICATIONS CHASSIS REMOVAL

F42600-81-D-1379-0004-003

CDRL 1004

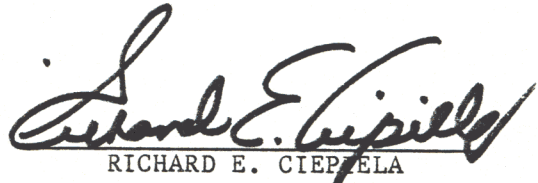
PREPARED BY:

JIM SHORT

APPROVED BY:



P. G. LAMB
SLS SYSTEM SAFETY



RICHARD E. CIEPELA
PROGRAM MANAGER
STRATEGIC SYSTEMS

1.0 SAFETY ENGINEERING ANALYSIS (SEA)

This Safety Analysis has been completed as required by parameters outlined in AFR 66-2. Engineering drawings were subjected to a detailed review; hazards and safety requirements are identified and classified in accordance with System Safety Program Requirements MIL-STD-882A.

2.0 DEFINITIONS OF HAZARD SEVERITY CATEGORIES

Category I

Catastrophic. May cause death or system loss.

Category II

Critical. May cause severe injury, severe occupational illness, or major system damage.

Category III

Marginal. May cause minor injury, minor occupational illness, or system damage.

Category IV

Negligible. Will not result in injury, occupational illness, or system damage.

NOTE: The Hoisting/Lifting tools will be rated and certified. Technical Orders and procedures have been reviewed to ensure that adequate safety precautions have been incorporated.

CHASSIS REMOVAL REQUIREMENTS

This safety engineering analysis covers those tasks required to remove OGE and Communications Chassis from their racks and move them to the topside area safely. Each task consists basically of electrically safing the racks, removing the chassis and transporting them topside. All of the removals are basically the same except for the electrical safing requirements peculiar to each rack. These are specified with each individual rack safety analysis. No particular sequence is required for chassis removal.

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

1.0 Remove the Operational Ground Equipment (OGE) chassis from the Missile Guidance Alignment-Checkout Group (MGACG) cabinet.

1.1 Personnel injury due to electrical shock. Category III

1.1.1 Ensure that all circuit breakers and switches are in the OFF position per T.O. 21M-LGM25C-2-4-2, FIG 1-4 DANGER tagged (AF Form 1492).

1.2 Personnel injury due to improper use of power and hand tools. Category III.

1.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

1.3 Personnel injury due to lifting of heavy equipment. Category III

1.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

3.0 HAZARD ANALYSIS

SEA: 003
DATE: MAY 1982

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

1.4 Personnel injury, equipment damage due to improper handling of chassis. Category III

1.4.1 Chassis will be secured to and transported on cart/hand truck.

2.0 Remove the Operational Ground Equipment (OGE) chassis from the Power Distribution Control (PDC) rack.

2.1 Personnel injury due to electrical shock. Category III

2.1.1 Ensure that all circuit breakers and switches are in the OFF position per T.O. 21M-LGM25C-2-6, FIGS 2-343 & 2-58.

2.2 Personnel injury due to improper use of power and hand tools. Category III.

2.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

2.3 Personnel injury due to lifting of heavy equipment. Category III

2.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

2.4 Personnel injury, equipment damage due to improper handling of chassis. Category III

2.4.1 Chassis will be secured to and transported on cart/hand truck.

3.0 Remove the Operational Ground Equipment (OGE) chassis from the Control-Monitor Group (CMG) rack.

3.1 Personnel injury due to electrical shock. Category III

3.1.1 Ensure that all circuit breakers and switches are in the OFF position per T.O. 21M-LGM25C-2-6, FIGS 2-63 & 2-64.

3.2 Personnel injury due to improper use of power and hand tools. Category III.

3.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

3.3 Personnel injury due to lifting of heavy equipment. Category III

3.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

3.4 Personnel injury, equipment damage due to improper handling of chassis. Category III

3.4.1 Chassis will be secured to and transported on cart/hand truck.

4.0 Remove the Operational Ground Equipment (OGE) chassis from the Missile Systems Fault Locator (MFL) rack.

4.1 Personnel injury due to electrical shock. Category III

4.1.1 Ensure that all circuit breakers and switches are in the OFF position per T.O. 21M-LGM25C-2-6, FIG 2-61.

4.2 Personnel injury due to improper use of power and hand tools. Category III.

4.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

4.3 Personnel injury due to lifting of heavy equipment. Category III

4.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

4.4 Personnel injury, equipment damage due to improper handling of chassis. Category III

4.4.1 Chassis will be secured to and transported on cart/hand truck.

5.0 Remove the Operational Ground Equipment (OGE) chassis from the Alternate Launch Officers Console (ALOC).

5.1 Personnel injury due to electrical shock. Category III

5.1.1 Ensure that all circuit breakers and switches are in the OFF position per SAC/CEM 21-SM68B-2-21-X, FIG 2-15 and T.O. 21M-LGM25C-2-24, FIG 2-61.

9

5.2 Personnel injury due to improper use of power and hand tools. Category III.

5.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

5.3 Personnel injury due to lifting of heavy equipment. Category III

5.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

5.4 Personnel injury, equipment damage due to improper handling of chassis. Category III

5.4.1 Chassis will be secured to and transported on cart/hand truck.

6.0 Remove the Operational Ground Equipment (OGE) chassis from the Launch Control Complex Facilities Console (LCCFC).

6.1 Personnel injury due to electrical shock. Category III

6.1.1 Ensure that all circuit breakers and switches are in the OFF position per SAC/CEM 21-SM68B-2-21-X, FIG 2-15 AND T.O. 21M-LGM25C-2-24, FIG 2-61.

6.2 Personnel injury due to improper use of power and hand tools. Category III.

6.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

6.3 Personnel injury due to lifting of heavy equipment. Category III

6.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

3.0 HAZARD ANALYSTS

SEA: 003
DATE: MAY 1982

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

6.4 Personnel injury, equipment damage due to improper handling of chassis. Category III

6.4.1 Chassis will be secured to and transported on cart/hand truck.

7.0 Remove the Communications chassis from the Radio Receiver-Teletypewriter (487L).

7.1 Personnel injury due to electrical shock. Category III

7.1.1 Ensure that all circuit breakers and switches are in the OFF position per SAC/CEM 21-SM68B-2-21-X, FIG 2-15 AND T.O. 21M-LG25C-2-24, FIG 2-61.

7.2 Personnel injury due to improper use of power and hand tools. Category III.

7.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

7.3 Personnel injury due to lifting of heavy equipment. Category III

7.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

<u>Height of lift from ground</u>	<u>Maximum Weight*</u>
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

7.4 Personnel injury, equipment damage due to improper handling of chassis. Category III

7.4.1 Chassis will be secured to and transported on cart/hand truck.

8.0 Remove the Communications chassis from the HF-SSB/UHF.

8.1 Personnel injury due to electrical shock. Category III

8.1.1 Ensure that all circuit breakers and switches are in the OFF position per SAC/CEM 21-SM68B-2-21-X, FIG 2-15 AND T.O. 21M-LGM25C-2-24, FIG 2-61.

8.2 Personnel injury due to improper use of power and hand tools. Category III.

8.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

8.3 Personnel injury due to lifting of heavy equipment. Category III

8.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

8.4 Personnel injury, equipment damage due to improper handling of chassis. Category III

8.4.1 Chassis will be secured to and transported on cart/hand truck.

9.0 Remove the Communications chassis from the Digital Data Converter Set (465L).

9.1 Personnel injury due to electrical shock. Category III

9.1.1 Ensure that all circuit breakers and switches are in the OFF position per SAC/CEM 21-SM68B-2-21-X, FIG 2-15 AND T.O. 21M-LGM25C-2-24, FIG 2-61.

9.2 Personnel injury due to improper use of power and hand tools. Category III.

9.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

9.3 Personnel injury due to lifting of heavy equipment. Category III

9.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

3.0 HAZARD ANALYSIS

SEA: 003
DATE: MAY 1982

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

9.4 Personnel injury, equipment damage due to improper handling of chassis. Category III

9.4.1 Chassis will be secured to and transported on cart/hand truck.

10.0 Remove the chassis from the Radar Surveillance System (TPS-39).

10.1 Personnel injury due to electrical shock. Category III

10.1.1 Ensure that all circuit breakers and switches are in the OFF position per SAC/CEM 21-SM68B-2-21-X, FIG 2-15 AND T.O. 21M-LGM25C-2-24, FIG 2-61.

10.2 Personnel injury due to improper use of power and hand tools. Category III.

10.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

10.3 Personnel injury due to lifting of heavy equipment. Category III

10.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

10.4 Personnel injury, equipment damage due to improper handling of chassis. Category III

10.4.1 Chassis will be secured to and transported on cart/hand truck.

11.0 Remove the Communications chassis from the Primary Alert System (PAS) ALOC-1.

11.1 Personnel injury due to electrical shock. Category III

11.1.1 Ensure that all circuit breakers and switches are in the OFF position per SAC/CEM 21-SM68B-2-21-X, FIG 2-15 AND T.O. 21M-LGM25C-2-24, FIG 2-61.

11.2 Personnel injury due to improper use of power and hand tools. Category III.

11.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

11.3 Personnel injury due to lifting of heavy equipment. Category III

11.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

11.4 Personnel injury, equipment damage due to improper handling of chassis. Category III

11.4.1 Chassis will be secured to and transported on cart/hand truck.

12.0 Remove the Communications chassis from the Transmitter Group (XMTR-1, -2).

12.1 Personnel injury due to electrical shock. Category III

12.1.1 Ensure that all circuit breakers and switches are in the OFF position per SAC/CEM 21-SM68B-2-21-X, FIG 2-15 AND T.O. 21M-LGM25C-2-24, FIG 2-61.

12.2 Personnel injury due to improper use of power and hand tools. Category III.

12.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

12.3 Personnel injury due to lifting of heavy equipment. Category III

12.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

12.4 Personnel injury, equipment damage due to improper handling of chassis. Category III

12.4.1 Chassis will be secured to and transported on cart/hand truck.

13.0 Remove the Communications chassis from the Multicoupler Assembly (MUX-CUP).

13.1 Personnel injury due to electrical shock. Category III

13.1.1 Ensure that all circuit breakers and switches are in the OFF position per SAC/CEM 21-SM68B-2-21-X, FIG 2-15 AND T.O. 21M-LG25C-2-24, FIG 2-61.

13.2 Personnel injury due to improper use of power and hand tools. Category III.

13.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

13.3 Personnel injury due to lifting of heavy equipment. Category III

13.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

13.4 Personnel injury, equipment damage due to improper handling of chassis. Category III

13.4.1 Chassis will be secured to and transported on cart/hand truck.

14.0 Remove the Communications chassis from the Multicoupler-Receiver Group (MUX-RCVR).

14.1 Personnel injury due to electrical shock. Category III

14.1.1 Ensure that all circuit breakers and switches are in the OFF position per SAC/CEM 21-SM68B-2-21-X, FIG 2-15 AND T.O. 21-M-LGM25C-2-24, FIG 2-61.

14.2 Personnel injury due to improper use of power and hand tools. Category III.

14.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

14.3 Personnel injury due to lifting of heavy equipment. Category III

14.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

14.4 Personnel injury, equipment damage due to improper handling of chassis. Category III

14.4.1 Chassis will be secured to and transported on cart/hand truck.

15.0 Remove the Communications chassis from the Terminal Equipment Group (TE).

15.1 Personnel injury due to electrical shock. Category III

15.1.1 Ensure that all circuit breakers and switches are in the OFF position per SAC/CEM 21-SM68B-2-21-X, FIG 2-15 AND T.O. 21-M-LGM25-C-2-24, FIG 2-61.

15.2 Personnel injury due to improper use of power and hand tools. Category III.

15.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

15.3 Personnel injury due to lifting of heavy equipment. Category III

15.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

TASK DESCRIPTIONHAZARDSAFETY REQUIREMENTS

15.4 Personnel injury, equipment damage due to improper handling of chassis.
Category III

15.4.1 Chassis will be secured to and transported on cart/hand truck.

16.0 Remove the Communications chassis from the Power and Supervisory Equipment (PWR-1).

16.1 Personnel injury due to electrical shock. Category III

16.1.1 Ensure that all circuit breakers and switches are in the OFF position per SAC/CEM 21-SM68B-2-21-X, FIG 2-15 AND T.O. 21M-LGM25C-2-24, FIG 2-61.

16.2 Personnel injury due to improper use of power and hand tools. Category III.

16.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

16.3 Personnel injury due to lifting of heavy equipment. Category III

16.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

16.4 Personnel injury, equipment damage due to improper handling of chassis.
Category III

16.4.1 Chassis will be secured to and transported on cart/hand truck.

17.0 Remove the Communications chassis from the Wire Control and Transmission Equipment (WCT-1, -2, -3).

17.1 Personnel injury due to electrical shock. Category III

17.1.1 Ensure that all circuit breakers and switches are in the OFF position per SAC/CEM 21-SM68B-2-21-X, FIG 2-15 AND T.O. 21M-LGM25C-2-24, FIG 2-61.

17.2 Personnel injury due to improper use of power and hand tools. Category III.

17.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

17.3 Personnel injury due to lifting of heavy equipment. Category III

17.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

TASK DESCRIPTIONHAZARDSAFETY REQUIREMENTS

- 17.4 Personnel injury, equipment damage due to improper handling of chassis. Category III
- 17.4.1 Chassis will be secured to and transported on cart/hand truck.

18.0 Remove the Communications chassis from the Alternate Launch Officers Console (ALOC).

18.1 Personnel injury due to electrical shock. Category III

- 18.1.1 Ensure that all circuit breakers and switches are in the OFF position per SAC/CEM 21-SM68B-2-21-X, FIG 2-15 AND T.O. 21M-LGM25C-2-24, FIG 2-61.

18.2 Personnel injury due to improper use of power and hand tools. Category III.

- 18.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

18.3 Personnel injury due to lifting of heavy equipment. Category III

- 18.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

3.0 HAZARD ANALYSIS

SEA: 003
DATE: MAY 1982

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

18.4 Personnel injury, equipment damage due to improper handling of chassis. Category III

18.4.1 Chassis will be secured to and transported on cart/hand truck.

19.0 Remove the Communications chassis from the Launch Control Complex Facilities Console (LCCFC).

19.1 Personnel injury due to electrical shock. Category III

19.1.1 Ensure that all circuit breakers and switches are in the OFF position per SAC/CEM 21-SM68B-2-21-X, FIG 2-15 AND T.O. 21M-LGM25C-2-24, FIG 2-61.

19.2 Personnel injury due to improper use of power and hand tools. Category III.

19.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

19.3 Personnel injury due to lifting of heavy equipment. Category III

19.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

TASK DESCRIPTIONHAZARDSAFETY REQUIREMENTS

19.4 Personnel injury, equipment damage due to improper handling of chassis.
Category III

19.4.1 Chassis will be secured to and transported on cart/hand truck.

20.0 Remove the Communications chassis from the Voice Signaling System (VSS).

20.1 Personnel injury due to electrical shock. Category III

20.1.1 Ensure that all circuit breakers and switches are in the OFF position per SAC/CEM 21-SM68B-2-21-X, FIG 2-15 AND T.O. 21M-LGM25C-2-24, FIG 2-61.

20.2 Personnel injury due to improper use of power and hand tools. Category III.

20.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

20.3 Personnel injury due to lifting of heavy equipment. Category III

20.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

20.4 Personnel injury, equipment damage due to improper handling of chassis.
Category III

20.4.1 Chassis will be secured to and transported on cart/hand truck.

21.0 Remove the Communications chassis from the Radio Type Maintenance Network (RTMN) RAD-1.

21.1 Personnel injury due to electrical shock. Category III

21.1.1 Ensure that all circuit breakers and switches are in the OFF position per SAC/CEM 21-SM68B-2-21-X, FIG 2-15 AND T.O. 21M-LGM25C-2-24, FIG 2-61.

21.2 Personnel injury due to improper use of power and hand tools. Category III.

21.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

21.3 Personnel injury due to lifting of heavy equipment. Category III

21.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

3.0 HAZARD ANALYSIS

SEA: 003
DATE: MAY 1982

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

21.4 Personnel injury, equipment damage due to improper handling of chassis.
Category III

21.4.1 Chassis will be secured to and transported on cart/hand truck.

22.0 Remove the Propellant Tank Pressure Monitor Unit (PTPMU) from the Launch Control Complex Facilities Console (LCCFC).

22.1 Personnel injury due to electrical shock. Category III

22.1.1 Ensure that all circuit breakers and switches are in the OFF position per T.O. 31X2-10-28-2, FIG 7021

22.2 Personnel injury due to improper use of power and hand tools. Category III.

22.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

22.3 Personnel injury due to lifting of heavy equipment. Category III

22.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

3.0 HAZARD ANALYSIS

SEA: 003
DATE: MAY 1982

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

22.4 Personnel injury, equipment damage due to improper handling of chassis.
Category III

22.4.1 Chassis will be secured to and
transported on cart/hand truck.

MARTIN MARIETTA CORPORATION

DENVER, COLORADO

SAFETY ENGINEERING ANALYSIS

FOR

TITAN II RIVETCAP

HS-1 SHUTDOWN

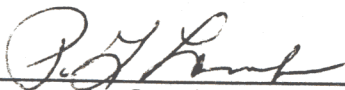
F42600-81-D-1379-0004-004

CDRL 1004

PREPARED BY:

JIM SHORT

APPROVED BY:



P. G. LAMB
SLS SYSTEM SAFETY



RICHARD E. CIEPELA
PROGRAM MANAGER
STRATEGIC SYSTEMS

1.0 SAFETY ENGINEERING ANALYSIS (SEA)

This Safety Analysis has been completed as required by parameters outlined in AFR 66-2. Engineering drawings were subjected to a detailed review; hazards and safety requirements are identified and classified in accordance with System Safety Program Requirements MIL-STD-882A.

2.0 DEFINITIONS OF HAZARD SEVERITY CATEGORIES

Category I

Catastrophic. May cause death or system loss.

Category II

Critical. May cause severe injury, severe occupational illness, or major system damage.

Category III

Marginal. May cause minor injury, minor occupational illness, or system damage.

Category IV

Negligible. Will not result in injury, occupational illness, or system damage.

NOTE: The Hoisting/Lifting tools will be rated and certified.
 Technical Orders and procedures have been reviewed to ensure
 that adequate safety precautions have been incorporated.

No other activities will be performed beyond blast door nine during HS-1 shutdown.

3.0 HAZARD ANALYSIS

SEA: 004
DATE: MAY 1982

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

1.0 Shut Off HS-1 Electrical Power At MCC-1.

1.1 No Hazards Identified. Category IV

1.1.1 Perform Per Procedure.

2.0 Bleed Hydraulic Pressure Off System.

2.1 Personnel Injury Due to High Pressure (3500 PSI). Category III

2.1.1 Relief ports shall be located so that escaping gases or vapor will not be hazardous to personnel or equipment.

2.2 Personnel Injury due to improper use of hand tools. Category III

2.2.1 Normal industrial safety practices associated with the use of common hand tools shall be utilized. (AFOSH STD 127-31)

3.0 Vent Nitrogen from system to topside.

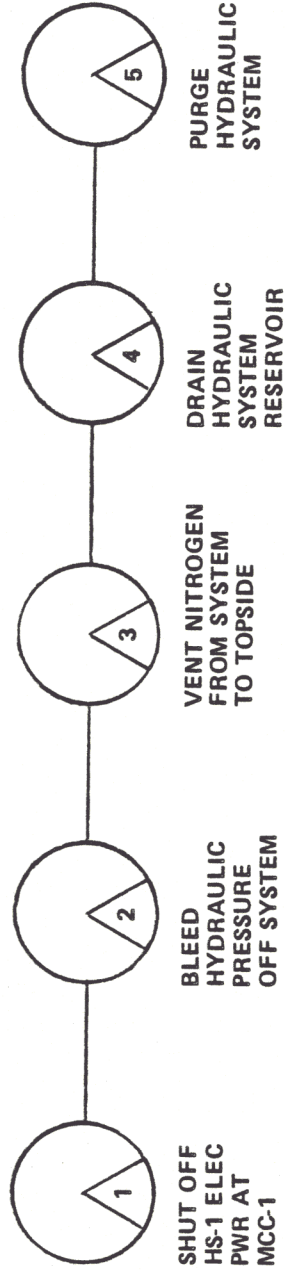
3.1 Personnel injury due to high pressure (2800 PSI). Category III

3.1.1 Personnel will exercise caution while working around high pressure. Safety relief valve outlets shall be vented to atmosphere.

3.0 HAZARD ANALYSIS

SEA: 004
DATE: MAY 1982

<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
4.0 Drain Hydraulic System reservoir.		
	4.1	Personnel injury while handling 55 gallon drums. <u>Category III</u>
		4.1.1 Personnel will use proper handling equipment for transporting drums.
		4.1.2 Personnel will wear gloves while draining fluid and handling drums.
5.0 Purge Hydraulic System.		
	5.1	Personnel injury due to high pressure. <u>Category III</u>
		5.1.1 Relief ports shall be located so that escaping gases or vapor will not be hazardous to personnel or equipment.



HS-1 Shutdown Sequence Chart

MARTIN MARIETTA CORPORATION

DENVER, COLORADO

SAFETY ENGINEERING ANALYSIS

FOR

TITAN II RIVETCAP

PROPELLANT UMBILICAL REMOVAL


F42600-81-D-1379-004-005

CDRL 1004

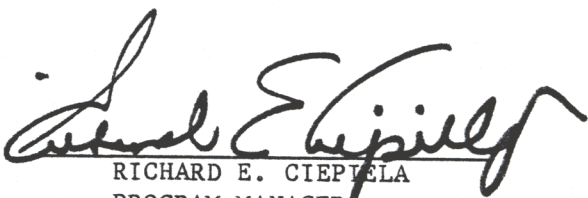
PREPARED BY:

ART HALE

APPROVED BY:



P. G. LAMB
SLS SYSTEM SAFETY



RICHARD E. CIEPIELA
PROGRAM MANAGER
STRATEGIC SYSTEMS

1.0 SAFETY ENGINEERING ANALYSIS (SEA)

This Safety Analysis has been completed as required by parameters outlined in AFR 66-2. Engineering drawings were subjected to a detailed review; hazards and safety requirements are identified and classified in accordance with System Safety Program Requirements MIL-STD-882A.

2.0 DEFINITIONS OF HAZARD SEVERITY CATEGORIES

Category I

Catastrophic. May cause death or system loss.

Category II

Critical. May cause severe injury, severe occupational illness, or major system damage.

Category III

Marginal. May cause minor injury, minor occupational illness, or system damage.

Category IV

Negligible. Will not result in injury, occupational illness, or system damage.

NOTE: Technical Orders and procedures have been reviewed to ensure that adequate safety precautions have been incorporated.

TASK DESCRIPTIONHAZARDSAFETY REQUIREMENTS

1.0 Remove Stage I Fuel Fill-Drain Hose.

1.1 Residual fuel in fixed piping. Category I

1.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1)

1.1.2 Vapor concentration shall be monitored with a PVD.

1.2 High pressure gases. Category III

1.2.1 Isolate hose by performing procedures IAW T.O. 21M-LGM25C-2-12, Figure 5-36, Item 9.

1.3 Personnel injury due to improper use of hand tools. Category III

1.3.1 Normal industrial safety practices associated with the use of common tools shall be used.

1.4 Dropped tools and/or equipment. Category III

1.4.1 Drop cloths shall be placed below working area.

1.5 Falling off work platforms in launch duct. Category I

1.5.1 Safety poles and chains will be installed prior to commencement of work activity.

2.0 Install split gaskets and cover plates.

2.1 Residual fuel in fixed piping. Category I

2.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
3.0 Wrap hose for transport.		
4.0 Remove Stage II Fuel Fill-Drain Hose.		
	2.2 Personnel injury due to improper use of hand tools. Category III	
	2.3 Dropped tools and/or equipment. Category III	2.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used.
	2.4 Falling off work platforms in launch duct. Category I	2.3.1 Drop cloths shall be placed below working area.
	3.1 Handling contaminated equipment. Category I	2.4.1 Safety poles and chains will be installed prior to commencement of work activity.
	4.1 Residual fuel in fixed piping. Category I	3.1.1 Personnel shall wear Category I protective clothing. (T.O. 21M-LGM25C-1)
		3.1.2 Hose shall be wrapped in plastic film, sealed with tape and labeled FUEL CONTAMINATED.
	4.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1)	
	4.1.2 Vapor concentration shall be monitored with a PVD.	

<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
4.2	High pressure gases.	Category III
4.2.1	Isolate hose by performing procedures IAW T.O. 21M-LGM25C-2-12, Figure 5-36, Item 8.	
4.3	Personnel injury due to improper use of hand tools.	Category III
4.3.1	Normal industrial safety practices associated with the use of common tools shall be used.	
4.4	Dropped tools and/or equipment.	Category III
4.4.1	Drop cloths shall be placed below working area.	
4.5	Falling off work platforms in launch duct.	Category I
4.5.1	Safety poles and chains will be installed prior to commencement of work activity.	
5.0	Install split gaskets and cover plates.	
5.1	Residual fuel in fixed piping.	Category I
5.1.1	Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).	
5.2	Personnel injury due to improper use of hand tools.	Category III
5.2.1	Normal industrial safety practices associated with the use of common hand tools shall be used.	
5.3	Dropped tools and/or equipment.	Category III
5.3.1	Drop cloths shall be placed below working area.	

TASK DESCRIPTIONHAZARDSAFETY REQUIREMENTS

- 5.4 Falling off work platforms in launch duct. Category I
- 5.4.1 Safety poles and chains will be installed prior to commencement of work activity.
- 6.0 Wrap hose for transport.
- 6.1 Handling contaminated equipment. Category I
- 6.1.1 Personnel shall wear Category I protective clothing. (T.O. 21M-LGM25C-1)
- 6.1.2 Hose shall be wrapped in plastic film, sealed with tape and labeled FUEL CONTAMINATED.
- 7.0 Remove Stage I Oxidizer Fill-Drain Hose.
- 7.1 Residual oxidizer in fixed piping. Category I
- 7.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1)
- 7.1.2 Vapor concentration shall be monitored with a PVD.
- 7.2 High pressure gases. Category III
- 7.2.1 Isolate hose by performing procedures IAW T.O. 21M-LGM25C-2-12, Figure 5-36, Item 47.
- 7.3 Personnel injury due to improper use of hand tools. Category III
- 7.3.1 Normal industrial safety practices associated with the use of common tools shall be used.

<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
7.4	Dropped tools and/or equipment.	Category III
7.4.1	Drop cloths shall be placed below working area.	
7.5	Falling off work platforms in launch duct.	Category I
7.5.1	Safety poles and chains will be installed prior to commencement of work activity.	
8.0	Install split gaskets and cover plates.	
8.1	Residual oxidizer in fixed piping.	Category I
8.1.1	Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).	
8.2	Personnel injury due to improper use of hand tools.	Category III
8.2.1	Normal industrial safety practices associated with the use of common hand tools shall be used.	
8.3	Dropped tools and/or equipment.	Category III
8.3.1	Drop cloths shall be placed below working area.	
8.4	Falling off work platforms in launch duct.	Category I
8.4.1	Safety poles and chains will be installed prior to commencement of work activity.	

TASK DESCRIPTION

9.0 Wrap hose for transport.

HAZARD

9.1 Handling contaminated equipment. Category I

SAFETY REQUIREMENTS

9.1.1 Personnel shall wear Category I protective clothing. (T.O. 21M-LGM25C-1)

9.1.2 Hose shall be wrapped in plastic film, sealed with tape and labeled OXIDIZER CONTAMINATED.

10.0 Remove Stage II Oxidizer Fill-Drain Hose.

10.1 Residual oxidizer in fixed piping. Category I

10.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1)

10.1.2 Vapor concentration shall be monitored with a PVD.

10.2 High pressure gases. Category III

10.2.1 Isolate hose by performing procedures IAW T.O. 21M-LGM25C-2-12, Figure 5-36, Item 46.

10.3 Personnel injury due to improper use of hand tools. Category III

10.3.1 Normal industrial safety practices associated with the use of common tools shall be used.

10.4 Dropped tools and/or equipment. Category III

10.4.1 Drop cloths shall be placed below working area.

TASK DESCRIPTIONHAZARDSAFETY REQUIREMENTS

10.5 Falling off work platforms in launch duct. Category I

10.5.1 Safety poles and chains will be installed prior to commencement of work activity.

11.0 Install split gaskets and cover plates.

11.1 Residual oxidizer in fixed piping. Category I

11.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

11.2 Personnel injury due to improper use of hand tools. Category III

11.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used.

11.3 Dropped tools and/or equipment. Category III

11.3.1 Drop cloths shall be placed below working area.

11.4 Falling off work platforms in launch duct. Category I

11.4.1 Safety poles and chains will be installed prior to commencement of work activity.

12.0 Wrap hose for transport.

12.1 Handling contaminated equipment. Category I

12.1.1 Personnel shall wear Category I protective clothing. (T.O. 21M-LGM25C-1)

12.1.2 Hose shall be wrapped in plastic film, sealed with tape and labeled OXIDIZER CONTAMINATED.

<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
13.0 Remove Stage I Fuel Vent Hose.		
13.1 Residual fuel in fixed piping.	Category I	
13.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1)		
13.1.2 Vapor concentration shall be monitored with a PVD.		
13.2 High pressure gases.	Category III	
13.2.1 Isolate hose by performing procedures IAW T.O. 21M-LGM25C-2-12, Figure 5-36, Item 2.		
13.3 Personnel injury due to improper use of hand tools.	Category III	
13.3.1 Normal industrial safety practices associated with the use of common tools shall be used.		
13.4 Dropped tools and/or equipment.	Category III	
13.4.1 Drop cloths shall be placed below working area.		
13.5 Falling off work platforms in launch duct.	Category I	
13.5.1 Safety poles and chains will be installed prior to commencement of work activity.		
14.0 Install split gaskets and cover plates.		
14.1 Residual fuel in fixed piping.	Category I	
14.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).		

<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
14.2	Personnel injury due to improper use of hand tools.	Category III
14.2.1	Normal industrial safety practices associated with the use of common hand tools shall be used.	
14.3	Dropped tools and/or equipment.	Category III
14.3.1	Drop cloths shall be placed below working area.	
14.4	Falling off work platforms in launch duct.	Category I
14.4.1	Safety poles and chains will be installed prior to commencement of work activity.	
15.0	Wrap hose for transport.	
15.1	Handling contaminated equipment.	Category I
15.1.1	Personnel shall wear Category I protective clothing. (T.O. 21M-LGM25C-1)	
15.1.2	Hose shall be wrapped in plastic film, sealed with tape and labeled FUEL CONTAMINATED.	
16.0	Remove Stage II Fuel Vent Hose.	
16.1	Residual fuel in fixed piping.	Category I
16.1.1	Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1)	
16.1.2	Vapor concentration shall be monitored with a PVD.	

<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
16.2	High pressure gases.	Category III
16.2.1	Isolate hose by performing procedures IAW T.O. 21M-LGM25C-2-12, Figure 5-36, Item 1.	
16.3	Personnel injury due to improper use of hand tools.	Category III
16.3.1	Normal industrial safety practices associated with the use of common tools shall be used.	
16.4	Dropped tools and/or equipment.	Category III
16.4.1	Drop cloths shall be placed below working area.	
16.5	Falling off work platforms in launch duct.	Category I
16.5.1	Safety poles and chains will be installed prior to commencement of work activity.	
17.0	Install split gaskets and cover plates.	
17.1	Residual fuel in fixed piping.	Category I
17.1.1	Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).	
17.2	Personnel injury due to improper use of hand tools.	Category III
17.2.1	Normal industrial safety practices associated with the use of common hand tools shall be used.	
17.3	Dropped tools and/or equipment.	Category III
17.3.1	Drop cloths shall be placed below working area.	

<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
17.4	Falling off work platforms in launch duct.	Category I
17.4.1	Safety poles and chains will be installed prior to commencement of work activity.	
18.0	Wrap hose for transport.	
18.1	Handling contaminated equipment.	Category I
18.1.1	Personnel shall wear Category I protective clothing. (T.O. 21M-LGM25C-1)	
18.1.2	Hose shall be wrapped in plastic film, sealed with tape and labeled FUEL CONTAMINATED.	
19.0	Remove Stage I Oxidizer Vent Hose.	
19.1	Residual oxidizer in fixed piping.	Category I
19.1.1	Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1)	
19.1.2	Vapor concentration shall be monitored with a PVD.	
19.2	High pressure gases.	Category III
19.2.1	Isolate hose by performing procedures IAW T.O. 21M-LGM25C-2-12, Figure 5-36, Item 41.	
19.3	Personnel injury due to improper use of hand tools.	Category III
19.3.1	Normal industrial safety practices associated with the use of common tools shall be used.	

<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
19.4	Dropped tools and/or equipment.	Category III
19.4.1	Drop cloths shall be placed below working area.	
19.5	Falling off work platforms in launch duct.	Category I
19.5.1	Safety poles and chains will be installed prior to commencement of work activity.	
20.0	Install split gaskets and cover plates.	
20.1	Residual oxidizer in fixed piping.	Category I
20.1.1	Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).	
20.2	Personnel injury due to improper use of hand tools.	Category III
20.2.1	Normal industrial safety practices associated with the use of common hand tools shall be used.	
20.3	Dropped tools and/or equipment.	Category III
20.3.1	Drop cloths shall be placed below working area.	
20.4	Falling off work platforms in launch duct.	Category I
20.4.1	Safety poles and chains will be installed prior to commencement of work activity.	

3.0 HAZARD ANALYSIS

SEA: 005

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

21.0 Wrap hose for transport.

21.1 Handling contaminated equipment. Category I

21.1.1 Personnel shall wear Category I protective clothing. (T.O. 21M-LGM25C-1)

21.1.2 Hose shall be wrapped in plastic film, sealed with tape and labeled OXIDIZER CONTAMINATED.

22.0 Remove Stage II Oxidizer Vent Line.

22.1 Residual oxidizer in fixed piping. Category I

22.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1)

22.1.2 Vapor concentration shall be monitored with a PVD.

22.2 High pressure gases. Category III

22.2.1 Isolate hose by performing procedures IAW T.O. 21M-LGM25C-2-12, Figure 5-36, Item 40.

22.3 Personnel injury due to improper use of hand tools. Category III

22.3.1 Normal industrial safety practices associated with the use of common tools shall be used.

22.4 Dropped tools and/or equipment. Category III

22.4.1 Drop cloths shall be placed below working area.

<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
23.0 Install split gaskets and cover plates.	22.5 Falling off work platforms in launch duct.	Category I 22.5.1 Safety poles and chains will be installed prior to commencement of work activity.
23.1 Residual oxidizer in fixed piping.	Category I	23.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
23.2 Personnel injury due to improper use of hand tools.	Category III	23.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used.
23.3 Dropped tools and/or equipment.	Category III	23.3.1 Drop cloths shall be placed below working area.
23.4 Falling off work platforms in launch duct.	Category I	23.4.1 Safety poles and chains will be installed prior to commencement of work activity.
24.0 Wrap hose for transport.	24.1 Handling contaminated equipment.	Category I 24.1.1 Personnel shall wear Category I protective clothing. (T.O. 21M-LGM25C-1) 24.1.2 Hose shall be wrapped in plastic film, sealed with tape and labeled OXIDIZER CONTAMINATED.

TASK DESCRIPTIONHAZARDSAFETY REQUIREMENTS

25.0 Remove Stage I Fuel Dead Leg Drain Hose.

25.1 Residual fuel in fixed piping. Category I

25.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1)

25.1.1.2 Vapor concentration shall be monitored with a PVD.

25.2 High pressure gases. Category III

25.2.1 Isolate hose by performing procedures IAW T.O. 21M-LGM25C-2-12, Figure 5-36, Item 9.

25.3 Personnel injury due to improper use of hand tools. Category III

25.3.1 Normal industrial safety practices associated with the use of common tools shall be used.

25.4 Dropped tools and/or equipment. Category III

25.4.1 Drop cloths shall be placed below working area.

25.5 Falling off work platforms in launch duct. Category I

25.5.1 Safety poles and chains will be installed prior to commencement of work activity.

26.0 Install split gaskets and cover plates.

26.1 Residual fuel in fixed piping. Category I

26.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

15.4 Personnel injury, equipment damage due to improper handling of chassis. Category III

15.4.1 Chassis will be secured to and transported on cart/hand truck.

16.0 Remove the Communications chassis from the Power and Supervisory Equipment (PWR-1).

16.1 Personnel injury due to electrical shock. Category III

16.1.1 Ensure that all circuit breakers and switches are in the OFF position per SAC/CEM 21-SM68B-2-21-X, FIG 2-15 AND T.O. 21M-LGM25C-2-24, FIG 2-61.

16.2 Personnel injury due to improper use of power and hand tools. Category III.

16.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

16.3 Personnel injury due to lifting of heavy equipment. Category III

16.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

16.4 Personnel injury, equipment damage due to improper handling of chassis. Category III

16.4.1 Chassis will be secured to and transported on cart/hand truck.

17.0 Remove the Communications chassis from the Wire Control and Transmission Equipment (WCT-1, -2, -3).

17.1 Personnel injury due to electrical shock. Category III

17.1.1 Ensure that all circuit breakers and switches are in the OFF position per SAC/CEM 21-SM68B-2-21-X, FIG 2-15 AND T.O. 21M-LGM25C-2-24, FIG 2-61.

17.2 Personnel injury due to improper use of power and hand tools. Category III.

17.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

17.3 Personnel injury due to lifting of heavy equipment. Category III

17.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

17.4 Personnel injury, equipment damage due to improper handling of chassis. Category III

17.4.1 Chassis will be secured to and transported on cart/hand truck.

18.0 Remove the Communications chassis from the Alternate Launch Officers Console (ALOC).

18.1 Personnel injury due to electrical shock. Category III

18.1.1 Ensure that all circuit breakers and switches are in the OFF position per SAC/CEM 21-SM68B-2-21-X, FIG 2-15 AND T.O. 21M-LGM25C-2-24, FIG 2-61.

18.2 Personnel injury due to improper use of power and hand tools. Category III.

18.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

18.3 Personnel injury due to lifting of heavy equipment. Category III

18.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

18.4 Personnel injury, equipment damage due to improper handling of chassis. Category III

18.4.1 Chassis will be secured to and transported on cart/hand truck.

19.0 Remove the Communications chassis from the Launch Control Complex Facilities Console (LCCFC).

19.1 Personnel injury due to electrical shock. Category III

19.1.1 Ensure that all circuit breakers and switches are in the OFF position per SAC/CEM 21-SM68B-2-21-X, FIG 2-15 AND T.O. 21M-LGM25C-2-24, FIG 2-61.

19.2 Personnel injury due to improper use of power and hand tools. Category III.

19.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

19.3 Personnel injury due to lifting of heavy equipment. Category III

19.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

19.4 Personnel injury, equipment damage due to improper handling of chassis. Category III

19.4.1 Chassis will be secured to and transported on cart/hand truck.

20.0 Remove the Communications chassis from the Voice Signaling System (VSS).

20.1 Personnel injury due to electrical shock. Category III

20.1.1 Ensure that all circuit breakers and switches are in the OFF position per SAC/CEM 21-SM68B-2-21-X, FIG 2-15 AND T.O. 21M-LGM25C-2-24, FIG 2-61.

20.2 Personnel injury due to improper use of power and hand tools. Category III.

20.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

20.3 Personnel injury due to lifting of heavy equipment. Category III

20.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

20.4 Personnel injury, equipment damage due to improper handling of chassis. Category III

20.4.1 Chassis will be secured to and transported on cart/hand truck.

21.0 Remove the Communications chassis from the Radio Type Maintenance Network (RTMN) RAD-1.

21.1 Personnel injury due to electrical shock. Category III

21.1.1 Ensure that all circuit breakers and switches are in the OFF position per SAC/CEM 21-SM68B-2-21-X, FIG 2-15 AND T.O. 21M-LGM25C-2-24, FIG 2-61.

21.2 Personnel injury due to improper use of power and hand tools. Category III.

21.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

21.3 Personnel injury due to lifting of heavy equipment. Category III

21.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

21.4 Personnel injury, equipment damage due to improper handling of chassis. Category III

21.4.1 Chassis will be secured to and transported on cart/hand truck.

22.0 Remove the Propellant Tank Pressure Monitor Unit (PTPMU) form the Launch Control Complex Facilities Console (LCCFC).

22.1 Personnel injury due to electrical shock. Category III

22.1.1 Ensure that all circuit breakers and switches are in the OFF position per T.O. 31X2-10-28-2, FIG 7021

22.2 Personnel injury due to improper use of power and hand tools. Category III.

22.2.1 Normal industrial safety practices associated with the use of common tools (saws, power drills, etc.) shall be utilized. (AFOSH STD 127-31)

22.3 Personnel injury due to lifting of heavy equipment. Category III

22.3.1 Per MIL-STD-1472B, the following maximum one man lift requirements shall be followed.

Height of lift from ground	Maximum Weight*
5 ft.	35 lb.
4 ft.	50 lb.
3 ft.	65 lb.
2 ft.	80 lb.
1 ft.	85 lb.

*Double for two man lift.

3.0 HAZARD ANALYSIS

SEA: 003
DATE: MAY 1982

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

22.4 Personnel injury, equipment damage due to improper handling of chassis.
Category III

22.4.1 Chassis will be secured to and
transported on cart/hand truck.

MARTIN MARIETTA CORPORATION

DENVER, COLORADO

SAFETY ENGINEERING ANALYSIS

FOR

TITAN II RIVETCAP

HS-1 SHUTDOWN

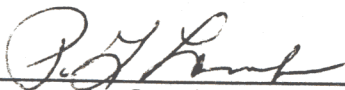
F42600-81-D-1379-0004-004

CDRL 1004

PREPARED BY:

JIM SHORT

APPROVED BY:



P. G. LAMB
SLS SYSTEM SAFETY



RICHARD E. CIEPELA
PROGRAM MANAGER
STRATEGIC SYSTEMS

1.0 SAFETY ENGINEERING ANALYSIS (SEA)

This Safety Analysis has been completed as required by parameters outlined in AFR 66-2. Engineering drawings were subjected to a detailed review; hazards and safety requirements are identified and classified in accordance with System Safety Program Requirements MIL-STD-882A.

2.0 DEFINITIONS OF HAZARD SEVERITY CATEGORIES

Category I

Catastrophic. May cause death or system loss.

Category II

Critical. May cause severe injury, severe occupational illness, or major system damage.

Category III

Marginal. May cause minor injury, minor occupational illness, or system damage.

Category IV

Negligible. Will not result in injury, occupational illness, or system damage.

NOTE: The Hoisting/Lifting tools will be rated and certified. Technical Orders and procedures have been reviewed to ensure that adequate safety precautions have been incorporated.

No other activities will be performed beyond blast door nine during HS-1 shutdown.

3.0 HAZARD ANALYSIS

SEA: 004
DATE: MAY 1982

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

1.0 Shut Off HS-1 Electrical Power At MCC-1.

1.1 No Hazards Identified. Category IV

1.1.1 Perform Per Procedure.

2.0 Bleed Hydraulic Pressure Off System.

2.1 Personnel Injury Due to High Pressure (3500 PSI). Category III

2.1.1 Relief ports shall be located so that escaping gases or vapor will not be hazardous to personnel or equipment.

2.2 Personnel Injury due to improper use of hand tools. Category III

2.2.1 Normal industrial safety practices associated with the use of common hand tools shall be utilized. (AFOSH STD 127-31)

3.0 Vent Nitrogen from system to topside.

3.1 Personnel injury due to high pressure (2800 PSI). Category III

3.1.1 Personnel will exercise caution while working around high pressure. Safety relief valve outlets shall be vented to atmosphere.

3.0 HAZARD ANALYSIS

SEA: 004
DATE: MAY 1982

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

4.0 Drain Hydraulic System reservoir.

4.1 Personnel injury while handling 55 gallon drums. Category III

4.1.1 Personnel will use proper handling equipment for transporting drums.

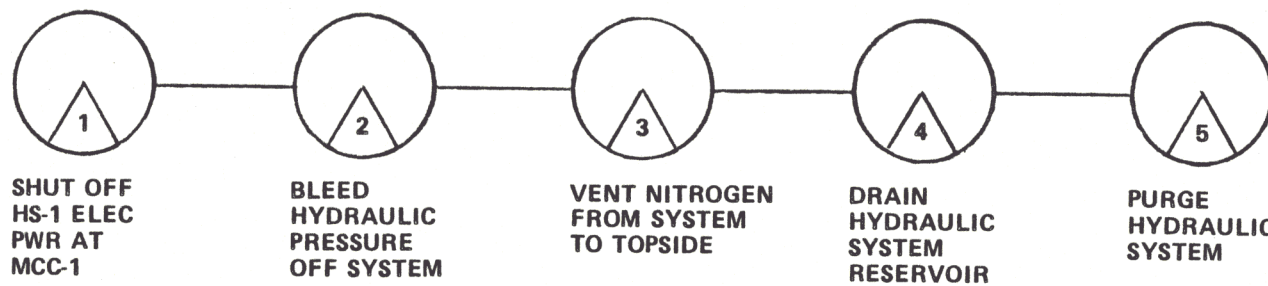
4.1.2 Personnel will wear gloves while draining fluid and handling drums.

5.0 Purge Hydraulic System.

5.1 Personnel injury due to high pressure. Category III

5.1.1 Relief ports shall be located so that escaping gases or vapor will not be hazardous to personnel or equipment.

4



HS-1 Shutdown Sequence Chart

MARTIN MARIETTA CORPORATION

DENVER, COLORADO

SAFETY ENGINEERING ANALYSIS

FOR

TITAN II RIVETCAP

PROPELLANT UMBILICAL REMOVAL


F42600-81-D-1379-004-005

CDRL 1004

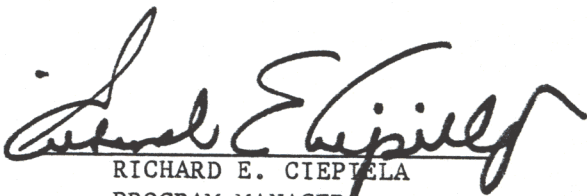
PREPARED BY:

ART HALE

APPROVED BY:



P. G. LAMB
SLS SYSTEM SAFETY



RICHARD E. CIEPIELA
PROGRAM MANAGER
STRATEGIC SYSTEMS

1.0 SAFETY ENGINEERING ANALYSIS (SEA)

This Safety Analysis has been completed as required by parameters outlined in AFR 66-2. Engineering drawings were subjected to a detailed review; hazards and safety requirements are identified and classified in accordance with System Safety Program Requirements MIL-STD-882A.

2.0 DEFINITIONS OF HAZARD SEVERITY CATEGORIES

Category I

Catastrophic. May cause death or system loss.

Category II

Critical. May cause severe injury, severe occupational illness, or major system damage.

Category III

Marginal. May cause minor injury, minor occupational illness, or system damage.

Category IV

Negligible. Will not result in injury, occupational illness, or system damage.

NOTE: Technical Orders and procedures have been reviewed to ensure that adequate safety precautions have been incorporated.

<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
1.0 Remove Stage I Fuel Fill-Drain Hose.		
	1.1 Residual fuel in fixed piping. Category I	
		1.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1)
		1.1.2 Vapor concentration shall be monitored with a PVD.
	1.2 High pressure gases. Category III	
		1.2.1 Isolate hose by performing procedures IAW T.O. 21M-LGM25C-2-12, Figure 5-36, Item 9.
	1.3 Personnel injury due to improper use of hand tools. Category III	
		1.3.1 Normal industrial safety practices associated with the use of common tools shall be used.
	1.4 Dropped tools and/or equipment. Category III	
		1.4.1 Drop cloths shall be placed below working area.
	1.5 Falling off work platforms in launch duct. Category I	
		1.5.1 Safety poles and chains will be installed prior to commencement of work activity.
2.0 Install split gaskets and cover plates.		
	2.1 Residual fuel in fixed piping. Category I	
		2.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

TASK DESCRIPTIONHAZARDSAFETY REQUIREMENTS

- 2.2 Personnel injury due to improper use of hand tools. Category III
- 2.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used.
- 2.3 Dropped tools and/or equipment. Category III
- 2.3.1 Drop cloths shall be placed below working area.
- 2.4 Falling off work platforms in launch duct. Category I
- 2.4.1 Safety poles and chains will be installed prior to commencement of work activity.
- 3.0 Wrap hose for transport.
- 3.1 Handling contaminated equipment. Category I
- 3.1.1 Personnel shall wear Category I protective clothing. (T.O. 21M-LGM25C-1)
- 3.1.2 Hose shall be wrapped in plastic film, sealed with tape and labeled FUEL CONTAMINATED.
- 4.0 Remove Stage II Fuel Fill-Drain Hose.
- 4.1 Residual fuel in fixed piping. Category I
- 4.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1)
- 4.1.2 Vapor concentration shall be monitored with a PVD.

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

- 4.2 High pressure gases. Category III
 - 4.2.1 Isolate hose by performing procedures IAW T.O. 21M-LGM25C-2-12, Figure 5-36, Item 8.
- 4.3 Personnel injury due to improper use of hand tools. Category III
 - 4.3.1 Normal industrial safety practices associated with the use of common tools shall be used.
- 4.4 Dropped tools and/or equipment. Category III
 - 4.4.1 Drop cloths shall be placed below working area.
- 4.5 Falling off work platforms in launch duct. Category I
 - 4.5.1 Safety poles and chains will be installed prior to commencement of work activity.
- 5.0 Install split gaskets and cover plates.
 - 5.1 Residual fuel in fixed piping. Category I
 - 5.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
 - 5.2 Personnel injury due to improper use of hand tools. Category III
 - 5.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used.
 - 5.3 Dropped tools and/or equipment. Category III
 - 5.3.1 Drop cloths shall be placed below working area.

TASK DESCRIPTIONHAZARDSAFETY REQUIREMENTS

- 5.4 Falling off work platforms in launch duct. Category I
- 5.4.1 Safety poles and chains will be installed prior to commencement of work activity.
- 6.0 Wrap hose for transport.
- 6.1 Handling contaminated equipment. Category I
- 6.1.1 Personnel shall wear Category I protective clothing. (T.O. 21M-LGM25C-1)
- 6.1.2 Hose shall be wrapped in plastic film, sealed with tape and labeled FUEL CONTAMINATED.
- 7.0 Remove Stage I Oxidizer Fill-Drain Hose.
- 7.1 Residual oxidizer in fixed piping. Category I
- 7.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1)
- 7.1.2 Vapor concentration shall be monitored with a PVD.
- 7.2 High pressure gases. Category III
- 7.2.1 Isolate hose by performing procedures IAW T.O. 21M-LGM25C-2-12, Figure 5-36, Item 47.
- 7.3 Personnel injury due to improper use of hand tools. Category III
- 7.3.1 Normal industrial safety practices associated with the use of common tools shall be used.

TASK DESCRIPTIONHAZARDSAFETY REQUIREMENTS

7.4 Dropped tools and/or equipment. Category III

7.4.1 Drop cloths shall be placed below working area.

7.5 Falling off work platforms in launch duct. Category I

7.5.1 Safety poles and chains will be installed prior to commencement of work activity.

8.0 Install split gaskets and cover plates.

8.1 Residual oxidizer in fixed piping. Category I

8.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

8.2 Personnel injury due to improper use of hand tools. Category III

8.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used.

8.3 Dropped tools and/or equipment. Category III

8.3.1 Drop cloths shall be placed below working area.

8.4 Falling off work platforms in launch duct. Category I

8.4.1 Safety poles and chains will be installed prior to commencement of work activity.

<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
9.0 Wrap hose for transport.	9.1 Handling contaminated equipment. Category I	9.1.1 Personnel shall wear Category I protective clothing. (T.O. 21M-LGM25C-1) 9.1.2 Hose shall be wrapped in plastic film, sealed with tape and labeled OXIDIZER CONTAMINATED.
10.0 Remove Stage II Oxidizer Fill-Drain Hose.	10.1 Residual oxidizer in fixed piping. Category I	10.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1) 10.1.2 Vapor concentration shall be monitored with a PVD.
	10.2 High pressure gases. Category III	10.2.1 Isolate hose by performing procedures IAW T.O. 21M-LGM25C-2-12, Figure 5-36, Item 46.
	10.3 Personnel injury due to improper use of hand tools. Category III	10.3.1 Normal industrial safety practices associated with the use of common tools shall be used.
	10.4 Dropped tools and/or equipment. Category III	10.4.1 Drop cloths shall be placed below working area.

TASK DESCRIPTIONHAZARDSAFETY REQUIREMENTS

10.5 Falling off work platforms in launch duct. Category I

10.5.1 Safety poles and chains will be installed prior to commencement of work activity.

11.0 Install split gaskets and cover plates.

11.1 Residual oxidizer in fixed piping. Category I

11.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

11.2 Personnel injury due to improper use of hand tools. Category III

11.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used.

11.3 Dropped tools and/or equipment. Category III

11.3.1 Drop cloths shall be placed below working area.

11.4 Falling off work platforms in launch duct. Category I

11.4.1 Safety poles and chains will be installed prior to commencement of work activity.

12.0 Wrap hose for transport.

12.1 Handling contaminated equipment. Category I

12.1.1 Personnel shall wear Category I protective clothing. (T.O. 21M-LGM25C-1)

12.1.2 Hose shall be wrapped in plastic film, sealed with tape and labeled OXIDIZER CONTAMINATED.

<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
13.0 Remove Stage I Fuel Vent Hose.		
	13.1 Residual fuel in fixed piping. Category I	
		13.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1)
		13.1.2 Vapor concentration shall be monitored with a PVD.
	13.2 High pressure gases. Category III	
		13.2.1 Isolate hose by performing procedures IAW T.O. 21M-LGM25C-2-12, Figure 5-36, Item 2.
	13.3 Personnel injury due to improper use of hand tools. Category III	
		13.3.1 Normal industrial safety practices associated with the use of common tools shall be used.
	13.4 Dropped tools and/or equipment. Category III	
		13.4.1 Drop cloths shall be placed below working area.
	13.5 Falling off work platforms in launch duct. Category I	
		13.5.1 Safety poles and chains will be installed prior to commencement of work activity.
14.0 Install split gaskets and cover plates.		
	14.1 Residual fuel in fixed piping. Category I	
		14.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

TASK DESCRIPTIONHAZARDSAFETY REQUIREMENTS

14.2 Personnel injury due to improper use of hand tools. Category III

14.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used.

14.3 Dropped tools and/or equipment. Category III

14.3.1 Drop cloths shall be placed below working area.

14.4 Falling off work platforms in launch duct. Category I

14.4.1 Safety poles and chains will be installed prior to commencement of work activity.

15.0 Wrap hose for transport.

15.1 Handling contaminated equipment. Category I

15.1.1 Personnel shall wear Category I protective clothing. (T.O. 21M-LGM25C-1)

15.1.2 Hose shall be wrapped in plastic film, sealed with tape and labeled FUEL CONTAMINATED.

16.0 Remove Stage II Fuel Vent Hose.

16.1 Residual fuel in fixed piping. Category I

16.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1)

16.1.2 Vapor concentration shall be monitored with a PVD.

TASK DESCRIPTIONHAZARDSAFETY REQUIREMENTS

- 16.2 High pressure gases. Category III
- 16.2.1 Isolate hose by performing procedures IAW T.O. 21M-LGM25C-2-12, Figure 5-36, Item 1.
- 16.3 Personnel injury due to improper use of hand tools. Category III
- 16.3.1 Normal industrial safety practices associated with the use of common tools shall be used.
- 16.4 Dropped tools and/or equipment. Category III
- 16.4.1 Drop cloths shall be placed below working area.
- 16.5 Falling off work platforms in launch duct. Category I
- 16.5.1 Safety poles and chains will be installed prior to commencement of work activity.
- 17.0 Install split gaskets and cover plates.
- 17.1 Residual fuel in fixed piping. Category I
- 17.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
- 17.2 Personnel injury due to improper use of hand tools. Category III
- 17.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used.
- 17.3 Dropped tools and/or equipment. Category III
- 17.3.1 Drop cloths shall be placed below working area.

TASK DESCRIPTIONHAZARDSAFETY REQUIREMENTS

17.4 Falling off work platforms in launch duct. Category I

17.4.1 Safety poles and chains will be installed prior to commencement of work activity.

18.0 Wrap hose for transport.

18.1 Handling contaminated equipment. Category I

18.1.1 Personnel shall wear Category I protective clothing. (T.O. 21M-LGM25C-1)

18.1.2 Hose shall be wrapped in plastic film, sealed with tape and labeled FUEL CONTAMINATED.

19.0 Remove Stage I Oxidizer Vent Hose.

1.1 Residual oxidizer in fixed piping. Category I

19.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1)

19.1.2 Vapor concentration shall be monitored with a PVD.

19.2 High pressure gases. Category III

19.2.1 Isolate hose by performing procedures IAW T.O. 21M-LGM25C-2-12, Figure 5-36, Item 41.

19.3 Personnel injury due to improper use of hand tools. Category III

19.3.1 Normal industrial safety practices associated with the use of common tools shall be used.

TASK DESCRIPTIONHAZARDSAFETY REQUIREMENTS

19.4 Dropped tools and/or equipment. Category III

19.4.1 Drop cloths shall be placed below working area.

19.5 Falling off work platforms in launch duct. Category I

19.5.1 Safety poles and chains will be installed prior to commencement of work activity.

20.0 Install split gaskets and cover plates.

20.1 Residual oxidizer in fixed piping. Category I

20.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

20.2 Personnel injury due to improper use of hand tools. Category III

20.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used.

20.3 Dropped tools and/or equipment. Category III

20.3.1 Drop cloths shall be placed below working area.

20.4 Falling off work platforms in launch duct. Category I

20.4.1 Safety poles and chains will be installed prior to commencement of work activity.

TASK DESCRIPTIONHAZARDSAFETY REQUIREMENTS

21.0 Wrap hose for transport.

21.1 Handling contaminated equipment. Category I

21.1.1 Personnel shall wear Category I protective clothing. (T.O. 21M-LGM25C-1)

21.1.2 Hose shall be wrapped in plastic film, sealed with tape and labeled OXIDIZER CONTAMINATED.

22.0 Remove Stage II Oxidizer Vent Line.

22.1 Residual oxidizer in fixed piping. Category I

22.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1)

22.1.2 Vapor concentration shall be monitored with a PVD.

22.2 High pressure gases. Category III

22.2.1 Isolate hose by performing procedures IAW T.O. 21M-LGM25C-2-12, Figure 5-36, Item 40.

22.3 Personnel injury due to improper use of hand tools. Category III

22.3.1 Normal industrial safety practices associated with the use of common tools shall be used.

22.4 Dropped tools and/or equipment. Category III

22.4.1 Drop cloths shall be placed below working area.

TASK DESCRIPTIONHAZARDSAFETY REQUIREMENTS

22.5 Falling off work platforms in launch duct. Category I

22.5.1 Safety poles and chains will be installed prior to commencement of work activity.

23.0 Install split gaskets and cover plates.

23.1 Residual oxidizer in fixed piping. Category I

23.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

23.2 Personnel injury due to improper use of hand tools. Category III

23.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used.

23.3 Dropped tools and/or equipment. Category III

23.3.1 Drop cloths shall be placed below working area.

23.4 Falling off work platforms in launch duct. Category I

23.4.1 Safety poles and chains will be installed prior to commencement of work activity.

24.0 Wrap hose for transport.

24.1 Handling contaminated equipment. Category I

24.1.1 Personnel shall wear Category I protective clothing. (T.O. 21M-LGM25C-1)

24.1.2 Hose shall be wrapped in plastic film, sealed with tape and labeled OXIDIZER CONTAMINATED.

<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
25.0 Remove Stage I Fuel Dead Leg Drain Hose.		
	25.1 Residual fuel in fixed piping. Category I	
		25.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1)
		25.1.2 Vapor concentration shall be monitored with a PVD.
	25.2 High pressure gases. Category III	
		25.2.1 Isolate hose by performing procedures IAW T.O. 21M-LGM25C-2-12, Figure 5-36, Item 9.
	25.3 Personnel injury due to improper use of hand tools. Category III	
		25.3.1 Normal industrial safety practices associated with the use of common tools shall be used.
	25.4 Dropped tools and/or equipment. Category III	
		25.4.1 Drop cloths shall be placed below working area.
	25.5 Falling off work platforms in launch duct. Category I	
		25.5.1 Safety poles and chains will be installed prior to commencement of work activity.
26.0 Install split gaskets and cover plates.		
	26.1 Residual fuel in fixed piping. Category I	
		26.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

26.2 Personnel injury due to improper use of hand tools. Category III

26.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used.

26.3 Dropped tools and/or equipment. Category III

26.3.1 Drop cloths shall be placed below working area.

26.4 Falling off work platforms in launch duct. Category I

26.4.1 Safety poles and chains will be installed prior to commencement of work activity.

27.0 Wrap hose for transport.

27.1 Handling contaminated equipment. Category I

27.1.1 Personnel shall wear Category I protective clothing. (T.O. 21M-LGM25C-1)

27.1.2 Hose shall be wrapped in plastic film, sealed with tape and labeled FUEL CONTAMINATED.

28.0 Remove Stage I Oxidizer Dead Leg Drain Hose.

28.1 Residual oxidizer in fixed piping. Category I

28.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1)

28.1.2 Vapor concentration shall be monitored with a PVD.

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

28.2 High pressure gases. Category III

28.2.1 Isolate hose by performing procedures IAW T.O. 21M-LGM25C-2-12, Figure 5-36, Item 47.

28.3 Personnel injury due to improper use of hand tools. Category III

28.3.1 Normal industrial safety practices associated with the use of common tools shall be used.

28.4 Dropped tools and/or equipment. Category III

28.4.1 Drop cloths shall be placed below working area.

28.5 Falling off work platforms in launch duct. Category I

28.5.1 Safety poles and chains will be installed prior to commencement of work activity.

29.0 Install split gaskets and cover plates.

29.1 Residual oxidizer in fixed piping. Category I

29.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

29.2 Personnel injury due to improper use of hand tools. Category III

29.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used.

29.3 Dropped tools and/or equipment. Category III

29.3.1 Drop cloths shall be placed below working area.

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

29.4 Falling off work platforms in launch duct. Category I

29.4.1 Safety poles and chains will be installed prior to commencement of work activity.

30.0 Wrap hose for transport.

30.1 Handling contaminated equipment. Category I

30.1.1 Personnel shall wear Category I protective clothing. (T.O. 2 M-LGM25C-1)

30.1.2 Hose shall be wrapped in plastic film, sealed with tape and labeled OXIDIZER CONTAMINATED.

MARTIN MARIETTA CORPORATION

DENVER, COLORADO

SAFETY ENGINEERING ANALYSIS

FOR

TITAN II RIVETCAP

FUEL SYSTEM PURGE

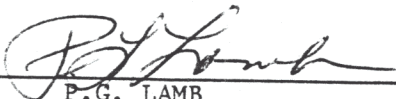
F42600-81-D-1379-0004-006

CDRL 1004


PREPARED BY:

KEITH WANKLYN

APPROVED BY:



P.G. LAMB
SLS SYSTEM SAFETY



RICHARD E. CIEPELA
PROGRAM MANAGER
STRATEGIC SYSTEMS

1.0 SAFETY ENGINEERING ANALYSIS (SEA)

This Safety Analysis has been completed as required by parameters outlined in AFR 66-2. Engineering drawings, test procedures and instructions were subjected to a detailed review; hazards and safety requirements are identified and classified in accordance with System Safety Program Requirements MIL-STD-882A.

2.0 Definitions of Hazard Severity Categories

CATEGORY I

Catastrophic. May cause death or system loss.

CATEGORY II

Critical. May cause severe injury, severe occupational illness, or major system damage.

CATEGORY III

Marginal. May cause minor injury, occupational illness, or system damage.

CATEGORY IV

Negligible. Will not result in injury, occupational illness, or system damage.

NOTE: Technical Orders and procedures have been reviewed to ensure that adequate safety precautions have been incorporated.

Task numbers refer to tasks in sequence chart, attachment 1.

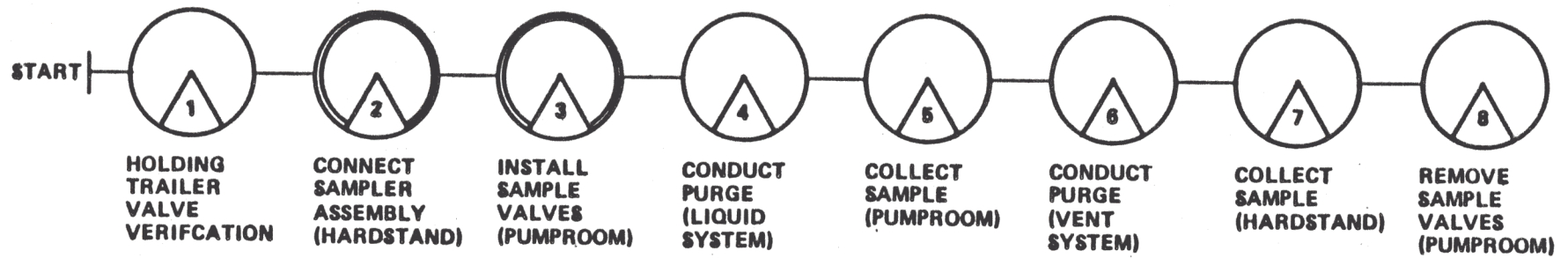
<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
1.0 Holding trailer valve verification.	1.1 Negligible. Category IV	1.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-66.
2.0 Connect sampler assembly at hardstand.	2.1 Residual fuel in fixed piping. Category I	2.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
	2.2 Personnel injury due to improper use of hand tools. Category III	2.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)
3.0 Install sample valves in pumproom.	3.1 Residual fuel in fixed piping. Category I	3.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
	3.2 Personnel injury due to improper use of hand tools. Category III	2.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)

3.0 HAZARD ANALYSIS

SEA: 006

<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
4.0 Purge liquid oxidizer system.		
	4.1 Toxic fuel vapors. Category II	
		4.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-66, steps 1 through 18.
5.0 Collect sample at pump room.		
	5.1 Toxic fuel vapors. Category II	
		5.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-66, steps 19 and 20.
6.0 Purge fuel vent system.		
ω	6.1 Toxic fuel vapors. Category II	
		6.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-66, steps 21 through 36.
7.0 Collect sample at hardstand.		
	7.1 Toxic fuel vapors. Category II	
		7.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-66, steps 37 and 38.
8.0 Remove sample valves in pump room.		
	8.1 Personnel injury due to improper use of hand tools. Category III	
		2.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)

PURGE FOR DEACTIVATION



**RFHCO
SUITED
ACTIVITY**

Attachment 1
Fuel System Purge Sequence Chart

MARTIN MARIETTA CORPORATION

DENVER, COLORADO

SAFETY ENGINEERING ANALYSIS

FOR

TITAN II RIVETCAP

OXIDIZER SYSTEM PURGE

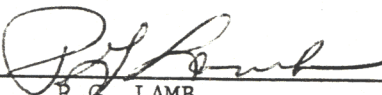
F42600-81-D-1379-0004-007

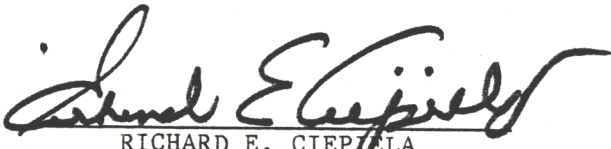
CDRL 1004

PREPARED BY:

KEITH WANKLYN

APPROVED BY:


R.C. LAMB
SLS SYSTEM SAFETY


RICHARD E. CIEPELA
PROGRAM MANAGER
STRATEGIC SYSTEMS

1.0 SAFETY ENGINEERING ANALYSIS (SEA)

This Safety Analysis has been completed as required by parameters outlined in AFR 66-2. Engineering drawings, test procedures and instructions were subjected to a detailed review; hazards and safety requirements are identified and classified in accordance with System Safety Program Requirements MIL-STD-882A.

2.0 Definitions of Hazard Severity Categories

CATEGORY I

Catastrophic. May cause death or system loss.

CATEGORY II

Critical. May cause severe injury, severe occupational illness, or major system damage.

CATEGORY III

Marginal. May cause minor injury, occupational illness, or system damage.

CATEGORY IV

Negligible. Will not result in injury, occupational illness, or system damage.

NOTE: Technical Orders and procedures have been reviewed to ensure that adequate safety precautions have been incorporated.

Task numbers refer to tasks in sequence chart, attachment 1.

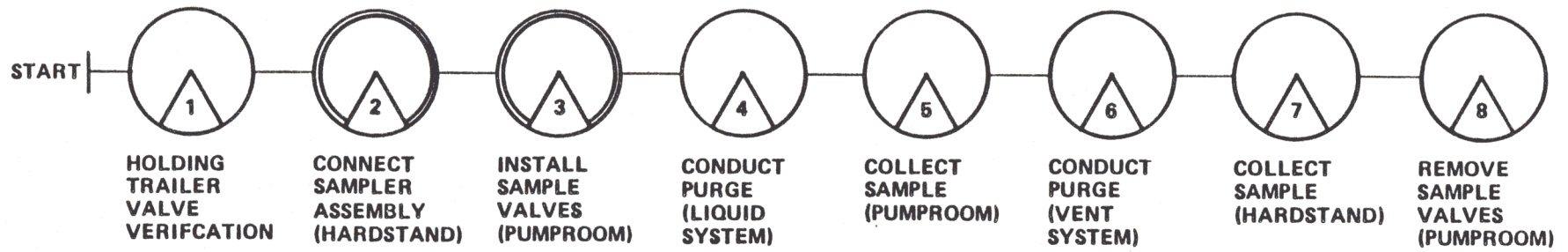
<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
1.0 Holding trailer valve verification.	1.1 Negligible. Category IV	1.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-100.
2.0 Connect sampler assembly at hardstand.	2.1 Residual oxidizer in fixed piping. Category I	2.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
	2.2 Personnel injury due to improper use of hand tools. Category III	2.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)
3.0 Install sample valves in pumphoom.	3.1 Residual oxidizer in fixed piping. Category I	3.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
	3.2 Personnel injury due to improper use of hand tools. Category III	2.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)

3.0 HAZARD ANALYSIS

SEA: 007

<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
4.0 Purge liquid oxidizer system.	4.1 Toxic oxidizer vapors.	Category II
		4.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-100, steps 1 through 18.
5.0 Collect sample at pump room.	5.1 Toxic oxidizer vapors.	Category II
		5.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-100, steps 19 and 20.
6.0 Purge fuel vent system.	6.1 Toxic oxidizer vapors.	Category II
ω		6.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-100, steps 21 through 36.
7.0 Collect sample at hardstand.	7.1 Toxic oxidizer vapors.	Category II
		7.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-100, steps 37 and 38.
8.0 Remove sample valves in pump room.	8.1 Personnel injury due to improper use of hand tools.	Category III
		2.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)

PURGE FOR DEACTIVATION



RFHCO SUITED ACTIVITY

Attachment 1
Oxidizer System Purge Sequence Chart

MARTIN MARIETTA CORPORATION

DENVER, COLORADO

SAFETY ENGINEERING ANALYSIS

FOR

TITAN II RIVETCAP

FUEL HOLDING TRAILER DISCONNECTION

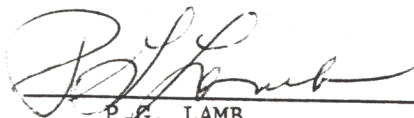
F42600-81-D-1379-0004-008

CDRL 1004

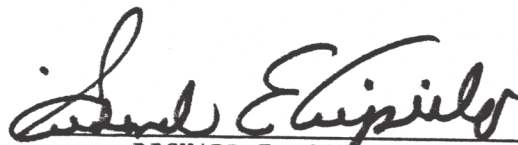
PREPARED BY:

KEITH WANKLYN

APPROVED BY:



P.G. LAMB
SLS SYSTEM SAFETY



RICHARD E. CIPPIELA
PROGRAM MANAGER
STRATEGIC SYSTEMS

1.0 SAFETY ENGINEERING ANALYSIS (SEA)

This Safety Analysis has been completed as required by parameters outlined in AFR 66-2. Engineering drawings, test procedures and instructions were subjected to a detailed review; hazards and safety requirements are identified and classified in accordance with System Safety Program Requirements MIL-STD-882A.

2.0 Definitions of Hazard Severity Categories

CATEGORY I

Catastrophic. May cause death or system loss.

CATEGORY II

Critical. May cause severe injury, severe occupational illness, or major system damage.

CATEGORY III

Marginal. May cause minor injury, occupational illness, or system damage.

CATEGORY IV

Negligible. Will not result in injury, occupational illness, or system damage.

NOTE: Technical Orders and procedures have been reviewed to ensure that adequate safety precautions have been incorporated.

Task numbers refer to tasks in sequence chart, attachment 1.

3.0 HAZARD ANALYSIS

SEA: 008

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

1.0 Holding trailer valve verification.

1.1 Negligible. Category IV

1.1.1 IAW T.O. 21M-LGM25C-2-12, Figure 2-40.

2.0 Vent holding trailer system.

2.1 Personnel injury due to release of propellant vapor/liquid. Category I

2.1.1 Category I protective clothing must be worn. (T.O. 21M-LGM25C-1)

3.0 Disconnect hoses from holding trailer and hardstand.

3.1 Residual fuel in fixed piping. Category I

3.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

3.2 Personnel injury due to improper use of hand tools. Category III

3.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)

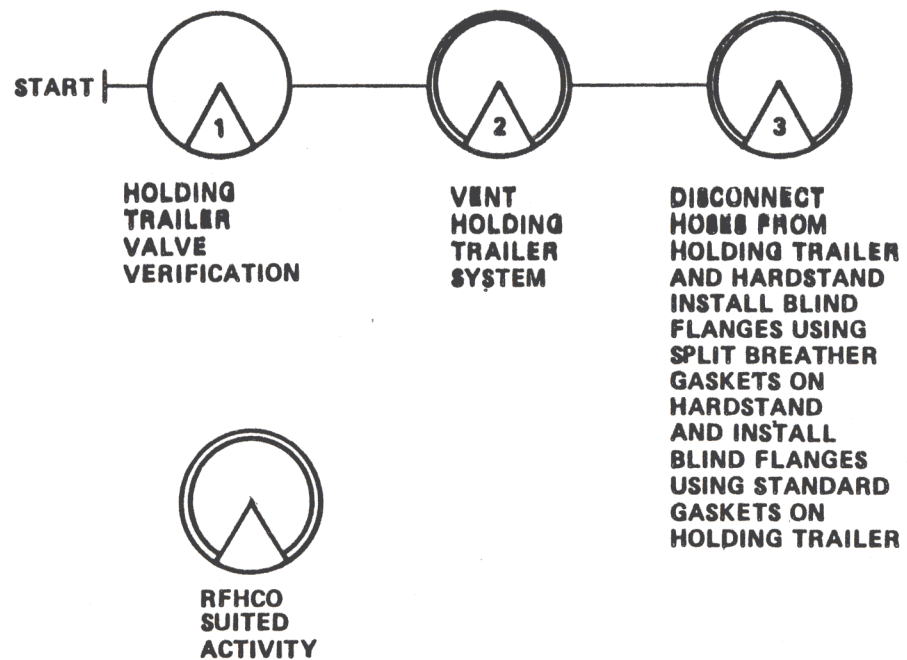
4.0 Install blind flanges and gaskets on hardstand and holding trailer.

4.1 Residual fuel in fixed piping. Category I

4.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

4.2 Personnel injury due to improper use of hand tools. Category III

4.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)



Attachment 1
Fuel Holding Trailer Disconnect
Sequence Chart

MARTIN MARIETTA CORPORATION

DENVER, COLORADO

SAFETY ENGINEERING ANALYSIS

FOR

TITAN II RIVETCAP

OXIDIZER HOLDING TRAILER DISCONNECTION

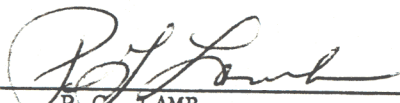
F42600-81-D-1379-0004-009

CDRL 1004

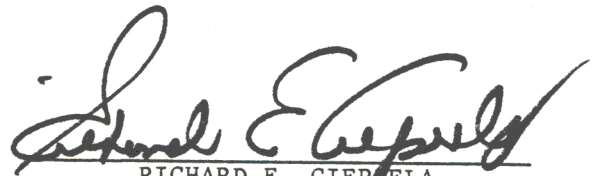
PREPARED BY:

KEITH WANKLYN

APPROVED BY:



P. G. LAMB
SLS SYSTEM SAFETY



RICHARD E. CIEPELA
PROGRAM MANAGER
STRATEGIC SYSTEMS

1.0 SAFETY ENGINEERING ANALYSIS (SEA)

This Safety Analysis has been completed as required by parameters outlined in AFR 66-2. Engineering drawings, test procedures and instructions were subjected to a detailed review; hazards and safety requirements are identified and classified in accordance with System Safety Program Requirements MIL-STD-882A.

2.0 Definitions of Hazard Severity Categories

CATEGORY I

Catastrophic. May cause death or system loss.

CATEGORY II

Critical. May cause severe injury, severe occupational illness, or major system damage.

CATEGORY III

Marginal. May cause minor injury, occupational illness, or system damage.

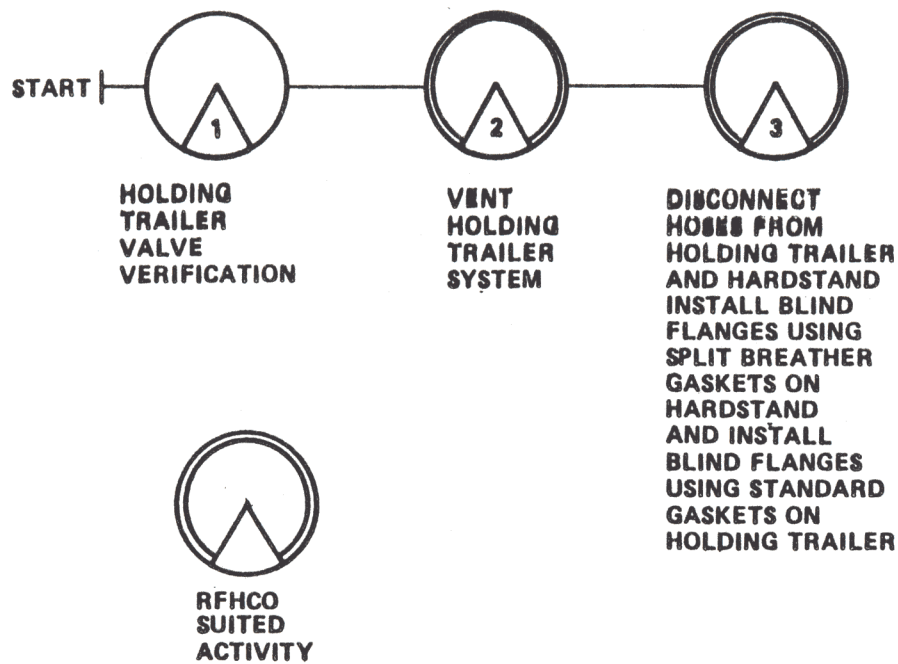
CATEGORY IV

Negligible. Will not result in injury, occupational illness, or system damage.

NOTE: Technical Orders and procedures have been reviewed to ensure that adequate safety precautions have been incorporated.

Task numbers refer to tasks in sequence chart, attachment 1.

<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
1.0 Holding trailer valve verification.	1.1 Negligible. <u>Category IV</u>	1.1.1 IAW T.O. 21M-LGM25C-2-12, Figure 2-40.
2.0 Vent holding trailer system.	2.1 Personnel injury due to release of propellant vapor/liquid. <u>Category I</u>	2.1.1 Category I protective clothing must be worn. (T.O. 21M-LGM25C-1)
3.0 Disconnect hoses from holding trailer and hardstand.	3.1 Residual oxidizer in fixed piping. Category I	3.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
	3.2 Personnel injury due to improper use of hand tools. Category III	3.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)
4.0 Install blind flanges and gaskets on hardstand and holding trailer.	4.1 Residual oxidizer in fixed piping. Category I	4.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
	4.2 Personnel injury due to improper use of hand tools. Category III	4.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)



Attachment 1
 Oxidizer Holding Trailer Disconnect
 Sequence Chart

MARTIN MARIETTA CORPORATION

DENVER, COLORADO

SAFETY ENGINEERING ANALYSIS

FOR

TITAN II RIVETCAP

TRANSPORT PLACEMENT ON FUEL HARDSTAND

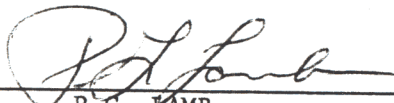
F42600-81-D-1379-0004-010

CDRL 1004

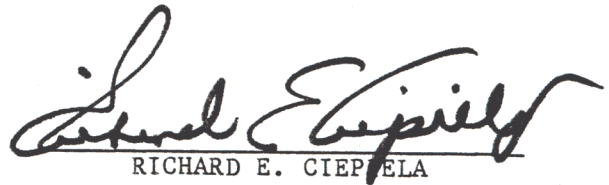
PREPARED BY:

KEITH WANKLYN

APPROVED BY:



P.G. LAMB
SLS SYSTEM SAFETY



RICHARD E. CIEPELA
PROGRAM MANAGER
STRATEGIC SYSTEMS

1.0 SAFETY ENGINEERING ANALYSIS (SEA)

This Safety Analysis has been completed as required by parameters outlined in AFR 66-2. Engineering drawings, test procedures and instructions were subjected to a detailed review; hazards and safety requirements are identified and classified in accordance with System Safety Program Requirements MIL-STD-882A.

2.0 Definitions of Hazard Severity Categories

CATEGORY I

Catastrophic. May cause death or system loss.

CATEGORY II

Critical. May cause severe injury, severe occupational illness, or major system damage.

CATEGORY III

Marginal. May cause minor injury, occupational illness, or system damage.

CATEGORY IV

Negligible. Will not result in injury, occupational illness, or system damage.

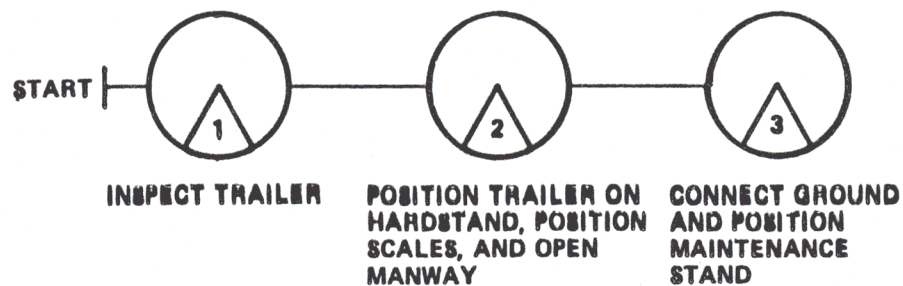
NOTE: Technical Orders and procedures have been reviewed to ensure that adequate safety precautions have been incorporated.

Task numbers refer to tasks in squence chart, attachment 1.

3.0 HAZARD ANALYSIS

SEA: 010

<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
1.0 Inspect trailer.		
	1.1 Negligible. Category IV	
		1.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-56.
2.0 Position trailer on hardstand, position scales, and open manway.		
	2.1 Negligible. Category IV	
		2.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-56.
3.0 Connect ground and position maintenance stand.		
	3.1 Negligible. Category IV	
		3.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-56.



**RFHCO
SUITED
ACTIVITY**

Attachment 1
Commercial Trailer Placement on Fuel Hardstand
Sequence Chart

MARTIN MARIETTA CORPORATION

DENVER, COLORADO

SAFETY ENGINEERING ANALYSIS

FOR

TITAN II RIVETCAP

TRANSPORT PLACEMENT ON OXIDIZER HARDSTAND

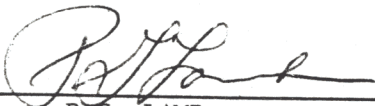
F42600-81-D-1379-0004-011

CDRL 1004

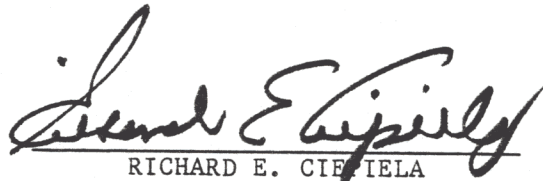
PREPARED BY:

KEITH WANKLYN

APPROVED BY:



P.G. LAMB
SLS SYSTEM SAFETY



RICHARD E. CIESIELA
PROGRAM MANAGER
STRATEGIC SYSTEMS

1.0 SAFETY ENGINEERING ANALYSIS (SEA)

This Safety Analysis has been completed as required by parameters outlined in AFR 66-2. Engineering drawings, test procedures and instructions were subjected to a detailed review; hazards and safety requirements are identified and classified in accordance with System Safety Program Requirements MIL-STD-882A.

2.0 Definitions of Hazard Severity Categories

CATEGORY I

Catastrophic. May cause death or system loss.

CATEGORY II

Critical. May cause severe injury, severe occupational illness, or major system damage.

CATEGORY III

Marginal. May cause minor injury, occupational illness, or system damage.

CATEGORY IV

Negligible. Will not result in injury, occupational illness, or system damage.

NOTE: Technical Orders and procedures have been reviewed to ensure that adequate safety precautions have been incorporated.

Task numbers refer to tasks in sequence chart, attachment 1.

3.0 HAZARD ANALYSIS

SEA: 011

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

1.0 Inspect trailer.

1.1 Negligible. Category IV

1.1.1 Perform IAW T.O. 21M-LGM25C-2-12,
Figure 2-87.

2.0 Position trailer on hardstand, position scales, and open manway.

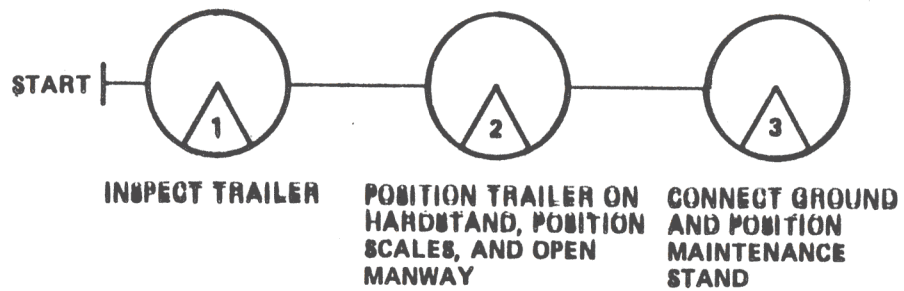
2.1 Negligible. Category IV

2.1.1 Perform IAW T.O. 21M-LGM25C-2-12,
Figure 2-87.

3.0 Connect ground and position maintenance stand.

3.1 Negligible. Category IV

3.1.1 Perform IAW T.O. 21M-LGM25C-2-12,
Figure 2-87.



**RFHCO
SUITED
ACTIVITY**

Attachment 1
Commercial Trailer Placement on Oxidizer
Hardstand Sequence Chart

MARTIN MARIETTA CORPORATION

DENVER, COLORADO

SAFETY ENGINEERING ANALYSIS

FOR

TITAN II RIVETCAP

P-52 PUMP SET REMOVAL

F42600-81-D-1379-0004-012

CDRL 1004

PREPARED BY:

KEITH WANKLYN

APPROVED BY:



P.G. LAMB
SLS SYSTEM SAFETY



RICHARD E. CIEPELA
PROGRAM MANAGER
STRATEGIC SYSTEMS

1.0 SAFETY ENGINEERING ANALYSIS (SEA)

This Safety Analysis has been completed as required by parameters outlined in AFR 66-2. Engineering drawings, test procedures and instructions were subjected to a detailed review; hazards and safety requirements are identified and classified in accordance with System Safety Program Requirements MIL-STD-882A.

2.0 Definitions of Hazard Severity Categories

CATEGORY I

Catastrophic. May cause death or system loss.

CATEGORY II

Critical. May cause severe injury, severe occupational illness, or major system damage.

CATEGORY III

Marginal. May cause minor injury, occupational illness, or system damage.

CATEGORY IV

Negligible. Will not result in injury, occupational illness, or system damage.

NOTE: Technical Orders and procedures have been reviewed to ensure that adequate safety precautions have been incorporated.

Task numbers refer to tasks in sequence chart, attachment 1.

3.0 HAZARD ANALYSIS

SEA: 012

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

1.0 Verify system has been purged for deactivation.

1.1 Negligible. Category IV

1.1.1 Perform IAW T.O. 21M-LGM25C-2-12,
Figure 2-149A.

2.0 Power down pump electrical system.

2.1 Negligible. Category IV

2.1.1 Perform IAW T.O. 21M-LGM25C-2-12,
Figure 2-149A.

3.0 Vent piping system.

3.1 Negligible. Category IV

3.1.1 Perform IAW T.O. 21M-LGM25C-2-12,
Figure 2-149A.

4.0 Remove pump set, differential pressure switch panel, and relief valves and install blind flanges, pipe assemblies using slit breather gaskets. (Pumproom)

4.1 Electrical shock. Category III

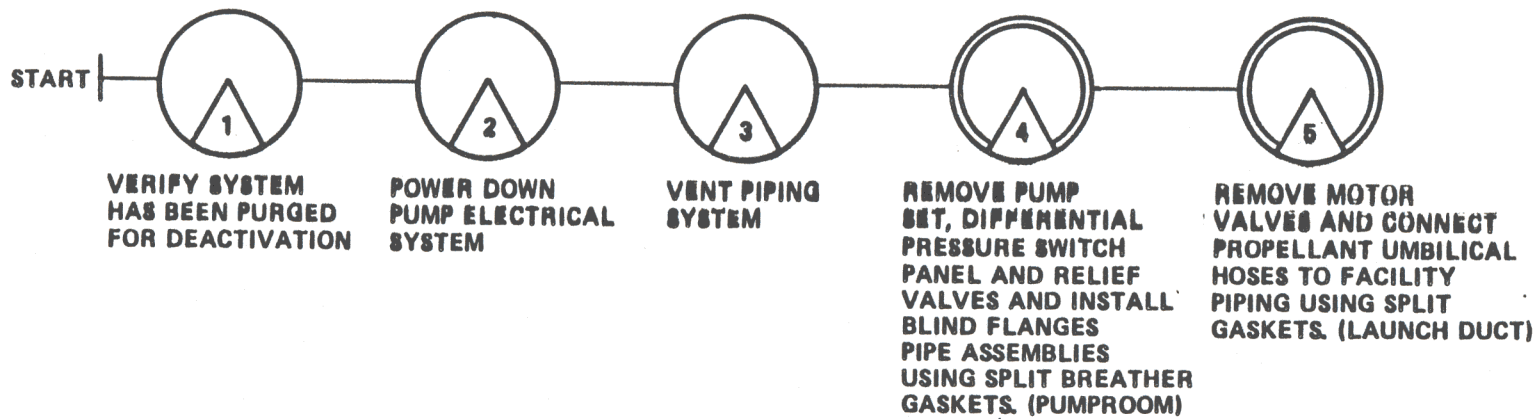
4.1.1 Ensure that P-52 circuit breaker is in
the OFF position and danger tagged with
AF Form 1492.

TASK DESCRIPTIONHAZARDSAFETY REQUIREMENTS

- 4.2 Residual fuel in fixed piping. Category I
- 4.2.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
 - 4.2.2 Vapor concentration shall be monitored with a PVD.
- 4.3 Personnel injury due to improper use of hand tools. Category III
- 4.3.1 Normal industrial safety practices associated with the use of common tools shall be used. (AFOSH STD 127-31)
- 4.4 Personnel injury and/or equipment damage due to use of improper manual lifting techniques. Category III
- 4.4.1 Proper manual lifting techniques shall be used. If size, weight, and/or shape of an object is beyond one person's capability, help shall be solicited.
- 5.0 Remove motor valves and connect propellant umbilical hoses to facility piping using slit gaskets. (Launch Duct)
- 5.1 Residual fuel in fixed piping. Category I
- 5.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
 - 5.1.2 Vapor concentration shall be monitored with a PVD.

TASK DESCRIPTIONHAZARDSAFETY REQUIREMENTS

- 5.2 Personnel injury due to improper use of hand tools. Category III
- 5.2.1 Normal industrial safety practices associated with the use of common tools shall be used. (AFOSH STD 127-31)
- 5.3 Personnel injury, equipment damage due to dropping tools and/or equipment in Silo Equipment Area and Launch Duct. Category III
- 5.3.1 Personnel will wear hard hats at all times (chin straps will be used in Launch Duct).
- 5.3.2 Drop cloths will be utilized while working in Launch Duct.
- 5.3.3 Personnel will exercise caution to not leave tools or equipment in compromising locations in silo equipment area.
- 5.4 Personnel injury due to personnel falling off work platforms in Launch Duct. Category II
- 5.4.1 Safety poles and chains will be installed prior to commencement of work activity.



**RFHCO
SUITED
ACTIVITY**

Attachment 1
P-52 Pump Set Removal
Sequence Chart

SEA: 012

MARTIN MARIETTA CORPORATION

DENVER, COLORADO

SAFETY ENGINEERING ANALYSIS

FOR

TITAN II RIVETCAP

P-51 PUMP SET REMOVAL

F42600-81-D-1379-0004-013


CDRL 1004

PREPARED BY:

KEITH WANKLYN

APPROVED BY:


P.G. LAMB
SLS SYSTEM SAFETY


RICHARD E. CIEPIELA
PROGRAM MANAGER
STRATEGIC SYSTEMS

1.0 SAFETY ENGINEERING ANALYSIS (SEA)

This Safety Analysis has been completed as required by parameters outlined in AFR 66-2. Engineering drawings, test procedures and instructions were subjected to a detailed review; hazards and safety requirements are identified and classified in accordance with System Safety Program Requirements MIL-STD-882A.

2.0 Definitions of Hazard Severity Categories

CATEGORY I

Catastrophic. May cause death or system loss.

CATEGORY II

Critical. May cause severe injury, severe occupational illness, or major system damage.

CATEGORY III

Marginal. May cause minor injury, occupational illness, or system damage.

CATEGORY IV

Negligible. Will not result in injury, occupational illness, or system damage.

NOTE: Technical Orders and procedures have been reviewed to ensure that adequate safety precautions have been incorporated.

Task numbers refer to tasks in squence chart, attachment 1.

3.0 HAZARD ANALYSIS

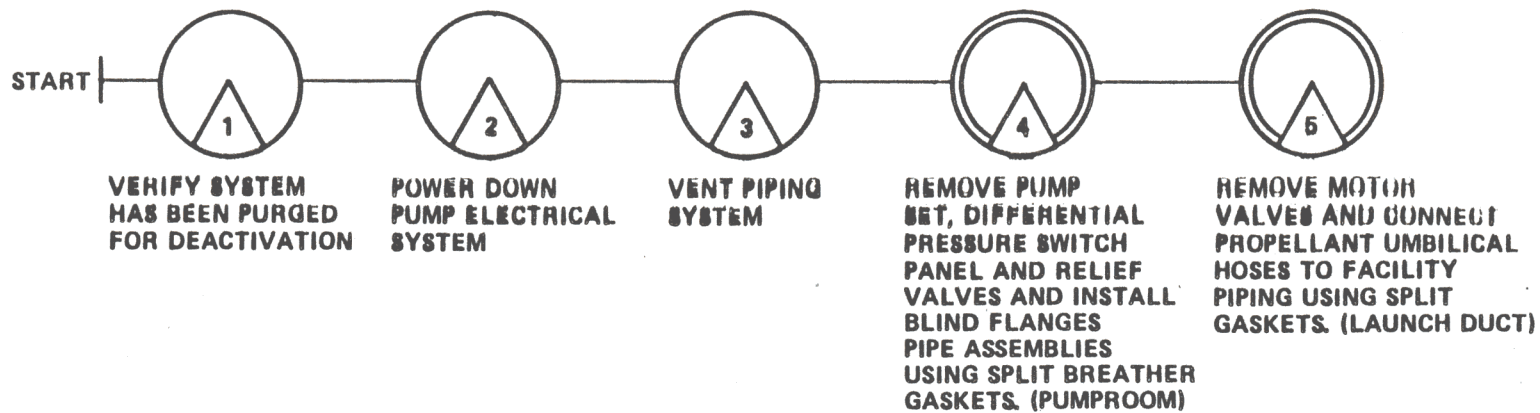
SEA: 013

<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
1.0 Verify system has been purged for deactivation.	1.1 Negligible. Category IV	1.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-81C.
2.0 Power down pump electrical system.	2.1 Negligible. Category IV	2.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-81C.
3.0 Vent piping system.	3.1 Negligible. Category IV	3.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-81C.
4.0 Remove pump set, differential pressure switch panel, and relief valves and install blind flanges, pipe assemblies using slit breather gaskets. (Pumproom)	4.1 Electrical shock. Category III	4.1.1 Ensure that P-51 circuit breaker is in the OFF position and danger tagged with AF Form 1492.

<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
	4.2 Residual fuel in fixed piping. Category I	
		4.2.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
		4.2.2 Vapor concentration shall be monitored with a PVD.
	4.3 Personnel injury due to improper use of hand tools. Category III	
		4.3.1 Normal industrial safety practices associated with the use of common tools shall be used. (AFOSH STD 127-31)
	4.4 Personnel injury and/or equipment damage due to use of improper manual lifting techniques. <u>Category III</u>	
		4.4.1 Proper manual lifting techniques shall be used. If size, weight, and/or shape of an object is beyond one person's capability, help shall be solicited.
5.0 Remove motor valves and connect propellant umbilical hoses to facility piping using slit gaskets. (Launch Duct)		
	5.1 Residual oxidizer in fixed piping. Category I	
		5.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
		5.1.2 Vapor concentration shall be monitored with a PVD.

TASK DESCRIPTIONHAZARDSAFETY REQUIREMENTS

- 5.2 Personnel injury due to improper use of hand tools. Category III
- 5.2.1 Normal industrial safety practices associated with the use of common tools shall be used. (AFOSH STD 127-31)
- 5.3 Personnel injury, equipment damage due to dropping tools and/or equipment in Silo Equipment Area and Launch Duct. Category III
- 5.3.1 Personnel will wear hard hats at all times (chin straps will be used in Launch Duct).
- 5.3.2 Drop cloths will be utilized while working in Launch Duct.
- 5.3.3 Personnel will exercise caution to not leave tools or equipment in compromising locations in silo equipment area.
- 5.4 Personnel injury due to personnel falling off work platforms in Launch Duct. Category II
- 5.4.1 Safety poles and chains will be installed prior to commencement of work activity.



**RFHCO
 SUITED
 ACTIVITY**

Attachment 1
 P-51 Pump Set Removal
 Sequence Chart

MARTIN MARIETTA CORPORATION

DENVER, COLORADO

SAFETY ENGINEERING ANALYSIS

FOR

TITAN II RIVETCAP

UNLOAD FUEL HOLDING TRAILER TO
COMMERCIAL TRANSPORT TRAILER

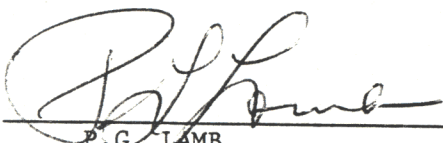
F42600-81-D-1379-0004-014

CDRL 1004


PREPARED BY:

KEITH WANKLYN

APPROVED BY:



P.G. LAMB
SLS SYSTEM SAFETY



RICHARD E. CIELALA
PROGRAM MANAGER
STRATEGIC SYSTEMS

1.0 SAFETY ENGINEERING ANALYSIS (SEA)

This Safety Analysis has been completed as required by parameters outlined in AFR 66-2. Engineering drawings, test procedures and instructions were subjected to a detailed review; hazards and safety requirements are identified and classified in accordance with System Safety Program Requirements MIL-STD-882A.

2.0 Definitions of Hazard Severity Categories

CATEGORY I

Catastrophic. May cause death or system loss.

CATEGORY II

Critical. May cause severe injury, severe occupational illness, or major system damage.

CATEGORY III

Marginal. May cause minor injury, occupational illness, or system damage.

CATEGORY IV

Negligible. Will not result in injury, occupational illness, or system damage.

NOTE: Technical Orders and procedures have been reviewed to ensure that adequate safety precautions have been incorporated.

Task numbers refer to tasks in sequence chart, attachment 1.

3.0 HAZARD ANALYSIS

SEA: 014

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

1.0 Inspect holding trailer pumps.

1.1 Negligible. Category IV

1.1.1 Perform IAW T.O. 21M-LGM25C-2-12,
Figure 2-188.

2.0 Position transport trailer on hardstand.

2.1 Negligible. Category IV

2.1.1 Perform IAW T.O. 21M-LGM25C-2-12,
Figure 2-56.

3.0 Prepare holding trailer for connection to transport trailer.

3.1 Negligible. Category IV

3.1.1 Perform IAW T.O. 36A11-10-9-1,
Figure 5-21.

4.0 Install filter assembly and pressure drain adapter on holding trailer.

4.1 Residual fuel in piping. Category I

4.1.1 Personnel shall wear Category I
protective clothing (T.O. 21M-LGM25C-1).

4.2 Personnel injury due to improper use of hand tools. Category III

4.2.1 Normal industrial safety practices
associated with the use of common hand
tools shall be used. (AFOSH STD 127-31)

<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
5.0 Connect transport trailer to holding trailer.		
	5.1 Residual fuel in piping. Category I	
		5.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
	5.2 Personnel injury due to improper use of hand tools. Category III	
		5.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)
6.0 Leak check hose connections.		
	6.1 Residual fuel in piping. Category I	
		6.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
7.0 Determine Stage II pump flowrate.		
	7.1 Residual fuel in piping. Category I	
		7.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
8.0 Load transport trailer from Stage II side of holding trailer.		
	8.1 Residual fuel in piping. Category I	
		8.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
9.0 Pressure drain liquid hose and disconnect transport trailer.		
	9.1 Residual fuel in piping. Category I	
		9.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
	9.2 Personnel injury due to improper use of hand tools. Category III	
		9.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)
10.0 Remove loaded transport trailer from hardstand.		
	10.1 Neglibible. Category IV	
		10.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-38, Steps 128 through 130.
11.0 Position empty transport trailer on hardstand.		
	11.1 Negligible. Category IV	
		11.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-56.
12.0 Connect transport trailer to holding trailer.		
	12.1 Residual fuel in piping. Category I	
		12.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

3.0 HAZARD ANALYSIS

SEA: 014

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

12.2 Personnel injury due to improper use of hand tools. Category III

12.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)

13.0 Leak check hose connections.

13.1 Residual fuel in piping. Category I

13.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

14.0 Load transport trailer from Stage II side of holding trailer.

14.1 Residual fuel in piping. Category I

14.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

15.0 Pressure drain liquid hose and disconnect transport trailer.

15.1 Residual fuel in piping. Category I

15.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

15.2 Personnel injury due to improper use of hand tools. Category III

15.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)

3.0 HAZARD ANALYSIS

SEA: 014

<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
16.0 Remove loaded transport trailer from hardstand.		
	16.1 Negligible. Category IV	
		16.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-38, Steps 128 through 130.
17.0 Position empty transport trailer on hardstand.		
	17.1 Negligible. Category IV	
		17.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-56.
18.0 Connect transport trailer to holding trailer.		
9	18.1 Residual fuel in piping. Category I	
		18.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
	18.2 Personnel injury due to improper use of hand tools. Category III	
		18.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)
19.0 Leak check hose connections.		
	19.1 Residual fuel in piping. Category I	
		19.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
20.0 Determine Stage I pump flowrate.	20.1 Residual fuel in piping. Category I	20.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
21.0 Load transport trailer from Stage I side of holding trailer.	21.1 Residual fuel in piping. Category I	21.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
22.0 Pressure drain liquid hose and disconnect transport trailer.	22.1 Residual fuel in piping. Category I	22.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
	22.2 Personnel injury due to improper use of hand tools. Category III	22.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)
23.0 Remove loaded transport trailer from hardstand.	23.1 Neglibible. Category IV	23.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-38, Steps 128 through 130.

3.0 HAZARD ANALYSIS

SEA: 014

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

24.0 Position empty transport trailer on hardstand.

24.1 Negligible. Category IV

24.1.1 Perform IAW T.O. 21M-LGM25C-2-12,
Figure 2-56.

25.0 Connect transport trailer to holding trailer.

25.1 Residual fuel in piping. Category I

25.1.1 Personnel shall wear Category I
protective clothing (T.O. 21M-LGM25C-1).

25.2 Personnel injury due to improper use of hand tools. Category III

∞ 25.2.1 Normal industrial safety practices
associated with the use of common hand
tools shall be used. (AFOSH STD 127-31)

26.0 Leak check hose connections.

26.1 Residual fuel in piping. Category I

26.1.1 Personnel shall wear Category I
protective clothing (T.O. 21M-LGM25C-1).

27.0 Continue to load transport trailer from Stage I side of holding trailer.

27.1 Residual fuel in piping. Category I

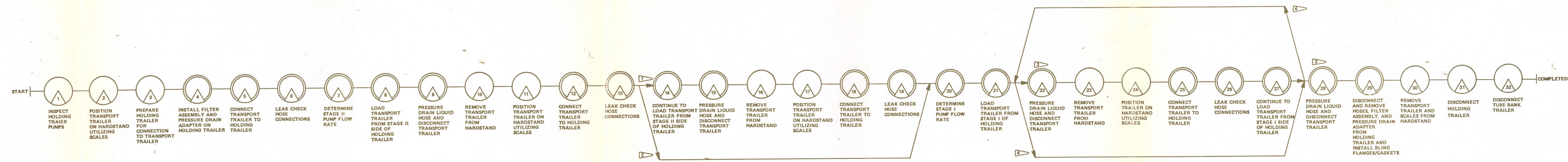
27.1.1 Personnel shall wear Category I
protective clothing (T.O. 21M-LGM25C-1).

<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
28.0 Pressure drain liquid hose and disconnect transport trailer.		
	28.1 Residual fuel in piping. Category I	
		28.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
	28.2 Personnel injury due to improper use of hand tools. Category III	
		28.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)
29.0 Disconnect and remove hoses, filter assembly, and pressure drain adapter from holding trailer and install blind flanges and gaskets.		
6	29.1 Residual fuel in piping. Category I	
		29.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
	29.2 Personnel injury due to improper use of hand tools. Category III	
		29.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)
30.0 Remove loaded transport trailer from hardstand.		
	30.1 Negligible. Category IV	
		30.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-38, Steps 128 through 130.

3.0 HAZARD ANALYSIS

SEA: 014

<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
31.0 Disconnect fuel holding trailer.		
	31.1 Residual fuel in piping. Category I	
		31.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
	31.2 Personnel injury due to improper use of hand tools. Category III	
		31.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)
32.0 Disconnect tube bank trailer.		
	32.1 Neglibible. Category IV	
		32.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-46.



RFHCO
SUITED
ACTIVITY

1 IF HOLDING TRAILER STILL CONTAINS STAGE II PROPELLANT
2 IF HOLDING TRAILER DOES NOT CONTAIN STAGE II PROPELLANT

3 IF HOLDING TRAILER STILL CONTAINS STAGE I PROPELLANT
4 IF HOLDING TRAILER DOES NOT CONTAIN STAGE I PROPELLANT

MARTIN MARIETTA CORPORATION

DENVER, COLORADO

SAFETY ENGINEERING ANALYSIS

FOR

TITAN II RIVETCAP

UNLOAD OXIDIZER HOLDING TRAILER TO
COMMERCIAL TRANSPORT TRAILER

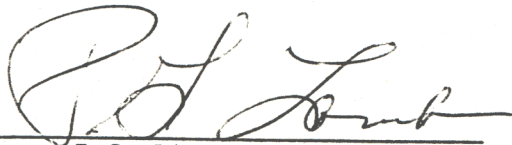
F42600-81-D-1379-0004-015

CDRL 1004

PREPARED BY:

KEITH WANKLYN

APPROVED BY:



P.G. LAMB
SLS SYSTEM SAFETY



RICHARD E. CIIPIELA
PROGRAM MANAGER
STRATEGIC SYSTEMS

1.0 SAFETY ENGINEERING ANALYSIS (SEA)

This Safety Analysis has been completed as required by parameters outlined in AFR 66-2. Engineering drawings, test procedures and instructions were subjected to a detailed review; hazards and safety requirements are identified and classified in accordance with System Safety Program Requirements MIL-STD-882A.

2.0 Definitions of Hazard Severity Categories

CATEGORY I

Catastrophic. May cause death or system loss.

CATEGORY II

Critical. May cause severe injury, severe occupational illness, or major system damage.

CATEGORY III

Marginal. May cause minor injury, occupational illness, or system damage.

CATEGORY IV

Negligible. Will not result in injury, occupational illness, or system damage.

NOTE: Technical Orders and procedures have been reviewed to ensure that adequate safety precautions have been incorporated.

Task numbers refer to tasks in sequence chart, attachment 1.

TASK DESCRIPTIONHAZARDSAFETY REQUIREMENTS

- | | | | |
|-------|--|---|--|
| 1.0 | Inspect holding trailer pumps. | | |
| 1.1 | Negligible. Category IV | | |
| 1.1.1 | | Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-188. | |
| 2.0 | Position transport trailer on hardstand. | | |
| 2.1 | Negligible. Category IV | | |
| 2.1.1 | | Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-87. | |
| 3.0 | Prepare holding trailer for connection to transport trailer. | | |
| 3.1 | Negligible. Category IV | | |
| 3.1.1 | | Perform IAW T.O. 36A11-10-10-1, Figure 5-21. | |
| 4.0 | Install filter assembly and pressure drain adapter on holding trailer. | | |
| 4.1 | Residual oxidizer in piping. Category I | | |
| 4.1.1 | | Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1). | |
| 4.2 | Personnel injury due to improper use of hand tools. Category III | | |
| 4.2.1 | | Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31) | |

3.0 HAZARD ANALYSIS

SEA: 015

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

5.0 Connect transport trailer to holding trailer.

5.1 Residual oxidizer in piping. Category I

5.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

5.2 Personnel injury due to improper use of hand tools. Category III

5.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)

6.0 Leak check hose connections.

6.1 Residual oxidizer in piping. Category I

ω

6.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

7.0 Determine Stage II pump flowrate.

7.1 Residual oxidizer in piping. Category I

7.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

8.0 Load transport trailer from Stage II side of holding trailer.

8.1 Residual oxidizer in piping. Category I

8.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

TASK DESCRIPTIONHAZARDSAFETY REQUIREMENTS

- 9.0 Pressure drain liquid hose and disconnect transport trailer.
- 9.1 Residual oxidizer in piping. Category I
- 9.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
- 9.2 Personnel injury due to improper use of hand tools. Category III
- 9.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)
- 10.0 Remove loaded transport trailer from hardstand.
- 10.1 Negligible. Category IV
- 10.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-39, Steps 130 through 132.
- 11.0 Position empty transport trailer on hardstand.
- 11.1 Negligible. Category IV
- 11.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-87.
- 12.0 Connect transport trailer to holding trailer.
- 12.1 Residual oxidizer in piping. Category I
- 12.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

- 12.2 Personnel injury due to improper use of hand tools. Category III
 - 12.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)
- 13.0 Leak check hose connections.
 - 13.1 Residual oxidizer in piping. Category I
 - 13.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
- 14.0 Load transport trailer from Stage II side of holding trailer.
 - 14.1 Residual oxidizer in piping. Category I
 - 14.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
- 15.0 Pressure drain liquid hose and disconnect transport trailer.
 - 15.1 Residual oxidizer in piping. Category I
 - 15.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).
 - 15.2 Personnel injury due to improper use of hand tools. Category III
 - 15.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)

3.0 HAZARD ANALYSIS

SEA: 015

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

16.0 Remove loaded transport trailer from hardstand.

16.1 Negligible. Category IV

16.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-39, Steps 130 through 132.

17.0 Position empty transport trailer on hardstand.

17.1 Negligible. Category IV

17.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-87.

18.0 Connect transport trailer to holding trailer.

18.1 Residual oxidizer in piping. Category I

18.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

18.2 Personnel injury due to improper use of hand tools. Category III

18.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)

19.0 Leak check hose connections.

19.1 Residual oxidizer in piping. Category I

19.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

3.0 HAZARD ANALYSIS

SEA: 015

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

20.0 Determine Stage I pump flowrate.

20.1 Residual oxidizer in piping. Category I

20.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

21.0 Load transport trailer from Stage I side of holding trailer.

21.1 Residual oxidizer in piping. Category I

21.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

22.0 Pressure drain liquid hose and disconnect transport trailer.

22.1 Residual oxidizer in piping. Category I

22.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

22.2 Personnel injury due to improper use of hand tools. Category III

22.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)

23.0 Remove loaded transport trailer from hardstand.

23.1 Negligible. Category IV

23.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-39, Steps 130 through 132.

3.0 HAZARD ANALYSIS

SEA: 015

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

24.0 Position empty transport trailer on hardstand.

24.1 Negligible. Category IV

24.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-87.

25.0 Connect transport trailer to holding trailer.

25.1 Residual oxidizer in piping. Category I

25.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

25.2 Personnel injury due to improper use of hand tools. Category III

∞

25.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)

26.0 Leak check hose connections.

26.1 Residual oxidizer in piping. Category I

26.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

27.0 Continue to load transport trailer from Stage I side of holding trailer.

27.1 Residual oxidizer in piping. Category I

27.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

3.0 HAZARD ANALYSIS

SEA: 015

TASK DESCRIPTION

HAZARD

SAFETY REQUIREMENTS

28.0 Pressure drain liquid hose and disconnect transport trailer.

28.1 Residual oxidizer in piping. Category I

28.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

28.2 Personnel injury due to improper use of hand tools. Category III

28.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)

29.0 Disconnect and remove hoses, filter assembly, and pressure drain adapter from holding trailer and install blind flanges and gaskets.

9

29.1 Residual oxidizer in piping. Category I

29.1.1 Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).

29.2 Personnel injury due to improper use of hand tools. Category III

29.2.1 Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)

30.0 Remove loaded transport trailer from hardstand.

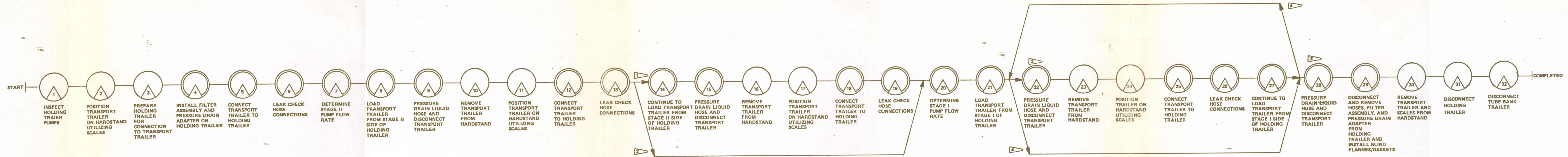
30.1 Negligible. Category IV

30.1.1 Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-39, Steps 130 through 132.

3.0 HAZARD ANALYSIS

SEA: 015

<u>TASK DESCRIPTION</u>	<u>HAZARD</u>	<u>SAFETY REQUIREMENTS</u>
31.0 Disconnect oxidizer holding trailer.		
31.1	Residual oxidizer in piping.	Category I
31.1.1	Personnel shall wear Category I protective clothing (T.O. 21M-LGM25C-1).	
31.2	Personnel injury due to improper use of hand tools.	Category III
31.2.1	Normal industrial safety practices associated with the use of common hand tools shall be used. (AFOSH STD 127-31)	
32.0 Disconnect tube bank trailer.		
32.1	Negligible.	Category IV
32.1.1	Perform IAW T.O. 21M-LGM25C-2-12, Figure 2-80.	



- 1 IF HOLDING TRAILER STILL CONTAINS STAGE II PROPELLANT
- 2 IF HOLDING TRAILER DOES NOT CONTAIN STAGE II PROPELLANT

- 3 IF HOLDING TRAILER STILL CONTAINS STAGE I PROPELLANT
- 4 IF HOLDING TRAILER DOES NOT CONTAIN STAGE I PROPELLANT