



Dryden Flight Research Center  
Edwards, California 93523

**DCP-S-064, Baseline**  
**Expires January 1, 2016**

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# **Dryden Centerwide Procedure**

## **Code S**

### **Lifting Operations, Devices, & Equipment**

Electronically approved by  
Assistant Director for Management Systems

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## 1.0 PURPOSE OF DOCUMENT

This document describes the procedures and guidance for safe Lifting Device Equipment (LDE) operations and assigns responsibility for the operation of lifting devices owned, controlled, or contracted by Dryden Flight Research Center (DFRC).

## 2.0 PROCEDURE SCOPE & APPLICABILITY

**Scope:** This procedure applies to on or off site DFRC LDE activities including operating, designing, testing, inspecting, maintaining, and certifying equipment. The procedure also encompasses LDE activities including training, certifying, and decertifying personnel for DFRC LDE activities on or off site.

**Applicability:** This procedure applies to all civil servants and contractors who participate in LDE activities at DFRC and its operations.

## 3.0 PROCEDURE OBJECTIVES, TARGET, METRICS, & TREND ANALYSIS

**Objective:** Ensure the safe operation of LDE by DFRC employees, and DFRC operations in accordance with NASA-STD-8719.9, Standard for Lifting Devices and Equipment, and DFRC requirements.

**Target:** Zero incidents during operation of lifting devices and equipment.

**Metric:** Number of incidents during LDE activities.

**Objective:** Ensure LDE operated by DFRC employees are inspected and tested in accordance with NASA-STD-8719.9, Standard for Lifting Devices and Equipment, and manufacturers' recommendations.

**Target:** All LDE are current on required inspections and testing.

**Metric:** Percentage of LDE scheduled for inspection and testing compared to amount completed.

**Objective:** Ensure LDE operated by DFRC employees are maintained in accordance with NASA-STD-8719.9, Standard for Lifting Devices and Equipment, and manufacturers' recommendations.

**Target:** All LDE are current on required maintenance.

**Metric:** Percentage of LDE scheduled for maintenance compared to amount completed.

**Objective:** Ensure persons operating, inspecting, testing, and maintaining LDE are trained and certified in accordance with NASA-STD-8719.9, Standard for Lifting Devices and Equipment, and DFRC requirements.

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**Target:** All operators, inspectors, testers, and maintenance personnel of LDE are current on training and required certifications.

**Metric:** Percentage of personnel working with lifting devices that are trained and certified in accordance with NASA-STD-8719.9.

**Trend analysis:** Metrics will be analyzed by the Lifting Device Equipment Manager (LDEM) to determine whether procedural objectives have been met.

## 4.0 WAIVER AUTHORITY

If a requirement of this procedure or NASA-STD-8719.9 cannot be met, a safety variance will be prepared in accordance with NPR 8715.3, NASA General Safety Program Requirements, and coordinated through the center's Lifting Devices & Equipment Manager (LDEM).

**Note:** The NASA variance process does not apply to Federal and applicable state and local regulations (e.g., OSHA, Cal OSHA). Any variance of a federal or state/local regulation must be approved by the appropriate federal, state, and/or local agency (e.g., NASA Alternate Safety Standard for Suspended Load Operations approved by OSHA). The NASA Safety and Risk Management Division will review all proposed safety variances of federal regulations before submittal for approval.

## 5.0 RESPONSIBILITIES & DUTIES

### 5.1 Lifting Devices & Equipment Manager (LDEM)

- A. Implement requirements of NASA-STD-8719.9, applicable compliance and consensus standards, and manufactures guidelines.
- B. Assist in developing and managing the facility and/or AGE contractor inventory database of lifting devices and associated equipment under DFRC control.
- C. Assist in developing and monitoring the training program for lifting device operators.
- D. Coordinate variance requests related to LDE using supporting directives and guidelines.
- E. Participate as chairperson of the DFRC Lifting Devices and Equipment committee.
- F. Select LDE committee members consisting of representation from organizations that are involved with, or responsible for, LDE activities.
- G. Review LDE regulatory changes, assess impact to DFRC operations, implement required changes, and disseminate appropriately.

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- H. Investigate lifting device incidents and accidents and report findings to DFRC management.
- I. Approve procurement specifications of LDE.
- J. The DFRC LDEM will conduct and/or coordinate a recognized safety hazard analysis on required LDE.
- K. Review LDE activity plans and procedures.
- L. Collect and analyze metrics.

## **5.2 Lifting Devices & Equipment Committee**

The committee is composed of selected individuals across the Center who are involved with LDE operations in their respective organizations. The committee assists the LDEM in reviewing proposed changes in NASA-STD-8719.9 and any local directives. The approved committee charter and organizational chart is located in the Dryden Organizational Manual (DOM).

## **5.3 Vehicle & Aerospace Ground Equipment Contractor**

- A. Train and certify industrial equipment operators, riggers, and signalman and groundman.
- B. Maintain a current database of LDE trained personnel.
- C. Provide inspection, testing, maintenance, and certifications on LDE (excluding overhead and jib cranes, elevators, hangar doors, and vehicle shop lifts) owned/operated by DFRC in accordance with NASA-STD-8719.9.
- D. Maintain inspection, testing, maintenance, and certifications records on LDE (excluding overhead/jib cranes, elevators, hangar doors, and vehicle shop lifts) owned and/or operated by DFRC in accordance with NASA-STD-8719.9. Provide these records to the DFRC LDEM.
- E. Affix and maintain labeling and tagging of LDE per NASA-STD-8719.9 and mark critical LDE as such.
- F. Add new LDE to inspection, testing, maintenance, and certification program and remove as needed.

## **5.4 Facilities Maintenance Contractor**

- A. Provide inspection, testing, maintenance, and certifications on overhead and jib cranes, elevators, hangar doors, and vehicle shop lifts owned and/or operated by DFRC in accordance with NASA-STD-8719.9.

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- B. Maintain inspection, testing, maintenance, and certification records on overhead and jib cranes, elevators, hangar doors, and vehicle shop lifts owned/operated by DFRC in accordance with NASA-STD-8719.9. Provide these records to the DFRC LDEM
- C. Add new overhead and jib cranes, elevators, hangar doors, and vehicle shop lifts to inspection, testing, maintenance, and certification program and remove as needed.

### **5.5 Branch Chiefs, Supervisors, & Leads**

- A. Ensure LDE under their control have current inspections and are in proper operating condition or proper LOTO applied per [DCP-S-062](#) until mitigated.
- B. Ensure only trained and certified persons operate LDE.
- C. Be knowledgeable of and ensure LDE activities are conducted in accordance with NASA-STD-8719.9.
- D. Determine if a lift activity is a critical lift.
- E. Must understand critical lift procedures, if performing a critical lift.
- F. Contact the LDEM of any unusual lifts where extra safety precautions may be required.
- G. Notify the LDEM and Safety, Health, and Environmental Office immediately of any incidents or close calls involving LDE.
- H. Ensure daily preoperational inspections are completed before use on LDE under their control.
- I. Ensure Appendix A, Emergency Procedure, is included in lift plans and tailored to operation.
- J. Perform Operational Procedure and Hazard Analysis on overhead cranes within their respective facility, retained in the respective area, and made available to operators.

### **5.6 Lift Supervisor**

- A. Must conduct all LDE activities in accordance with NASA-STD-8719.9 and all applicable standards.
- B. Ensure a lift plan is developed and adhered to during the lift activity.
- C. Must understand critical lift procedures, if performing a critical lift.
- D. Must be critical lift certified, by attending DFRC critical lift training, if performing a critical lift.
- E. Must understand the lift plan, associated hazards, and be able to convey them.

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- F. Must understand and communicate to lift team participants, and affected employees, safety related issues related to the lift.
- G. Must monitor the lift activity.
- H. Determine that required inspections and certification for the LDE are current.
- I. Determine that lift hardware (e.g., slings and shackles, etc.) are properly rated and sized for the activity and a current inspection load test tag attached.
- J. Establish a controlled lift area and ensure the area is secure (i.e., delineate area, reroute traffic, prohibit unauthorized access, etc.) during lift activities and conveyed to affected employees.
- K. Assign lift team roles and responsibilities (e.g., operator, rigger, signalman, technician, etc.).
- L. Ensure operators, riggers, signalman, technician, etc. are currently trained and certified.
- M. Notify their supervisor, Safety, Health, and Environmental Office, and LDEM immediately of any incidents or close calls involving LDE.
- N. Ensure Appendix A, Emergency Procedure, is included in lift plan, tailor to operation, and conveyed to affected employees.
- O. Ensure Activity Hazard Analysis (AHA) is completed for LDE activities.

## 5.7 LDE Operators

- A. Maintain a valid operator's certificate for the type and/or specific LDE they are operating per NASA-STD-8719.9.
- B. Perform, and record, pre-use inspections and functional tests before operating.
  - 1) Mobile cranes will be recorded on form [D-WK 266-8](#), Crane Operator Pre-Use Inspection Report, located in the equipment logbook pouch attached to the equipment. The TEREX RT230 Crane will be recorded on form [D-WK 267-8](#), Terex Operator Pre-Use Inspection Report.
  - 2) Overhead cranes and hoists will be recorded in the logbook attached to the crane or hoist.
  - 3) Powered industrial trucks will be recorded on form [D-WK 265-8](#), Forklift Operators Pre-Use Inspection Report, located in the equipment logbook pouch attached to the equipment.
  - 4) Mobile aerial platforms will be recorded on form [D-WK 264-8](#), Mobile Aerial Platform Operators Pre-Use Inspection Report, located in the equipment logbook pouch attached to the equipment. CONDOR's will be recorded on form [D-WK 268-8](#), Condor Pre-Use

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Inspection Report, located in the equipment logbook pouch attached to the equipment.

**Note:** Pre-use inspections are required on rented or leased equipment. Contact the DFRC LDEM for issuance of forms in this instance.

- C. Ensure LDE certifications are current before operating.
- D. Must adhere to manufacturers operating instructions and applicable operating standards.
- E. Must safely operate LDE within its intended scope of operation proficiently and with finesse.
- F. Must use standard hand signals and/or appropriate two-way communication devices dependent on the activity.
- G. Must understand lift activity plans and associated hazards.
- H. Must understand critical lift procedures, if performing a critical lift.
- I. Must read, understand, and adhere to the Operational Procedure and Hazard Analysis for the overhead crane being operated.
- J. Must be critical lift certified, by attending DFRC critical lift training, when operating LDE during critical lift activities.
- K. Critical lift operator's qualification card will be annotated as critical lift qualified.
- L. Ensure that lift planning forms [D-WK 250-8](#) and [D-WK 251-8](#) are completed when using mobile cranes for both critical and noncritical lift operations.
- M. Must be able to interpret and apply load chart confines to mobile crane operations in any configuration specific to the equipment on which the operator is certified.
- N. Must be certified to operate powered hoists and winches except for platform hoists with procedural controls.
- O. Must be certified to operate personnel lifting devices.
- P. Must be certified to operate mobile aerial platforms (except for manually propelled platforms).
- Q. Must be certified to operate powered industrial trucks.
- R. Must be instructed in the proper use of jacks before operating.
- S. Must have certification card on person while operating LDE.
- T. Notify their supervisor, Safety, Health, and Environmental Office, and LDEM immediately of any incidents or close calls involving LDE.

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### 5.7.1 Operator Medical Requirements

- Maintain a current medical physical per NPR 1800.1 or DOT equivalent. Must be annotated on operator's certification card.
  - Includes mobile and overhead cranes, powered industrial trucks, and mobile aerial platforms (except for manually propelled platforms).
- It is the employee's responsibility to self-disclose a medical condition that would disqualify them that arises between physical renewals. This will be reported to the DFRC Health Unit.

## 5.8 **Riggers**

- A. Maintain a valid rigger's certification per NASA-STD-8719.9.
- B. Must adhere to applicable rigging standards.
- C. Must understand lift plans and associated hazards.
- D. Must understand critical lift procedures, if performing a critical lift.
- E. Must be critical lift certified, by attending DFRC critical lift training, when performing rigging during a critical lift activity. Certification card will be annotated as critical lift qualified.
- F. Ensure that lift activity hardware (e.g., slings and shackles, etc.) is properly rated and sized for the activity, all items are in acceptable condition, and are currently certified (e.g., inspection, tests, tags attached).
- G. Must be able to estimate (may use any resource available) the load weight being lifted and know the maximum allowable radius of the crane at its configured capacity.
- H. Ensure the center of gravity is addressed. If known, follow the lift plan as briefed. If unknown, lift item enough to assess and mitigate before proceeding.
- I. Ensure rigging is not binding or impinging on itself or the load in any way that may cause damage to it or the load.

### 5.8.1 Rigger Medical Requirements

- Maintain a current medical physical per NPR 1800.1 or DOT equivalent. Must be annotated on operator's certification card.
- It is the employee's responsibility to self-disclose a medical condition that would disqualify them that arises between physical renewals. This will be reported to the DFRC Health Unit.

## 5.9 Signalman

- A. Maintain a valid signalman certification.
- B. Must adhere to applicable signalman operating standards.
- C. Direct the crane operator when picking, moving, and landing the designated load.
- D. Must use standard hand signals and/or appropriate two-way communication devices dependent on the activity.
- E. Must understand lift plans and associated hazards.
- F. Must know the maximum allowable radius of the crane at its configured capacity.
- G. Ensure the load does not pass over personnel or critical equipment.
- H. Stop the lift operation when any unsafe condition is noted during the lift operation.

## 5.10 Project Managers or Designee

- A. Be knowledgeable of and ensure LDE activities under their control are conducted in accordance with NASA-STD-8719.9 and all applicable standards.

### 5.10.1 Project Managers who are required to develop lift plans:

- A. Be knowledgeable of and ensure LDE activities are conducted in accordance with NASA-STD-8719.9 and all applicable standards.
- B. Ensure a lift plan is developed and adhered to during lift activities.
- C. Determine if a lift activity is a critical lift per NASA-STD-8719.9 guidelines. See section 7.0, A, Determination if lift activity is critical or noncritical.
- D. Must understand critical lift procedures, if performing a critical lift.
- E. Must understand the lift plan, associated hazards, and be able to convey them.
- F. Must understand and communicate to lift team participants, and affected employees, safety related issues related to lift activities.
- G. Include Appendix A, Emergency Procedure, in lift plan and tailor to operation.

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### 5.11 Safety Observer

- A. Understand and apply NASA-STD-8719.9.
- B. Understand lift plan in its entirety.
- C. Understand critical lift plan in its entirety, if performing role of safety observer during a critical lift.
- D. Verify inspections and certifications on the crane, hardware, and rigging.
- E. Verify certifications for operators, riggers, and signalman, are currently trained and certified.
- F. Be a concurring signature on the critical lift activity plan if performing role of safety observer during a critical lift.
- G. Attend the pre-lift safety meeting if performing role of safety observer during a critical lift.
- H. Monitor the critical lift activity at all times if performing role of safety observer during a critical lift.
- I. Verify that forms [D-WK 250-8](#), Lift Planning: Mobile Crane Critical and Non-Critical Lift Hazard Analysis Checklist and [D-WK 251-8](#), Hazardous Operation Mobile Crane Lift Plan, are completed, as required.
- J. Verify Appendix A, Emergency Procedure, is applicable to the area of operation.
- K. Must be critical lift certified, by attending DFRC critical lift training, if performing role of safety observer during a critical lift.

### 5.12 Revoking of Certifications

Certifications may be revoked by the LDEM in cases of negligence or violation of safety requirements. Reinstatement will be dependent on the violation, and may range from counseling, retraining, to no reinstatement. Certifications may be revoked by the Medical Officer for medical reasons.

## 6.0 GENERAL REQUIREMENTS FOR ALL PERSONNEL ENGAGED WITH OR PLANNING LIFTING ACTIVITIES

- A. All LDE activities conducted at DFRC and under DRFC's control will be performed in accordance with NASA-STD-8719.9 and all applicable standards.
- B. When Lockout / Tagout is required for any reason on any LDE at DFRC and under DRFC's control it will adhere to [DCP-S-062](#), Lockout / Tagout Program.

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- C. Prior to procuring any LDE under DFRC's control refer to NASA-STD-8719.9 and submit to the DFRC LDEM for specification approval.
- D. Recognized safety hazard analysis:
  - 1) Cranes, hoists & winches, hydra-sets, and special personnel lifting devices supporting personnel lifting devices, used for critical lifts, must have a recognized safety hazard analysis before utilized for a critical lift activity.
  - 2) Mobile aerial platforms and powered industrial trucks used for lifts where failure or loss of control could result in loss of or damage to flight hardware must have a recognized safety hazard analysis before utilized for such activity.
  - 3) Jacks where failure or loss of control could result in loss of or damage to flight hardware must have a recognized safety hazard analysis before utilized for such activity.
    - a) The DFRC LDEM will conduct and/or participate in a recognized safety hazard analysis on required LDE.
- E. All overhead cranes require an operational procedure and hazard analysis.
- F. Operational procedure and hazard analysis will be performed by respective Branch Chief facility owner.
- G. Operational procedure and hazard analysis will be reviewed, approved, and filed with the DFRC LDEM and respective Branch Chief facility owner.
- H. Operational procedure and hazard analysis will be reviewed annually by the DFRC LDEM and respective Branch Chief facility owner.
- I. Multiple lift activities may occur at differing dates and times if the activity does not differ from the procedure stated in the approved lift plan with concurrence from the DFRC LDEM. The duration will not be longer than 1 year.
- J. Any LDE requiring the use of RF transmission will require approval of the DFRC Frequency Manager before use.
- K. Exhaust fume accumulation from LDE will be mitigated respective to the operation being performed.
- L. Fuel handling and storage will be conducted per DFRC guidelines.
- M. Battery changing and charging will be conducted per DFRC guidelines.

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## 7.0 LIFT ACTIVITIES & PLANS

- A. Determination if lift activity is critical or noncritical.
- 1) Reference NASA-STD-8719.9 for determining guidelines.
  - 2) Form [D-WK 269-8](#), Candidate Critical Lift Checklist/Accepted Risk of Determination, must be completed, coordinated, and filed with the DFRC LDEM before any critical lift activities, or accepted risk of determination regarding program/project assets.
    - a) Programs or Projects may accept risk of determination regarding program/project assets, but may not accept risk regarding life safety or Center facility assets.
- B. Critical LDE lift activities
- 1) Reference NASA-STD-8719.9 and all critical lift activities must comply.
  - 2) Critical lift plan. The lift plan will be followed as approved. All critical lift activities must have a plan that consists of: (See example in Appendix B, Lift Plan.)
    - a) Critical lift procedure
      - Detailed steps of operation
      - Rigging plan showing lift points, procedures, and hardware requirements.
    - b) For mobile crane activities
      - [D-WK 251-8](#), Hazardous Operation Mobile Crane Lift Plan
      - [D-WK 250-8](#), Lift Planning: Mobile Crane Critical and Non-Critical Lift Hazard Analysis Checklist
        - Leased mobile cranes
          - Must have a recognized safety hazard analysis performed by the LDEM before crane is transported to work site.
          - Crane certifications
          - Operator certifications
          - Certificate of insurance
    - c) For overhead crane activities
      - Current operational procedure and hazard analysis
      - Operator must read, understand, and adhere to the operational procedure and hazard analysis for specific crane utilized.
    - d) Affected area
      - Define controlled area
      - Inspect lift area verifying no obstructions or conflicting hardware will interfere with load path.
    - e) Hazard analysis

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- f) Review of certificates
    - Operators
    - Training
    - LDE
  - g) Center impact
  - h) Appropriate notifications
    - LDEM
    - Date, time, and location of critical lift activity
    - Affected entities
      - Must be notified of areas and assets that may be affected
      - Date, time, and location of critical lift activity
  - i) Emergency procedures (Appendix A)
- 3) Critical lift plan review
- a) Review and approval must take place before critical lift activity begins and be recorded, with all concurring signatures, on form [D-WK 230-8](#), Critical Lift Process Approval. The review should occur no later than 24 hours prior to the activity.
  - b) The critical lift plan review should be attended by individuals with concurring signatures on form D-WK 230-8.
  - c) The form D-WK 230-8 must be filed with the LDEM.
  - d) The LDEM must review and approve all critical lift activity plans.
- 4) Must have a safety observer that is independent from the critical lift activity. The safety observer must fulfill the requirements of Section 5.11, Safety Observer. This individual may be:
- a) LDEM
  - b) Safety professional
  - c) SQ representative
  - d) Supervisor
  - e) Engineer
  - f) Task leader
- 5) Suspended load lift activities will adhere to NASA-STD-8719.9, Appendix A, NASA Alternate Standard for Suspended Load Operations
- 6) Pre-Lift activity safety meeting
- a) Will be held before any lift activity
  - b) Be attended by all participants of the lift activity
  - c) Will cover at a minimum
    - Lift procedure

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- Hazards
  - Responsibilities
  - PPE
  - [D-WK 251-8](#), Hazardous Operation Mobile Crane Lift Plan
  - Affected area
  - Emergency procedures
- 7) Changes to plan in real time
- a) Owner of the plan will redline and sign changes with concurrence & signature from safety observer.
- 8) Debrief
- a) A debrief should be held after all lifts. If significant issues or problems arise during a lift, any lessons learned will be documented by the Project Manager or Operations Engineer in a Memo for Record and a copy provided to the Chief of Safety, Health, and Environmental Office, and the Code S Lessons Learned POC.

#### C. Noncritical LDE lift activities

1. Noncritical lift activities will adhere to standard industry rules and practices except as supplemented with unique NASA testing, operations, maintenance, inspection, and personnel licensing requirements.
2. Mobile crane lifts performed by DFRC entities will require a lift plan. The plan will include:
  - a) [D-WK 251-8](#), Hazardous Operation Mobile Crane Lift Plan
  - b) [D-WK 250-8](#), Lift Planning: Mobile Crane Critical and Non-Critical Lift Hazard Analysis Checklist
  - c) Rigging plan showing lifts points, procedures, and hardware requirements
  - d) Description of work. Example in Appendix B, Lift Plan.
    - Sequence of events
    - Center impact
    - Affected area
      - Define controlled area
      - Inspect lift area verifying no obstructions or conflicting hardware will interfere with load path
    - Activity hazard analysis
    - Emergency procedures (Appendix A)
    - Verification checklist
3. Lift plans will be reviewed and approved by the DFRC LDEM before commencement of activity.
  - a lift Activity hazard analysis
4. Pre-Lift activity safety meeting

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- a) Will be held before any lift activity
  - b) Be attended by all participants of the lift activity
  - c) Will cover at a minimum:
    - Lift procedure
    - Hazards
    - Responsibilities
    - PPE
    - [D-WK 251-8](#), Hazardous Operation Mobile Crane Lift Plan
    - Affected area
    - Emergency procedures
5. Debrief
- a) A debrief should be held after all lifts. If significant issues or problems arise during a lift a debrief will be held and any lessons learned will be documented by the Project Manager or Operations Engineer in a Memo for Record and a copy provided to the Chief of Safety, Health, and Environmental Office, DFRC LDEM, and the Code S Lessons Learned POC.
6. Overhead crane
- a) Operator must read, understand, and adhere to the operational procedure and hazard analysis for specific crane utilized.
7. Mobile crane lifts performed by outside entities for DFRC will require all of the above plus the following:
- Crane certifications
  - Operator certifications
  - Certificate of insurance

## 8.0 MANAGEMENT RECORDS & RECORDS RETENTION

The DFRC LDE Surveillance Plan Record will be kept to support Agency lifting device trend and data analysis and will be retained in the DFRC LDEM Office for three years.

Maintenance, inspection, test, certification status, and preoperational checklists are retained by the AGE contractor for the life of the item, then records follow item through disposition.

Training is recorded in SATERN and retained per SATERN protocol.

LDE incidents are recorded in IRIS and retained per IRIS protocol.

Waivers are retained in the DFRC LDEM Office for three years.

Project Managers or Operations Engineers who produce a Memo for Record will provide a copy to the Chief of Safety, Health, and Environmental Office, DFRC LDEM, and the Code S Lessons Learned POC. These memos will reside in the respective offices for three years.

## 9.0 RELEVANT DOCUMENTS

### 9.1 Authority Documents

|                           |   |
|---------------------------|---|
| NASA-STD-8719.9           | Standard for Lifting Devices and Equipment                |
| NPR-1800.1                | NASA Occupational Health Program Procedures.              |
| NPR-8715.3                | NASA General Safety Program Requirements                  |
| 29 CFR 1910.132           | General Requirements for Personnel Protective Equipment   |
| 29 CFR 1910.29            | Subpart 1 Manually Propelled Mobile Ladders and Scaffolds |
| 29 CFR 1910.67            | Vehicle Mounted Elevated and Rotating Work Platforms      |
| 29 CFR 1910.178           | Powered Industrial Trucks                                 |
| 29 CFR 1910.179           | Overhead and Gantry Cranes                                |
| 29 CFR 1910.180           | Crawler, Locomotive, and Truck Cranes                     |
| 29 CFR 1910.181           | Derricks  |
| 29 CFR 1910.184           | Slings  |
| 29 CFR 1910.6             | Incorporation by Reference                                |
| 29 CFR 1926.550           | Cranes and Derricks                                       |
| 29 CFR 1926.554           | Overhead Hoists   |
| 29 CFR 1926.556           | Aerial Lifts  |
| <a href="#">DCP-S-062</a> | Lockout Tagout Program                                    |

### 9.2 Reference Documents

|                  |                                  |
|------------------|----------------------------------|
| NASA –STD 8719.9 | 2.3, Non-Government Publications |
|------------------|----------------------------------|

### 9.3 Forms

|                            |   |
|----------------------------|---|
| <a href="#">D-WK 230-8</a> | Critical Lift Process Approval  |
| <a href="#">D-WK 250-8</a> | Lift Planning Mobile Crane Critical and Non-Critical Lift Hazard Analysis Checklist.      |
| <a href="#">D-WK 251-8</a> | Hazardous Operation Mobile Crane Lift Plan Hydraulic-Boom Rubber-Tired Pre-Lift Worksheet |

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|                            |  |
|----------------------------|--|
| <a href="#">D-WK 264-8</a> | Mobile Aerial Platform Operator Pre-Use Inspection Report        |
| <a href="#">D-WK 265-8</a> | Forklift Operators Pre-Use Inspection Report                     |
| <a href="#">D-WK 266-8</a> | Crane Operator Pre-Use Inspection Report                         |
| <a href="#">D-WK 267-8</a> | Terex Operator Pre-Use Inspection Report                         |
| <a href="#">D-WK 268-8</a> | Condor Operator Pre-Use Inspection Report                        |
| <a href="#">D-WK 269-8</a> | Candidate Critical Lift Checklist/Accepted Risk of Determination |
| <a href="#">D-WK 329-8</a> | Activity Hazard Analysis   |

## 10.0 ACRONYMS & DEFINITIONS

### 10.1 Acronyms

|      |  |
|------|--|
| AGMA | American Gear Manufacturers Association          |
| ANSI | American National Standards Institute            |
| ASME | American Society of Mechanical Engineers         |
| CFR  | Code of Federal Regulations                      |
| CMAA | Crane Manufacturers Association of America, Inc. |
| DOT  | Department of Transportation                     |
| LDE  | Lifting Devices and Equipment                    |
| LDEM | Lifting Device and Equipment Manager             |
| OSHA | Occupational Safety and Health Administration    |

### 10.2 Definitions

|                          |   |
|--------------------------|---|
| Certification            | That situation when the lifting device or equipment maintenance, test, or other operational checks have been performed and are current. |
| Certification, Personnel | See <i>Licensed Operator</i> .  |
| Crane                    | A machine for lifting and lowering a load and moving it horizontally, with the hoisting mechanism an integral part of the machine.      |
| Crane Operator           | A licensed individual who operates cranes for the purpose of lifting, moving, and placement of articles.                                |
| Crane Rigger             | A licensed individual who understands and   |

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|                              |  |
|------------------------------|--|
|                              | comprehends the intricacies of lifting equipment for the movement, positioning, and placement of payloads.   |
| Critical Lift                | A lift where failure/loss of control could result in loss of life, loss of or damage to flight hardware, or a lift involving special, high dollar items, such as spacecraft, one-of-a-kind articles, or major facility components, whose loss would have serious programmatic or institutional impact. Critical lifts also include the lifting of personnel with a crane, lifts where personnel are required to work under a suspended load and operations with special personnel and equipment safety concerns beyond normal lifting hazards. |
| Critical Lift Review Meeting | A meeting to review specific lift plans to include the procedure and associated hazard analysis.   |
| Designated Person            | Any person who has been selected or assigned (in writing) by the responsible NASA organizational element or the using contractor as being qualified to perform specific duties. A licensed operator may serve as a designated person for the equipment he/she is licensed to operate.  |
| Dummy Load                   | A test load to simulate the real load; typically a test weight.  |
| Emergency Stop (E-Stop)      | A manually operated switch or valve to cut off electric power or control fluid power independently of the regular operating controls.  |
| Frequently                   | For the purpose of this document, the term "frequently" is used to mean once or more per year.   |
| Hazard                       | Any real or potential condition that can cause injury or death to personnel, or damage to or loss of equipment or property.  |
| Hazard Analysis              | A document that provides the results of an evaluation performed on a system and/or activity identifying existing and potential hazards and the mitigations imposed.  |
| Hoist                        | A machinery unit device used for lifting and lowering a  |

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|  |  |
|--|--|
|  | load.  |
| Holding Brake                                | A brake that holds the load when power is off the lifting device.  |
| Idle Lifting Device                          | Lifting device that has no projected use for the next 12 months.   |
| Infrequently                                 | For the purpose of this document, the term “infrequently” is used to mean less than once per year.   |
| Jack   | A mechanism with a base and load point designed for controlled linear movement.  |
| Licensed Operator                            | Any person who has successfully completed the examination for crane, hoist, or heavy equipment operator and has been authorized to operate such equipment. (Note: This term includes certified and/or authorized operator.)  |
| Lift Plan                                    | A document that specifies the requirements and resources, including hazard analysis, required to perform a lift.   |
| Lifting Devices and Equipment                | Devices such as overhead and gantry cranes (including top running monorail, underhung, and jib cranes), mobile cranes, derricks, hoists, winches, special hoist supported personnel lifting devices, hydra-sets, load measuring devices, hooks, slings and rigging, mobile aerial platforms, powered industrial trucks, jacks, and mechanisms and equipment used for lifting and lowering. |
| Lifting Devices and Equipment Manager (LDEM) | Person responsible for overall management of the installation lifting devices and equipment program, coordinating with appropriate personnel at their installation on lifting issues and providing their installation’s position on lifting devices and equipment safety issues.   |
| Load   | The total load, including the sling or structural sling, below the hoisting device hook, being raised or moved.  |
| Load Measuring Device                        | A measuring device below the hook that is part of the load path for lifting operations.  |

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|                               |   |
|-------------------------------|---|
| Mobile Aerial Platform        | A mobile device that has an adjustable position platform, supported from ground level by a structure.   |
| NASA Operation                | Any activity or process that is under NASA direct control or includes major NASA involvement.   |
| Noncritical Lift              | A lift involving routine lifting operations governed by standard industry rules and practices except as supplemented with unique NASA testing, operations, maintenance, inspection, and personnel licensing requirements contained in NASA documents. |
| Operational Test              | A test to determine if the equipment (limit switches, emergency stop controls, brakes, etc.) is functioning properly.   |
| Overhead and Gantry Crane     | Overhead and gantry cranes are machines used for lifting and lowering a load and moving horizontally with the hoist machine an integral part of the machine.  |
| Payload                       | The actual object, below the sling or structural sling, being raised or moved.  |
| Periodic Load Test            | A load test performed at predetermined intervals with load greater than or equal to the rated load, but less than the proof load.   |
| Personnel Basket (Man-basket) | Any structure utilized to carry personnel by a crane, lift truck, or other lifting device.  |
| Personnel Certification       | A means to ensure an individual is qualified to perform a designated task.  |
| Personnel Lift                | A working platform that lifts, lowers, sustains, and transports personnel.  |
| Proof Load                    | The specific load or weight applied in performance of a proof load test and is greater than the rated load.   |
| Rated Capacity                | Maximum capacity of a particular crane in its working configuration. This will be determined by the manufacturers engineered/approved load charts.  |
| Rated Load or Safe Working    | An assigned weight that is the maximum load the device or equipment will operationally handle and   |

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|                           |  |
|---------------------------|--|
| Load or Rated Capacity    | maintain. This value is marked on the device indicating maximum working capacity. This is also the load referred to as “safe working load” or “working load limit.” If the device has never been downrated or uprated, this also is the “manufacturer’s rated load.” |
| Single Point Failure      | A single item or component whose failure would cause an undesired event such as dropping a load or loss of control.  |
| Sling                     | A lifting assembly and associated hardware used between the actual object being lifted and hoisting device hook.   |
| Suspended Load Operations | When personnel have any part of their body beneath a suspended load during lift operations involving a crane or hoist.   |
| Tagline                   | A line used to restrain or control undesirable motion of a suspended load.   |
| Variance                  | Documented and approved permission to perform some act contrary to established requirements.   |
| Waiver                    | A variance that authorizes departure from a specific safety requirement, where a special level of risk has been documented and accepted.   |
| Working Load              | If the device has never been downrated or uprated, this also is the “manufacturer’s rated load.”   |

**APPENDIX A – EMERGENCY PROCEDURES**

The following must be readily available during operations. Note that every emergency situation is unique and must be treated as such. The steps below are guidelines and may require modification or be tailored to the lift operation.

**EVACUATION EVENT**

|   |   |
|---|---|
| 1.  | Assess the situation. Barring further instruction, follow the steps below as appropriate.               |
| <b>WARNING:</b> No personnel will position themselves under the load at any time. Severe injury or death could result.      |   |
| 2.  | Secure the load by returning it to a supported position or by clearing it from personnel egress routes. |
| 3.  | Secure crane using shut down sequence   |
| <b>WARNING:</b> Do not engage emergency shut off until cleared to do so. Premature triggering may prevent securing of load. |   |
| 4.  | Upon clearance from crane operator, engage remote emergency shut off.                                   |
| 5.  | Evacuate area   |

**PARTIAL LOSS OF LOAD / LOSS OF LOAD CONTROL**

|  |   |
|--|---|
| <b>WARNING:</b> Do not shut off crane. This may prevent securing of load.  |   |
| 1.   | Stop operations.  |
| <b>WARNING:</b> No personnel will position themselves under the load at any time. Severe injury or death could result. |   |
| 2.   | Assess security of load and determine best course of action. Barring further instruction, follow the steps below as appropriate.                                    |
| 3.   | Assess medical needs  |
| <b>CAUTION:</b> Movement of load may result in further loss of load.   |   |
| 4.   | Secure the load if possible.<br>Some suggested courses of action:<br>a) Reattach or replace failed lifting hardware.<br>b) Place cribbing below load to support it. |
| 5.   | Secure stored energy  |
| 6.   | Secure area, preserving all evidence  |
| 7.   | Activate mishap plan  |

**LOSS OF LOAD**

|   |   |
|---|---|
| 1.  | Stop all operations.  |
| 2.  | Secure load   |
| 3.  | Assess medical needs  |
| 4.  | Secure crane using shut down sequence                                 |
| <b>WARNING:</b> Do not engage emergency shut off until cleared to do so. Premature triggering may prevent securing of remaining load. |   |
| 5.  | Upon clearance from crane operator, engage remote emergency shut off. |
| 6.  | Secure stored energy  |
| 7.  | Secure area, preserving all evidence                                  |
| 8.  | Activate mishap plan  |

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## APPENDIX B – LIFT PLAN

### DESCRIPTION OF WORK

#### Sequence of Events

*(Example)*

**PROJECT:** SOPHIA

**LOCATION:** Building 703, DAOF, inside northwest corner.

**CONTRACT:** NAS4-XXX, Task Order NNDXXXXXX

The purpose of this operation is to

---

---

The planned dates of the operation are \_\_\_\_\_.

- *(A bullet format is the easiest to convey the description of work.)*
- *(Provide enough detail so anyone can tell what you're doing, but the description does not need to be in micro detail. Describe the sequence of operations.)*

## **CENTER IMPACT ANALYSIS**

*(Example)*

### **CRANE ACTIVITY (dates of operation)**

#### Mirror Coating Project

To allow for safe operations of the crane and its loads at Building 703, access to the \_\_\_\_\_ area of the building is restricted to only the individuals associated with the crane lift operation. State “no impact” if there are no impacts.

List impacts to any operations and/or people: closure of areas, restricted use of doors for access (egress cannot be restricted), walkways, vehicle traffic, etc.

In the event an emergency or mishap occurs: *(Who do they call, what do they do?)*

- Call 911
- Call XXX-XXX on cell phone
- If mishap occurs, what do you do? Assess medical needs, contact safety, preserve evidence, etc.

In the event of a security issue: *(If one occurs, what do they do; who do they call?)*

- Call 276-3256

**Notification Plan:** *(How are you going to convey this impact?)*

- DM3
- Public email
- Safety meeting
- Status board

**AFFECTED AREA**  
*(Attach sketch of the affected area.)*

## **ACTIVITY HAZARD ANALYSIS** (*Example*)

List AHA(s) specifically related to the lifting activity.

Your crane company or subcontractor should provide you with an AHA for crane operations specific to the operation. It needs to contain the required components, i.e.,

1. What are you doing?
2. What might happen? (worst case)
3. What do you do to prevent with controls (engineering, manage, PPE/controls, etc.)?
4. What equipment is used?
5. What inspections are required, i.e., crane cert, rigging, PPE, etc.
6. What training/ operator certifications are required?

Use form [D-WK 329-8](#), Activity Hazard Analysis, if needed.

**CRANE CERTIFICATIONS**

Attach copies of the current annual and quadrennial certificates. Ensure certifications and cranes match-up, especially their load charts and weight proofs.

**OPERATOR CERTIFICATIONS**

Attach copies of Crane Operator, Rigger, and Signaller Certifications and Medical Examiners Certification/

**CERTIFICATE OF INSURANCE**

Attach copies.

**EMERGENCY PROCEDURES**

Attach Appendix A. Ensure it is tailored, if necessary, to LDE activity being performed.

**VERIFICATION CHECKLIST**

Expound on this checklist. It is your verification that items were completed with a responsible POC.

| <b>ITEM</b>              | <b>DATE VERIFIED</b> | <b>INITIALS</b> |
|--------------------------|----------------------|-----------------|
| Crane Operation Approval |                      |                 |
| Operator Certifications  |                      |                 |
| Crane Certifications     |                      |                 |
| Insurance                |                      |                 |
| Lifting Hardware         |                      |                 |
| Load Charts              |                      |                 |
| Pre-Lift Safety Meeting  |                      |                 |
| PPE                      |                      |                 |
| Brief Appendix A         |                      |                 |
| Etc.                     |                      |                 |

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**Document History Log**  
**IPP Review Date: 11-10-2010**

This page is for informational purposes and does not have to be retained with the document.

| Status Change | Document Revision | Effective Date | Page | Description of Change                |
|---------------|-------------------|----------------|------|--------------------------------------|
| Baseline      |                   | 01-01-11       |      | Replaces DCP-S-009 chapters 6 and 7. |
|               |                   |                |      |                                      |
|               |                   |                |      |                                      |
|               |                   |                |      |                                      |
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