



National Aeronautics and  
Space Administration

**GSDO-SPEC-1290**

**BASELINE**

**RELEASE DATE: 08/06/2020**

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## **EXPLORATION GROUND SYSTEMS PROGRAM**

### **TECHNICAL OPERATING PROCEDURE REQUIREMENTS**

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## REVISION AND HISTORY PAGE

| Status   | Revision No. | Change No. | Description                                                                                                              | Release Date |
|----------|--------------|------------|--------------------------------------------------------------------------------------------------------------------------|--------------|
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## 1.0 INTRODUCTION

Note: Exploration Systems Development Management Directive ESD-MD-12029, November 16, 2017, establishes the Exploration Ground Systems (EGS) Program name and retires the name Ground Systems Development and Operations (GSDO). There is no change in scope or architecture for EGS. Documentation may still contain references to GSDO until revisions are completed through normal updates. GSDO will remain as part of the document number.

### 1.1 PURPOSE

This document is the EGS Program Technical Operating Procedure (TOP) Requirements specification for Kennedy Space Center (KSC) contractors that perform work in support of EGS processing of ground and flight hardware. The specification applies to work activities associated with, but not limited to, Flight Hardware, Software, Ground Support Equipment (GSE), Flight Support Equipment (FSE), Facility Systems and Equipment (FS&E), and Ground Support Systems (GSS).

This document establishes the EGS Program requirements for TOPs used in ground processing operations at the Kennedy Space Center to ensure that procedures are sufficiently developed, documented and executed to support the operations of EGS systems.

### 1.2 SCOPE

These requirements apply to government contractor operations performed within EGS Program processing facilities identified in Table 1 that meet one or more of the following criteria: .

- Operation is considered Hazardous as defined by KNPR 8715.3-1.
- Operation constitutes a potential launch, test, vehicle, or payload processing constraint.
- Operation is detailed or complex and there is reasonable doubt that it can be performed correctly without written procedures.
- Operation is of significant scope and complexity, and as a result, requires detailed control and mitigations (e.g. Lockout/Tagout, Control Areas, etc.) in order for the operation to be performed successfully and safely.
- Maintenance, repair, operation or modification of equipment that is designated operationally essential, life safety or configured.

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**TABLE 1 - APPLICABLE EGS FACILITIES**

|                                                                                      |
|--------------------------------------------------------------------------------------|
| Rail System and JJ-Railroad Bridge<br>Rotation, Processing and Surge Facility (RPSF) |
| Multi-Payload Processing Facility (MPPF)<br>Launch Abort System Facility (LASF)      |
| Vehicle Assembly Building (VAB)                                                      |
| Mobile Launcher 1 (ML1)<br>Mobile Launcher 2 (ML2)                                   |
| Crawler Transporter 2 (CT-2)                                                         |
| Launch Complex 39B (LC-39B)                                                          |
| Barge Terminal Facility (BTF)<br>Crawlerway                                          |

### **1.3 CHANGE AUTHORITY/RESPONSIBILITY**

An EGS Program Change Request shall be submitted to the EGS Program Review Board (PRB) for consideration and disposition for proposed changes to this document. All such requests will adhere to the change management process described in GSDO-PLN-1001, Exploration Ground Systems Program Information and Configuration Management Plan. The appropriate NASA Office of Primary Responsibility (OPR) identified for this document is the EGS Program Integration Office, LX-S.

### **1.4 VERB APPLICATION**

Throughout this document statements containing the following verbs are defined as such:

- a. "Shall" - Used for binding requirements (verification not required)
- b. "Should" – Used to indicate a statement of best practice
- c. "Will" – Used to indicate a statement of fact, declaration of purpose, or expected occurrence

## **2.0 DOCUMENTS**

### **2.1 APPLICABLE DOCUMENTS**

|               |                                                                                                                    |
|---------------|--------------------------------------------------------------------------------------------------------------------|
| KNPR 8715.3-1 | KSC Safety Procedural Requirements Volume 1, Safety<br>Procedural Requirements for Civil Servants/NASA Contractors |
|---------------|--------------------------------------------------------------------------------------------------------------------|

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|               |                                                                                |
|---------------|--------------------------------------------------------------------------------|
| KNPR-1440.6   | KSC Records Management                                                         |
| GSDO-PLN-1183 | Exploration Ground Systems Program Ground Operations Management Plan           |
| GSDO-PLN-1192 | Exploration Ground Systems Program Call Sign and Channel Assignment Philosophy |
| GSDO-PLN-1232 | Cross-Program Quality Planning Requirements Document Plan                      |

## 2.2 REFERENCE DOCUMENTS

The following documents contain supplemental information to guide the user in the application of this document.

|               |                                                                                  |
|---------------|----------------------------------------------------------------------------------|
| GSDO-PLN-1001 | Exploration Ground Systems Program Information and Configuration Management Plan |
|---------------|----------------------------------------------------------------------------------|

## 2.3 PARENT DOCUMENT

The following document is the higher-level specification, standard, guideline, handbook, special publication, or requirement document containing the requirement driving the creation of this document.

|               |                                                                        |
|---------------|------------------------------------------------------------------------|
| GSDO-PLN-1002 | Exploration Ground Systems Program Systems Engineering Management Plan |
|---------------|------------------------------------------------------------------------|

## 3.0 GENERAL INFORMATION

### 3.1 DOCUMENT STRUCTURE

By formal definition, TOPs are approved work instructions, such as Work Plans, Job Plans, Operations and Maintenance Instructions and Work Authorizing Documents (WADs) that are scheduled and approved for execution as Work Orders (WOs). To streamline the processes defined in this document, the term WAD is used to capture the meaning of both WAD and TOP.

WADs shall be used to direct and document work activities associated with, but not limited to, Flight Hardware, Software, GSE, FSE, FS&E, and GSS.

WADs shall provide for operational coordination, test management, console and test equipment operation, monitoring, readout, and any related instructions required to verify performance, to perform maintenance, or to service flight systems, support equipment and facility systems.

WADs may be required at several indentured levels with higher-level WADs controlling the performance of lower level WADs (referred to as subtasks).

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WADs shall comply with program, Agency [such as NASA Procedural Requirements (NPR)], Federal [such as Operational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA)], and contractual requirements.

The content and structure of the WAD shall assure the repeatability of successful operations and should allow for the ability to investigate the causes and contributing factors of unsuccessful operations of any ground or flight operation.

#### **4.0 WAD CONTENT**

The following sections identify expected/required content in WADs.

##### **4.1 LEVEL OF DETAIL**

WADs shall contain sufficient detail to assure the repeatability of successful operations and to allow for the ability to investigate the causes and contributing factors of unsuccessful ground or flight operations.

WADs shall contain sufficient detail to identify and document the order of performance and verification of the work or testing being accomplished.

WADs should be developed to fit the job to the person, specifying the appropriate tools/resources, be physical feasible, avoid adjacent interferences/hazards, plan for off-nominal and contingency operations.

WADs should be developed in conjunction with the workers who touch the hardware/systems such as technicians, quality, and engineers.

WADs content should contain clear, essential information, including illustrations as appropriate, and should be factual, specific, concise, comprehensive and unambiguous.

WADs shall be readily understandable by qualified operators at the organizational level where the publication will be used.

WADs shall contain sufficient detail to assure proper sequencing of testing, servicing, installation, removal, assembly or disassembly of flight or ground components.

WADs shall provide traceability to the person who accomplished the task.

##### **4.2 SAFETY REQUIREMENTS**

All WADs developed for use on the EGS Program shall meet the safety requirements for Technical Operating Procedures per KNPR 8715.3-1 Volume 1.

- Prior to use, final versions off any new, changed, or revised hazardous WADs shall be reviewed and approved by the appropriate Safety and Mission Assurance professional(s)
- All personnel participating in the hazardous task/sequence of the WAD are required to review the WAD prior to performing the hazardous steps

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WADs shall include steps to obtain concurrence to proceed from the EGS Area Integrator prior to start of procedures containing hazardous operations, prior to hazardous steps or sequences and prior to opening any control area for controlled work at the conclusion of hazardous activities.

WADs shall include steps to notify the test team before the start of hazardous steps.

WADs shall define the area to be cleared and include instructions to establish those clears, a Public Address (PA) notification of personnel to clear the designated area, a list of authorized essential personnel and a verification step from the test team to commence with the hazardous operations.

Warning notes shall be used whenever there is a potential of danger or hazard to personnel. The Warning shall include a description of the danger or hazard, any mitigation action required and a listing of the Personal Protective Equipment (PPE) required for the task.

A Warning note shall be listed prior to the work steps that directs a specific hazardous task.

Caution notes shall be used whenever there is a potential of damage to hardware, equipment or facility systems. The Caution shall include a description of the potential damage and any mitigation actions required.

WADs shall provide Emergency Instructions when required to safeguard personnel and equipment where the hardware, equipment or facility systems under test is not Fail Safe and failure would create a hazardous condition.

WADs shall provide contingency operations to address a condition that requires safing and/or securing of hardware where adequate time is available to perform the task safely and completely.

#### **4.3 CALIBRATED TOOLS, TEST EQUIPMENT**

WADs shall identify any requirements to collect traceability information during use of calibrated tools and/or equipment when accuracy is required to meet an operational or design requirement.

#### **4.4 DATA COLLECTION AND VERIFICATION**

When data is recorded or verified by a WAD, the WAD shall identify the acceptance criteria (value, tolerance and units). Data recorded for reference only shall be so identified (e.g. baseline data).

WADs that install/remove configuration controlled components shall record part#/serial#/lot# information as required. Configuration controlled information shall be provided to the appropriate organization responsible for configuration management of the affected system.

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#### **4.5 WORK STEPS**

All work steps/tasks in a WAD shall be sequentially numbered.

Work steps/tasks shall be arranged to ensure all permissions to proceed, notifications, safety clears, communication protocols, etc. are completed prior to operation of any hardware, equipment or facilities systems and/or changes to hardware/system configurations.

WADs shall identify any applicable/associated Program/Cross-Program Requirements that are implemented or supported in that WAD.

Standard communication test team protocols shall be used per GSDO-PLN-1183 - EGS Program Ground Operations Management Plan.

WADs using Voice communications systems (Operational Intercommunication System [OIS], radio, etc.) shall identify the authoritative command position and the response position(s) for each step and have provisions for identifying the communications channel used.

Call Signs and OIS channels shall be documented in accordance with GSDO-PLN-1192 - EGS Program Call Sign and Channel assignment handbook

Hardware/software shall be clearly identified by Reference Designator (Ref Des) or part number to identify where work is being performed (e.g. room location, panel number/ref des, valve number/ref des, part number, etc.).

Direction of rotation for valves and regulators (i.e. Clockwise or Counter-clockwise) shall be identified.

Work steps/tasks that require quality witness/verification shall include appropriate buy-offs. Customer/Government quality buyoff points shall be planned in accordance with GSDO-PLN-1232.

Conditional steps/tasks (e.g. If/Then/Else, Not Performed, Optional, Skip) shall describe the condition first and then the action to be taken if that condition applies.

Conditional sub steps/tasks shall be used to ensure adequate traceability to the action taken.

#### **4.6 PAGING AND AREA WARNING SYSTEM (PAWS)**

When a Page or Warning announcement is to be made in support of an operation, the WAD shall have a work step identifying the announcement to be made.

The PAWS system shall not be utilized to open a control area.

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## 4.7 COORDINATION OF RESOURCES

WADs shall identify the material, equipment, skills, support and configurations required to perform the WAD.

WADS requiring support from external organizations (i.e. outside of contract) shall provide the specific requirements being levied upon the organization.

## 5.0 REVIEW AND APPROVAL

### 5.1 REVIEW

WAD Authors have the responsibility to make sure all areas affected or impacted by the work they are performing in their WAD are involved in the development of the WAD

The personnel impacted or affected by the work documented in the WAD are referred to as "Colleagues"

WAD Authors are responsible for identifying their colleagues

Colleague reviews of WADs related to EGS processing should be performed.

Colleague review is required for:

- Initial performance and significant revision of WADs
- Integrated operations, major hazardous operations and/or operations that cross contract boundaries.

### 5.2 APPROVAL

WADs shall have verifiable approval signatures or authenticated electronic approvals of all persons required to approve the content of the WAD.

- The approval shall be recognizable as a part of the specific revision of the WAD.
- The approval shall be accompanied by the identification of the system or function and KSC Contractor that each signer represents.

## 6.0 DOCUMENT REPOSITORY

KSC contractors shall provide the EGS Area Integrator visibility of WADs that are part of an integrated or major hazardous operation within the EGS facilities (Table 1).

Records of as-run WADs shall be maintained and made available to the EGS Program in accordance with record retention requirements identified in KNPR-1440.6 KSC Records Management.

Data for external analysis that is collected in as-run WADs shall be made available to the data-requesting/responsible organizations.

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## APPENDIX A ACRONYMS AND ABBREVIATIONS

|      |                                               |
|------|-----------------------------------------------|
| EGS  | Exploration Ground Systems                    |
| EPA  | Environmental Protection Agency               |
| FS&E | Flight Systems and Equipment                  |
| FSE  | Flight Support Equipment                      |
| GSE  | Ground Support Equipment                      |
| GSDO | Ground Systems Development and Operations     |
| GSS  | Ground Support Systems                        |
| KSC  | Kennedy Space Center                          |
| NASA | National Aeronautics and Space Administration |
| OIS  | Operational Intercommunication System         |
| OSHA | Operational Safety and Health Administration  |
| PA   | Public Address                                |
| PAWS | Paging and Area Warning System                |
| PPE  | Personal Protective Equipment                 |
| PRB  | Program Review Board                          |
| TOP  | Technical Operating Procedure                 |
| WAD  | Work Authorizing Document                     |
| WO   | Work Order                                    |

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## APPENDIX B OPEN WORK

### B1.0 TO BE DETERMINED

Table B-1 lists the specific To Be Determined (TBD) items in the document that are not yet known. The TBD is inserted as a placeholder wherever the required data is needed and is formatted in bold type within brackets. The TBD item is numbered based on the section where the first occurrence of the item is located as the first digit and a consecutive number as the second digit (i.e., **<TBD 4-1>** is the first undetermined item assigned in Section 4 of the document). As each TBD is solved, the updated text is inserted in each place that the TBD appears in the document and the item is removed from this table. As new TBD items are assigned, they will be added to this list in accordance with the above described numbering scheme. Original TBDs will not be renumbered.

**TABLE B-1 TO BE DETERMINED ITEMS**

| <b>TBD</b> | <b>Section</b> | <b>Description</b> |
|------------|----------------|--------------------|
| None       |                |                    |

### B2.0 TO BE RESOLVED

Table B-2 lists the specific To Be Resolved (TBR) issues in the document that are not yet known. The TBR is inserted as a placeholder wherever the required data is needed and is formatted in bold type within brackets. The TBR issue is numbered based on the section where the first occurrence of the issue is located as the first digit and a consecutive number as the second digit (i.e., **<TBR 4-1>** is the first unresolved issue assigned in Section 4 of the document). As each TBR is resolved, the updated text is inserted in each place that the TBR appears in the document and the issue is removed from this table. As new TBR issues are assigned, they will be added to this list in accordance with the above described numbering scheme. Original TBRs will not be renumbered.

**TABLE B-2 TO BE RESOLVED ISSUES**

| <b>TBR</b> | <b>Section</b> | <b>Description</b> |
|------------|----------------|--------------------|
| None       |                |                    |

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### B3.0 FORWARD WORK

Table B-3 lists the specific forward work items identified during this document's Change Request (CR) review and evaluation. Each item is given a sequential number (i.e., **<FWD 001>**). For each item, in the CR/CE field enter the specific number of the CR followed by the comment number from the Change Evaluation (CE) i.e., GSDO-C0345/CE-10, GSDO-C0345/CE-27. Do not include a placeholder for forward work items in the body of the document; list them only in Table B-3.

**TABLE B-3 FORWARD WORK**

| <b>FWD</b> | <b>CR/CE</b> | <b>Description</b> |
|------------|--------------|--------------------|
| None       |              |                    |

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