



Work Instruction (WI)

DIRECTIVE NO. 320-WI-5330.1.1C
EFFECTIVE DATE: January 14, 2013
EXPIRATION DATE: January 14, 2018

APPROVED BY Signature: Original Signed By
NAME: Mike Kelly
TITLE: Chief, Mission Support Division

COMPLIANCE IS MANDATORY

Responsible Office: 320 / Mission Support Division

Title: Quality Assurance and Safety Review and Approval of Work Orders and Procedures for Flight Projects

PREFACE

P.1 PURPOSE

This document establishes guidelines for Quality Assurance (QA) and Safety reviews of Work Order Authorizations (WOA) and Procedures for GSFC managed flight projects.

P.2 APPLICABILITY

This work instruction is applicable to Mission Support Division personnel reviewing or approving Work Order Authorizations or Procedures.

P.3 REFERENCES

- a. GPR 1280.1, The GSFC Quality Manual
- b. GPR 5330.1, Product Processing, Inspection, and Test
- c. GPR 5340.4, Problem Reporting and Problem Failure Reporting
- d. GPR 8621.1, Mishap Reporting
- e. GPR 8730.1, Calibration and Metrology
- f. 320-PG-5330.1.4, Process for Establishment, Management and Control of Mandatory Inspection Points (MIPs)
- g. GSFC Form 4-30, Work Order Authorization
- h. KNPR 8715.3, Kennedy Space Center Safety Practices Procedural Requirements

P.4 CANCELLATION

320-WI-5330.1.1B, Quality Assurance and Safety Review and Approval of Work Orders and Procedures for Flight Projects

P.5 TOOLS, EQUIPMENT, AND MATERIALS

N/A

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P.6 SAFETY PRECAUTIONS AND WARNINGS

N/A

P.7 TRAINING

N/A

P.8 RECORDS

N/A

P.9 MEASUREMENT/VERIFICATION

N/A

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Instructions

In this document, a requirement is identified by “shall,” a good practice by “should,” permission by “may” or “can,” expectation by “will,” and descriptive material by “is.”

1.0 Overview

The guidelines described in this work instruction focus on the review of work orders and procedures. They are guidelines and not requirements because the specifics for QA and Safety review of WOAs and procedures are contained in a project’s Configuration Management system, Quality Plan, or Document Control Plan and they may differ from project to project.

The Chief Safety and Mission Assurance Officer (CSO) will ensure that QA and Safety are appropriately included in the approval process and that, as a general rule, QA is the last reviewer of any documentation. It is also expected that responsible managers, systems engineers, integration and test managers, engineers, safety, contamination, and other personnel will have reviewed the documents prior to QA signature for release.

QA approval of WOAs and procedures indicates that safety and mission assurance issues have been acceptably addressed. The adequacy of the technical content and execution is verified by the originating responsible manager and technical experts.

2.0 CSO or QAE AUTHORIZATION REVIEW FOR WOA RELEASE

Generally the Project Design Lead (PDL) who will oversee the work generates the WOA. The WOA proceeds through a documented review and signature process before it is released for use. When required by the project, the CSO or authorized Quality Assurance Engineer (QAE) will review the WOA for completeness and insert any additional QA verification events or MIPs necessary to assure the appropriate level of QA coverage. Refer to 320-PG-5330.1.4 for guidelines. The CSO or QAE approval signature indicates that all recommended comments have been satisfactorily addressed. The following should be considered in review of a WOA:

- a. Ensure Blocks 1-12 are filled out appropriately and completely.
- b. Ensure all required documents (Block 10) are attached to the WOA in order to be readily available for personnel performing the work described. Ensure all documents are the correct revision, released and under Configuration Management Control.
- c. Ensure that appropriate Serial Number (S/N) and Part Number (P/N) are specified in Blocks 8a and 8b.
- d. Special Requirements/Support (Block 11):
 - 1) Check if safety support or oversight will be required
 - 2) Hazardous Materials and Operations are noted
 - 3) Hazardous Waste Provisions are noted
 - 4) Electrostatic Discharge (ESD) Statement/precautions are identified
 - 5) Contamination sensitivity is addressed

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- 6) Special Handling requirements are stated
- 7) Special Equipment needed is identified
- 8) Work sequence is addressed (For example, steps may be performed out of sequence.)
- 9) Check if photo support will be needed.
- e. Ensure all approvals and mandatory signatures been received (Block 12). If the WOA includes lifts or other hazardous operations, hazardous materials, or involves potentially hazardous hardware (heat pipes, batteries, radioactive sources lasers, pressurized vessels, etc.), a safety review and signature must be obtained.
- f. Ensure that hazardous WOAs are formatted correctly. In order for a hazardous WOA to be acceptable, it must meet the safety criteria for a hazardous procedure. Guidelines for formatting hazardous procedures are available via Kennedy NASA Procedural Requirements (KNPR) 8715.3 Kennedy Space Center Safety Practices Procedural Requirements, Chapter 9. Note: Hazardous operations typically require more details than can be accommodated under a WOA.
- g. Confirm the first event listed in Blocks 13, 14, 15 is "Notify QA and/or Notify Safety". Any time activities are in progress using flight hardware or critical Ground Support Equipment (GSE), QA shall be notified even if QA witnessing is not required.
- h. Review all other events to ensure that they follow a logical order.
- i. Review additional procedures and documents attached and make certain that they are referenced in events, listed in Block 10 and under configuration management.
- j. Check that adequate space is allocated to record measurements or expected results. This may be included in reference procedures.
- k. Check that adequate space is allocated for calibration data to be recorded. This may be included in reference procedures.
- l. Check that adequate space is allocated for recording batch, lot, and expiration dates of epoxies being used. This may be included in reference procedures.
- m. Each operation or activity shall be listed as a single event with its own event number assigned.
- n. An appropriate organizational code shall be listed for each event with a 320 code next to it if QA witnessing is required.
- o. MIPs shall be included as separate events. Refer to 320-PG-5330.1.4 for guidelines.
- p. Any redlines prior to release of the WOA shall be discussed, concurred, and initialed by the PDL, QAE, and the Safety Representative (if appropriate). Note: Under no circumstances shall undocumented deviations be permitted from a released WOA. Ensure that any later deviations from the WOA receive the necessary approvals and are incorporated prior to performing an operation.
- q. The level of detail in the planned events must be adequate to ensure product quality. Details should be appropriate for the individuals performing the work.
- r. Critical tasks and hazardous operations should be separated into individual WOAs and performed sequentially.
- s. In general, the last step is a review by the PDL and the CSO or other designated QA representative.
- t. The appropriate form for logging Problem Records (PRs) shall be included in the WOA.
- u. Ensure that the work called out pertains to the proper assembly; part and serial numbers should be referenced for clarification.
- v. Verify all safety requirements are listed and all equipment to be used is identified. Where appropriate, equipment serial numbers should be recorded.

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3.0 SAFETY AUTHORIZATION REVIEW FOR WOA RELEASE

When required by the project, CSO, or QAE, an authorized safety representative will perform a review of the WOA. The safety representative must review WOAs that include hazardous operations or conditions. In addition, the safety representative may elect to review a WOA to verify that it does not contain hazardous operations. In either case the review will ensure that safety verification events or MIPs are included to assure that appropriate safety coverage is available. Refer to 320-PG-5330.1.4 for guidelines. The safety representative's signature indicates that all recommended comments have been satisfactorily addressed and implemented. The following should be considered in the safety review of a WOA:

- a. Ensure all required documents (Block 10) are attached to the WOA in order to be readily available for personnel performing the work described. Consider whether other documents might be needed, such as Material Safety Data Sheets. Ensure all documents are under Configuration Management Control, the correct revision, and properly released. Review the additional procedures and documents that are attached and make certain that they are referenced in appropriate events, as listed in Block 10 and under Configuration Management Control.
- b. Special Requirements/Support (Block 11):
 - 1) Safety support and/or oversight is required
 - 2) Hazardous Materials and Operations are noted
 - 3) Hazardous Waste Provisions are noted
 - 4) ESD Statement/precautions are identified
 - 5) Special Handling requirements are stated
 - 6) Special Equipment is needed
 - 7) Work sequence is addressed (For example, steps that may or may not be performed out of sequence are identified)
- c. Verify that all approvals and mandatory signatures been received (Block 12).
- d. Ensure that hazardous WOAs are formatted correctly. In order for a hazardous WOA to be acceptable, it must meet the safety criteria for a hazardous procedure. Guidelines for formatting hazardous procedures are available via KNPR 8715.3 Kennedy Space Center Safety Practices Procedural Requirements, Chapter 9. Note: Hazardous operations typically require more details than can be accommodated under a WOA.
- e. Confirm the first event listed in Blocks 13, 14, 15 is to notify QA or notify safety". Whenever activities using flight hardware or critical GSE are in progress, ensure that QA has been notified even if QA witnessing is not required.
- f. Review all other events to ensure that the operation can be completed safely and that the steps follow a logical order. For example, a step to perform work or clean underneath test hardware cannot be permitted when the hardware is suspended from a crane.
- g. Each operation or activity should be listed as a single event with its own event number assigned.
- h. An appropriate organizational code should be listed for each event with a 320 code next to it if safety verification is required.
- i. MIPs shall be included as separate events. Refer to 320-PG-5330.1.4 for guidelines.

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- j. Any safety-related redlines inserted prior to release of the WOA shall be discussed, concurred with, and initialed by the PDL, CSO or QAE, and the safety representative. Note: Under no circumstances shall undocumented deviations from a released WOA be permitted. Ensure that any later deviations from the WOA receive the necessary approvals and that redlines are incorporated prior to performing an operation.
- k. The level of detail in the planned events must be adequate to ensure the operation can be completed safely. Details should be appropriate for the team performing the work.
- l. At a minimum, critical tasks and hazardous operations shall be divided among separate WOAs and performed sequentially. As noted previously, Hazardous operations typically require more details than can be accommodated under a WOA.
- m. Confirm that the last step on a hazardous WOA requires a review by the PDL, the CSO or other designated QA representative, and the safety representative.
- n. The appropriate form for logging PRs shall be included in the WOA.

4.0 CSO or QAE REVIEW FOR WOA CLOSURE

The last step on a WOA is for the PDL, CSO or other designated QA representative, and Safety Representative (if required) to review the documentation and hardware. The signatures indicate that all planned work, inspections, and tests have been satisfactorily completed and that documentation is complete. The CSO or designated QAE will verify the following before closing the WOA:

- a. Verify all events have been performed and documented. Both the “Performed By” and “Inspected By” Blocks (Blocks 16 and 17) shall have the completion dates and signatures or initials of the work performer and/or inspector or a slash (/) placed in the unused block. Include notations, with your initials and the current date, to explain discrepancies such as updated, altered, or unavailable information.
- b. Confirm that all Material Certifications, Certificates of Compliance, or Certificates of Conformance from the vendor or other documentation that verifies the materials used have been attached to the WOA. If polymeric or other materials were added to the hardware, traceability documentation shall be attached verifying that it is compatible with the hardware as well as usable for “Flight”.
- c. If procedures were used, the completed as-run procedures shall be attached to the WOA. These shall be filled in with required data.
- d. Make certain all calibration data has been recorded on the WOA. This information maybe recorded in as run procedures. All devices, systems and standards that are used to measure, gauge, test, inspect or otherwise determine compliance with prescribed technical requirements shall be properly calibrated, maintained and identified per GPR 8730.1.
- e. Verify that all redlines have been initialed by the PDL or by the responsible person identified in Block 14 and the QA Representative.
- f. Ensure all PRs/Problem Failure Reports (PFRs) have been properly documented and resolved per GPR 5340.4.
- g. Ensure all recorded data, pass/fail criteria or reports have been reviewed for accuracy and attached to the WOA.

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5.0 SAFETY AUTHORIZATION REVIEW FOR WOA CLOSURE

The Safety Representative will verify the following before authorizing closure of a hazardous WOA:

- a. Verify all safety events have been performed and documented. Both the “Performed By” and “Inspected By” Blocks (Blocks 16 and 17) shall have the completion dates and signatures or initials of the work performer and/or inspector or a slash (/) placed in the unused block. Include notation, with initials and the date, to explain discrepancies such as updated, altered, or unavailable information.
- b. If procedures were used, the completed as-run procedures shall be attached to the WOA. These shall be filled in with the required data.
- c. Verify that all safety redlines have been initialed by the PDL or responsible person identified in Block 14, the safety representative, and the QA representative (as appropriate).
- d. Ensure that any close calls, incidents, or mishaps have been reported per GPR 8621.1.

6.0 AUTHORIZATION REVIEW FOR RELEASE OF A PROCEDURE

Procedures should describe the step-by-step operations and the expected results. A technical expert typically authors the procedure. The procedure review process is documented in the project’s Configuration Management Plan and the procedure must be officially released prior to its use. As part of the review process, the CSO or delegated QA representative shall review the document for completeness and ensure that it meets the project safety and mission assurance requirements. A safety representative will review procedures containing hazardous operations, conditions, or systems. If the review requires detailed knowledge of hardware, equipment or contractor operations, other technical experts (e.g., QAEs, Defense Contract Management Agency (DCMA) representatives, Materials Branch personnel, and Parts Branch personnel) with the required level of knowledge should be added to the signature list. Procedures are written for a wide variety of tasks, but each should include common topics:

- a. The sign off list should provide for review by knowledgeable experts so that the technical accuracy of the procedure is verified. Review signatures should be required for quality assurance and safety representatives whenever appropriate. At a minimum, an approval signature for a safety representative is required for all hazardous procedures.
- b. The purpose of the procedure shall be clearly stated.
- c. The scope should encompass
 1. Hardware to be used
 2. Software to be used
 3. Interfacing systems
 4. Major events
- d. The requirement of an open Work Order Authorization to be used in conjunction with the procedure shall be indicated and the WOA system should be referenced.

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- e. Instructions addressing problem reporting per GPR 5340.4 and mishap reporting per GPR 8621.1 shall be included in the procedure.
- f. Instructions outlining redlining or procedural changes should be included in the procedure.
- g. Verify that the correct drawings and other documentation are referenced.
- h. The roles for the test conductor, QAE, safety representative, and other required personnel should be clearly defined.
- i. Proper precautions such as ESD, safety constraints, hazardous operations, contamination control, safe-to-mate, etc., should be addressed.
- j. The required personnel and equipment should be listed.
- k. The tasks and steps should be broken down by significant events.
- l. The tasks and steps should be presented in a logical order and have good flow.
- m. The tasks/steps should be ordered to ensure that an operation can be conducted safely. For example, a step requiring personnel to perform work while positioned beneath hardware cannot be permitted when the hardware is suspended from a crane. Failure to identify and correct these occurrences during the review cycle will require an operation to be halted when the procedure is executed.
- n. The illustrations used should clarify tasks or test set-up and should contain sufficient details
- o. Expected results should be listed.
- p. MIPs or tasks that require QA or Safety witnessing should be identified. Refer to 320-PG-5330.1.4 for guidelines regarding MIPs.
- q. There should be places for operator, QA, and safety sign-off on the step or the page when it is required.
- r. Pre-operation conditions and equipment status should be discussed to ensure that the equipment is in the proper configuration.
- s. Emergency shut-down procedures should be addressed when applicable.
- t. Pass/fail criteria should be listed.
- u. The list of Measuring and Test Equipment (M&TE) and a place to record the calibration due date should be included.
- v. Safety inspections shall be included for safety critical systems or any situations where hazards to personnel could result if equipment is not properly calibrated.
- w. QA and safety verification should be included for hardware requiring certification such as lifting hardware, pressure lines, and relief devices.
- x. Review additional procedures and documents referenced or attached and make certain that they are under Configuration Management Control.

Appendix A – Definitions

- A.1 Hazardous Operations** – Those tasks that potentially have an immediate danger to the individual (death or injury) if not performed correctly, could create a danger to other individuals in the immediate area, or are a danger to the environment. These types of operations require written procedures. The procedures must be written in detailed steps to provide maximum protection to personnel, prevent procedural error, and minimize misinterpretation. They must include appropriate warnings and cautions where malfunctions or errors may cause injury or damage. Hazardous procedures must be approved by the appropriate Line Manager or designee and by safety personnel.
- A.2 PDL** – Product Design Lead, as defined in GPR 5330.1.
- A.3 Procedure** - documentation prepared for all formal operations or tests conducted by GSFC or contractors that describe what is to be tested or performed, the test equipment or facilities, personnel and the approach to be followed. It is a step-by-step instruction with expected results.
- A.4 Work Order Authorization (WOA)** – The Project’s GSFC Form 4-30 which initially documents step-by-step work plans, and then documents that work steps have been completed, approvals and/or inspections have been obtained, and the product is ready for release or for the next steps in its planned processing sequence.

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Appendix B – Acronyms

CSO	Chief Safety and Mission Assurance Officer
DCMA	Defense Contract Management Agency
ESD	Electrostatic Discharge
GPR	Goddard Procedural Requirements
GSE	Ground Support Equipment
KNPR	Kennedy NASA Procedural Requirements
M&TE	Measuring and Test Equipment
MIP	Mandatory Inspection Point
PDL	Product Design Lead
PFR	Problem Failure Report
PG	Procedures and Guidelines
P/N	Part Number
PR	Problem Record
S/N	Serial Number
QA	Quality Assurance
QAE	Quality Assurance Engineer
WI	Work Instruction
WOA	Work Order Authorization

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CHANGE HISTORY LOG

Revision	Effective Date	Description of Changes
Baseline	-	Initial Release
A	01/26/2005	Updated template, removed non-requirements, and revised for clarity
A	03/13/2010	Re-issued to assign new directive number to reflect new Code 320 organization. Administratively extended for 1 year from original expiration date.
B	4/02/2010	- Updated organization names, position titles, and referenced documents - Editorial and grammatical changes to improve clarity
C	01/14/2013	Revision brings document into alignment with actual process.

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