



Goddard Procedures and Guidelines

DIRECTIVE NO. GPG 5330.1D **APPROVED BY Signature:** W. F. Townsend
EFFECTIVE DATE: July 31, 2001 **NAME:** for A. V. Diaz
EXPIRATION DATE: July 31, 2006 **TITLE:** Director

Responsible Office: 500/Applied Engineering and Technology Directorate

Title: Product Processing, Inspection, and Test

PREFACE

P1. PURPOSE

This procedure describes the process for documenting the processing of Goddard Space Flight Center (GSFC) products including in-process and final inspections and tests, and test status. It describes the use of the Work Order Authorization (WOA) document, GSFC Form 4-30.

P2. APPLICABILITY

This procedure applies to all GSFC hardware and software products covered by the GSFC Quality Management System (QMS). Implementation of this procedure is to be defined in program or project-specific documentation (e.g., the design plan as described in Section 2.1.2).

Requirements for incoming inspection and test and the use of the WOA for receiving are described in GPG 4520.2, Incoming Inspection and Test.

P3. AUTHORITY

NPD 8730.3, NASA Quality Management System Policy (ISO 9000)

P4. REFERENCES

- a. GPG 1440.7, Control of Quality Records
- b. GPG 1710.1, Corrective and Preventive Action
- c. GPG 4520.2, Incoming Inspection and Test
- d. GPG 5340.2, Control of Nonconforming Product
- e. GPG 6400.1, Handling, Storage, Packaging, Marking, Preservation, and Transportation
- f. GPG 8700.1, Design Planning and Interface Management
- g. GPG 8700.2, Design Development
- h. GPG 8700.3, Design Validation
- i. GPG 8730.1, Calibration and Metrology
- j. 580-PG-8730.3.1, ISC Product Development Handbook
- k. GSFC Form 4-30, Work Order Authorization
- l. Training Module for GPG 5330.1, Product Processing, Inspection and Test

P5. CANCELLATION

GPG 5330.1C, Product Processing, Inspection, and Test

P6. RECORDS

Record Title	Record Custodian	Retention
Work Order Authorization (Completed)	Product Manager (PM)	NASA Records Retention Schedule (NRRS) 8/5A2 Project Test, Engineering, and Evaluation Files. Records may be retired to a Federal Records Center (FRC) when 2 years old. Destroy when 15 years old.

Upon “final product delivery,” all “completed” WOA’s shall be maintained by the Product Manager (PM) as quality record in accordance with GPG 1440.7. These records document the product processing, inspection, and test history. Section 2.1.2 states that “final product delivery” is to be defined in project documentation.

The WOA is initially generated as a “planning” document. Upon approval of the WOA by the appropriate authority, it becomes a “controlled” document, and the pre-approved events cannot be changed without the appropriate change authority as defined by the project. Additional intermediate processing steps and details can, and should, be recorded on the WOA (and WOA Continuation Sheets) and do not require change authority (See Section 2.4). These additional steps shall be within the scope of the originally planned WOA. For processing steps that fall outside of the scope of the original WOA, a new WOA shall be initiated, or the WOA shall be revised/changed as described in project documentation (See Section 2.1.2).

During the processing of the product, the various work performers and inspectors shall be responsible for maintaining and completing the WOA(s). WOA’s closed during product processing may be located with the product or filed nearby, but, in either case, must be readily accessible. When a Product Design Lead (PDL) completes his/her portion of the work and the product is ready for the next processing step, the associated WOA’s shall transition with the product to the next higher-level PDL. The WOA’s satisfy the requirement for maintaining the inspection and test status of the product. It is not until final product completion and delivery that the associated closed WOA’s shall transition to the PM for maintenance as “quality records.”

PROCEDURE

1. DEFINITIONS

- a. Final Inspection and Testing – A verification that the finished product conforms to specified requirements. The verification assures that all specified inspection and tests, including those specified either on receipt of product or in-process, have been carried out and that the results meet specified requirements as required by the quality plan and/or documented procedures.
- b. Final Product Delivery – The point in time when all planned product processing events to be documented by the WOA system have been completed. This might be final shipment/delivery, the launch event, or in-flight or on-orbit checkout. At this point, all WOA's are to be maintained by the product manager as quality records.
- c. In-process Inspection and Testing – A verification by inspection and/or testing of quality characteristics, defined by project quality requirements or documented procedures, during the processing of a product.
- d. Processing of a Product – Activities related to the manufacture, assembly, integration and handling of the product.
- e. Product Design Lead (PDL) – The manager or leader with overall responsibility for managing the design activity, managing the technical and organizational interfaces identified during design planning, and where required, forming and leading the Product Design Team. The term refers to flight project managers, mission managers, instrument managers, subsystem technical managers, integrated product development team leaders, lead engineers, etc.
- f. Product Manager – The manager or leader with overall responsibility for a product.
- g. Work Order Authorization - 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.

2. IMPLEMENTATION

2.1 General

2.1.1 WOA's are required for documenting the processing of in-scope products. They are written to guide the processing of a product as it progresses from the initial stages of manufacture through final integration and test so that a complete record of product processing is developed and maintained. The WOA is used to document the work plan, ensure appropriate approvals are identified and received, and log processing events as they are performed for specific elements of work. WOA's are to be used to meet Project quality requirements. The level of detail reflected on the WOA will vary due to the cost and complexity of the Project and the level of risk assumed by the Project. Additional information on the use

of the WOA's may be found in the Training Module for GPG 5330.1 that is posted to the GDMS Training web site. The Training Module may be found at the following URL:

<http://ohr.gsfc.nasa.gov/DevGuide/ISO/home.htm>

There are several ways a Work Order Authorization form (GSFC Form 4-30) may be obtained. The initiator chooses which of the methods to use, but use of the current revision of the form is required for projects that are initiated after the release date of Revision D of this document and is recommended, but not required, for existing projects at the time of the Revision D release. Changes consistent with paragraph b. below are allowed in either case. The methods are:

a. Access GSFC Form 4-30 on the Goddard Directives Management System (GDMS) to print the form and fill it out manually. The form may be found at the following URL:

http://gdms.gsfc.nasa.gov/gdms/plsql/dmform.master_list

Click on this URL to hyperlink to the GDMS Forms section to view a PDF version of Form 4-30 or download a MS Word version.

b. Access the form as described above, download the MSWord version and fill it out on-screen, and print it. Projects may add blocks and/or modify the size of existing blocks to better fit the needs of that particular project. For example, the approval block may be enlarged to allow more signatures, or the Special Requirements block might be enlarged or enhanced, or a request for other specific information may be added. These slightly modified versions of the posted Form 4-30 are acceptable, so long as all of the form's default information is included.

c. Complete the form on-line using the Work Order Authorization System. To access this system, go to the GDMS Guest Menu at the following URL:

http://gdms.gsfc.nasa.gov/gdms/plsql/menu_guest

Log on, select On Line Applications Main Menu, select Work Order Authorization System, and then follow the screen directions. This system maintains a database of all WOA's entered in the system, and has the advantages of allowing WOA searches and cloning existing work orders.

Note: Existing Microwave Anisotropy Probe (MAP) and Fabrication Engineering Management System (FEMS) electronic systems for identifying product development events and status which satisfy the inspection and test status requirements of ISO 9001 are acceptable alternatives to the use of [GSFC Form 4-30](#). However, the use of the FEMS-generated GSFC Certification Log is approved for use with the FEMS system only. Once the product being processed via FEMS has been released to the PDL, additional processing must be documented via the [GSFC Form 4-30](#).

2.1.2 Project documentation (i.e., design plan, Project Plan, specific procedures, etc. – see GPG 8700.1) shall define: approval authorities and processes (in some cases, approval authority may be delegated to the work performer or inspector), WOA numbering scheme, WOA revision/change

management process, and definition of the product completion and/or delivery event after which the WOA's become Quality Records.

2.1.3 The PDL (or his/her designee) will develop WOA's to provide the detail necessary to guide the work and ensure product quality. Recorded events on the WOA may be discrete actions or reference approved procedures.

2.1.4 The PDL will determine when in the product development process WOA's will first be used (unless otherwise defined in Project Documentation). However, the use of WOA's shall be initiated no later than the beginning of product manufacture or, in the case of software products, when the development effort comes under configuration control. The use of WOA's will continue to the point of final product delivery which may include launch site processing, the launch event, or in-orbit check-out.

2.1.5 The PDL for "software" development activities may determine that WOA [Form 4-30](#) is not applicable to his/her particular software related activities. When this is the case, the PDL shall approve the use of an equivalent WOA. The AETD/ISC Product Development Handbook (580-PG-8730.3.1) Product Plan is an approved WOA equivalent process. It is recognized that the function or implementation of software can be very diverse for flight missions and supporting ground elements and therefore the PDL has the discretion to tailor the WOA "equivalent" to meet his/her specific needs. However, at a minimum, the approach taken must document the proposed work plans and appropriate approvals. In addition, every formal release or version of operational product software/firmware shall be uniquely identified with a release/version identifier. Version/release changes, including data base changes, shall be documented in a version/release description document, including requirements and Nonconformance Report (NCR) status information.

2.1.6 WOA's generated throughout the development of a product shall remain with the product or filed locally, and, in either case, must be readily accessible.

2.2 Work Planning

2.2.1 Prior to performing any work related to the manufacture, assembly, integration or testing of a product, the PDL (or his/her designee) must develop and document, on the WOA, the work plan for the specific work process (e.g., assembly of an electronics box, optics coating process). The work plan may reference approved procedures or other documentation such as assembly drawings and should specifically note any special considerations or instructions that affect the work. This shall include work environment considerations such as personnel safety, environmental cleanliness requirements, etc. Any special items of equipment needed for inspections or tests should also be identified.

2.2.2 WOA's will be used, at a minimum, to specifically address in-process inspection and test events including all functional and environmental tests required for design verification and validation (see GPG 8700.2 and GPG 8700.3) and product handling with handling devices (see GPG 6400.1). WOA's may be used in the processing of product outside of the scope of the QMS to accomplish design verification and validation or as otherwise required in the Project Plan.

2.3 Prerequisites for Performing Work

Prior to performing any work, the responsible work performer or inspector, as identified on the WOA or equivalent, shall verify that:

- a previous product inspections and tests have been completed (or if not, that continued processing is approved);
- b identified controlling documentation (e.g., drawings, test procedures, etc.) is available and of the proper revision (or reflects current approved changes);
- c applicable measuring and test equipment and handling equipment is calibrated and certified as applicable in accordance with GPG 8730.1 and GPG 6400.1 respectively;
- d all NCR's which impact the continued processing of the product are dispositioned (i.e., the NCR may not necessarily be closed but the issues are understood and any impact of the nonconformance is mitigated by appropriate changes to the work plan); and,
- e all required approvals are obtained.

In addition, the PDL shall verify that all workers are appropriately trained and have necessary certification(s).

2.4 Documentation of Work

The WOA, in addition to the work planning and approval functions, also serves as the product processing log (Cert Log) and shall be used to record or reference all intermediate processing steps (do not require change authority) and all relevant information that are added to the pre-planned and pre-approved processing steps as the work progresses. This can be accomplished by documenting the additional details of the product processing directly on the approved WOA or on WOA Continuation Sheets that can then be attached to the approved WOA to form a complete record of the processing event. The level of detail in the planned and pre-approved events must be adequate to ensure product quality and will be as determined by the PDL. The completion of planned events, including identification of any NCR's (See GPG 5340.2), shall be recorded on the WOA prior to proceeding to subsequent events. Where specific pre-approved events cannot be completed as planned or the pre-approved event sequence must be modified, the WOA plan must be revised and approved in accordance with the project's defined change procedures.

It is also required that all "Performed by" and "Inspected by" blocks be filled in prior to proceeding with the next processing event. These blocks shall have the completion dates and signatures (or initials) of the work performer and/or inspector, or a "/" or "N/A" written in the block. Required inspection points may be specifically identified as separate events in the "Event Description" block, and should be signed off by the inspector in the "Inspected by" column and should have "N/A" or "/" in the "Performed by" column. Therefore, a completed WOA shall have no blank entries in the "Performed by" and "Inspected by" columns.

DIRECTIVE NO.	<u>GPG 5330.1D</u>
EFFECTIVE DATE:	<u>July 31, 2001</u>
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2.5 WOA Revision/Change Management

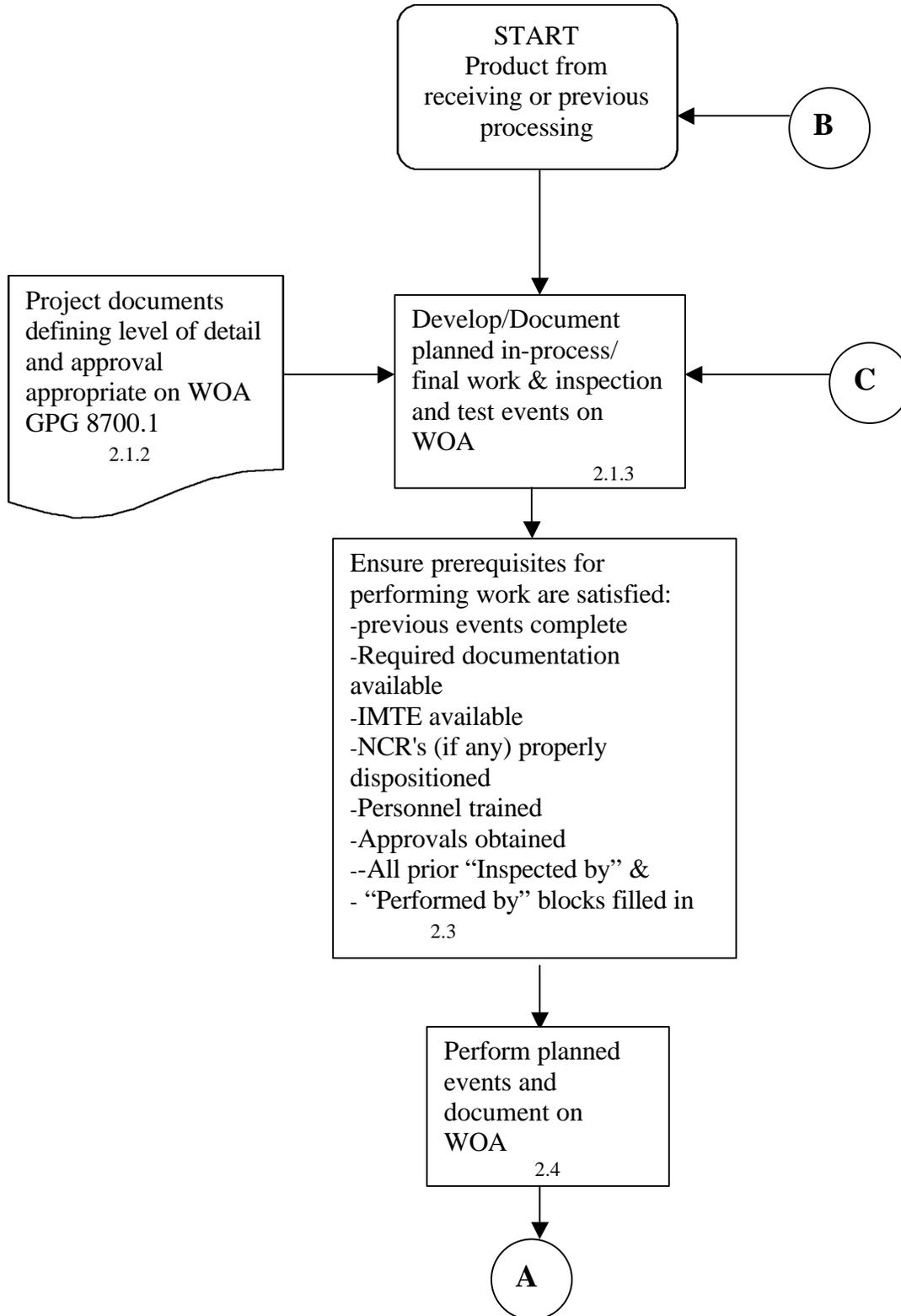
Where product processing operations uncover problems that require a change in pre-planned and pre-approved work events, these changes shall be recorded on the WOA, and approved using the process stipulated in the Project documentation. See Section 2.1.2.

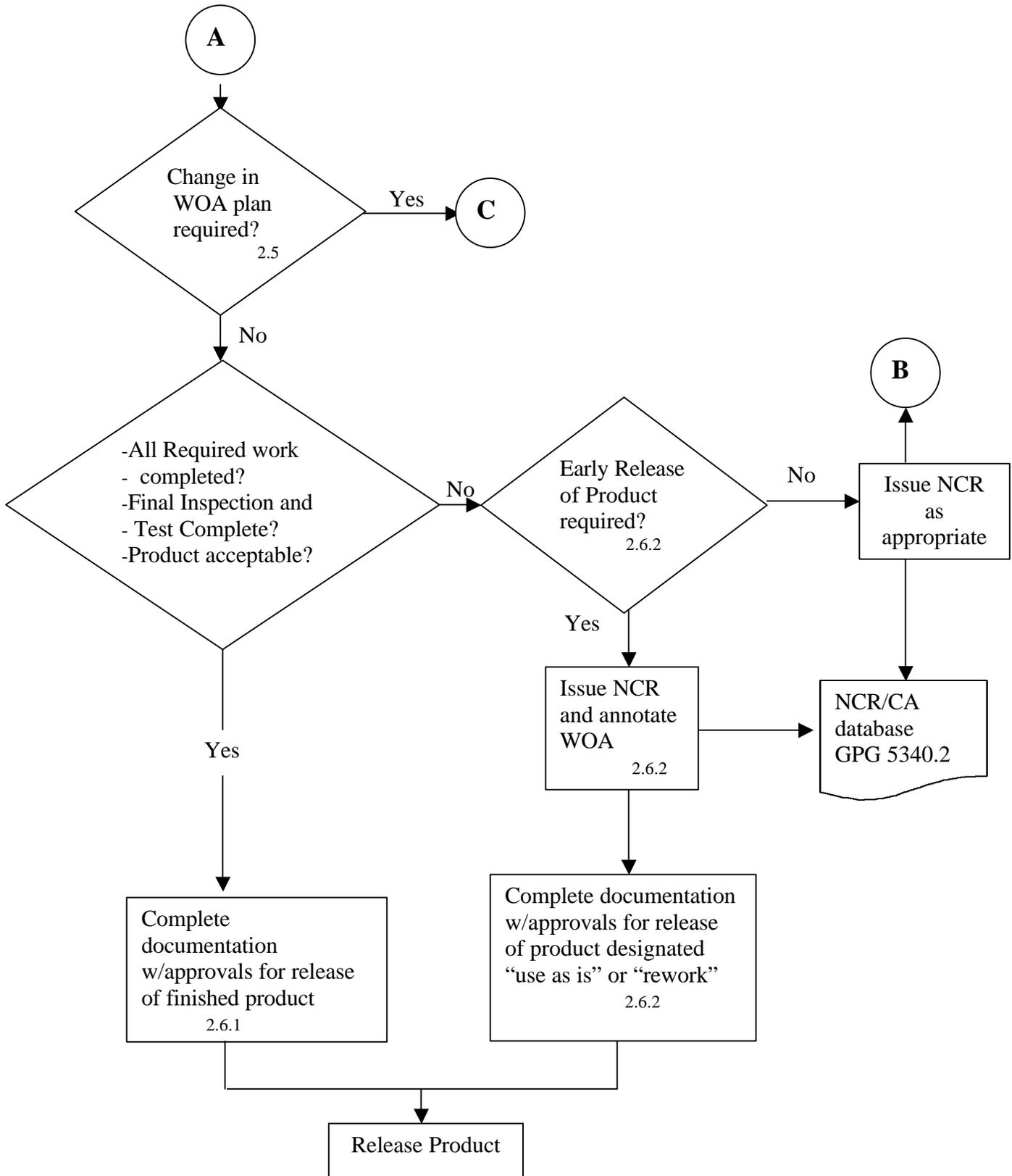
2.6 Product Release

2.6.1 Prior to final release of the product or release of the product for the next processing phase, the designated PDL shall sign off on the WOA that all planned work, inspections, and tests have been satisfactorily completed, and that documentation/quality records are complete and available. At this point the WOA will be closed.

2.6.2 Product which must be released prior to satisfactory completion of planned work, inspections, or testing shall be documented and processed as nonconforming product and dispositioned in accordance with GPG 5340.2. Corrective and preventive action (GPG 1710.1) shall be employed where appropriate. A copy of the NCR (most recent status) shall be attached to the referring WOA and/or be electronically accessible.

Product Development, Inspection and Test Flowchart





DIRECTIVE NO. GPG 5330.1D
EFFECTIVE DATE: July 31, 2001
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CHANGE HISTORY LOG

Revision	Effective Date	Description of Changes
Baseline	08/12/98	Initial Release
A	10/6/98	Header and footer format changes. Added Note in P2 regarding science research products. Expanded 2.2.1 required activities to include calibration and handling certification verification. Identified quality records maintenance responsibility.
B	04/21/99	Combined 5330.1A and 5330.3A. Moved Records from paragraph 3. to Preface paragraph P6. to comply with GPG 1410.1.
C	02/22/00	<p>Deleted GSFC Form 4-30 as an attachment.</p> <p>In P4, corrected ISC Product Development Handbook document number.</p> <p>In P6, changed quality record custodian to Product Manger and delineated the differences between a WOA as a planning document, a controlled document, and a quality record.</p> <p>Under 1, added the definitions of Product Manager and Final Product Delivery.</p> <p>Put definitions in alphabetical order.</p> <p>Added in 2.1.1 several ways to access WOA Form 4-30.</p> <p>Under 2.1.1 paragraph b, allowed slightly modified versions of GSFC Form 4-30 to better meet a particular project's needs.</p> <p>Expanded Note at end of 2.1.1 to explain the limited usage of the FEMS generated GSFC Certification Log.</p> <p>Under 2.4, identified several ways product processing details can be recorded via the WOA. Also, added requirement that all "Performed by" or "Inspected by" blocks have either initials/signatures, "N/A" or "/" written in them before proceeding to the next processing event.</p> <p>Adjusted paragraph references in Flowchart.</p>

DIRECTIVE NO. GPG 5330.1D
EFFECTIVE DATE: July 31, 2001
EXPIRATION DATE: July 31, 2006

CHANGE HISTORY LOG *Continued*

Revision	Effective Date	Description of Changes
D	07/31/01	<p>Added k. and l. references to P4.</p> <p>Added statements/words to P6, Section 2.4, and Section 2.5 to clarify that only the pre-planned and pre-approved processing events require change authority. Intermediate processing steps and information within the scope of the approved WOA do not require change authority.</p> <p>2.1.1 Added reference to training module and included direct link to website. Clarified the use of current revision of Form 4-30 for new and existing projects.</p> <p>2.2.1 Added sentence that states that the WOA shall include “work environment considerations.”</p> <p>Added “(or his/her designee)” after the initials “PDL” in Sections 2.1.3 and 2.2.1.</p>