



Goddard Procedural Requirements (GPR)

DIRECTIVE NO. GPR 8730.1K
EFFECTIVE DATE: July 21, 2008
EXPIRATION DATE: July 21, 2016

APPROVED BY Signature: Original signed by
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TITLE: Acting Director

COMPLIANCE IS MANDATORY

Responsible Office: 370/Quality and Reliability Division

Title: Metrology and Calibration

PREFACE

P.1 PURPOSE

This procedure establishes the process for ensuring that Measuring and Test Equipment (MTE) is properly calibrated, maintained, and identified.

P.2 APPLICABILITY

This procedure applies to all MTE used to process GSFC product.

P.3 AUTHORITY

NPD 8730.1, Metrology and Calibration

P.4 REFERENCES

- a. AS9100, Quality Management Systems – Aerospace - Requirements
- b. ISO 9001, Quality Management System - Requirements
- c. Form WI-710, (Wallops Island) Metrology Task Order Request for Service Quality Verification Laboratories Form
- d. GSFC 4-34, Nonconforming IMTE Tag
- e. GSFC 4-43, GSFC Out of Tolerance (OOT)/Repair Measurement & Test Equipment Findings

P.5 CANCELLATION

GPR 8730.1J, Calibration and Metrology

P.6 SAFETY

None

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P.7 TRAINING

All Greenbelt users shall take Metrology Information System (MIS) Training. Code 370 shall provide the training material.

P.8 RECORDS

Record Title	Record Custodian	Retention
Recall System Records	Calibration Laboratory	Maintain current list of Cat 1 MTE
MTE Cat 1 List	Calibration Laboratory	*NRRS 8/103 - Temporary. Destroy/delete between 5 and 30 years after program/project termination.
Calibration and Repair Records including WI-710	Calibration Laboratory	*NRRS 8/103
Records of test software verification used as MTE	MTE User	*NRRS 8/103
Calibration and Repair Records of MTE calibrated or repaired by other laboratories	MTE User	*NRRS 8/103
Calibration and Repair Records of MTE calibrated or repaired by user	MTE User	*NRRS 8/103
GSFC Out of Tolerance (OOT)/Repair Measurement & Test Equipment Impact Findings	Technical Monitor	*NRRS 8/103
Training Records	Supervisors	*NRRS 3/33G1 - Destroy 5 years after employee discontinues or completes training.

*NRRS – NASA Records Retention Schedules ([NPR 1441.1](#))

P.9 METRICS

The GSFC calibration contractor’s management is responsible for the monthly reporting of metrics to the Technical Monitor. As a minimum, metrics shall include the following:

- Cost
- Turn-around time
- Number of MTE items processed
- Out of Tolerance Reports, and
- Customer satisfaction (as measured by user feedback).

The Technical Monitor shall ensure that this information is reviewed for trends and process improvement.

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P.10 DEFINITIONS

- a. Calibration – A comparison between two instruments or devices where one is a standard of known accuracy to detect, correlate, report, or adjust deviations in the accuracy of the instrument being compared.
- b. Calibration Interval – The established time between calibrations of MTE. The interval may be determined and adjusted periodically by reviewing tolerance data, usage, historical data, MTE manufacturer’s specifications, and other relevant information. The time interval is determined by organizational management and/or the primary and/or secondary Points of Contact in conjunction with manufacturer’s recommendations.
- c. Calibration Label – A label affixed to MTE to show its calibration status. Appendix A shows the calibration labels commonly used by the Center’s calibration laboratories.
- d. Data – The value of a measured quantity provided by a measurement instrument and the information needed to duplicate the calibration.
- e. Measuring and Test Equipment (MTE) – All devices, systems, and standards that are used or available to be used to measure, gauge, test, inspect, or otherwise determine compliance with prescribed technical requirements of a product, or an element of a product, within the Goddard Management System (MS). MTE includes diagnostic and prognostic equipment; semiautomatic and automatic test equipment (with issued software); calibration, test, or measurement equipment; and bench set-ups used as standards. MTE is categorized three ways as follows:
 - (1) Category (Cat) 1, Calibration Required – MTE used in tests leading to new product development such as flight hardware, engineering models/test units, product dependent support equipment, research and development, and proof-of-concept. It includes any measurements where accuracy of measurement is important to ensure results are meaningful or where MTE malfunction may cause damage.
 - (2) Category (Cat) 2, Calibrate Before Use (CBU) – MTE that may be used on an infrequent basis so as not to justify keeping the equipment in calibration at all times. Use of this MTE to measure, gauge, test, inspect, or otherwise determine compliance with prescribed technical requirements is prohibited after the expiration date.
 - (3) Category (Cat) 3, Calibration Not Required (CNR) – MTE not used to measure, gauge, test, inspect, or otherwise determine compliance with prescribed technical requirements.
- f. MTE Recall List – An electronic or hardcopy listing of Cat 1 MTE that defines when calibration is due in accordance with the predetermined calibration interval, and is available and/or accessible to the users.
- g. MTE User – The individual in an organization who employs an item of MTE to measure, gauge, test, inspect, or otherwise determine compliance with prescribed technical requirements.

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- h. National Standards – Standards maintained by the National Institute of Standards and Technology, or based on intrinsic or natural phenomena that constitute the basis for the national measurement system.
- i. Organization Calibration Laboratory – A laboratory or organization, other than a Principal Calibration Laboratory, performing calibration, inspection, and repair of MTE on-site or through an outside service provider.
- j. Points of Contact (primary and secondary) – MTE owners/users that have designated responsibility for ensuring the proper maintenance of all MTE within their particular organization. Use of points of contact (POC) in this document refers to the primary (civil service) and/or secondary (civil service or contractor) personnel designated with this responsibility.
- k. Principal Calibration Laboratory – A specialized laboratory that is staffed and equipped to perform calibrations, inspections and repair of MTE. The term Principal Calibration Laboratory used in this document refers to the Center’s two primary calibration laboratories, one managed by Code 370 at Goddard’s Greenbelt Facility and the other by Code 803 at the Wallops Flight Facility.
- l. Recall System – A system, based on the MTE Recall List, that reminds MTE users when calibration is due on a Cat 1 item of MTE in accordance with the predetermined calibration interval.
- m. Standards – Devices or instruments that provide the basis for the calibration of MTE. Standards are defined in terms of their derivation and use.
- n. Technical Monitor – A civil servant designated as responsible for the management of the overall Metrology and Calibration Program at Greenbelt and/or Wallops Flight Facility.

P.11 ACRONYMS

CAT	Category
CBU	Calibrate Before Use
CNR	Calibration Not Required
GSFC	Goddard Space Flight Center
MIS	Metrology Information System
MS	Management System
MTE	Measuring and Test Equipment
NRRS	NASA Retention Schedule
OOT	Out of Tolerance
PCL	Principal Calibration Laboratory
POC	Points of Contact

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PROCEDURES

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. The Quality and Reliability Division (Code 370) of the Safety and Mission Assurance Directorate at Greenbelt and Safety Office (Code 803) of the Suborbital and Special Orbital Projects Directorate at Wallops Flight Facility shall each establish, at their respective sites, Principal Calibration Laboratory (PCL). The PCL services MTE containing the appropriate standards with traceability to the National Institute of Standards and Technology. Other calibration laboratories may exist on the respective sites to handle specific MTE. Each such laboratory shall have documented calibration and equipment control procedures that define the operating requirements and meet the Calibration Laboratory Requirements listed in section 2 of this directive.

2. Calibration Laboratory Requirements

At Greenbelt, users may request calibration services from the Principal Calibration Laboratory by submitting an on-line [Calibration Request](#) . For help with the Greenbelt Metrology and Calibration task order, contact the Program Manager in the Quality and Reliability Division. At the Wallops Flight Facility, users may request calibration services by completing Form WI-710, Task Order Request for Service Quality Verification Laboratories, obtained from local stores stock or from the Principal Calibration Laboratory at Wallops. For help with the Wallops Calibration task order contact the Task Monitor/Point of Contact in the Safety Office.

Greenbelt’s and WFF’s principal calibration laboratories and all organization calibration laboratories shall:

- a. Be compliant with ISO 9001 or AS9100 and meet the competency and accreditation requirements of NPd 8730.1. Calibration services, when procured, shall also meet these requirements. The suppliers of calibration services shall provide measurement data to users, upon request, as required in the referenced standards.
- b. Provide calibration and repair of MTE, including maintenance of related records and a MTE Recall List.
- c. Establish and document calibration intervals for Cat 1 MTE that shall be traceable to manufacturer’s specifications, industry practices, history, and use.
- d. Maintain a document control system for calibration laboratory manuals, procedures, equipment certifications, and other calibration documents to ensure proper controls and traceability for the calibration process.
- e. Document, maintain, and operate a MTE labeling system that indicates the calibration status of equipment. Labels are described below and in Appendix A.

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- (1) Cat 1 MTE will bear a CALIBRATION label. MTE so labeled shall have the date it was calibrated and the next calibration due date visibly displayed at all times.
 - (2) Cat 2 MTE will bear a CALIBRATE BEFORE USE (CBU) label. MTE so labeled may have two labels affixed at one time: a Calibration label and a CBU label. It is optional for the user to remove the Calibration Label upon expiration.
 - (3) Cat 3 MTE will bear a CALIBRATION NOT REQUIRED (CNR) label. MTE so labeled may have two labels affixed at one time: a CNR label and a Calibration label.
 - (4) A LIMITED USE CALIBRATION label is used in lieu of the Calibration label when it is necessary to describe limitations on the use of equipment that is otherwise considered calibrated. It may be used in combination with a CBU label or CNR label.
- f. Identify government-owned MTE by means of the Equipment Control Number (ECN) or a Metrology Control Number.
- g. Periodically review the MTE Recall List for accuracy which includes ensuring correct type identification, organization identification, and the activation and deactivation of equipment as directed by the owning organization. The MTE Recall List shall be available and/or accessible to the user.
- h. For MTE found to be Out of Tolerance (OOT), the calibration laboratory shall generate a calibration OOT Report and send it to the user. It will include general contact information, equipment identifying information, and instrument OOT details.
- i. Operate a Calibration Recall System that, for Cat 1 MTE, sends Calibration Due notices to the MTE organization's primary and secondary POCs 30-45 days prior to the calibration expiration date. Calibration due notices shall be sent to the organizational management personnel when alternative POCs have not been identified by management. Upon calibration expiration, a past due notification shall be sent to the POCs, and they have up to 30 days to respond to the notice. If there is no response, the calibration database shall be updated within the next 30 days to flag the past due item(s) as inactive. The inactive MTE shall be retained in the Calibration Laboratory Recall System. A list of the inactive MTE shall be forwarded to the responsible directorate office for appropriate action (see section 5).
- 3. MTE Users shall:**
- a. Ensure that the calibration status of MTE is understood before use and that all MTE used to measure, gauge, test, inspect or otherwise determine compliance with technical requirements is properly calibrated.
 - b. Ensure that MTE is appropriate for the measurements to be made and is used in a manner which ensures that measurement uncertainty is known and is consistent with the required measurement.

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- c. Properly store, handle, and maintain MTE.
- d. Ensure that only qualified personnel make adjustments to MTE that may affect its calibration.
- e. Determine whether the MTE is Cat 1, Cat 2 or Cat 3 and ensure the appropriate label is affixed. In cases where calibration services are provided by a non-GSFC calibration contractor, the user shall ensure that the MTE is labeled in a manner consistent with the labels defined in Appendix A.
- f. Affix the appropriate calibration status labels to storage containers of MTE that is too small or otherwise unsuitable for direct labeling. In the case of Cat 1 MTE, the calibration laboratory shall affix the label. The user shall develop and document procedures for the handling of Cat 1 MTE that is too small or otherwise unsuitable for direct labeling to ensure that tracking and traceability of calibration status is maintained and to prevent the inadvertent use of uncalibrated MTE.
- g. Be included in the calibration recall process if they utilize the Principal Calibration Laboratory for all Cat 1 MTE calibration requirements. If the MTE user elects to utilize off-site calibration and metrology resources, they must maintain a valid recall system for all Cat 1 MTE and define the process employed for calibration including details of equipment type, unique identification, and location, frequency of checks, check methods, and acceptance criteria.
- h. Ensure that when personnel responsible for areas or facilities where GSFC product is processed find MTE that is not in compliance with this procedure, they shall tag the MTE with a GSFC 4-34, NONCONFORMING MTE tag (see Figure 1), indicate on the tag the reason for the nonconformance and segregate the MTE to prevent unintended use. Nonconforming MTE shall not be used on GSFC product. The MTE user is responsible for ensuring nonconforming MTE is properly dispositioned.
- i. Ensure that if sources other than the Principal Calibration Laboratories are selected for support, they shall be compliant with ISO 9001 or AS9100, and meet the competency and accreditation requirements of NPD 8730.1. MTE calibrated by these sources is not included in the Metrology Information System.
- j. Develop and document procedures according to the documents/standards stated in 3.i for the calibration of specific items of MTE, including test software and bench test setups related to product testing.
- k. Upon receipt of a [GSFC 4-43](#) Out of Tolerance (OOT)/Repair Measurement & Test Equipment Impact Findings form from the metrology and calibration laboratory, assess the validity of work done with any MTE found to be out-of-tolerance (OOT) or in need of repair. Develop, document, and implement additional testing, if required.
 - (1) A [GSFC 4-43](#) shall be completed for every OOT/repair condition. When the OOT/repair condition is found to have an impact or possible impact on previously inspected or tested product, a Problem Report/Problem Failure Report (PR/PFR) shall be prepared. The PR/PFR shall document the impact of the out-of-tolerance condition/repair on all products or services

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processed with the MTE in question since the last acceptable assessment by the metrology and calibration laboratory.

- (2) Quality Representative sign-off of the 4-43 and return of the 4-43 to the calibration laboratory shall occur within 30 working days of initial notification by the metrology and calibration laboratory.
- (3) If not completed within 30 working days, the Technical Monitor shall within 10 working days, generate a Nonconformance Report (NCR) against the user's division-level management for failure to resolve an reported condition.

4. Organizational Management shall:

- a. Identify primary (civil service) and/or secondary (civil service or contractor) POCs to handle the day-to-day responsibility for the organization's MTE.
- b. Receive recall notification if no POCs have been identified.
- c. Ensure proper use of the Principal Calibration Laboratory or organizational calibration laboratory.
- d. Ensure that users develop, document, and implement procedures for the control of MTE to reflect specific and unique requirements.
- e. Ensure that new MTE designated as Cat 1 is added to the MIS. The calibration laboratory can provide details of this process.

- 5. Directorate Management or Equivalent** shall, upon receipt of an inactive MTE list, ensure that it is verified and corrected by the Division Management or equivalent and the corrected list forwarded to the Principal Calibration Laboratory manager to update the MTE database.

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**NONCONFORMING IMTE
DO NOT USE**

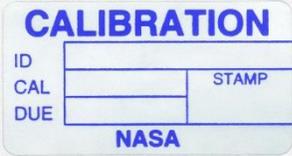
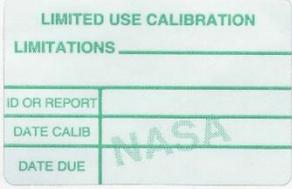
No Calibration System Label per GPR 8730.1
 Cat 1 IMTE with expired calibration
 Other (explain) _____

GSFC 4-34 (7/99)

Figure 1. Nonconforming IMTE Tag

**APPENDIX A
CALIBRATION SYSTEM LABELS**

Labels - All instruments, devices, and artifacts serviced are to be labeled with the appropriate calibration label(s). The labels shown below are the commonly used labels by the Metrology and Calibration Laboratories. In addition to these labels, equivalent labels from outside service providers are acceptable.

	<p>Calibration - This NASA Metrology label identifies by ECN, or MCN, the test equipment, device, or artifact calibrated, the date calibrated, and the date due for next calibration. This label is used when the test equipment was compared with calibrated standard(s) or test equipment and determined to perform within specifications over all ranges/parameters/functions, except as identified on an accompanying Limited Use Calibration label.</p> <p>Blue lettering on a silver background in sizes 0.9" x 1.5" and 0.5" x 0.9".</p>
	<p>Calibrate Before Use - This NASA Metrology label identifies test equipment, devices, or artifacts which: (1) must be calibrated before using, (2) are not included in the GSFC Calibration Recall Program and are out-of calibration and not expected to be used for a period of time, or (3) are included in the GSFC Metrology and Calibration Recall Program and are put in a hold status.</p> <p>Red lettering on a silver background in size 0.9" x 1.5".</p>
	<p>Calibration Not Required - This NASA Metrology label identifies test equipment, devices, or artifacts that, because of their specific non-accuracy sensitivity or non-hazardous measurements, do not require calibration. Signature by authorized management designee is optional. Such requirements may be addressed in the user's procedures.</p> <p>Red lettering on a silver background in sizes 0.9" x 1.5" and 0.5" x 0.9".</p>
	<p>Limited Use Calibration - This NASA Metrology label identifies the test equipment, devices, or artifacts for which a complete calibration has not been performed or which does not meet all specifications for a full calibration but are still usable. The label identifies the limitation for use, the ECN, MCN, or serial number, the date calibrated, and the date due for next calibration.</p> <p>Green lettering on silver background in sizes 1" x 1.5" and 0.6" x 0.9".</p>

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CHANGE HISTORY LOG

Revision	Effective Date	Description of Changes
Baseline		Initial Release
A	9/4/98	<ul style="list-style-type: none"> Format changes to add document number and page number to header and correct version warning to footer. Added a Calibration Laboratory responsibility to investigate the cause of out of calibration conditions, report findings to the User, and to use such findings to modify calibration procedures as appropriate (2.1.f) Added Calibration Laboratory responsibility to establish and maintain a facility-wide Master List of IMTE (2.1.g). Added a Calibration Laboratory responsibility to submit a notice of expiration of calibration to the Audit Office when no acceptable response is received for a Calibration Due Notice (2.1.h). Deleted requirement for directorate-level procedures regarding calibration of IMTE, making Users responsible for applying requirements of this GPG to IMTE in their laboratory (2.2). Added explanation of acceptable responses to a Calibration Due Notice (2.2.f). Added a requirement for Users to ensure that IMTE information is submitted for inclusion on the IMTE Master List and that notice of IMTE disposal is submitted to delete items from the Master List (2.2.i). Added an Audit Office responsibility to initiate a Nonconformance Report for expiration of calibration notices, with the "found by" code to be Item d. In-Process/Final Inspection/Test (non-operational) and the Item Type in Block 7a to be Item 9. QMS Element (2.4).
B	5/21/99	GPG rewritten in its entirety to simplify process and description.
C	8/19/99	<ul style="list-style-type: none"> Deleted requirement for IMTE list. Added sentence to allow for Type 3 IMTE to be used on product for certain conditions in paragraph 1.a. (3). Added description for Limited Use Calibration Labels in paragraph 1. <i>DEFINITIONS, (1) Type 1, Calibration Required.</i> Changed paragraph to show that the IMTE can have two labels instead of only one in paragraph <i>PROCEDURE, 1. DEFINITIONS, a, (3) Type 3, Calibration Not Required.</i> Added reference to Appendix for examples of calibration labels in paragraph <i>PROCEDURE, 1. DEFINITIONS, d.</i> Deleted requirement for mandatory response by user to recall system notices.

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		<ul style="list-style-type: none"> Added requirement for Non Conformance Tags. Added paragraph 2.4 Changed to have signature optional on Calibration Not Required Label in Appendix.
D	11/09/99	<ul style="list-style-type: none"> Deleted definition of "Code" Corrected name of Code 800 2.2. e - Added requirement for second Calibration Due Notice and for removal of IMTE from Recall list 30 days after second notice if no response is received. 2.3. h - Removed references to Attachments. Added embedded hyperlink to GDMS Forms section for Greenbelt and Wallops calibration lab support request forms Delete Attachments 1 and 2 (calibration lab support request forms)
E	09/01/00	<ul style="list-style-type: none"> P6. - Records Retention schedules corrected. 2.2f -- Paragraph rewritten to eliminate verbiage related to cause investigation.
F	10/22/01	<ul style="list-style-type: none"> P4 - Added references for forms referenced in the document. 2.1 - Requires use of the principal Calibration Laboratories unless not practical 2.2. a - Added requirement that calibration and repair be initiated on receipt of CO approved Task Order. 2.2.e - Added calibration notices by e-mail Equipment entry in IMTE database to be made inactive versus removal so that Directorates can identify and address equipment out-of-calibration and so that history information on last calibration will be kept and not lost. Out-of-cal still becomes the responsibility of the owner. 2.2. h - Adds equipment to ETCR contract if request for calibration or repair is for IMTE not on the contract. 2.3.h - Changes from old calibration request form to task order required by new ETCR contract. Identifies web page at Greenbelt. Reformats to eliminate sub sections. 2.3.k - Identifies user responsibility for proper property labeling. 2.3.l - Identifies user responsibility for periodic review of IMTE list for accuracy and addition or inactivation of equipment in list. 2.5 - Identifies responsibility of Logistics Management Division to notify the Calibration Laboratory of any IMTE that is exceeded.
G	08/15/02	<ul style="list-style-type: none"> P2 - Procedure applies to all IMTE P10.a – Include engineering models, R&D leading to product, flight software verification and other instances where accuracy is important to ensure results are meaningful.
H	08/15/03	<ul style="list-style-type: none"> Minor corrections for punctuation and ease of reading throughout.

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		<ul style="list-style-type: none"> • Changed references to organization responsible for calibration laboratory from Code 300 to Code 540. • Amended process description to reflect the Code 540 process. • P4 – Deleted Davis Calibration Task Order Request Form 214.4-1845.
I	12/29/04	<ul style="list-style-type: none"> • As directed during the FY04 Center Rules Review, the Responsible Office modified this document to remove requirements that were no longer needed and to clearly distinguish requirements from supporting information. Administrative changes were made throughout to correct responsible organization names and codes, and to retitle Goddard Procedures and Guidelines (GPG) to Goddard Procedural Requirements (GPR). All changes were reviewed and approved by the Goddard Quality Management System Council (QMSC). • Clarify requirements P10.a.3 and clarified metrics.
J	2/23/07	<ul style="list-style-type: none"> • In the Preface, changed P.2 to apply to only to IMTE used to process GSFC product. Updated P.4. Deleted P.6. In P.7, added IMTE User training requirement. In P.8, corrected records retention schedule and added training records. Clarified metrics in P.9. In P.10, updated definitions as needed. • In section 1, updated owning organizations. Identified code 500.W at WFF to own the Wallops calibration lab. • Reorganized sections 2, 3, and 4 into two sections, one for calibration lab responsibilities, and one for user responsibilities. • Corrected references to ISO 9001, AS9100, and the Z540.1 standards. • Added detail information for proper closure of an Out of Tolerance situation and included new GSFC 4-43. • Added new sections 4 and 5 for organizational and directorate management responsibilities
K	07/21/08	<ul style="list-style-type: none"> • 2.i Added a 30-day period to the inactive equipment process • Change all Type 1, 2, 3, to Category (Cat) to reflect the Agency language • 3.k (3) Changed may to shall and added 10 working days to the NCR processing of OOTs
K	05/03/13	<ul style="list-style-type: none"> • Administratively Extended for 1 year.
K	03/10/14	<ul style="list-style-type: none"> • Administratively Extended for 1 year.
K	07/08/15	<ul style="list-style-type: none"> • Administratively Changed and Extended. Change Responsible office from Code 500 to Code 370 and extended for 1 year.

CHECK THE GSFC DIRECTIVES MANAGEMENT SYSTEM AT
<http://gdms.gsfc.nasa.gov/gdmsnew/home.jsp> TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

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K	12/23/2015	<ul style="list-style-type: none"> • Administrative Change to update office of responsibility throughout document and to add clarity. • Changed title from Calibration and Metrology to Metrology and Calibration • Changed IMTE to MTE • Changed Goddard Space Flight Center Out of Tolerance (OOT) Notification Impacts Findings to GSFC Out of tolerance (OOT)/Repair Impacts Findings • Changed Calibration Laboratory Recall System to Metrology Information System (MIS) • Changed all locations from Code 540 to Code 370 • Changed all locations from 500.W to 803 • Changed all locations from Mechanical Systems Division to Quality and Reliability Division • Changed all location from Applied Engineering and Technology Directorate to Safety and Mission Assurance Directorate • Added the WFF Task Monitor/POC • Corrected the WFF's calibration lab's location: Safety Office (Code 803) of the Suborbital and Special Orbital Projects Directorate
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