

NONREIMBURSABLE INTERAGENCY AGREEMENT IA1-38527  
BETWEEN  
THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
LANGLEY RESEARCH CENTER  
AND  
QUANTUM MEASUREMENTS DIVISION OF THE  
THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY  
FOR  
ANGLE MEASUREMENT RESEARCH

ARTICLE 1. AUTHORITY AND PARTIES

The National Aeronautics and Space Administration Langley Research Center, located at Langley Research Center, Hampton, VA 23681 (hereinafter referred to as "NASA" or "NASA LaRC") enters into this Interagency Agreement (hereinafter referred to as "IAA") in accordance with 51 U.S.C. § 20113(e). The National Institute of Standards and Technology (NIST), located at 100 Bureau Drive, Gaithersburg, MD 20899-0003, (hereinafter referred to as "NIST"), enters into this IAA in accordance with Title 15 USC 272(b)(4), (b)(8), and (c)(3). NASA and NIST may be individually referred to as a "Party" and collectively referred to as the "Parties."

ARTICLE 2. PURPOSE

The purpose of this IAA is for NASA and NIST to collaborate in the calibration and characterization of static and dynamic angle measurement devices. NASA's interest is in the characterization of angle sensors to be used in aerodynamic ground facilities, which demand high precision and accuracy measurements. NASA has developed a small tri-axis accelerometer package based on Micro-Electro-Mechanical Systems (MEMS), sponsored by the Aerosciences Evaluation and Test Capabilities (AETC) Portfolio Office. This sensor has undergone extensive static testing, but NASA has limited dynamic evaluation capability. NIST has been researching calibration and characterization techniques of MEMS accelerometers in pursuit of creating standards. NIST has similar but different calibration capabilities that includes single-axis dynamic accelerometer characterization, and a dual-axis rate table. The methods for testing and characterizing angle device behavior that will be developed during this collaboration will benefit NASA's aerodynamic ground facilities and NIST's accelerometer calibration methodology development.

ARTICLE 3. RESPONSIBILITIES

A. NASA LaRC intends to:

1. Design hardware to mount the NASA Mini/MEMS Tri-Axis Sensor System (MTASS) to NIST's angle and accelerometer calibration equipment. This will include drafting mechanical hardware, procuring materials, fabrication, and defining electrical interfaces.

2. Temporarily loan up to three MTASS units, supporting electrical sub-systems, and supporting physical hardware to NIST. NASA and NIST engineers will determine the loan length to perform testing properly.
3. Provide calibration information and data to NIST for each of the MTASS units.
4. Provide engineering and statistical support to process and reduce sensor data and perform characterization/calibration analysis of NASA and NIST obtained data. Analysis will be conducted to produce calibration models for each of the MTASS units tested, both static and dynamic per unit.
5. Jointly write a journal article, paper, or technical memorandum detailing the calibration results, data reduction methods, and any recommended practices.

B. NIST intends to:

1. Provide engineering support to assist in adapting NASA MTASS unit to NIST-owned calibration apparatuses. This will include NIST providing equipment engineering drawings and interface documentation to aid NASA in the design and fabrication of matting hardware.
2. Perform static and dynamic evaluations of three (3) NASA MTASS units. Each of the three (3) MTASS will be calibrated static and dynamically using NIST calibration equipment for a minimum of three (3) runs. NASA and NIST will collaborate on defining specific experiments to characterize the devices for both static and dynamic environments.
3. Provide engineering support to process and reduce NASA and NIST-obtained data. Analysis will be conducted to produce calibration models for each of the MTASS units tested, both static and dynamic. Data and methods from both NASA and NIST tests will be compared by both agencies to develop a recommended method.
4. Jointly write a journal article, paper, or technical memorandum with NASA detailing the calibration results, data reduction methods, and any recommended practices.

ARTICLE 4. SCHEDULE AND MILESTONES

The planned major milestones for the activities defined in the "Responsibilities" Article are as follows:

1. NASA and NIST to define equipment and hardware to be fabricated to mount NASA MTASS to NIST test equipment.	Two (2) months after Effective Date
2. NASA and NIST to complete fabrication of all supporting hardware.	Six (6) months after Effective Date
3. NASA and NIST to complete testing and evaluation of three (3) MTASS units.	Sixteen (16) months after Effective Date

4. NASA and NIST to complete analysis of data collected from the three (3) MTASS units.	24 months after Effective Date
5. NASA and NIST to jointly write a journal article, paper, or technical memorandum detailing the calibration results, data reduction methods, and any recommended practices.	Thirty-six (36) months after Effective Date

**ARTICLE 5. FINANCIAL OBLIGATIONS**

There will be no transfer of funds between the Parties under this IAA and each Party will fund its own participation. All activities under or pursuant to this IAA are subject to the availability of funds, and other necessary resources. No provision of this IAA shall be interpreted to require obligation or payment of funds in violation of the Anti-Deficiency Act (31 U.S.C. § 1341).

**ARTICLE 6. PRIORITY OF USE**

Any schedule or milestone in this IAA is estimated based upon the Parties' current understanding of the projected availability of its respective goods, services, facilities, or equipment. In the event that either Party's projected availability changes, NASA or NIST, respectively, shall be given reasonable notice of that change, so that the schedule and milestones may be adjusted accordingly. The Parties agree that NASA's and NIST's use of its own goods, services, facilities, or equipment shall have priority over the use planned in this IAA.

**ARTICLE 7. LIABILITY**

Each Party agrees to be responsible for their own risks arising from or related to activities conducted under this IAA.

**ARTICLE 8. INTELLECTUAL PROPERTY RIGHTS - DATA RIGHTS**

NASA and NIST agree that the information and data exchanged in furtherance of the activities under this IAA will be exchanged without use and disclosure restrictions unless required by national security regulations (e.g., classified information) or as otherwise provided in this IAA or agreed to by NASA and other Federal Agency for specifically identified information or data (e.g., information or data specifically marked with a restrictive notice).

**ARTICLE 9. INTELLECTUAL PROPERTY RIGHTS - INVENTION AND PATENT RIGHTS**

Unless otherwise agreed upon by NASA and NIST, custody and administration of inventions made (conceived or first actually reduced to practice) under this IAA will

remain with the respective inventing Party. In the event an invention is made jointly by employees of the Parties (including by employees of a Party's contractors or subcontractors for which the U.S. Government has ownership), the Parties will consult and agree as to future actions toward establishment of patent protection for the invention.

#### ARTICLE 10. RELEASE OF GENERAL INFORMATION TO THE PUBLIC AND MEDIA

NASA or NIST may, consistent with Federal law and this IAA, release general information regarding its own participation in this IAA as desired. Insofar as participation of the other Party in this IAA is included in a public release, NASA and NIST will seek to consult with each other prior to any such release, consistent with the Parties' respective policies. This IAA and its contents may be released by either Party at the releasing Party's discretion.

Pursuant to Section 841(d) of the NASA Transition Authorization Act of 2017, Public Law 115-10 (the "NTAA"), NASA is obligated to publicly disclose copies of all agreements conducted pursuant to NASA's 51 U.S.C. §20113(e) authority in a searchable format on the NASA website within 60 days after the agreement is signed by the Parties. The Parties acknowledge that, if this IAA is entered into pursuant to NASA's 51 U.S.C. §20113(e) authority, this IAA will be disclosed, without redaction, in accordance with the NTAA.

#### ARTICLE 11. TERM OF AGREEMENT

This IAA becomes effective upon the date of the last signature below ("Effective Date") and shall remain in effect until the completion of all obligations of both Parties hereto (except those obligations of a continuing nature as contemplated in Article 13 of this IAA), or three (3) years from the Effective Date, whichever comes first.

#### ARTICLE 12. RIGHT TO TERMINATE

Either Party may unilaterally terminate this IAA by providing thirty (30) calendar days written notice to the other Party.

#### ARTICLE 13. CONTINUING OBLIGATIONS

The rights and obligations of the Parties that, by their nature, would continue beyond the expiration or termination of this IAA, e.g., "Liability" and "Intellectual Property Rights" and related clauses shall survive such expiration or termination of this IAA.

ARTICLE 14. POINTS OF CONTACT

The following personnel are designated as the Points of Contact between the Parties in the performance of this IAA.

Management Points of Contact	
<u>NASA Langley Research Center</u> Jennifer Hubble Viudez Center Agreements Manager Mail Stop: 254 Langley Research Center Hampton, VA 23681 Phone: 757.864.5627 jennifer.m.hubble@nasa.gov	<u>National Institute of Standards and Technology</u> Dr. Gerald J. FitzPatrick Chief, Quantum Measurement Division 100 Bureau Drive Gaithersburg, MD 20899-0003 Phone: 301.975.8922 gerald.fitzpatrick@nist.gov
Technical Points of Contact	
<u>NASA Langley Research Center</u> Kenneth Toro AST, Electronic Instrumentation Systems Mail Suite: 290 Langley Research Center Hampton, VA 23681 Phone: 757.864.3359 kenneth.g.toro@nasa.gov	<u>National Institute of Standards and Technology</u> Akobuije D. Chijioke Physicist 100 Bureau Drive Gaithersburg, MD 20899-0003 Phone: 301.975.3898 akobuije.chijioke@nist.gov

ARTICLE 15. DISPUTE RESOLUTION

All disputes concerning questions of fact or law arising under this IAA shall be referred by the claimant in writing to the appropriate person identified in this IAA as the "Points of Contact." The persons identified as the "Points of Contact" for NASA and NIST will consult and attempt to resolve all issues arising from the implementation of this IAA. If they are unable to come to agreement on any issue, the dispute will be referred to the signatories to this IAA, or their designees, for joint resolution after the Parties have separately documented in writing clear reasons for the dispute. As applicable, disputes will be resolved pursuant to The Department of the Treasury's Intragovernmental Transaction Guide (Treasury Financial Manual, Vol. 1, Chapter 2, Part 4700, Appendix 10 (hereinafter, the "Intragovernmental Transaction Guide")).

ARTICLE 16. MODIFICATIONS

Any modification to this IAA shall be executed, in writing, and signed by an authorized representative of NASA and the NIST.

ARTICLE 17. APPLICABLE LAW

U.S. Federal law governs this IAA for all purposes, including, but not limited to, determining the validity of the IAA, the meaning of its provisions, and the rights, obligations and remedies of the Parties.

ARTICLE 18. LOAN OF GOVERNMENT PROPERTY

The Parties shall enter into a NASA Form 893, Loan of NASA Equipment, for NASA equipment loaned to NIST.

ARTICLE 19. SIGNATORY AUTHORITY

Approved and authorized on behalf of each Party by:

NATIONAL AERONAUTICS AND  
SPACE ADMINISTRATION  
LANGLEY RESEARCH CENTER

QUANTUM MEASUREMENTS  
DIVISION of the  
NATIONAL INSTITUTE OF  
STANDARDS AND TECHNOLOGY

BY: \_\_\_\_\_  
John H. Koelling  
Director, Aeronautics Research  
Directorate

BY: \_\_\_\_\_  
Gerald Fitzpatrick  
Chief, Quantum Measurement Division

DATE: \_\_\_\_\_

DATE: \_\_\_\_\_