National Aeronautics and Space Administration

Langley Research Center
100 NASA Road
Hampton, VA 23681-2199

May 7 2012

Reply to Attn of: 162

TO: 106/Director

FROM: 162/Director, Research Directorate

SUBJECT: Justification for Other than Full and Open Competition (JOFOC) for a Contract for the National Institute of Aerospace (NIA or the "Institute")

1.0 Recommendation

I recommend that NASA Langley Research Center (LaRC) negotiate only with the National Institute of Aerospace Associates, Inc. (NIAA) for essential engineering, research, and development capabilities that NASA needs to maintain within the Institute and that NASA needs to obtain from the Institute. Because of the similarities in the name of the company and the name of the Institute, to avoid confusion, subsequent references to the NIA will be referred to as the "Institute."

2.0 Nature of Action

Langley Research Center proposes to award an Indefinite Delivery/Indefinite Quantity (IDIQ), performance-based contract to the NIAA for leading-edge research in emerging fields, for education in science and engineering, and for dissemination (including promotion and outreach) of the results of the research and technology developed within the NIAA. The contract type is anticipated to be cost-plus fixed fee and firm fixed price depending on the type of work as defined in the task orders. The contract will permit NASA to maintain essential engineering, research and development capability within the Institute for NASA's direct use or benefit that are only available because of the capabilities that the Agency established under a cooperative agreement, NNL09AA00A. The guaranteed minimum will be $100,000 and the maximum value of the contract will be $48M for a five-year period of performance.

3.0 Background

NASA has unique ties to and dependencies on the scientific community, particularly academia. The relationship with the scientific community is apparent within the National Aeronautics and Space Act. The Space Act states that NASA's purposes include: "The expansion of human knowledge of the Earth and of phenomena in the atmosphere and space," "The establishment of long-range studies of the potential benefits to be gained from, the opportunities for, and the problems involved in the utilization of aeronautical and space

activities for peaceful and scientific purposes," "The preservation of the role of the United States as a leader in aeronautical and space science and technology and in the application thereof to the conduct of peaceful activities within and outside the atmosphere," and "The preservation of the United States preeminent position in aeronautics and space through research and technology development related to associated manufacturing processes." The Space Act also states that NASA shall: "arrange for participation by the scientific community in planning scientific measurements and observations to be made through use of aeronautical and space vehicles, and conduct or arrange for the conduct of such measurements and observations," "provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof," and "seek and encourage, to the maximum extent possible, the fullest commercial use of space."

Based on these Agency purposes and functions, NASA has a longstanding relationship with the academic sector of the scientific community, particularly with U.S. institutions of higher education. There are few better ways to disseminate the results of the Agency's research and development, preserve the Nation's aeronautical and space science and technology roles, arrange for participation in the Agency's science, and encourage commercial use of space than through close association with the nation's advanced science, technology and engineering degree-granting colleges and universities. Many of the country's greatest scientific and technological advances have come from our colleges and universities. The nation's colleges and universities also produce the future scientists and engineers who will provide NASA and industry with essential scientific and technological leadership.

Despite these important ties between the Agency and academia, around the year 2000, NASA recognized that a trend had occurred over the preceding decade. That trend reflected decreasing roles of the academic community in the Agency's far-reaching technology programs. NASA redoubled its efforts to foster interaction with universities to sponsor longer-term research efforts to give universities planning assurances and to leverage an improved NASA/University cooperation to maintain an Agency recruiting pipeline. Based on these objectives, NASA LaRC undertook an effort in 2001 to significantly enhance its relationship with the academic community. The Agency remains committed to expanding university partnerships in the accomplishment of its overall science and research programs. The Agency's intention to form and maintain strong partnerships with academia through a variety of research and outreach initiatives remains unchanged from its 2006 and 2011 Strategic Plan.

NASA LaRC's conduit for this enhanced relationship was the establishment of a new Science and Research Institute. LaRC developed the Institute in accordance with then current NASA Procedures and Guidelines (NPG) 5000.1 entitled "Establishing a Science and Research Institute." This NPG stated: "A Science and Research Institute represents a long-term Agency commitment. Where appropriate, the period of performance of Science and Research Institutes shall span at least 10 years and shall normally be structured to contain a base period of 5 years plus the appropriate number of 5-year options to reach full term."

Based on applicable guidance, NASA LaRC developed an acquisition strategy for the Institute that involved the competitive award of a cooperative agreement and an IDIQ contract. The

objective of the cooperative agreement, consistent with the guidance contained in the Federal Grant and Cooperative Agreement Act of 1978 (FGCA), 31 USC 6305, was to establish (or create) an Institute – an effort performed for a public purpose of support or stimulation as authorized under the Space Act. Through the cooperative agreement, LaRC fostered the development of a nonprofit Institute that, through its member universities, (i) provides masters and PhD graduate degrees in science and engineering, (ii) provides a means to conduct cooperative/collaborative leading edge research, and (iii) develops revolutionary new technologies.

LaRC also planned and concurrently issued a task order contract that has enabled NASA to obtain work from the Institute for NASA's direct use or benefit and to maintain the capabilities of the Institute that are fostered by the cooperative agreement. The scope of the current contract includes (i) leading edge research and development of new technologies, (ii) graduate and continuing education in science and engineering, and (iii) promotion of aerospace science and engineering and outreach to the region and nation. This two-instrument acquisition strategy ensures proper use in all cases of the appropriate instruments and relies on both the cooperative agreement and a contract to maintain essential engineering, research and development capability to support the NASA mission.

NPG 5000.1 stated that the "lead proposing entity for a Science and Research Institute shall be a domestic academic institution or a not-for-profit organization, or a consortium of such entities." Although the NPG did not require preparation of a JOFOC, LaRC prepared and NASA Headquarters concurred in a JOFOC that limited competition for the Institute to academic and not-for-profit organizations as specified in the NPG. Based on this acquisition approach, the Institute was established to strengthen NASA's ties to the academic community and enhance and broaden the capabilities of the nation's universities to meet the needs of NASA's science and technology programs.

To support the Institute strategy, LaRC conducted an Acquisition Strategy Meeting (ASM) on November 15, 2001, at NASA Headquarters. The minutes of the ASM stated: "The ASM chairman concluded the discussion by recommending that LaRC pursue a 20-year cooperative agreement but limit the contract to a 5-year period of performance, with no option periods. At the end of the contract period of performance, the ASM chairman recommended that LaRC review the program and revisit the contract structure at that time. Work that needs to continue beyond the 5-year contract could be continued with a sole source justification. The ASM attendees agreed with this recommendation." The ASM chairman was Thomas Luedtke, then Assistant Administrator for Procurement.

Based on the approved approach, NASA LaRC established an Institute on September 26, 2002, with the simultaneous award of a cooperative agreement and an IDIQ task order contract to the National Institute of Aerospace Associates, Inc. (NIAA). Consistent with the ASM guidance, the period of performance of the cooperative agreement that fostered the NIAA, including all options, is twenty years ending on September 30, 2022. The associated contracts, however, are issued for five years. The period of performance of the initial contract, NAS1-02117, was five years and ended on March 25, 2008. The current five-year contract, NNL08AA00B, was effective April 1, 2008 and expires March 31, 2013.

LaRC uses performance-based metrics to assess the NIAA's performance on an annual basis to ensure continued alignment with the strategic objectives of LaRC and the mission of the Agency. In fact, in 2008 an independent Headquarters Institutes Study conducted by the Office of Program Analysis and Evaluation noted that the LaRC Institute mapped into almost every one of the Agency's strategic goals. The synergistic effort of the cooperative agreement and IDIQ contract fulfill LaRC's needs to advance leading-edge research and technology development and to supplement the technical depth of our existing workforce via the graduate and continuing education programs developed and offered by NIAA. LaRC reassessed and identified a continued need to obtain the NIAA's essential expertise, capabilities, and unique skill mix to support the Agency's missions as outlined in the President's 2010 Vision for Space Exploration.

4.0 Description of Services Being Acquired

In 2010, the President unveiled a new era in space exploration for NASA, laying the groundwork for a sustainable program of exploration and innovation that would build on new technologies as well as proven capabilities. This new direction extends the life of the International Space Station, supports the growing commercial space industry, and addresses important scientific challenges while continuing NASA's commitment to robust human space exploration, science, and aeronautics programs. LaRC expects to play a key role in the development of next generation technologies while preserving national capabilities to support ongoing and critical opportunities in Aeronautics, Science and Exploration Systems and, the newest mission, Space Technology. NASA is contracting for support in several key research, engineering and development competencies that are fundamental to the performance of these missions. As NASA implements the President's vision and pursues a portfolio of research and technology investments that will increase the nation's capability to operate in space and enable long-term deep space exploration, the need to supplement and maintain critical national capabilities that transcend all missions is critical. NIAA is recognized for its expertise and breadth in several technical research areas required to perform all aspects of the Aeronautics, Science, Space Technology, and Exploration Systems Missions. The capacity to conduct basic, formative and leading-edge research to technology development of investigative findings and theories requires expertise in a breadth of key competencies. Maintaining core national capabilities in these competencies are critical and essential to enhance America's overall technological leadership in spaceflight.

The general functional requirements of the contract, which remain unchanged from the current contract, include:

- Conduct leading edge aerospace, earth, and space sciences research, and develop revolutionary new technologies by creating innovative, collaborative, synergistic partnerships among LaRC, academia, and industry;

- Provide comprehensive graduate and continuing education in science and engineering by using both a local campus and exploiting innovative distance-learning concepts; and

- Dissemination (including promotion and outreach) of the results of the research and technology developed within the NIAA.

Efforts undertaken by the NIAA in the performance of this contract shall seek to enhance the value and contribution of revolutionary new technologies to the nation's technological competitiveness, prosperity, quality of life, and other national priorities.

5.0 Statutory Authority

The statutory authority permitting other than full and open competition is 10 U.S.C. 2304 (c)(3), as implemented by Federal Acquisition Regulation (FAR) 6.302-3, "Industrial mobilization, engineering, developmental or research capability or expert services." FAR 6.302-3(b)(2)(i), (ii), and (iii) provides for an exception to full and open competition, when it is necessary to "establish or maintain an essential capability for theoretical analyses, exploratory studies, or experiments in any field of science or technology," and "establish or maintain an essential capability for engineering or developmental work calling for the practical application of investigative findings and theories of a scientific or technical nature," or "Contract for supplies or services as are necessary incident to paragraphs (b)(2)(i) or (ii)."

In addition, 10 U.S.C. 2304 (c)(1), as implemented by FAR 6.302-1, Only One Responsible Source, and by FAR 6.302-1(a)(2)(iii)(A), supports award of the IDIQ contract to the same entity that holds the NIAA cooperative agreement. NIAA is the only source operating the Institute with funding and collaboration under the NASA cooperative agreement and therefore the only source from which NASA can obtain the benefits of the activities first developed under the cooperative agreement for NASA's own use. It is also the only source in a position to provide technology development and leading-edge research tasks that are continuations of efforts initiated under the cooperative agreement.

The follow-on contract will provide access to the continued provision of highly specialized services and it is likely that award to any other source would result in substantial duplication of costs that is not expected to be recovered through competition. Under the cooperative agreement, NASA funds the initiation of collaborative research with the NIAA for the purpose of stimulating private sector research in areas of interest to NASA. Subsequently, when NASA requires further maturation of such research for NASA mission purposes, NASA relies on the IDIQ contract to purchase follow-on efforts. NASA would incur costs to reproduce initial efforts accomplished under the cooperative agreement with any source other than the NIAA for such follow-on efforts.

Additionally, to replicate an institute with the NIAA capabilities that are specified within this document, NASA would have to duplicate the start up costs incurred in establishing the Institute over a five-year period. In order to establish the Institute, NASA committed to an initial investment of $25M during the first five years of the cooperative agreement to establish an institute that would provide the intellectual leadership role and form the central focus of the science and research program for the ultimate goal of generating knowledge and enhancing technology in support of NASA's missions. NASA's significant investment in the Institute has resulted in the unique capabilities discussed below in Section 6.0. NASA would incur

significant duplication of costs not expected to be recovered through competition if it tried to duplicate these capabilities in other sources.

6.0 Rationale Supporting Use of Authority – Unique Qualifications

NASA has determined that the leading-edge research services to be provided by the NIAA through operations of the Institute meet the requirements for other than full and open competition set forth at 10 U.S.C. § 2304(c)(3) and 10 U.S.C. 2304 (c) (1). NASA LaRC has a continuing need for the essential engineering, research and development capabilities possessed by the NIAA and fostered by NASA under a cooperative agreement. As NASA LaRC's only established research institute, operating with a 20-year NASA cooperative agreement, the NIAA meets special long-term research and development needs of NASA LaRC and accomplishes tasks that are integral to LaRC's operation. The nature of the acquisition, predicated on the need to maintain capabilities fostered at the Institute under the cooperative agreement for NASA's own use, together with the NIAA's unique qualifications, requires use of the cited contractual authority.

6.1 Unique Nature of the Acquisition

The award of the original two contractual vehicles to the NIAA was designed to serve as complementary tools to meet LaRC's needs for adapting to changes in missions and resources of the Agency. The cooperative agreement has two objectives: (1) To conduct leading-edge research with the NIAA's academic and technical community in partnership with LaRC, and (2) To develop a student pipeline through a unique academic program focused on emerging technical areas of interest to LaRC. These objectives remain valid as the Agency reaches for new heights by supporting cutting-edge aeronautics and space technology innovations, research and development that fuel the nation's economy, and develop the next generation of American scientists and engineers. The IDIQ contract is used for the maturation of the research conducted under the cooperative agreement and the utilization of the uniquely skilled researcher and university staff and student workforce that began under the cooperative agreement. The contract is essential to allow the Agency access to engineering, research and development capabilities that NASA established and nurtured within the Institute. NASA proposes to award this contract non-competitively to NIAA because the contract is necessary to maintain essential capabilities as stated in paragraph 5.0 above. The following describes a variety of NASA essential needs and NIAA unique qualifications, as operator of the Institute, to meet those needs:

6.2 Essential Research Capability Provided By NIAA

a. Unique Academic Consortium and Academic Reach-back: Through the contract, NASA has access to NIAA's consortium of leading research universities that serve as the core of NIAA's academic research program. The full university members of the consortium are: Georgia Institute of Technology, University of Maryland, North Carolina A&T, North Carolina State University, University of Virginia, Virginia Polytechnic Institute and State University, and Hampton University. Other affiliated members are Old Dominion University and the College of William and Mary. In addition to the consortium members, NIAA has

established relationships with many other colleges and universities across the nation. The NIAA facilitates, develops and leverages intellectual capital of the academic community in fulfillment of NASA missions. This represents unique academic capability available to NASA through a single source and supports the utilization of authority 10 U.S.C. 2304 (c) (1), as implemented by FAR 6.302-1, Only One Responsible Source.

Since the Agency established the Institute in 2002, the NIAA has fostered an innovative environment by successfully building a strong research staff consisting of resident scientists and engineers, faculty with reach back to universities across the nation, consultants, subject matter experts, and industry partners. As NIAA conducts a broad range of scientific and engineering research under the cooperative agreement, NIAA has established the essential cross disciplinary technical ability and unique in-depth skills that are necessary to conduct cutting-edge and revolutionary investigatory work. Through the contract, NASA can leverage NIAA's cadre of scientists and engineers that afford NASA the flexibility and ability to respond to emerging opportunities and maintains NASA as a premier global leader in the aeronautics, science, space technology and exploration systems. As mission directions develop within LaRC and NASA, the contract provides LaRC the ability to task the NIAA's unique capabilities in response to government defined requirements with milestones and deliverables, thereby preserving continuity in programs by tasking and receiving specific technical answers, tools and data for critical technology and program requirements.

Because of the existence of the NIAA and the consortia of universities and resident faculty, NASA has reach back access to a broad network of universities across the Nation. Universities are a breeding ground for technology innovation and state-of-the-art technical skills due to their research and academic environments. LaRC supports collaborative efforts with universities through the cooperative agreement, but also needs the contract to access the capabilities offered by these environments. The NIAA offers two tiers of university reach back: to the member universities and to non-member universities when needed to acquire specific faculty expertise and/or physical test or laboratory capabilities. The NIAA maintains active and deep relationships with member universities which ensure that the NIAA knows what expertise and resources are available. The NIAA is also well networked with many non-member universities. The NIAA's ability to quickly involve university faculty and graduate students in meeting research requirements has long been a key feature of its support to LaRC. For example, approximately 40% of work on the current contract tapped into the NIAA's network of universities for faculty expertise. Contract work involving universities include Transportation Systems Analysis Modeling supporting the Next Generation Air Transportation System Project; Propulsion/Airframe Noise Scattering Prediction Development and Study supporting the Environmentally Responsible Aviation Project; and Advanced Conceptual Design Tools and Development that supports the Unmanned Aircraft Systems Integration in the National Airspace Systems Project. In each case, the work involves a university principal investigator supported by graduate/post doctorate assistants while inspiring the next generation of researchers to pursue advanced technological studies that are aligned with NASA missions. The NIAA's reach back capability to a cadre of experts possessing essential capabilities in theoretical analyses and exploratory studies, and the practical application of investigative findings in a number of fields of science and that does

not exist in any other Institute is critical to ensure NASA's access to these high value technical resources in support of NASA's current space exploration vision.

The contract will permit NASA access to extended faculty of member universities, other academic institutions, and national and international experts who can provide NASA new and different ideas for technological solutions. Therefore, this contract, utilized together with the cooperative agreement, will provide a means to maintain this essential expertise and capability to continue NASA efforts.

b. Essential Multidisciplinary Technical Capabilities in Aerosciences Research; Systems Analysis, Advanced Concepts and Mission analysis; Advanced Materials and Structures; and Atmospheric and Intelligent Aerospace Automation and Controls Systems. Specific essential capabilities to be maintained include computational electromagnetic and theoretical analysis in electromagnetics, aeroacoutics, sub-scale prototyping, systems analysis, structural analysis and statistical analysis. NIAA's staff has conducted a wide variety of analytic and experimental research studies, integration challenges, and formulation of optimized designs often furthering the research of key emerging technologies such as boomless supersonic flight, campaign assessment tools to enable lunar landers and design and develop multi-functional materials/systems to enable new classes of systems. The NIAA has demonstrated an essential ability to quickly build cross discipline teams from its network of partnering universities, consultants, subject matter experts, and industry partners. This is particularly important for work in niche technical areas involving systems level studies that require consultants/subject matter experts (SMEs) possessing very unique skill sets. To illustrate, the Agency's Integrated Systems Research Program (ISRP) requires a specialized team to investigate key emerging technologies for synergistic system design for safe, quiet, clean, efficient, secure, and affordable commercial transportation. The NIAA has provided a unique and exemplary team of subject matter experts to explore ISRP technologies to meet these complex challenges.

c. Essential Multidisciplinary Research Capabilities in Atmospheric and Vehicle Sensor System Technology; Planetary Traversing, Capture and Entry Technology; and Atmospheric Chemistry Climate and Radiation Science. Specific essential capabilities to be maintained include multifunctional aerospace materials and structures; sonic boom minimization, rotorcraft aeromechanics, flight controls, formal methods, aviation safety; and atmospheric sciences, inflatable space structures and laser materials and optical conversion techniques to reach the far-infrared region of the spectrum. NIAA performs essential engineering and developmental work in measurement technology and atmospheric modeling, analysis and prediction integral to research in key emerging technologies such as multi-functional sensor systems; predictive capability for traversing planetary atmospheres and remote sensing technology.

6.3 Essential Educational Capability Provided by NIAA

a. Unique Graduate Program with NASA focused curriculum. Under the cooperative agreement, NASA fostered and the NIAA established, through its member universities, a truly

unique academic program offering masters and PhD degrees with curricula focused on NASA's needs. All university residency requirements are fulfilled at NIAA in Hampton, Virginia; there is course credit sharing among the member universities; and the NIAA offers unique distance learning capability in support of the program. This program is based on innovative educational curricula in essential new fields of science and engineering, especially in emerging cross-disciplinary fields such as: (i) advanced systems analysis, vehicle concepts development, and mission architecture design; (ii) entry, descent and landing for space exploration; (iii) advanced materials and structures and structural health monitoring; (iv) adaptive aerospace vehicle technology; (v) planetary atmospheres and planetary dynamics; (vi) aerospace acoustics technologies; (vii) advanced sensors and microsystems; and (ix) microsattelite technology. As the Agency's missions change, NASA has the ability to influence the curriculum to ensure the development of a better educated workforce and foster a pipeline in emerging areas that are essential to NASA. For example, the latter four emerging fields mentioned above were recently added and are sustained by the NIAA research centers (described in Attachment A) that support the Science, Space Technology and Exploration Systems Missions. This education program combines an innovative educational curriculum with hands-on focused research in these areas conducted in collaboration with NASA.

b. Unique Academic Program for a technically skilled NASA workforce. In the last eight years, the NIAA's academic program has successfully awarded advanced degrees to more than 100 graduates, including 27 PhDs. It has also contributed to LaRC's pipeline with more than 30 graduate and/or research staff transitioning to the LaRC's civil servant workforce. The education program provides an essential capability to NASA in that it enables the Agency to influence the next generation of engineers and scientists to conduct theoretical analyses, exploratory studies, or experiments in emerging fields as well as for engineering or developmental work calling for the practical application of investigative findings and theories of a scientific or technical nature that are directly related and important to NASA. This program provides both essential theoretical knowledge and practical application to graduate level students. No other educational entity provides NASA the ability to access an educational program with these essential characteristics for Agency purposes.

c. Continuing Education for NASA workforce development. This contract also allows for the development and execution of unique seminars, colloquia, workshops and short courses for NASA's existing workforce, which are complementary and synergistic with NIAA's unique graduate education program. The NIAA has the requisite skills in instructional design to develop the content for these events that provide both continuing education and the opportunity for diverse teams to be assembled to examine a particular problem area and work to define viable research approaches and methodologies to advance the state of the art. Since 2002, NIAA has delivered over 500 short courses, workshops and conferences covering a wide variety of leading-edge research topics in aerospace and atmospheric sciences research and in other developing technical areas of interest to LaRC. Participation in these events enhances the knowledge of the LaRC workforce in new and emerging technical areas as well as broadening perspective into areas not formally studied. For example, the study of Uncertainty Quantification and Management merged and was developed under the cooperative agreement. As a result, workshops and conferences in this new technical are available to civil servants through the contract.

NIAA's unique academic program enhances the student pipeline and workforce development resulting in a continuing source of superbly skilled and highly trained scientists and engineers in emerging technical areas that are essential to LaRC, the region and the nation. Through the contract, NASA has access to this continuous supply of fresh talent to preserve critical capabilities that has become more acute as LaRC experiences a reduction in civil service workforce through attrition. Therefore, the NIAA and the access to members of the consortium are uniquely qualified to provide these continuing educational services to the NASA workforce under the contract.

d. Dissemination of Information about the Results of NASA Research. NIAA is recognized for its outstanding outreach capability to the technical and educational communities as well as the public at large. Under the cooperative agreement, NIAA has created and delivered a wide range of programming to both educate and stimulate interest in NASA discoveries in the general population. For example, NASA 360 is a premiere NASA outreach program that engages an adult or general population audience. The program highlights NASA's current research projects, and informs and educates on ways to conserve and sustain life on earth, while looking ahead to life beyond earth. NASA 360 is available to multiple media platforms including international airline flights. NIAA has also established the Center for Integrated Science, Technology, Engineering and Math (STEM) Education as the basis of their educational outreach program. The Center aims to provide a platform for collaboration and research, and includes a team of highly skilled leaders and practitioners in the field of integrative STEM education. NIAA has proven the capability to successfully disseminate NASA discoveries via the cooperative agreement. Through the contract, NASA can leverage this same expertise and programming equipment without the duplication of cost to disseminate the results of research efforts initiated under the cooperative agreement and matured under the IDIQ contract. The Institute is uniquely qualified to disseminate the discoveries of these research efforts continued under the IDIQ contract to inform audiences of all ages while stimulating the next generation of scientists and engineers and achieving the Agency's public and educational outreach objectives.

6.4 Access to Unique Research and Branding Centers

The contract provides NASA access to unique cutting-edge research expertise and unique educational capabilities which have their genesis under the cooperative agreement. NIAA's capabilities are developed and sustained by its resident researchers and faculty staff and broad university network. To illustrate, NIAA has seven functioning "Research Centers" in emerging areas of interest to NASA that sustain the essential capabilities discussed in Section 6.2 and provide a unique educational program. Each research center is supported by a resident professor and their respective home university. These research centers maintain multi-disciplinary skills that transcend across all NASA missions. These research centers also support upcoming technological challenges of interest to LaRC in areas such as Atomistic Materials; Understand the Climate; Affordable and Safe Space Exploration; Enter the Virtual Age; Freedom to Fly in Controlled Airspace; Revolutionary Air Transports; Transportation in an Energy-Rich World; and Aerospace Vehicle Digital Twin for Certification, Design, Operations. These Research Centers that are defined in Attachment A are: Center for

Adaptive Aerospace Technology; Bruel and Kjaer Center for Aerospace Vibration and Acoustics; Center for Smart Structures and Materials; Center for Nanotechnology for Advanced Sensors, Actuators and Microsystems; Center for Reliable Autonomic Small Satellite Systems; Center for Aerospace Systems Engineering, and Center for Planetary Dynamics. The most mature Research Center is the Center for Aerospace Systems Engineering (CASE). CASE promotes excellence in our nation's systems development through research, education, creativity and innovation in systems engineering and engineering integration; modeling and simulation of system of systems for space exploration and aeronautics; robust design and engineering practices; and advanced engineering environments. It is a center for the integration of systems engineering practices across the complete system life cycle.

Most recently in 2011, the NIAA is developing two "Branding Centers" beginning with [1] development of boron nitride nano tubes (BNNT) for aerospace applications, and [2] incorporation of uncertainty quantification (UQ) into commercial aircraft and other large aerospace systems manufacturing. The BNNT Branding Center is the more mature of the two centers and is associated with specialized BNNT-related lab equipment. Specialized technical capabilities in this center include carbon nanotube nanocomposite development and boron nitride nanotube characterization. The second branding center, Uncertainty Quantification and Management in Aerospace Design (UQ&M), is formed to develop and nurture a national community of best practice for UQ&M methods and processes. The essential technical capabilities in this branding center include, for example, advanced computational modeling and model-based analysis to determine the uncertainty propagation for multi-scale, multi-physics models. Expertise in UQ&M themes can advance a specific new product design and reduce the time from concept to reality of a complex aerospace system. UQ&M was identified as an emerging area of interest to LaRC and NIAA as a result of efforts conducted under the cooperative agreement. The BNNT and UQ&M centers illustrate how NIAA has developed focused "Centers" to address NASA's emerging technological challenges to fulfill mission objectives which continually evolve based on the Agency's and national priorities. The essential skills, capabilities and laboratory facilities associated with these research and branding centers that arose from under the cooperative agreement, will be available to NASA via this contract.

In conclusion, the Institute provides a research and engineering capability, as well as a unique educational program, which is essential to NASA. The NIAA, as the entity which holds the Institute cooperative agreement, is uniquely qualified to perform the related leading edge research needed for LaRC missions under a contract. Therefore, the two-instrument approach is critical to take full advantage of this unique Institute.

7.0 Efforts to Solicit Other Sources

As explained herein, this action is for the award of an IDIQ contract to obtain leading-edge research and technology development that are a continuation of efforts initiated under the NIAA's cooperative agreement. The Agency's twenty-year cooperative agreement cannot operate as envisioned without its companion contract. This award must go to the same entity

that holds the cooperative agreement in order for the Agency to benefit from its long-term investment as envisioned for this dual-instrument strategy.

Further, it would be impractical, costly and ineffective for NASA to solicit and award a contract to an entity other than the entity that holds the cooperative agreement for services that continue work efforts initiated under its cooperative agreement.

8.0 Market Research

The Office of Program Analysis and Evaluation at NASA Headquarters conducted a NASA Institute Study in July 2008. At that time, no other institute included in the study offered the synergistic combination of leading-edge research in a broad range of technical areas and unique graduate and continuing education as the NIAA. Since then, no new university consortia were found matching the broad capabilities established under the Institute. While the Aerospace Education Research Operations (AERO) Institute offers college-credit courses in aerospace technology through distant learning, AERO does not offer resident faculty or the opportunity to work in tandem with NASA researchers on graduate level thesis research. The proposed contract will be publicized as required by FAR Subpart 5.2.

9.0 Determination of Fair and Reasonable Costs

By signature on this document, the Contracting Officer determines that the anticipated cost to the Government will be fair and reasonable. The cost and firm-fixed price of individual task orders to be issued under the contract will be negotiated between NASA and NIAA. The Contracting Officer and the Contracting Officer's Representative will monitor NIAA's performance on an annual basis. In addition, there is sufficient cost data available on the prior IDIQ contracts to determine fair and reasonable costs. The estimated maximum value for this contract is based on the review of task order trends, straight-line estimation and forecasting of the potential use of this contract by the Contracting Officer and the Contracting Officer's Representative. An analysis will be conducted for all tasks before award. NASA expects to procure NIAA services to supplement LaRC's on-going requirements for Aeronautics, Science, Space Technology, and Exploration Systems Missions. Therefore, $48 million is estimated to be sufficient to cover a five-year performance period.

10.0 Technical Certification

I hereby certify that to the best of my knowledge and belief, the data furnished above is complete and accurate.

Charles E. Harris
41718

Contracting Officer's Certification

I hereby certify that the above justification is accurate and complete, to the best of my knowledge and belief, and the anticipated cost to the Government will be fair and reasonable.

Lisa M. Harvey
Contracting Officer

5-14-12
Date

Concurrence:

William T. McMurry, Jr.
Office of Chief Counsel

16 MAY 12
Date

Susan E. McClain
Head, Research and Development
Contracting Branch

Date 5/16/2012

Virginia C. Wycoff
Procurement Officer

5/17/2012
Date

Stephen G. Jurczyk
Competition Advocate

5/21/2012
Date

Approval:

Lesa B. Roe
Director

5/21/2012
Date

ATTACHMENT A - NIAA RESEARCH CENTERS

These Research Centers are cross cutting among all NASA missions but are best aligned with the mission as follows:

Aeronautics Research Mission

Center for Adaptive Aerospace Technology is focused on advanced control of morphing wing autonomous airframes and flight dynamics of flexible skins for aerospace applications of smart materials and adaptive structures. (Professor Hubbard, University of Maryland, College Park).

Bruel and Kjaer Center for Aerospace Vibration and Acoustics (CAVA) is dedicated towards providing education, research and outreach in the vibration and acoustics as applied to aerospace problems. CAVA is involved in analytical and experimental investigations of a number of cutting edge areas in aerospace acoustics and vibrations including beam forming techniques for imaging aerospace acoustic sources, meta acoustic materials, advanced passive vibration and noise control and energy harvesting. The main aim of CAVA is to support provide education in acoustics and vibration and development of advanced aerospace vehicles from an environmental aspect. (Professor Fuller, Virginia Tech)

Space Technology and Exploration Systems Missions

Center for Aerospace Systems Engineering (CASE)is focused on advanced missions, space architectures, vehicle systems, and technologies to enable safe and affordable exploration of space for the advancement of science and the search for life, Near-Earth object defense, and expansion of human presence in the universe. Research is directed towards the synergism of system-of-systems integration with advanced technologies to enable an evolutionary path for space exploration. (Professor Wilhite, Georgia Tech)

Center for Smart Structures and Materials aims to develop methods and tools for structural diagnosis and prognosis via damage sensing and signal processing. This is accomplished through multidisciplinary research in the advanced fields of wireless sensing networks to monitor structural integrity, in-situ mounted and embedded sensors for multi-functional composite structures, energy harvesting as well as systems integration. (Professor Yuan, North Carolina State University)

Center for Nanotechnology for Advanced Sensors, Actuators and Microsystems is focused on developing sensors based on quantum dots and materials for optical energy conversion and emissivity control. (Professor Gupta, University of Virginia)

Science Mission

Center for Reliable Autonomic Small Satellite Systems performs research to increase the reliability of small satellites in the pico/nano/micro-class through the use of formal methods in the design stage of the life-cycle. In addition, research will be performed to develop heterogeneous suite of this class of satellites that will have the ability to operate autonomously while being able to self heal, optimize, and reconfigure. The objective is to provide improvements in time to orbit, lower cost, maximum flexibility in design accommodation, and performance in order to enable deep-space missions with little to no human interaction. (Professor Edmonson, North Carolina Agriculture and Technology State University)

Center for Planetary Dynamics conducts scientific research into the evolution of the solid planetary bodies in the solar system in two areas: planetary exploration and planetary dynamical modeling. Planetary exploration involves the proposal, analysis, and development of mission and instrument concepts, and participation in the development of NASA priorities and programs. Planetary Dynamical Modeling develops and utilized models of the physical processes operating in the solid planetary bodies of the solar system. (Professor Moore, Hampton)