National Aeronautics and Space Administration

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

April 14, 2014

Reply to Attn of: 12

TO: 12/Research and Development Contracting Branch, Office of Procurement
Attn: C. Lynn Jenkins

FROM: 190/Dawn Jegley, Structural Mechanics and Concepts Branch, Research Directorate

SUBJECT: Justification for Exception to the Fair Opportunity Process (JEFOP) for New Task Order entitled "ERA Structural Concept and Trailing Edge Evaluation" with The Boeing Company, on Contract NNL10AA05B, Total Estimated Cost $1.45M.

In accordance with FAR 16.505, the following information is provided to support this justification:

## I. Recommendation

NASA Langley Research Center (LaRC) intends to initiate a new task order with Boeing under the Structures, Materials, Aerodynamics, Aerothermodynamics, and Acoustics Research and Technology (SMAAART) contract. The purpose of this new task order is twofold. First is to analytically evaluate the Pultruded Rod Stitched Efficient Unitized Structure (PRSEUS) structural concept by applying it to the center portion of a Hybrid Wing Body (HWB) vehicle, a high aspect ratio wing and a tubular fuselage of a traditionally shaped aircraft. Second is to analytically evaluate the Adaptive Compliant Trailing Edge (ACTE) concept as applied to advanced HWB and tube-and-wing concepts.

Boeing is the sole source capable of performing the required effort with PRSEUS because it is the only contractor with experience with the stitched structure. Boeing is the only contractor with the appropriate experience to apply the ACTE technology to the HWB concept as required by this task. This new task order builds upon past Boeing efforts as described below.

Purchase Request (PR) 4200506439 has been generated to provide incremental funding in the amount of $800K for this task order. LaRC plans to utilize the SMAAART contract, which is a multiple award, indefinite delivery/indefinite quantity (IDIQ), cost plus fixed fee (CPFF) contract.

## II. Background

Some years ago, LaRC and Boeing joined forces under the NASA Advanced Composites Technology (ACT) Program to make large composite airplane structures a reality. As such, the NASA ACT program was set up in 1989 to improve the efficiency of composite structures and to reduce their manufacturing costs. The ACT Program aims to reduce air travel costs through the use of composite materials on commercial aircraft.

At the time the ACT Program was established, the potential of composites materials to save weight on aircraft primary structure (wing and fuselage) was well-known but the roadblocks to its use were its manufacturing complexity and cost, its brittle nature and sensitivity to damage, a lack of experience with the material systems, and inadequate analysis techniques to reliably predict the behavior of these complex structures.

The Environmentally Responsible Aviation (ERA) Project within the Integrated Systems Research Program (ISRP) of the NASA Aeronautics Research Mission Directorate (ARMD) has the responsibility to develop technologies which will allow future commercial aircraft to simultaneously burn less fuel, produce fewer pollutants, and reduce the amount of noise the community around the airport hears compared to aircraft today. One key component of this effort includes introducing new advanced aircraft configurations such as a hybrid wing body which provides less drag and more lift than the traditional tubular fuselage and wing configuration. Another key factor is lightweight primary structures. To meet these goals, a lightweight composite structure called PRSEUS will be analytically applied to a HWB center section, a traditional fuselage and a high-aspect ratio wing under this task order. This study will give NASA an indication of the potential weight savings by moving from state of the art construction to PRSEUS.

PRSEUS is an outgrowth of work begun under the NASA ACT Program in 1990-2000, and was continued through LaRC-supported trade studies with Boeing in 2004 and through a contract awarded under an NRA supporting the Subsonic Fixed Wing Program which ran from 2007-2010.

A summary of the McDonnell Douglas (now part of Boeing)/Boeing involvement through competitively and non-competitively awarded research efforts in resin infusion and stitching technology is shown in the following table and detailed in the narrative below.

Boeing has conducted extensive proprietary studies on the HWB concept. A goal of this new task order is to evaluate the ACTE technology applied to a HWB, which requires highly specialized HWB design services. This proposed new task order will build upon work completed under NASA Neil A. Armstrong Flight Research Center (formerly Dryden Flight Research Center) contract NND11AG03C ($4.9M effort with a period of performance from December 2010 through December 2011), which was solicited competitively under ARMD NRA NNH10ZEA001N, Amendment 10 – Systems Analysis for Advanced Vehicle Configurations under ERA2. Three proposals were competitively selected under this NRA and contracts were awarded to Lockheed Martin, Northrop Grumman, and Boeing. Under contract NND11AG03C, entitled "ERA Project N+2 Advanced Vehicle Concepts Study and Conceptual Design of Sub-scale Test Vehicle," Boeing's final report defined advanced tube-and-wing and HWB 224 passenger concepts which will be directly leveraged for this ACTE study.

| Item | Contract / Task Order | Title | Value | Period of Performance | Type |
|---|---|---|---|---|---|
| 1. | NAS1-18862 | Innovative Composite Aircraft Primary Structures (ICAPS). | $30,382,645 | 3/1989-11/1995 | Competitive |
| 2. | NAS1-20546 | "Technology Verification of Composite Primary Wing Structures for Commercial Transport Aircraft". | $77,787,903 | 9/1995-9/2001 | Competitive |
| 3. | NNL04AA36C | "NASA Maturation of Advanced Aerodynamic and Structures". | $432,034 | 2/2004-8/2004 | Competitive |
| 4. | NNL07AA48C | "Damage Arresting Composites for Shaped Vehicles". | $3,905,015 | 9/2007-10/2010 | Competitive |
| 5. | NNL04AA11B/ NNL10AA99T | "Design, Analysis and Fabrication of Curved PRSEUS Panel" | $596,237 | 2/2010-12/2010 | Non-Competitive |
| 6. | NNL04AA11B/ NNL10AB00T | "HWB Multi-bay Test Article Design and Tooling". | $4,997,767 | 2/2010-3/2011 | Non-Competitive |
| 7. | NNL10AA05B/ NNL11AA68T | "HWB Multi-bay Test Article Analysis and Assembly". | $5,299,821 | 5/2011-9/2013 | Non-Competitive |
| 8. | NNL13AA11C | "PRSEUS Panels and Associated Components". | $6,199,742 | 7/13-12/13 | Non-Competitive |
| 9. | NNL10AA05B/ NNL13AB38T | "Fabrication of Lower Section and Upper Forward Bulkhead Panels of the Multi-bay Box and Panel Preparation". | $3,312,044 | 5/13-9/14 | Non-Competitive |
| | | TOTAL | $132,913,208 | | |

## III. Nature and/or Description of Required Supplies/Services

The ERA Project includes the development of lightweight aircraft structures to reduce fuel burn and emissions. For this new task order, which is the subject of this JEFOP, Boeing shall conduct analytical studies applying the PRSEUS concept to several sizes of HWB aircraft and to traditionally shaped aircraft. Boeing shall also evaluate the aerodynamic effects of ACTE.

The estimated value of this new task order is $1.45M and fits within the scope of the SMAAART contract SOW under 2.1.4 Structural Mechanics and Concepts. Further, this proposed new task order falls within the SMAAART contract performance period and within the maximum contract value.

## IV. Identification of the Exception to Fair Opportunity and Supporting Rationale

FAR 16.505(b)(1)(i) requires the Contracting Officer provide each awardee under a multiple award contract, a fair opportunity to be considered for each order exceeding $3,000 unless a statutory exception applies. Specifically, the exception that precludes the fair opportunity process for this acquisition is FAR 16.505(b)(2)(i)(B), which states that "Only one awardee is capable of providing the services or supplies required at the level of quality required because the service or supplies ordered are unique or highly specialized".

NASA LaRC has conducted numerous site visits to many commercial and military aircraft original equipment manufacturers (OEMs) and their aerospace supplier companies (small and large) over the last 6 years and found that the Boeing Research & Technology (R&T) group in Huntington Beach, CA (formerly Phantom Works) is the only company pursuing this technology at this time.

The ERA program engaged in a series of market research activities to develop its Phase 2 activities, where it seeks to mature technologies from a TRL of 4 to 5 or 6, with an emphasis on those technologies that can be matured to a higher technology maturation level and those that have demonstrated commercial viability in the 2020 to 2025 timeframe. These efforts included publishing a Request for Information (RFI) in FEDBIZOPPS and the NASA Acquisition Internet Site on February 24, 2012 which solicited extensive information including (1) recommendations of technologies associated with the technology focus areas ready for Integrated Technology Demonstrations, and associated test campaigns and test assets to be completed by the end of FY 2015, raising TRL to 5 or 6 and thereby advancing integration readiness level and (2) product focused transition plans associated with the identified technologies. The ERA program also conducted a Meeting of Experts (MOE) on March 29, 2012 to gather additional information to set its Phase 2 Strategy. After the RFI responses and information obtained at the MOE, the ERA Program made the decision to move forward on several Integrated Technology Demonstration (ITD) research efforts. PRSEUS was one of those selected. Only Boeing proposed continuing development of stitched structures or demonstrated, through responses to the RFI, that it has the capability to pursue development of stitched structure.

Under this proposed new task order for the ERA Project, it is advantageous to the Government to contract with Boeing to deliver the panels and associated hardware. As shown in the table above, these contracts represent 20 years of experience and a total of over $132 million invested by LaRC in stitching technology. This proposed new task order, which builds upon the work that Boeing has already accomplished, is in the best interest of the Government because LaRC has invested a substantial amount of money, time, and effort in the above-mentioned PRSEUS development efforts with Boeing. It is not economically feasible to award this task order to a new/different contractor who would not have the facilities, methods, experience, or data available to fabricate these PRSEUS panels. Thirty (30) patents related to various aspects of stitching, resin infusion and PRSEUS have been awarded to Boeing and McDonnell Douglas. Further, it is not advantageous for the Government to release this new task order as a competitive acquisition when there is no expectation that the other SMAAART contractors will submit a proposal.

As discussed above, Boeing is the sole source capable of performing the ACTE effort because it is the only contractor capable of providing the proprietary HWB concept with the ACTE technology applied which requires highly specialized HWB design services. The design of credible HWB concepts is a highly specialized research effort, and the Boeing Company is the only known source capable of producing the quality required. In addition to the $132M, NASA has also invested more than $35M to support ACTE over the past two decades to work with Boeing on HWB concept development.

Since no other SMAAART or outside contractor has any experience with PRSEUS or ACTE technology, an exception to the Fair Opportunity process is the most appropriate mechanism to continue to move this technology forward.

## V. Determination by the Contracting Officer That The Anticipated Cost to the Government Will Be Fair and Reasonable

The CPFF amount for this acquisition will be determined fair and reasonable by the Contracting Officer prior to award of this task order. Actions anticipated to ensure reasonableness will be accomplished using the procedures and criteria contained in the Federal Acquisition Regulation (FAR), NASA FAR Supplement (NFS), and other regulatory documents as applicable. Detailed documentation and justification of reasonableness will be disclosed in the Price Negotiation Memorandum (PNM) which will be prepared using the evaluation of the Boeing quoted pricing, compared to the independent Government estimate, and the pricing of previous similar efforts. Certified cost and pricing data will be obtained and used in determining a fair and reasonable cost.

## VI. Other Facts Supporting the Justification

None.

## VII. Actions the Agency May Take to Remove or Overcome Any Barriers To Increasing Fair Opportunity Before Any Subsequent Acquisition For the Supplies or Services

LaRC may have future requirements that can only be met by Boeing. However, the Contracting Officer will continue to scrutinize all SOWs received to ensure fair opportunity is appropriately given. LaRC typically looks for proactive steps that can be taken to eliminate barriers to competition for future requirements. Additionally, LaRC has no known future requirements for this technology at this time and lacks the ability to incentivize the other SMAAART contractors to invest the substantial sums that would be required to establish an alternate source for this service.

**Technical Certification:**

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

Dawn Jegley — 4/14/14

Dawn Jegley
ERA Integrated Technology Demonstration on
Unitized Structures Lead

Date

**Contracting Officer Certification:**

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

C. Lynn Jenkins — 4-14-14

C. Lynn Jenkins
Contracting Officer

Date

Concurrence:

Panice H. Clark — 4/17/14
Panice H. Clark
Head, Research and Development Contracting
Branch, Office of Procurement
Date

Michael I. Mark — 18 APR 14
Michael I. Mark
Office of Chief Counsel
Date

David H. Jones — 4-17-14
David H. Jones
Acting Procurement Officer
Date

Determination:

Based upon my review of the above, I have determined the exception that precludes the fair opportunity process for this acquisition as stated in paragraph IV applies to this task order.

David E. Bowles — 4/22/14
David E. Bowles
Competition Advocate
Date

cc:
12/OP
30/OCC
12/C. L. Jenkins
190/D. C. Jegley

12/CLJenkins:bt 04/10/14 (43284)