National Aeronautics and
Space Administration

Langley Research Center
Hampton, VA 23681-0001

Date: 8/1/13

To: **12**/G. Jeffrey Hisey/ Contracting Officer, Office of Procurement

From: **188A/** Eric K. Hoffman/ Materials Research Engineer/ Advanced Materials and Processing Branch

Subject: Justification for Other than Full and Open Competition (JOFOC) for Procurement of Services to Fabricate a Spin Formed Aft Bulkhead Pathfinder Component (PR 4200486415)

1. Recommendation

I recommend that NASA Langley Research Center (LaRC) negotiate with Spincraft, North Billerica, MA, for services for the spin form fabrication of a single-piece aluminum pathfinder component representative of the Orion crew module aft bulkhead. This contract includes all material procurement, tooling, fabrication, heat treatment, inspection, machining, and engineering and technical support. [redacted]

2. Nature of the Action

The nature of the action being approved is a justification for other than full and open competition for the purchase of the services described in Item 3. The current aft bulkhead configuration on the Orion crew module is multi-piece welded construction fabricated from aluminum-lithium (Al-Li) alloy 2195 plate. Manufacturing the aft bulkhead as a single-piece by spin forming will eliminate the welds and enable weight reduction of the crew module. A change of material to aluminum (Al) alloy 2219 is required to produce a forming blank of sufficient size without welds. Fabrication with commercial Al-Li 2195 plates requires two plates to be welded together to produce a forming blank. The NASA Engineering and Safety Center (NESC) has funded a project to reduce risks associated with and accelerate deployment of a single-piece Al 2219 spin formed aft bulkhead for the Orion crew module. This six-month project will evaluate the effects of spin forming on mechanical properties and provide material for friction stir weld (FSW) schedule development for the circumferential weld that will join the aft bulkhead to the barrel section of the crew module. In order to meet the project completion date the spin formed aft bulkhead must be delivered to NASA within two months of contract award. This schedule does not support fabrication of tooling according to the current Orion design, consequently a vendor must be found who can provide existing tooling that is close to the Orion design and available Al 2219 plate for fabrication.

3. Description of the Supplies or Services

The contractor shall assess the tooling requirements for fabricating the aft bulkhead pathfinder component using spin forming technologies typically used for manufacture of launch vehicle upper stage aluminum alloy cryogenic tank dome structures.

Based on preliminary designs, the aft bulkhead pathfinder component shall have approximate dimensions ranging from 100 – 150 in. diameter at the rim, 200 – 250 in. radius of curvature, and 2.0 – 2.5 in. thick.

The contractor shall fabricate an aft bulkhead pathfinder component through the following tasks:

1) Identify existing tooling necessary to support spin forming, heat treatment, and machining.
2) Identify and procure aluminum (Al) alloy 2219-F temper plate suitable for manufacturing the pathfinder component.
3) Fabricate the aft bulkhead pathfinder component including preparation of the spin forming blank, spin forming operations, inspections, subsequent heat treatment and machining.
4) After all spin forming and post-fabrication processing is complete, section the aft bulkhead pathfinder component and corner drops from the forming blank per NASA-supplied cut plan and ship pieces to NASA LaRC, MSFC, and Lockheed Martin MAF.
5) Prepare a final report on fabrication of the spin formed aft bulkhead pathfinder component to include a detailed description of the tooling and fabrication process and recommendations for further process development.

Further details on the required tasks are outlined in the statement of work (SOW).

4. Statutory Authority

Provision for this JOFOC is made under the statutory authority of 10 U.S.C. 2304(c)(1). Spincraft is the only responsible source; no other supplier or service will satisfy the Agency's requirements.

5. Contractor's Unique Qualifications

Among the identified sources, only Spincraft has a tool that could be used to fabricate an aft bulkhead with dimensions in the range specified in Item 3. The schedule for this six month project demands that the spin formed aft bulkhead pathfinder component be fabricated, heat treated, and sectioned into coupon blanks within two months of the contract award so that the material property testing and FSW development milestones of the project can be met. Hence, there is insufficient time to design and manufacture tooling to support the fabrication; consequently, a vendor must be found who can provide existing tooling that is close to the Orion design and available Al 2219 plate for fabrication. Spincraft purchases Al 2219 plate forming blanks in various thicknesses for producing spin formed components. Spincraft has identified an existing Al 2219 plate that meets the dimensional size required for spin forming the pathfinder component and that is available immediately. Spincraft also has an opening in their spin forming production schedule in the mid to late August time frame, which supports meeting the requirement to complete spin forming fabrication and post-fabrication processing, sectioning, and material delivery within two months. There is only one other vendor identified that produces spin formed components at the scale needed for the aft bulkhead pathfinder component. However, none of the tools identified by this vendor support the required aft bulkhead pathfinder geometry.

6. Efforts Made to Solicit Offers

A search was performed of industrial manufacturers who use the spin foming process through both an internet search and knowledge of vendors contracted during previous projects (ETDP – friction stir welded spin formed domes, NESC – spin forming a single-piece crew module bulkhead). All vendors that could potentially fabricate an aft bulkhead pathfinder component of the required size were contacted to determine whether they had existing tooling of an appropriate size and geometry that could be used by NASA and whether there was a near term opportunity for spin forming. They were also asked whether an aluminum alloy 2219-F temper forming blank of suitable size could be provided or procured to support the near term forming opportunity.

7. Determination of the Contracting Officer

With assistance from the NASA requiring organization, the Contracting Officer will conduct a thorough review of the proposal received to ensure that the anticipated cost to the Government will be fair and reasonable.

8. Description of the Market Research

A search was performed of industrial manufacturers who use the spin foming process to identify potential developers and fabricators of the aft bulkhead pathfinder component. Only two of the ~25 vendors surveyed can produce components in the size range needed for this development effort. Both companies were contacted to determine whether they could provide tooling and material to support fabrication of a component with the required dimensions of the aft bulkhead pathfinder and whether the fabricated component could be inspected, heat treated, sectioned, and delivered within two months of contract award. It was determined that only Spincraft has both the capability to produce the required aft bulkhead pathfinder component and can meet the program schedule. The other vendor does not have an existing tool of appropriate size and geometry to support manufacturing of the spin formed aft bulkhead pathfinder component.

9. Any Other facts supporting the use of other than full and open competition:

Spincraft has led development and maturity of spin forming technology and commercially produces cryogenic tank domes by spin forming for the Delta III and IV launch vehicles produced by the Boeing Company, Atlas V and Space Shuttle produced by Lockheed Martin, and HIIA launch vehicle produced by Mitsubishi Heavy Industries. The current fabrication effort will utilize the expertise at Spincraft and make use of existing tooling developed for other launch vehicle programs, thus increasing the economic benefit to NASA.

10. Listing of Sources

None

11. Subsequent Competitive Acquisitions

At this time, there are no known subsequent acquisitions of this nature and for the specific expertise required in this procurement. For any subsequent acquisition of similar nature that may occur, the Government will conduct an in-depth market research analysis.

12. Certifications

Technical Certification

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

_____ _____

Eric K. Hoffman Date
Technical Requester

Contracting Officer 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.

_____ _____

G. Jeffrey Hisey Date
Contracting Officer
Center Operations Contracting Branch