NNJ12HA96D

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LYNDON B. JOHNSON SPACE CENTER

LIMITED SOURCES JUSTIFICATION (LSJ)
PURSUANT TO FEDERAL ACQUISITION REGULATION (FAR)
8.405-6(a)(1)(i)(B)

1. This document is a Limited Sources Justification (LSJ) prepared by the NASA Lyndon B. Johnson Space Center (JSC).

2. The nature and/or description of the action being approved:

This is a LSJ to acquire a full-scale Extravehicular Activity (EVA)-compatible Rapid Cycling Amine (RCA) assembly from Hamilton Sundstrand. This acquisition is being conducted under the authority of the Multiple-Award Schedule Program.

3. Description of the supplies or services required, include an estimated value:

The Crew and Thermal Systems Division at JSC is currently developing technology for demonstration in the Advanced Exploration Systems (AES) EVA Suit/Portable Life Support System (PLSS) Project. The JSC PLSS team has performed extensive trade studies and evaluated dozens of technology options. Based upon evaluation of these technologies with EVA stakeholders the RCA technology was chosen as the best option to perform carbon dioxide (CO2) and humidity scrubbing in the PLSS. The AES EVA Project baseline schematic documents the need for this required technology. Hamilton Sundstrand has been developing a RCA canister and valve for the Government and with its own Independent Research & Development (IR&D) funds for an extensive period of time and has proven the feasibility of this technology. This effort will consist of design, development, test, and evaluation of a RCA assembly.

JSC is proposing to contract through the General Services Administration with Hamilton Sundstrand for a estimated period of performance from November 4, 2011, to September 1, 2012. The proposed contract value is estimated to be $850,000.

4. The authority and supporting rationale and, if applicable, a demonstration of the proposed contractor's unique qualifications to provide the required supply or service:

In accordance with FAR Part 8.4, Federal Supply Schedules, orders placed under Federal Supply Schedules are exempt from the requirements in FAR Part 6, Competition Requirements; however, an ordering activity must justify its action when restricting consideration to one source. The statutory authority permitting this action falls under FAR 8.405-6(a)(1)(i)(B), "Only one source is capable of providing the supplies or services required at the level of quality required because the supplies or services are unique or highly specialized." As demonstrated below,

Hamilton Sundstrand has unique qualifications and holds several patents on technology that make them the only responsible source capable of performing this effort.

Engineering hardware development and rapid prototyping activities for the PLSS are critical for completing a fully integrated test article that is required to be assembled within Fiscal Year (FY) 2012. The CO2 removal technology is one of the top three EVA technologies identified by the Office of Chief Technologist to be developed for this FY. The assembly will consist of an amine canister, cycling valve, valve motor, and controller.

Hamilton Sundstrand has demonstrated capabilities in the accelerated design, fabrication, and fielding of the solid amine-based systems for integrated testing and technology evaluation. Under NASA cooperative agreement NNJ04HF73A, Hamilton Sundstrand successfully designed, fabricated, tested, and delivered three state-of-the-art (SOTA) solid amine prototype systems capable of continuous CO2 and humidity removal from a closed vehicle atmosphere. The prototype systems were integrated into JSC test chambers for validation in a relevant environment, through both simulated human metabolic loads in a closed chamber and through human subject testing in a closed environment. One of the three prototype systems has since been integrated into a Development Test Objective flight test on the International Space Station. CO2 and humidity removal technology is essential to the safe operation of a space suit in any environment. However, the current SOTA in CO2 removal for the International Space Station is a regenerable silver oxide-based sorbent that is of limited duration and is not suitable for advanced programs because it is prohibitively heavy (32 lb). The silver oxide technology is likewise not capable of performing humidity removal in the space suit.

The RCA technology has been under development by JSC and Hamilton Sundstrand jointly since the early 1990s. The current canister and valve configurations were developed solely by Hamilton Sundstrand under IR&D since the early 2000s. JSC procured a breadboard-level canister and spool valve assembly from Hamilton Sundstrand under contract number NNJ10HB94C. This RCA assembly has undergone extensive performance characterization at JSC, and is currently being assessed for system-level performance in the integrated PLSS breadboard test stand. The RCA assembly has performed extremely well in these tests and has met all of the PLSS requirements with no failures of the hardware or control system. For the next stage of PLSS system design, JSC must procure and integrate PLSS components that meet specific sizing and interface requirements. In addition, a JSC trade study (and breadboard testing) indicates that the valve hardware should be an electrically operated/motorized valve vs. the breadboard valve configuration, which is a pneumatically operated design in order to save overall PLSS mass, volume, and power, and to increase PLSS reliability.

Many of these products have already been developed by Hamilton Sundstrand, but the existing canister design must be optimized for inclusion in the AES EVA PLSS. Volume, packaging, and interface constraints must be traded and iterated with the NASA PLSS integrator as part of the design process and the RCA assembly must undergo some design changes that are required by PLSS to comply with PLSS constraints. Hamilton Sundstrand's proprietary ownership of the RCA amine and valve technology along with their current role in the hardware development make them the only candidate for the work required.

5. Determination by the Contracting Officer (CO) that the order will be the best value consistent with FAR 8.404 (d):

Pursuant to FAR 8.404 (d), the General Services Administration (GSA) has already determined that the prices of supplies and fixed-rate services, and rates for services offered at hourly rates, under schedule contracts to be fair and reasonable; however prior to the award of the proposed order, pricing information will be obtained from Hamilton Sundstrand and price analysis will be performed and documented to sufficiently determine that the order represents the best value and results in the lowest overall cost alternative to meet the Government's needs. The price analysis will include a comparison of the existing efforts performed by Hamilton Sundstrand for NASA and comparison with the cost of comparable engineering skills and comparable skills under other GSA contracts. The labor hours and skill mix will be evaluated and approved by the CO's Technical Representative (COTR). Considering price and administrative costs, this order will represent the best value and result in the lowest overall cost alternative to meet the Government's needs.

6. A description of the market research conducted among schedule holders and the results or a statement of the reason market research was not conducted:

The COTR's technical knowledge of the work and the companies available in industry and on GSA schedule, was used in performing market research. The COTR also reviewed the companies currently under contract by NASA for related services, and none were found to have the critical skills necessary to complete the requirements of the Statement of Work. Due to the proprietary technology needed to meet the performance requirements for the NASA AES EVA system, Hamilton Sundstrand is the only company that can perform the work without significant cost impact and schedule delays. Their extensive in-house technical capability, unique technology patents, and related past performance in this area makes Hamilton Sundstrand the only company capable of performing this effort. An award to Hamilton Sundstrand would allow flexible utilization of an already trained, expert workforce preventing duplicate cost to the Government.

7. Other facts supporting the use of limiting sources:

The following list denotes the patents held by Hamilton Sundstrand for the amine sorbent and the electrically actuated rotary valve:

- Patent 6364938–SA9T sorbent and its use for CO2 removal
- Patent Application PA-0005149-US–Sorbent System and Method for Concurrent Removal of Carbon Dioxide (CO2) and Water Vapor (H2O) from the Atmosphere of a Closed Habitable Environment
- Patent Application PA-0008870-US–Rotary Valve Element for Twin Bed Alternative Treatment Systems
- Invention Disclosure ID-0016899-US–One piece captured spool valve seal with elastomeric energizer

Hamilton Sundstrand's unique expertise as illustrated by the patents identified is critical to the successful design and fabrication of the next generation RCA assembly that is needed for the AES EVA project. Their historical knowledge built over three decades of developing this technology is crucial to continued successful development of the RCA. Hamilton has critical knowledge of sorbent optimization parameters such as pressure, temperatures, flow rates, CO2 and humidity levels, and regeneration characteristics. The design of an optimized canister and valve system is dependent upon knowing how to balance and trade these parameters in order to meet the challenging requirements for operation in a space suit. In order to reach this level of competency, another contractor would be required to duplicate many of the IR&D and contracted research and development efforts and costs already incurred by the Government and Hamilton Sundstrand. Without this knowledge, a new vendor would be unable to quickly develop an operational canister that meets the AES EVA project performance and sizing requirements. And without the key piece of RCA technology, the patented amine sorbent, a new vendor is unlikely to ever meet the PLSS performance requirements. If this effort is not initiated with Hamilton Sundstrand the AES EVA project will not meet its overall objectives to provide NASA will viable exploration technologies to enable future missions

8. The actions, if any, the Agency may take to remove or overcome any barriers to competition before any subsequent acquisition for the supplies or services required:

The AES PLSS project will be up for review at the end of FY12. Depending on the results produced by this project, funding may be provided for continued development of this technology. Should additional funding be provided in FY13, the Government plans to continue to contract with Hamilton Sundstrand for the RCA technology on a limited source basis. The Government is unable to remove or overcome any barriers to competition as long as we use this Hamilton Sundstrand design which contains patents for several key parts of the system which are critical to the PLSS configuration. Attempts have been made under Small Business Innovative Research contracts to develop alternate technologies. To date, these attempts have failed to produce a viable alternative. The Government will continue to assess the market for any new technologies which may be utilized for future PLSS requirements.

Technical Officer: I certify that the supporting data presented in this justification are accurate and complete.

Gretchen A. Thomas
Contracting Officer's Technical Representative

10-26-11
Date

Contracting Officer: I hereby certify that this justification is accurate and and complete to the best of my knowledge and belief.

Jessica C. Miller
Contracting Officer

10/26/11
Date

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