

JUSTIFICATION FOR OTHER THAN FULL AND OPEN COMPETITION
(JOFOC)

1. This document is justification for other than full and open competition prepared by NASA Goddard Space Flight Center (GSFC)

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

NASA/Goddard Space Flight Center (GSFC) proposes to enter into a contract with AMU Engineering (AMU). This document justifies the determination for using other than full and open competition.

NASA's GSFC proposes to enter into a sole-source contract with AMU, a woman-owned small business, to continue the services of AMU as a LADEE team member for Phase B/C/D portion of the Neutral Mass Spectrometer (NMS) instrument development for the 2012 Lunar Atmosphere and Dust Environment Explorer (LADEE) mission. AMU will provide the personnel and services listed in Section 3 of this JOFOC.

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

The LADEE NMS requires that mechanical design changes be made to the existing flight spare Quadruple Mass Spectrometer designed by AMU for the 2001 CONTOUR mission in order to satisfy the science requirements of LADEE.

AMU will provide the mechanical engineering design and analyses for (a) the changes needed in the Quadruple Mass Spectrometer (QMS); (b) the RF module and the Main Electronics Box (MEB), and (c) the NMS packaging, mechanical structures and spacecraft interfaces. In addition, AMU will provide support and participate in all Peer Reviews, Preliminary Design Review, Critical Design Review and Pre-Environmental Review. All components and systems listed above require proven, flight heritage or a high degree of design maturity which can only be provided by AMU in order to successfully meet the aggressive instrument development schedule for the LADEE mission. The proposed contract will have an estimated value of [REDACTED] with an 18 month period of performance that will end on March 31, 2011.

4. Statutory authority permitting other than full and open competition:

The authority for this procurement is 10 U.S.C. 2304 (c) (1) Only One Responsible Source.

5. A demonstration that the proposed contractor's unique qualification or the nature of the acquisition requires use of this authority.

NASA Headquarters selected the LADEE NMS proposal as a low cost mission to explore the lunar atmosphere. One of the prime reasons for its selection was the availability of a flight spare QMS unit built for the 2001 CONTOUR. The availability of the QMS enables the LADEE NMS to come within the delivery and cost constraints established by NASA

Headquarters. Having essentially an 'off the shelf' QMS means the projected launch date in 2012 could be met as the normal two years of development time for typical new missions would not be necessary. AMU provided the detailed mechanical engineering design and structural analysis for this unit. For LADEE, work is required in several areas: 1) Design changes are necessary in the ion source and inlet region of the QMS to increase instrument sensitivity necessary to achieve several scientific goals of the mission. 2) An in-flight calibration system similar to the system used on CONTOUR may be required but won't be confirmed until the instrument Preliminary Design Review. AMU was responsible for the mechanical engineering design and structural analysis of the in-flight CONTOUR calibration system. 3) A QMS RF module will be required that houses and connects the electronics RF section to the QMS unit. The LADEE RF module will be very similar to the RF module used on the Cassini/Huygens Gas Chromatograph Mass Spectrometer. The Cassini/Huygens RF module was designed by a team of in-house engineers including an employee now working for AMU. 4) A MEB will be required to house the LADEE NMS electronics system. Its design is based on the MEB used on the Sample Analysis at Mars (SAM) instrument suite. AMU worked closely with the SAM electronics team during the MEB design to ensure all mechanical requirements of both the QMS and MEB would interface correctly. AMU is very familiar with the design of the SAM MEB. 5) Packaging of the QMS, the RF module and MEB into the LADEE NMS mechanical structure and its interface with the spacecraft structure will be required. The packaging, mechanical layout, mechanical support structure and spacecraft interface will be similar to that used for CONTOUR and the Cassini Ion and Neutral Mass Spectrometer. AMU's employees provided detailed designs for the packaging and mechanical layout for both the CONTOUR and Cassini missions. 6) There will also be task management and systems engineering responsibilities including providing monthly inputs to the Project regarding work status, funding and scheduling updates; reviewing and providing inputs to Project documents such as systems safety plan, and the Mission Assurance Plan; participate in weekly LADEE NMS staff meetings where technical status and schedule issues are discussed as well as coordinating with other team members; provide inputs into and participate in formal reviews including Monthly Management Reviews, Preliminary Design Review, Critical Design Review, hardware peer reviews and the Pre-Environmental Review. AMU is base lined as the Mechanical Systems Element Lead in the current LADEE NMS Team Structure and will be a key participant in the reviews listed above.

The following is a detailed rationale supporting the selection of AMU as being uniquely qualified to provide the mechanical engineering design, structural analyses, and LADEE management and systems engineering services for the LADEE NMS mission.

AMU recently completed the mechanical engineering design support for the SAM instrument suite. During this time, the company did a considerable amount of work involving the mechanical engineering design and analysis as well as the fabrication and assembly of the QMS and Gas Processing System which included gas manifolds, gas traps, scrubbers, getters, gas inlet leaks, gas transfer lines. Work included the initial conceptual designs followed by detailed designs and fabrication drawings; interacting with the fabrication vendors to ensure each part was fabricated correctly and within specification; generating assembly and processing steps and drawings for each sub assembly; interacting with the assembly technicians to ensure the parts were assembled correctly; and interacting with the Integration



and Testing (I&T) team during integration of all the components into the SAM suite. Many of the designs, components, fabrication vendors and team members used for the SAM mission will be used for the LADEE NMS work. An AMU Engineer was the SAM QMS Lead Engineer and had the responsibilities for all the management and systems engineering tasks as will be required in the LADEE project. The engineer prepared and gave presentations at all major SAM reviews where Goddard and JPL management were present as well as NASA Headquarters personnel. The AMU Engineer was often complimented on the professional and thorough way the presentations were given. The same AMU engineer will be doing this again for the LADEE NMS work.

The LADEE NMS is the engineering unit of the CONTOUR mass spectrometer built in 2001. For LADEE, changes in the ion source design needed to increase the instrument's sensitivity and modifications to the ion source cover are necessary to interface properly with the lunar environment. The LADEE NMS in-flight calibration system will be similar to the in-flight calibration system used on the CONTOUR mass spectrometer with differences being a design change necessary to interface properly with the new ion source cover and changes reflecting the LADEE science requirements. The LADEE's electronics packaging is based on a combination of that used on the CONTOUR mission and the SAM mission and will be tailored to fit into the LADEE space and mass requirements. LADEE's mechanical support structures will be based on a combination of both the CONTOUR mission and the SAM mission and again will be tailored to fit into LADEE's space and mass requirements. The LADEE NMS interface to the spacecraft requires thermal and structural designs will use features common to both the CONTOUR and SAM interface. The AMU structural and thermal analyst that will be used for LADEE is the same person who did the analyses for SAM and much of the same programs created for the SAM analyses can be used for the LADEE work. Being able to use the same personnel and to directly use many of the same designs and analyses work created on SAM and CONTOUR, or at a minimum can be modified to reflect LADEE's NMS requirements, will enable AMU to meet the aggressive LADEE schedule.

AMU Engineering personnel have been members of GSFC's mass spectrometer experiment team for almost 15 years and have been key participants in the last 5 missions – the Cassini Ion and Neutral Mass Spectrometer (INMS) the Cassini/Huygens GCMS, the Japanese Nozomi Neutral Mass Spectrometer, the CONTOUR Neutral Gas and Ion Mass Spectrometer and, most recently, the 2011 MSL SAM instrument suite. It should be noted that the Cassini INMS instrument was the precursor for the design and packaging of the CONTOUR mass spectrometer. AMU personnel were involved in the mechanical engineering design and analyses of all 5 instruments and have accumulated a vast amount of 'corporate knowledge' over these years relating to space flight mass spectrometry and is uniquely qualified to continue in this endeavor by performing the required work on LADEE.

The mass spectrometer group at GSFC has designed, built and flown more mass spectrometers on earth and planetary missions than any organization in the world. By providing the mechanical engineering design and analysis for many of these missions, AMU has gained an enormous wealth of experience unsurpassed elsewhere and is uniquely qualified to perform similar work on LADEE. There is no other company that has participated in the



design of more space flight neutral mass spectrometers than AMU. This gives AMU a clear and unique advantage over other companies in being able to provide this required support that will enable the science requirements to be met within the aggressive schedule, mass, power and cost constraints imposed by the LADEE mission.

The LADEE NMS having a complex analytical instrument combined with an in-flight gas calibration system and a sophisticated electronics package becomes a complex, integrated system requiring great skills, knowledge and ingenuity in its' design to insure the scientific requirements are met while meeting very stringent mass, budget and schedule constraints. An in-depth knowledge of the inter-workings of a mass spectrometer, the in-flight calibration system and the electronics packaging system is a pre requisite for providing an efficient, well integrated system that can meet LADEE's requirements. With nearly 15 years of 'corporate knowledge' residing at AMU for performing similar work as required for LADEE, any other vendor would have to spend several months in just learning about the designs of previous instruments on which the LADEE design is based. They would also have to spend a considerable amount of time in learning about the complex interactions and interfaces between the mass spectrometer, the in-flight calibration system, the QMS to electronics interface and the mechanical structures and spacecraft interfaces in order to be on the same level as AMU. The amount of time required for another vendor to acquire such knowledge would be prohibitive and would cause schedule delays which would prevent the LADEE NMS team from meeting a critical Instrument Preliminary Design Review scheduled for September 15, 2009, and the Instrument Critical Design Review scheduled for February 8, 2010. This 4 ½ months time period is a very short time to complete the final design package for a new vendor. For comparison, CONTOUR had an 8 month time period between PDR and CDR and the CONTOUR QMS was nearly a clone of the QMS used for the Cassini Orbiter mission which was also designed by AMU. The time period between PDR and CDR for SAM was one year which is still less than typical planetary missions. For instance, the time period between PDR and CDR for the Cassini Orbiter QMS was two years with a one year time period prior to PDR for the preliminary design to occur. The learning curve to attain such a level presents an unnecessary technical risk to the government. AMU is uniquely qualified and best able to ensure the required work is completed in the very short time period allowed in the LADEE schedule.

AMU served as one of the lead element engineers for the SAM instrument suite. This will be another responsibility for LADEE. As a lead element engineer, AMU must manage personnel and budgetary resources; must ensure all work conforms to the LADEE NMS Functional Requirements Document, the NMS Interface Requirements Document, the Goddard's GEVS document, LADEE's Mechanical Subsystem Requirements and Implementation Plan and the LADEE's NMS Instrument Mission Assurance Implementation Plan. AMU will participate in weekly LADEE teleconferences, Monthly Management Reviews and all Peer Reviews, Preliminary and Critical Design Reviews. AMU will create Work Order (WOA) for each part fabricated and assembled and will oversee the fabrication and assembly for all components, subsystems and systems for which AMU has the responsibility. AMU will use the LADEE Management Information System (MIS) into which all drawings, documents and WOAs are submitted. AMU has 4 years of experience in performing all these activities as the SAM

project used the same configuration control management system. AMU can effortlessly begin working on these activities upon award of contract causing no delay in the schedule.

6. Description of the efforts made to ensure that offers are solicited from as many potential sources as practicable, including whether a notice was or will be publicized as required by Federal Acquisition Regulation (FAR 5.202):

Notice of intent to award a noncompetitive contract to AMU will be advertised in the Federal Business Opportunities (FedBizOpps) in accordance with Federal Acquisition Regulation Subpart 5.2. In addition, a synopsis will be issued on the NASA Acquisition Internet Service (NAIS) in order to inform potential sources of NASA's intent to award this effort to AMU and to provide them with the opportunity.

7. A determination by the contracting officer that the anticipated cost to the Government will be fair and reasonable:

The Contracting Officer will conduct a cost and price analysis to determine that the proposed prices will be fair and reasonable. We have also performed an in-house (independent government estimate) that will be used to evaluate the proposal for fair and reasonable costs.

8. Description of the market research conducted and the results or a statement of the reasons market research was not conducted.

A formal market survey was not conducted; however a similar procurement was synopsized previously on the NAIS and FEDBIZOPPS to ensure that any other potential offerors had the opportunity to express their interest in proposing to meet the requirements for the very similar SAM instrument suite requirements. No responses were received.

The expertise required for manufacturing the components and providing the services needed for the LADEE NMS are unique and specialized experience is required to design, develop and build them. Based on NASA GSFC engineering knowledge of the market that goes back more than 30 years in participating in similar missions, it is felt there is no other viable source that could readily participate in development of the LADEE NMS subsystems required here. Members of the project team, however, have always been alert for any vendor that may be able to provide similar support. Contacts are maintained with other research groups, universities and manufacturers during meetings, trade shows, etc. who might provide acceptable, low risk alternatives. To date, no alternate US source has been identified.

9. Other Facts Supporting the Use of Other than Full and Open Competition.

Previous experience with components and services needed for space flight mass spectrometers and gas chromatograph mass spectrometers has demonstrated that unique experience and expertise is required to properly design, develop, test, assemble, qualify and deliver these highly specialized components within the tight LADEE schedule constraints. This experience and expertise requires years of effort to develop and cannot be captured or developed by another vendor that lacks the above described level of experience and still meet the tight

LADEE schedule. The amount of time required for another vendor to acquire sufficient expertise to provide input for the LADEE NMS would be prohibitive. Any other manufacturer would incur substantial start-up costs to acquire the requisite expertise. The learning curve to attain such a level presents an unnecessary technical risk to the government. During the past few years, NASA/GSFC has been developing measurement techniques and identifying critical technology areas that are essential for producing a scientific compelling and high technology-ready experiment for the 2012 LADEE mission. The science and experimental team for LADEE has evolved over the past 3 years and now include Co-I's, companies and organizations who have either been involved with past GSFC's flight missions, and/or manufacture components and systems having high technology ready levels as a result of development funding from competitively selected SBIR and PIDDP sources. AMU is a member of this team. During the past year, AMU has been funded through a simplified acquisition procurement to begin work in preparation of various design and documentation packages and to support several LADEE project meetings and reviews. AMU is well positioned to provide a smooth transition into Phase B C/D activities. As discussed in Section 5, there is only a 4 ½ month time period between LADEE PDR and CDR. By the time this procurement is awarded, there will be only about 3 months before PDR making it essentially impossible for a new company to complete the required work under these time constraints. Selecting another source for these requirements would result in unacceptable risks and schedule delays negating any advantage of utilizing the competitive procurement process.

10. Sources, if any, that expressed an interest, in writing, in the acquisition:

As stated in paragraph 6, a notice of intent to award a noncompetitive contract to AMU Engineering will be advertised in the Federal Business Opportunity (FedBizOpps). Additionally, a synopsis will be issued on the NASA Acquisition Internet (NAIS). A synopsis was posted for 15 days on June 2, 2009, to solicit input from industry.

11. The action the Agency may take to remove or overcome any barriers to competition before any subsequent acquisition for the supplies or services required.

A subsequent acquisition of similar components and services in support of the LADEE NMS is not anticipated. Should a similar requirement develop in the future, it will be synopsized and competed to the maximum extent practical.

