JUSTIFICATION FOR OTHER THAN FULL AND OPEN COMPETITION (JOFOC)
(In accordance with Federal Acquisition Regulation (FAR) 6.3 – Other than Full and Open Competition)

1. **This document is a justification for other than full and open competition prepared by NASA's Goddard Space Flight Center (NASA's GSFC) for the procurement of a wave- and solar-powered surface ocean autonomous vehicle to support the PACE ocean vicarious calibration effort/activities.**

It is recommended that NASA Goddard Space Flight Center (GSFC) negotiate only with Liquid Robotics, Inc. (LR) for the procurement of a Wave Glider SV3 surface autonomous vehicle. This vehicle is autonomous, and powered by solar and wave energy, allowing it to be remotely operated in any ocean region for long distance (thousands of miles) and extended ocean surveys. The goal in this procurement is to obtain a small, surface autonomous vehicle that requires no fuel, has a very small surface signature to avoid self-shading (i.e. no sails or large masts), can be deployed and recovered from a small coastal vessel, has demonstrated long distance ocean crossings, and is a Commercially Available/Off-the-shelf (COTS) device. NASA's plan is to interface a profiling optical instrument to the SV3 platform to support the PACE ocean color mission vicarious calibration field studies.

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

The procurement will purchase components from LR that are related to the acquiring of a fully (end-to-end) deployable and operational SV3 platform, including components to support development of the instrument/platform interfacing and remote operation and control center components. The entire package of vehicle and supporting options such as the development kit have been configured to support the integration of the optical instrumentation using instruments that will be procured through funding from a submitted ROSES proposal (Ocean Biology and Biogeochemistry: Ocean Color Remote Sensing Vicarious (In Situ) Calibration Instruments Solicitation: NNH14ZDA001N-OBB). The optical instrumentation is being developed and fabricated by Biospherical Instruments, Inc., under the ROSES support and is not involved in any aspect of this procurement other than in the development of the procurement requirements for the vehicle and components. NASA recognizes the need for integration of the optical instrumentation, but the actual platform that will be obtained within this procurement will not require any further modifications.

NASA requires that this platform have the following:

1) A demonstrated record of multiple, successful, autonomous, long-term open ocean deployments;
2) An ability to easily integrate additional sensors into the platform;
3) A platform that is fully autonomous, can navigate via uploaded 'waypoints', has a broad range of over-the-horizon communication options, including Iridium, RUDICS, and cellular and local access via wireless communications (e.g. WiFi);

4) Is small (less than 12 feet in length and 36 inches in width and light weight (less than 150 lbs) enough to be deployed using small coast vessels and no more than 2 persons;
5) Is capable of at least 1-2 knts;
6) Requires no fuel, operating on a combination of wave and/or solar energy (wind power is not an option due to the sinding nature of the sails impacting the light field that this NASA project will be measuring);
7) Complete and simple operational system;
8) Capable of long (multiple years) ocean deployments;
9) Capable of on-demand operation in multiple navigational modes including: station keeping to within 50m watch circle and along-track using GPS-located waypoint pairs;
10) Optional reserve power at 12-22V using RS232/284 and 10/100 Ethernet communication options;
11) Redundant navigational safety features including: Automatic Information System (AIS), solid state magnetometer for accurate heading, GPS WAAS capable with 3m radius accuracy.
12) Weather station wave information;
13) Radar reflector, flag, and navigational lighting;
14) Minimum payload weight of 75 lbs;
15) Minimum payload volume of 3 cubic feet;
16) No significant above-water superstructure (e.g. no sails or high masts, no large size) that can pose problems in terms of shading of the solar irradiance field in the area of the platform; and.
17) Simple standard shipment capability using multiple crates for easy deployment to other global ocean regions.

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

This procurement will obtain the following equipment components and service/training that correspond to our entire SV3 system and training/service needs from LR. These items include:

- One (1) Wave Glider Mobilization Service (Launch);
- One (1) Wave Glider De-Mobilization Service (Recovery);
- One (1) Custom Training--SV3 and WGMS training in Hawaii for 4 people;
- One (1) Wave Glider SV3 Base Vehicle;
- One (1) Wave Glider SV3 Auxiliary Power Unit (1-MPU); and,
- One (1) Wave Glider SV3 3-MPU Payload Box for Integrators.

All of these components are necessary for supporting use and deployment of the platform and to allow NASA to support the integration of optical instrumentation and sensors.

The estimated cost of this procurement is valued at approximately $250,500.

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

The statutory authority permitting other than full and open competition is in accordance with FAR Subpart 6.302-1 (Only one responsible source and no other supplies or services will satisfy agency requirements), 10 U.S.C. 2304(c)(1). The Government intends to award using FAR Part 13 and Subpart 13.5 – "Test Program For Certain Commercial Items".

5. A demonstration that the proposed contractor's unique qualifications or the nature of the acquisition requires use of the authority cited:

NASA requires a long-duration, autonomous, surface, ocean-going robotic vehicle to deploy NASA-developed optical instrumentation into coastal ocean areas in support of the PACE mission in situ vicarious calibration/validation measurement activities. NASA has prior experience in developing these types of platforms (Higenbotham et al., 2008) and is aware of no other commercially available vehicle with the required performances and demonstrated long distance deployment experience that the LR SV2 and SV3 vessels presently have e.g. Frolov, et al., 2001). NASA has already supported the use of these platforms (3 total) in field experiments in support of the Aquarius salinity mission (www.spurs.jpl.nasa.gov), where their long-distance and long-duration capabilities were specifically tested and confirmed. These platforms are the only type of platform like this that can presently be obtained through a procurement of COTS technology. For these reasons, no other source other than Liquid Robotics can be utilized to obtain the needed supplies or services. In addition, Liquid Robotics and the National Oceanic and Atmospheric Administration (NOAA) have announced the signing of a multi-year, Cooperative Research & Development Agreement (CRADA) designed to advance ocean observations to improve U.S. weather forecasting, fisheries management and environmental monitoring.

Higinbotham, J.R. J.R. Moisan, C. Schirtzinger, M. Linkwitler, J. Yungel, P. Orton, 2008, Update on the development and testing of a new long duration solar powered autonomous surface vehicle, OCEANS 2008, vol., no., pp.1-10, 15-18 Sept. 2008, doi: 10.1109/OCEANS.2008.5152048.

Frolov, S., J. Bellingham, W. Anderson, and G. Hine, 2001. Wave Glider—a platform for persistent monitoring of algal blooms, IEEE White Paper.

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) 5.2:

A notice of NASA GSFC's intent to enter into this new sole source procurement with Liquid Robotics will be publicized on the NASA Acquisition Internet Service and in the Government-wide Point of Entry in accordance with FAR under Subpart 5.201 describing the subject requirement. This publication allows any potential unknown offerors the opportunity to be considered based upon their qualifications and capabilities for this type of platform and specific capabilities.

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

A thorough analysis of the proposal will be conducted to ensure the resultant negotiated cost is fair and reasonable.

8. Description of Market Research & Listing of Sources that Expressed Interest

As noted in item 6 above, a Notice of Intent Synopsis was posted soliciting information about NASA GSFC's intent to negotiate with LR subject procurement with the opportunity for potential sources to respond. No expressed interest was received. This procurement will be published in the NASA Acquisition Internet Service and in the Government-wide Point of Entry in accordance with FAR under Subpart 5.201.

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

The value of the duplicated costs to find another source to perform this effort is unknown since as stated above LR is the only source currently involved in fabrication of solar/wave powered surface autonomous vehicles that can be used to support the NASA PACE cal/val activities. Cost to duplicate this effort is not a factor in the requirement being sole source to LR. LR is the only source in the world providing this type of COTS surface autonomous platform and is the only demonstrated pioneer of this technology.

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

Not applicable.

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

The agency has been proactive in supporting the commercial development of surface autonomous vessels through its SBIR program activities. The only commercially available surface vessel that meets the present requirements noted above is the LR Wave Glider platform.

JOFOC Signature Page for procurement of a Liquid Robotics SV3 and Associated Support

TECHNICAL DIRECTORATE: I certify that the facts presented in this justification are accurate and complete.

Signature: [John R. Nelson] Date: 13 November, 2014

CONTRACTING OFFICER: I certify that this justification is accurate and complete to the best of my knowledge and belief.

Signature Date: 11/13/2014