

JUSTIFICATION FOR OTHER THAN FULL AND OPEN COMPETITION

Upon the basis of the following justification, I as Contracting Officer hereby approve use of the other than Full and Open competition for the proposed contractual action pursuant to the authority of 10 USC 2304(c)(1), only one responsible source and no other supplier or servicing activity will satisfy agency requirements, as implemented by FAR 6.302-1.

1. Contracting Activity

Naval Postgraduate School
Department of Contracting and Logistics
1 University Circle
Monterey, CA 93943

2. Description of the Action Being Approved

This justification covers the procurement of 3D Robotics Pixhawk autopilot and its accessories. from 3D Robotics (3DR). This justification for other than full and open competition will be posted at the Government wide Point of Entry.

3. Description of Supplies/Services

3DR Pixhawk Autopilot: Qty - 150

- Advanced 32 bit ARM Cortex® M4 Processor running NuttX RTOS
- 14 PWM/servo outputs (8 with failsafe and manual override, 6 auxiliary, high-power compatible)
- Abundant connectivity options for additional peripherals (UART, I²C, CAN)
- Integrated backup system for in-flight recovery and manual override with dedicated processor and stand-alone power supply
- Backup system integrates mixing, providing consistent autopilot and manual override mixing modes
- Interfaces with UART (serial ports), Sprechtrum DSM (for manual flight), and microSD card
- Redundant power supply inputs and automatic failover
- External safety button for easy motor activation
- Multicolor LED indicator
- High-power, multi-tone piezo audio indicator
- microSD card for long-time high-rate logging
- low cost
- utilizes open-source software
- lightweight
 - Weight: 38g (1.31oz)
 - Width: 50mm (1.96")
 - Thickness: 15.5mm (.613")
 - Length: 81.5mm (3.21")

3DR Pixhawk accessories: Qty - 150 each

- uBlox GPS without the case (required for autonomous flight)

NAVSUPINST 4200.85D, Encl (1)
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- 915 Mhz telemetry kits without the case
- DF13.4 5cm and 15cm cables; and DF13.6 5cm, 18cm, and 88cm cables Arming switch
- Buzzer for Pixhawk autopilot
- Pitot tube hardware (required for fixed-wing aircraft)

The estimated cost is [REDACTED]

4. Statutory Authority Permitting Sole Source

FAR 6.302 -- Circumstances Permitting Other Than Full and Open Competition.

- 6.302-1 -- Only One Responsible Source and No Other Supplies or Services Will Satisfy Agency Requirements.

5. Rational Justifying Use of Cited Statutory Authority

Use of any other autopilots (including those that are cloned and not authentic 3DR Pixhawk units) would be detrimental to the ongoing research efforts, due to a need for overcoming a new learning curve and retooling the capabilities for use in the Unmanned Aerial Vehicles (UAVs). Upon significant evaluation, continuing use of Pixhawks would leverage existing capabilities within the research (and education) efforts already present. Robot Operating System (ROS) software integration with the Pixhawk is critical, with established research and education elements using ROS for robot control, sensing, and interface. Only one other platform, OpenPilot Revolution, has claimed that they can be integrated with ROS. But, the processor is less capable, has no redundant sensors, there is less support available, there are fewer peripherals (no airspeed sensor at all, for one), no SD card, the telemetry radio is built into the board, making it difficult to move to the wingtip – it looks like this is really aimed at helicopters. The NPS is flying fixed wing UAVs and therefore OpenPilot Revolution does not straightforwardly meet this requirement.

6. Description of Efforts Made to Solicit Offers from as Many Offerors as Practicable

As the market research indicates, 3DR is the only company that can provide the autopilot and accessories that satisfies the requirements.

7. Determination of Fair and Reasonable Cost

Costs will be determined fair and reasonable at time of award by the Contracting Officer and based on previous contracts and similar contracting efforts.

8. Market Research

The NPS requires a light weight, open-source, and low-cost autopilot. The NPS tested the Procerus Kestrel and the CloudCap Piccolo line, and found that neither met the requirements for size, weight, cost, and open-source software. There are other low-cost (hobby class) open-source autopilots available, but none as advanced as 3DR's Pixhawk. Most

do not even offer GPS support. The existing Unmanned Aerial Vehicles currently use Pixhawk, that upon significant evaluation, continuing use of Pixhawks would leverage existing capabilities within the research (and education) efforts already present.

The following products were identified during market research, however, none of which meet the requirements:

OpenPilot Revolution:

The price is lower, but the processor is less capable, has no redundant sensors, there is less support available, there are fewer peripherals (no airspeed sensor at all, for one), no SD card, the telemetry radio is built into the board, making it difficult to move to the wingtip – it looks like this is really aimed at helicopters)

Paparazzi / Lisa

The price is comparable but the web site only lists the price of the autopilot (not the supporting components), and has no redundant sensors and a less capable processor.

VRBrain:

The price is lower, but it has less capable processor, no redundant sensors, fewer R/C channels supported, fewer peripheral ports, and the software is far less mature.

BeaglePilot:

This product is still being developed and is not yet close to mature enough to satisfy the requirements.

9. Other Facts Supporting Use of Other Than Full and Open Competition

N/A

10. Actions to Remove Barriers to Future Competition

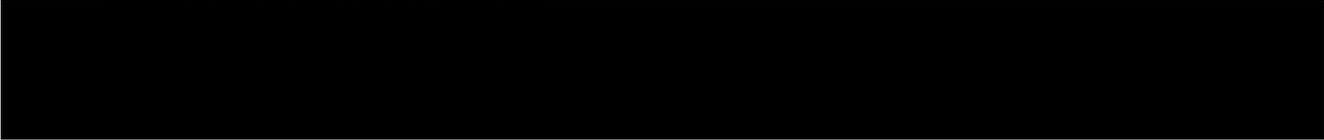
The NPS is encouraged by the OpenPilot (an all volunteer non-profit community project) and Paparazzi (a free and open-source hardware and software project encompassing an exceptionally powerful and versatile autopilot system for fixedwing aircrafts as well as multicopters) projects -- it may be that it becomes possible to use them as a source in the future. Currently, the obstacles to doing so are: their autopilots do not have the hardware to meet our needs (that may change in the future as hardware tends to follow Moore's Law), and their software and protocol stack are significantly different than our own and currently will not integrate into the Aerial Combat Swarms project without substantial effort and cost. The NPS intends to publish the protocols that it uses for Aerial Combat Swarms (e.g., BATMAN, Mavlink, ACS_message) in the hope that more vendors will support them in the future.

CERTIFICATIONS AND APPROVAL

TECHNICAL/REQUIREMENTS CERTIFICATION

I certify that the facts and representations under my cognizance which are included in this Justification and its supporting acquisition planning documents, except as noted herein, are complete and accurate to the best of my knowledge and belief.

Technical and Requirement Cognizance:



CONTRACTING OFFICER CERTIFICATION

To the extent that the LSJ value is between \$2,500 and \$150K for services and between \$3K and \$150K for products, the Contracting Officer's signature below also represents approval of the J&A/LSJ.

I certify that this Justification is accurate and complete to the best of my knowledge and belief.

