Objective: Develop software or a combination of software and hardware that enable an Unmanned Surface Vehicle (USV) to tailor its navigation safety active emissions and passive signatures to the current situation based on broad guidance given days earlier by a distant controlling station.

Description: Unmanned Vessels should be able to present an appearance that is appropriate to the current local situation. For example, a USV transiting through pirate-infested waters may seek to minimize its signatures to avoid attracting unwanted attention and a potential boarding. At the other extreme, a USV with a relatively low signature may want to increase its visibility in a high-traffic area to give other vessels more time to react to its presence. The USV may only be in intermittent communications with a distant oversight station, or communications may be completely severed. Therefore, the USV must be able to take the most recent broad guidance received and use it to adapt to the current local situation without real-time human assistance. The signature management may be limited to controlling radiofrequency (RF) emissions, but it may also include installing and operating hardware such as a hoisted radar reflector. Current manned vessels can and do manage their signatures, but the decision-making is done by people on those vessels. Research, development, and innovation are required to enable unmanned vessels to perform this function. The concept can be a novel way to reduce or enhance a particular signature, or it can be software for a USV to manage the signature that it presents, or both. Signature enhancement or reduction could be focused in one direction from the USV, or it could be an overall enhancement/reduction. Companies must include the expected scope of the Phase II effort in their Phase I proposals. Performance and technical requirements will be based on the solution that is proposed.

The Phase II effort will likely require secure access, and NAVSEA will process the DD254 to support the contractor for personnel and facility certification for secure access. The Phase I effort will not require access to classified information. If need be, data of the same level of complexity as secured data will be provided to support Phase I work.

Work produced in Phase II may become classified. Note: The prospective contractor(s) must be U.S. Owned and Operated with no Foreign Influence as defined by DOD 5220.22-M, National Industrial Security Program Operating Manual, unless acceptable mitigating procedures can and have been be implemented and approved by the Defense Security Service (DSS). The selected contractor and/or subcontractor must be able to acquire and maintain a secret level facility and Personnel Security Clearances, in order to perform on advanced phases of this contract as set forth by DSS and NAVSEA in order to gain access to classified information pertaining to the national defense of the United States and its allies; this will be an inherent requirement. The selected company will be required to safeguard classified material IAW DoD 5220.22-M during the advance phases of this contract.

Phase I: Provide a concept to solve the stated Navy problem and demonstrate the feasibility of that concept. At the end of Phase I, deliver a technical report including analysis showing how the concept would work and documenting its expected effectiveness. If the concept is for signature enhancement/reduction, its effectiveness should be measured in terms of expected percentage or dB enhancement/reduction as well as radians of coverage (2D case) or steradians of coverage (3D case) for the signature change. If the
concept is for signature management software, its effectiveness should be measured in terms of expected probability of matching a desired signature and expected time latency in changing the vessel’s signature. If practical and advantageous, conduct limited sub-scale prototyping and testing ashore or on a surrogate vessel. The Phase I Option, if exercised, will include the initial design specifications and capabilities description to build a prototype solution in Phase II.

PHASE II: Produce two prototype systems for testing and evaluation. If the solution is entirely a software product, integrate it with two different USVs using an Interface Control Document (ICD) supplied by Navy at the beginning of Phase II. Finish prototypes within three months prior to the end of Phase II, with the last three months of Phase II devoted to testing and demonstration of the prototypes. If the prototype includes any software, ensure that it complies with the Unmanned Maritime Autonomy Architecture (UMAA), which the Navy will provide at the beginning of Phase II. It is probable that the work under this effort will be classified under Phase II (see Description section for details).

PHASE III DUAL-USE APPLICATIONS: Support the Navy in transitioning the technology for Navy use. Ensure that, at the end, the Medium Unmanned Surface Vehicle (MUSV) and/or the Large Unmanned Surface Vehicle (LUSV) will have better control of its signatures even though the final product will vary based on the proposed solution. Deliver an integrated and tested hardware and software solution. (Note: Navy will provide ICDs in a timely fashion to support software integration.) Validate the product in a series of in-port tests followed by at-sea testing in a variety of conditions, depending on the nature of the solution. For example, if the solution changes the vessel’s appearance to an Electro-Optical sensor, then testing would occur in day and night conditions, clear visibility, haze, and fog.

Signature management tools for Navy USVs may be useful for unmanned or minimally manned commercial vessels. Such tools would allow a commercial vessel to make itself easier to detect for safety purposes, or harder to detect to avoid pirates.

REFERENCES:


KEYWORDS: Vessel Signature Management; Vessel Radar Cross-Section; Vessel Infrared Signature; Vessel Radiated Noise; Vessel Electromagnetic Signature; USV Autonomy