

Office of Naval Research Request for Information - Hypoxia Monitoring, Alarm, and Mitigation System

REQUEST FOR INFORMATION (RFI)

ONR RFI Announcement # 12-RFI-0007

I. DISCLAIMER:

This announcement constitutes a Request for Information (RFI) for the purpose of determining market capability of sources or obtaining information. It does not constitute a Request for Proposals (RFP), a Request for Quote (RFQ) or an indication that the Government will contract for any of the items and/or services discussed in this notice. Any formal solicitation that may subsequently be issued will be announced separately through Federal Business Opportunities (FedBizOpps). Information on the specific topics of interest is provided in the following sections of this announcement. Neither the Office of Naval Research (ONR) nor any other part of the federal government will be responsible for any cost incurred by responders in furnishing this information.

II. BACKGROUND:

The Office of Naval Research, Code 34, Warfighter Performance Department is seeking information regarding development, evaluation, and delivery of scientifically proven methodologies and technologies that enable the cognitive and physical superiority of Navy and Marine warfighters. Specifically, this call requests information that will aid in the development in the FY13/14 timeframe of three versions of a hypoxia monitoring, alarm, and mitigation system. The three versions are a fixed wing tactical, a rotary wing (RW), and a ground. The hypoxia monitoring, alarm, and mitigation systems will predict/detect/warn warfighters of impending hypoxic events based on individual physiological, environmental, and cognitive monitoring. The tactical version shall account for both altitude and acceleration-induced hypoxia; the rotary wing and ground systems will include a mitigation component, e.g., supplemental oxygen. The goal is to provide optimal protection of military personnel and equipment through intelligent monitoring and adaptive modeling that accounts for individual differences in tolerance and provides timely notification/warning aids such that personnel can take corrective action before human/air vehicle assets are compromised or lost.

The US Air Force has submitted an RFI for Air Force solutions in parallel with this effort, and the two Services will exchange information. Respondents to the Air Force RFI should also provide information in response to this RFI in the depth and formats requested in this RFI in order for their alternatives to be accurately considered in the analysis.

III. SPECIFIC INFORMATION OF INTEREST:

The responses shall address the design, fabrication, and testing of such a system that will integrate with existing personal protection equipment (PPE) and life support systems (LSS) without interfacing with vehicle power or data busses.

The following is provided as a guideline of initial systems capabilities. This is intended to establish baseline conditions for submissions and is not meant to constrain or direct responders to a specific point design or evolved set of solutions. The primary areas to address are (1) sensing suite, (2) detection/prediction algorithm, (3) warning modalities, and (4) modes of mitigation. Responders are encouraged to submit their ideas that cover some or all of these areas.

Physiologic sensors must be miniaturized sensors self-contained, low power, and unobtrusive, and must require minimal interaction with warfighters. These should be easy to maintain and calibrate without special tooling. Any person-borne system must not present an increased injury risk in the event of aircraft ejection or vehicle crash.

Physiologic monitoring for tactical suites should include oxygen mask breathing air quality/expiration of O₂, CO₂, flow, and pressure. Other parameters should be monitored to detect the presence of toxins in breathing gas, such as CO, NO, and hydrocarbons. Tissue responses, such as blood oxygen saturation (SpO₂), cerebral tissue oxygen content (rSO₂), and blood dyshemoglobins (carboxyhemoglobin (COHb) and methemoglobin (MetHb)) should be considered. Respiratory rate and function, as well as physical workload are also key parameters. Consideration should be given for developing sensor suites that do not include a tightly sealed aviator mask as well.

The system should include environmental measures, such as barometric pressure, acceleration, temperature and humidity.

All recommended sensing transducers should specify the necessary calibration methods for error sources.

An advanced adaptive monitoring algorithm should account for both the textbook predictions of hypoxia based on barometric pressure as well as individual variations in tolerance. It should predict physiologic state and how it changes over time and compute level of risk accordingly. The working environment will have multiple noise sources, including speaking, respiratory maneuvers, mask leaks, and data drop outs which must be considered. Predicted decrements in physiologic and cognitive / motor responses should factor into the decision algorithm to classify the type of warning issued.

The responses shall include a thorough description of the associated supporting power requirements, electronics, PPE and LSS integration details, safety-of-flight testing necessary to obtain a safe-to-fly status for at least initial testing, procedures for using the recommended system, and how such a system would impact the maintenance and life-cycle costs associated with a potential deployment of the system across specific aircraft types.

The Navy is interested in innovative solutions that address both the needs of warfighters and the personnel that maintain the system. Technologies should demonstrate that they meet and ideally exceed the current state of the art in quantitative metrics such as (but not limited to) size, weight, efficiency, effectiveness, producibility, power and interface requirements, term of expected availability, suitability for the industrial and military marketplace, initial cost, and life-cycle costs. Given the time

frame outlined in this RFI, the focus of the submissions should be on advanced technology solutions in the middle development stage.

IV. SUBMISSION INSTRUCTIONS and FORMATTING REQUIREMENTS:

- a. Responses to this RFI are due by **June 13, 2012** to the following email address: sheri.parker@navy.mil. Any response received after this date will also be considered but may not be included in initial reporting or assessments.
- b. All responses should be in PDF or MS Word format and emailed to the technical point of contact (CDR Sheri Parker) at sheri.parker@navy.mil. The subject line of the email should read, "Hypoxia RFI."
- c. Unclassified/Classified RFI Responses: All responses should be unclassified. All information received in response to this RFI that is marked proprietary will be handled accordingly. Responses to this notice will not be returned.
- d. Format specifications include 12-point font, single-spaced, single-sided, 8.5 by 11 inches paper, with 1-inch margins in either Microsoft Word or Adobe PDF format. Responses should not exceed 7 pages and should assume that we understand the operating environment in which we are seeking to address science and technology challenges. Research efforts should focus on budget activity 2 and budget activity 3 research.
- e. Submission of Documentation
 - i. Cover Page (1 page) with RFI number and name, address, company / institution, technical point of contact, with printed name, title, email address, phone, and date
 - ii. Table of contents with page numbers
 - iii. Abstract (1 page)
 - iv. Technical data and approach (4-5 pages, approximately 1500-1800 words)
 - v. No cost or pricing information should be provided. Any received will be deleted and destroyed.
 - vi. Due to email constraints, the size of the submission is limited to 10 MB.

V. ADDITIONAL INFORMATION

This RFI is an exchange of information between Government, Academia, and Industry. It is the first step of an iterative process aimed at understanding the existence of sources that can deliver a hypoxia monitoring/warning/mitigation system described herein. Additional RFIs requesting further detail may be issued in the future to continue the Government's informational exchange with Academia and Industry. Information received as a result of this request is expected to be proprietary to the responding company and will be protected as such. Any proprietary information received in response to this request will be properly protected from any unauthorized disclosures; however it is incumbent upon the responder to appropriately mark all submissions. The Government will not use any proprietary information submitted to establish the capability, requirements, approach, or solution so as to not inadvertently restrict competition. In order to complete its review, ONR CODE 34 must be able to share the information within the Government and with its support contractors; therefore, any responses

marked in a manner that will not permit such internal Government review may be returned/deleted without being assessed/considered.

The Government may invite outstanding RFI responders to present their ideas at a future public workshop. These ideas will include not only concepts that are technically superior and achievable within the FY13/14 timeframe, but also ideas that appear to provide operational benefits that address the needs of current and future Naval operations.

VI. QUESTIONS AND POINT OF CONTACT:

Questions of a technical nature regarding this RFI may be sent to the following Technical Point of Contact:

Name: CDR Sheri Parker, MSC, USN
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875 N Randolph St, Arlington, VA 22203
Email Address: sheri.parker@navy.mil