UNITED STATES SPECIAL OPERATIONS COMMAND
SBIR FY04.3 Proposal Submission

The United States Operations Command's (USSOCOM) mission includes developing and acquiring unique special operations forces (SOF) equipment, material, supplies and services. USSOCOM is seeking small businesses with a strong research and development capability and an understanding of the SOF operational characteristics. The topics represent a portion of the problems encountered by SOF in fulfilling its mission.

Inquiries of a general nature or questions concerning the administration of the SBIR program should be addressed to:

United States Special Operations Command
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USSOCOM will only accept proposals for those topics stated in this solicitation. The USSOCOM Program Executive Officers (PEOs) responsible for the research and development in these specific areas initiated the topics and are responsible for the technical evaluation of the proposals. The Phase I and Phase II proposal evaluation factors are listed below. Each proposal must address each factor in order to be considered for an award.

Selection of proposals for funding is based upon technical merit and the evaluation criteria in Section 4.0 of the solicitation. Phase I and Phase II funding is limited, therefore USSOCOM will select and fund only those Phase I and Phase II proposals considered to be superior in overall technical quality and most critical to the mission. USSOCOM may fund more than one proposal in a specific topic area if the technical quality of the proposal is deemed superior, or it may fund no proposals in a topic area.

Potential offerors must submit proposals in accordance with the DoD Program Solicitation at www.dodsbir.net/solicitation. The maximum amount of SBIR funding for a USSOCOM Phase I award is $100,000 and the maximum time frame for a Phase I proposal is 6 months. A Phase I proposal for less than 6 months and/or less than $100,000 is encouraged where low risk technologies are being proposed.

USSOCOM, may request a Phase II proposal from any Phase I contractor, based on the results of the Phase I effort utilizing the criteria in Section 4.3. A Phase II proposal for less than 24 months and/or less than $750,000 is encouraged. The maximum amount of **SBIR funding** allocated for a USSOCOM Phase II award is $750,000 and the maximum time frame for a Phase II award is 24 months. Proposals should be based on realistic cost and time estimates, not on the maximum time (months) and dollars. The cost of the project is based on the overall amount of hours spent to accomplish the work required and the overall term of the project should also be based on the same effort. In preparing the proposal, (including the statement of objectives and milestones), firms should consider that workload and operational tempo will preclude extensive access to government and military personnel beyond established periodic reviews.

Electronic Submission Instructions

All proposal information must be received electronically via the DOD SBIR/STTR Submission site. To submit, proceed to http://www.dodsbir.net/submission. Once registered, a firm must prepare (and update) Company Commercialization Report Data, prepare (and edit) Proposal Cover Sheets, complete the Cost Proposal form, and upload corresponding Technical Proposal(s). The proposal submission, exclusive of the Company Commercialization Report, must not exceed 25 pages.

Paper copies will not be considered. A complete electronic submission is required for proposal evaluation. An electronic signature is not required on the proposal. Please note that there have been problems reported in the past when using AOL for large file uploads; therefore, we suggest using an alternate internet service

provider for files larger than 5MB. It is strongly suggested that all firms **submit final, completed proposals 5-7 days prior to the solicitation closing date to ensure complete submission**. *Firms are entirely responsible for complete and timely submission of the proposal.*

Firms are encouraged, but not required, to embed graphics within the technical proposal file. When including images, care should be taken to ensure images are not of excessive size. A resolution of 200 dpi or below is requested for all embedded images. Please use standard fonts in order to prevent conversion difficulties.

Performing a virus check on each proposal to be uploaded electronically is the responsibility of the firm. The detection of a virus on a submitted electronic technical proposal may be cause for proposal rejection. *E-mail submissions will not be accepted.*

The DoD SBIR/STTR Submission site will present a confirmation page when a technical proposal file upload has been received. The upload will be available for viewing on the site within an hour. It is in your best interest to review the upload to ensure the server received the complete, readable file.

For additional information about electronic proposal submission, including uploading your technical proposal, refer to the instructions on the solicitation and the on-line help area of the DoD SBIR/STTR Submission site, or call the DoD SBIR/STTR Help Desk at 866-SBIRHLP (866-724-7457).

Please note that E-mail is the only method of communication that will be used by the contracting office to notify the submitter/proposer if they have or have not been selected for an award, therefore please include the e-mail address of the person authorized to negotiate contracts for your firm.

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SOCOM 04.3 Topic Descriptions

SOCOM04-006 TITLE: SOF Tactical Repeater

TECHNOLOGY AREAS: Electronics

OBJECTIVE: Design and build a small lightweight man portable tactical UHF/VHF repeater that will provide enhanced LOS communications (voice and data) connectivity.

DESCRIPTION: Currently Special Operations Forces face a myriad of tactical communications challenges within their Areas of Operation (AOR) which directly affect Line of Sight Communications (LOS). Examples of these challenges are terrain obstacles (both urban and rural), and limited over the horizon capability (SATCOM). Because of these unique challenges, the LOS capability of the legacy SOF military radios is very limited at best. The SOF Tactical Repeater will give the Special Operations Soldier the ability to overcome these current communications and information challenges by providing a small, lightweight relay capability on demand according to environmental and situational need. This tactical relay capability would build upon already existing commercial repeater technology and tailor itself toward military radio specific concerns such as encryption, frequency, data throughput and compression and power. This capability would have the potential of enhancing situational awareness by providing radio communicators the ability to overcome both urban obstacles (buildings) as well as terrain obstacles (mountains and valleys). This increased capability would allow for transfer of situational critical information within the battlefield area specifically by overcoming obstacle limitations that would normally force over the horizon communications operations in too many cases. With this increased capability to move information more freely, already over used SATCOM channels could be less burdened. In addition, this tactical repeater capability could tie into already emplaced sensors to allow for transfer of mission critical information that does not necessarily have to be pushed out over the horizon to higher echelons of command.

Of major importance in gaining the most effect of a tactical repeater is actual employment/deployment of the repeater itself. Consideration would be given as to the most viable means of employment/deployment of the system. As with all LOS signal based repeaters three primary factors need to be considered for optimal use, distance between relays and height above ground and power level. The SOF Tactical repeater employment consideration would examine the following delivery methods: hand emplacement, weapons delivery emplacement, robotic emplacement, UAV emplacement, and rotary and fixed wing emplacement.

PHASE I: Develop overall system design to include specifications for size, weight, power, frequencies, channels, antennas, and emplacement delivery.

PHASE II: Develop and demonstrate a prototype system in realistic urban and rural environment. Conduct testing to prove feasibility over extended operating conditions.

PHASE III: This system capability could be used in other military and civilian types of applications such as Combat Search and Rescue (CSAR) or Search and Rescue (SAR), Surveillance and Reconnaissance (SR), Force Protection, Information Operations (IO), Civil Disasters, Situational Awareness, Combating Terrorism (CT), and Unconventional Warfare (UW).

KEYWORDS: Tactical repeater, small, lightweight relay capability, urban and rural, low power draw, camouflaged, high antenna gain, channel spacing, re-useable, disposable, encryption, combat search and rescue (CSAR) or search and rescue (SAR), surveillance and reconnaissance (SR), force protection, information operations (IO), civil disasters, situational awareness, combating terrorism (CT), and unconventional warfare (UW). communications, intelligence, over the horizon capability, and seamless.

SOCOM04-007 TITLE: Vertical Wind Profile Data Collection Using Laser Technology on Unmanned Delivery Platforms.

TECHNOLOGY AREAS: Air Platform, Ground/Sea Vehicles, Sensors

OBJECTIVE: Design and build a Light Detection and Radar (LIDAR) vertical wind profiling system for the Wind Supported Air Delivery System LDS variant. The maximum weight of the complete system shall not exceed 30 pounds and have maximum volume not to exceed one cubic foot. The maximum altitude of interest is currently 18,000 foot Mean Sea Level. The wind profiler shall be designed as a standalone system so that it can be later used on various Unmanned Aerial Vehicles (UAV) or on commercially available aircraft.

DESCRIPTION: The Leaflet Delivery System (LDS) Acquisition Program requires the capability to provide real-time vertical wind profiles to aid in precision air delivery and data collection in support of long range and short range unmanned aerial variant employment. Real time wind profiles are essential for precision air drop delivery of Psychological Operation materiel such as leaflets, as well as cargo delivery such as ammunition, medical, water, and food supplies, and data for plume tracking, meteorological modeling, missile accuracy etc. Legacy means of wind profiling expose personnel and high cost aircraft to combat loss. Miniaturized LIDAR technology can provide real time vertical wind profiles to delivery platforms for wind correction at a drop site, and additional environmental parameters such as humidity, biochemical readings, etc. for data transfer updating local situational awareness relevant to other weapon systems employment.

Proposals should reflect the vendor's expertise, especially in power efficiency, small package design, and what they propose to research. Phase I companies will discuss their proposed research in detail and propose in general what they would continue in Phase II.

Design considerations:
- Size and weight is the main concern.
- High power output operation, low heat signature is very desirable.
- Power efficient designs will be given higher ranking.
- Keep in mind that the LIDAR system may be moved between UAV frequently.

Proposers should budget for a single one day trip to Tampa, Florida for a Phase I kickoff meeting.

Successful proposals will use novel ideas to improve soldier usability, create future commercial markets, and increase functional capability. Pluses include:
- Fully demonstrating the company's past and present experience;
- Supplying references on proposing company's products/programs (particularly government program managers);
- Giving detail on its proposed technologies to show expertise.
- Showing detailed expertise in technologies related to this SBIR.
- Experience designing products for use in a military environment.
- Companies that can assist the topic author in commercializing the product.

The proposing company should be prepared to deliver products in accordance with the general information outlined in each of the phases as listed below:

PHASE I – Develop an overall system design that includes expected human-mechanical interfaces (HMI), human operational factors, rated power continuous operation, low heat signature, and operational requirements. Design documents must include MTBF projections, maintenance concept, system specifications, operation with commercially available or military procured UAV and aircraft, and a commercialization concept. Provide a Final Technical Report which will be evaluated to determine which Phase I company will be selected to continue development in Phase II.

PHASE II – Develop, build, and demonstrate a prototype system in a realistic military field environment. Conduct extensive testing to prove feasibility over varied extended operation conditions, to refine/validate MTBF data, validate HMI, establish power output data in UAV and aircraft configurations, and to validate the total system design. Make system design modifications, as necessary, within the proposed budget to ensure Government satisfaction with the prototype. Provide a Final Technical Report of Phase II activities which includes test results and final system specifications.

PHASE III DUAL-USE APPLICATIONS: This system could be used by US Military psychological operations (PSYOP) forces, with either a manned aircraft or a UAV, to assist in the delivery of PSYOP messages to target audiences in denied areas on by leaflets. This LIDAR system could also be used by civilian emergency response authorities or aerial fire fighters to precisely deliver cargoes or personnel in a given geographical area of an emergency situation.

KEYWORDS: psychological, psyop, leaflet delivery system, lds, uav, lidar, wind profiling, radar

SOCOM04-008 TITLE: Alternative Power Sources

TECHNOLOGY AREAS: Ground/Sea Vehicles, Electronics

OBJECTIVE: Design and build a rechargeable power source that can collect energy over a wide range of illumination intensities and can operate unattended for 4 years or greater. The energy platform shall assure long-term reliability with no batteries and virtually no maintenance and shall be capable of operating 24 hours a day/7 days a week for extended periods under extreme weather conditions. The power storage module shall be enclosed in a waterproof enclosure with watertight feedthrough connectors and associated cable harnesses. The weight and volume of the power storage module and solar charging system shall meet requirements for man portable systems.

The energy platform shall be highly scalable and adaptable. It shall also be configurable to support a wide range of applications and tailored to interface with a wide variety of sensors. A series of power modules shall be developed to accommodate outputs of 5, 10 and 25 watt-hr/day capacitance. Typical mission profiles illustrating steady state and burst power consumption per event and number of events (day and night) that occur per day for unattended ground sensors and imaging systems.

DESCRIPTION: Battery power sources are a major weakness for unattended sensor systems. Current systems depend on batteries – an unreliable, short-term source of energy, particularly when used under severe environmental conditions. To meet SOF operational requirements, a robust, reliable, alternative energy solution is required to power remote sensor systems. Recent advances in photovoltaic technology and power storage devices are making possible a new generation of rechargeable, highly robust, long-term power sources that can operate over a wide range of illumination conditions. This technology has been demonstrated to deliver solutions for low-power applications (e.g., irrigation management sensors). This SBIR topic addresses the need to scale up the power output by an order of magnitude to support equipment that draws significantly more power. There are obvious technical risks associated with this objective, but if the these requirements could be met, the resulting alternative power system would have a significant impact on operations.

PHASE I: SYSTEM DESIGN: Develop the preliminary design for 5, 10 and 25 watt-hr/day stackable power modules.

PHASE II: PROTOTYPE DEVELOPMENT: Develop a prototype system and conduct evaluations to demonstrate its capabilities in a realistic environment. Conduct testing to prove feasibility over extended operating conditions. Phase II tasks include the following:

1. Develop the detailed design for the 5, 10 and 25 watt-hr/day stackable prototype power modules.
2. Build two 25 watt-hr/day power module/solar collector prototypes.
3. Conduct developmental testing of the 25 watt- hr/day rugged prototype power module/solar collector.

4. Incorporate any required changes based on Developmental and Test Plan feedback.
5. Deliver two ruggedized power module solar collector/capable of multiple stacks of 25 watt-hr/day power outputs, incorporating modifications based on test results.

PHASE III: DUAL-USE APPLICATIONS: This alternative power system could be used in a broad range of military and civilian security applications where persistent unattended surveillance and tracking are necessary -- for example, in homeland security operations or in enhancing security in industrial facilities. The power systems described in this SBIR Topic would also be useful for any type of monitoring system that is remote (no access to electrical power, periodic battery replacement would be difficult) and needs to operate over extended time periods. Examples of such applications are forest fire alert, flood alert, earthquake alert, and irrigation management.

KEYWORDS: Alternative power sources, sensors, persistent unattended surveillance, tagging tracking and locating.

SOCOM04-009 TITLE: Image Intensified Lightweight Lens Development

TECHNOLOGY AREAS: Materials/Processes, Sensors

OBJECTIVE: In recent years there have been dramatic technical advancements in optical design techniques related to high performance imaging zoom lenses. Using a sophisticated computer software/hardware package, an experienced zoom lens designer can generate up to 4 million optical ray traces/second during the design reiteration process to generate the optimum optical design solution for highest performance. Similar technical advancements have occurred in the use of alternative synthetic optical and barrel materials utilized in the construction of precision lens systems. These respective technical advances, combined and successfully implemented, can result in major increases in performance, user utilization and the cost effectiveness of lenses for sophisticated night vision in MIL environment applications. The purpose of this project will be to collectively integrate these technologies into a low risk design configuration for subsequent hardware fabrication of unique high performance lenses.

The Phase 1 investigation will explore feasibility and develop a low risk high performance design approach for a multi focal length incrementally stepped zoom lens. The lens should be suitable for both video and direct viewing image intensified systems and utilize a C mount interface, 1" (16mm) format, with an approximate free aperture of 125mm. Selective optional fixed focal length configurations, derived from and based upon the basic design formulation should be explored to address standard intensified manual night vision scope applications. The goal will be to formulate a compact optical/mechanical design approach with a major reduction of weight compared to traditional lenses of this class thereby increasing field portability in addition to significant increases in optical range performance. The initial study will include, but not be limited to, analyzing various optical design forms and investigating of alternative optical and barrel materials traditionally utilized. The envisioned optimum design goal will incorporate three (3) incremental stepped zoom positions along with focus and aperture attenuation, all user controllable. Subject to weight and size restrictions, the multiple FL/f stop aperture positions will be selected for optimum acquisition, recognition and identification ranges of man/vehicle size targets down to overcast starlight conditions. The lens will be optically corrected and coated for the combined visible/near IR spectrum and will address thermal stability and color defocus considerations. The objective is to demonstrate these lenses in an environment of -30F through 120F without loosing performance.

This study will require a comprehensive specialized understanding of night vision requirements related to aperture, FOV (Field of View) and optical performance along with an appreciation of the trade off practicalities of size, weight, and other germane factors. This knowledge, along with sophisticated optical design techniques and utilization of suitable alternative synthetic construction materials will be necessary to successfully address the goals of this program. Proven manufacturing capability pertinent to hardware implementation of units proposed will be expected to insure low risk.

Design MTF and other salient performance data along with comprehensive range modeling data, based upon industry standard procedures and should be presented for all proposed unit configurations derived from the Phase 1 study.

PHASE I: Develop overall system design that includes specification of video surveillance and recognition technology, sensor specification, and protocol operation.

PHASE II: Develop and demonstrate a prototype system in a realistic environment. Conduct testing to prove feasibility over extended operating conditions utilizing fielded night vision systems.

KEYWORDS: Lens, focal length, MTF, optical Methods and Technologies, SPIE. 1996