UNITED STATES SPECIAL OPERATIONS COMMAND

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. Proposal evaluation factors are listed below and each proposal must address each factor in order to be considered for an award. Prior to July 1, 2002, scientific and technical questions may be directed to the topic author, and after that, through the DTIC SBIR Interactive Technical Information System (SITIS).

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 will request Phase II proposals on a case by case basis. The proposal must be structured as follows: the first 10-12 months (base effort) should be approximately $375,000; the second 10-12 months (option) of incremental funding should also be approximately $375,000. 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 plan 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.

Evaluation Criteria – Phase I & II

1) The soundness, technical merit, and innovation of the proposed approach and its incremental progress toward topic or subtopic solution.

2) The qualifications of the proposed principal/key investigators supporting staff, and consultants. Qualifications include not only the ability to perform the research and development but also the ability to commercialize the results.

3) The potential for commercial (Government of private sector) application and the benefits expected to accrue from this commercialization.

Selection of proposals for funding is based upon technical merit and the evaluation criteria included in the solicitation. As funding is limited, USSOCOM will select and fund only those proposals considered to be superior in overall technical quality and most critical. 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.

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 your firm has been registered, you may prepare (and edit) Company Commercialization Report Data, prepare (and edit) Proposal Cover Sheets(s) (formerly referred to as Appendix A and B), complete the Cost Proposal form, and upload corresponding Technical Proposal(s). The electronic proposal must be transmitted to the site by 3:00PM EST on August 14, 2002. The proposal submission, exclusive of the Company Commercialization 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. Proposal evaluation will be accomplished via a secure web site. Please call (866) 724-7457 (SBIR Help Desk) for assistance in uploading proposals. Please note that there have been problems in the past with AOL uploads, therefore we suggest using an alternate internet service provider (ISP) for files larger than 5MB. It is strongly suggested the proposal be submitted 3-5 days prior to closing date to ensure complete submission. Firms are entirely responsible for complete and timely submission of the proposal.

Refer to the on-line help area of the DoD SBIR/STTR Submission site for questions, troubleshooting, etc. For further assistance, contact the help desk at sbirhelp@brtrc.com or (866) 724-7457.

USSOCOM offers information on the Internet about its SBIR program at http://www.socom.mil and http://www.acq.osd.mil/sadbu/sbir.

Electronic Technical Proposal Upload

The term "Technical Proposal" refers to the part of the submission as described in Section 3 of the Solicitation. WordPerfect, Text, MS Word, RTF, and PDF are the only acceptable formats for proposal submissions. You are encouraged, but not required, to embed graphics within the document. 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. An overall file size of 5MB or less is recommended for each electronic proposal submission.

You will receive a confirmation page via the submission site once the proposal has been uploaded. The upload will be available for viewing on the DoD SBIR/STTR Submission site within 24 hours. It is within your best interest to review the upload to ensure the server received the complete file. Questions or problems should be directed to the help desk as mentioned above.

You are responsible for performing a virus check on each proposal to be uploaded electronically. The detection of a virus on any submitted electronic technical proposal may be cause for the rejection of the proposal. *USSOCOM will not accept e-mail submissions*. You should contact your Internet Service Provider if you have questions concerning the provider's file size transmission allowance.

USSOCOM
FY 2002.2 SBIR TOPIC INDEX

SOCOM02-006 **TITLE**: Worldwide C4I for Special Operations Forces Combatant Craft

TECHNOLOGY AREAS: Information Systems Technology

OBJECTIVE: To develop innovative, secure systems to enable real time communications with Special Forces Operations Combatant Craft deployed anywhere in the world with sufficient band width to enable command structure decision making, to monitor craft and personnel status and to enable real time failure analysis and in some cases, correction of deficiencies that critically impact mission performance.

DESCRIPTION: USSOCOM is incorporating an Integrated Bridge System into SOF Combatant Craft. IBS consolidates the information from on board radar, GPS, optical sights, weapons control, propulsion system monitoring, communication functions, navigational charts and normal craft administrative functions into one or redundant workstations. Developing a system of secure communications would increase situation awareness by incorporating data from remote locations such as video imagery from a closer camera, AWACS input and other real time data available to the command structure. If the on board system is capable of receiving the data from the remote location, it should also be capable of sending on board data to remote locations. By sending target data to the command structure, the decision to engage can be reviewed in real time. The same system would also be capable of transmitting the status of the various subsystems on the craft and the status of the personnel if a personnel status monitor were developed. With the craft and personnel status data available, persons at a remote site, not under the stress of boat operation and/or combat conditions could conduct trend analysis, or failure analysis and could devise work around plans for a failure, or in some cases actually send software instructions to make the repair without crew involvement. This system would be secure so that intelligence data cannot be monitored by external means.

PHASE I: Design a secure, probably encrypted, communication system that takes maximum advantage of on board systems, is compatible with the Integrated Bridge System and can either directly or with local relay be connected via world wide net to over the horizon remote locations. The design must include identifying algorithms and communication equipment interface to facilitate to the best means of exchanging video and bi-directional data over existing low bandwidth communication equipment currently in use on SOF Maritime Combatant Craft. The design should not preclude expansion of bandwidth or data rates as new communications equipment is deployed anywhere in the system.

PHASE II: Determine which encryption and transmission methods are effective within the constraints of existing compression rates. Produce a prototype system using data from IBS, the onboard communications system based on the PRC-117F radio (which allow encryption and frequency hopping). Install the prototype system on one or more SOF Combatant Craft and determine the effectiveness and the impact on operator workload.

PHASE III DUAL USE APPLICATIONS: Security and timeliness of data are major stumbling blocks for web-centric information systems, especially for wireless systems. Any progress in this area would greatly enhance the ability of local Law Enforcement and Emergency Response Teams to respond to local emergencies and to take advantage of a command structure that can see the big picture in real time. A system of this sort deployed to individual police and firefighters would have been invaluable in the recovery from the attacks on the World Trade Center. If this radio in the system could be reduce for just local transmission, and all the other elements of the system left in place i.e., encryption, data and video compression and real time, full time transmission, it could be deployed to individuals, squad cars, SWAT teams, and emergency response vehicles.

KEYWORDS: Automation; Control; Remote; Trouble-Shooting; Support; Weapons

SOCOM02-007 **TITLE**: Special Operations Forces Combatant Motion Recording and Biofeedback

TECHNOLOGY AREAS: Biomedical

OBJECTIVE: Deliver accurate, wireless, fieldable, full-body motion recording system and biofeedback system for training Special Operations Forces Special Boat Unit (SBU) combatant craft crewmembers. System will provide corrective biofeedback signals to novice crew trainees for optimum body positioning to best mitigate effects from shock. Basis will be data recorded directly from expert/experienced crew or otherwise derived from extrapolated conclusions.

DESCRIPTION: USSOCOM personnel are exposed to high shock environments aboard SOF maritime combatant craft. That environment represents a risk of injury to personnel, especially SBU crewmembers who are exposed to shock environments continually over extended periods (years) of time. One means for significantly reducing personnel risk is proper training. USSOCOM desires an untethered, biofeedback system that will assist in risk reduction training. The first and foremost

requirement of the apparatus is that it must not present any heightened risk to the user. It must not, for example, have any hard points that could impinge upon or penetrate the body. It must be completely self-contained on the user. It must require no equipment on the boat other than what is on the user. For systems requiring frequent calibrations, the calibration process must be sufficiently fast and automatic to be used by minimally trained SBU personnel. The system must be low power for long-duration operations with minimal battery load and pose no shock risk to the user. At a minimum, it must measure posterior/anterior knee and ankle bend, varus/valgus of the knee, posterior movement of the spine near along several sites, and movement of the head relative to the plane of the shoulders. It must measure accelerations at appropriate body locations and in appropriate planes of motion while minimizing soft tissue artifacts. All data collection, processing and interaction with the biofeedback system must require little to no user interaction. The system must operate over a 24-hour time period with appropriate duty cycle. The system must collect data at a rate of 60 Hz or higher when risk is judged to be highest. The system will record all data so that, if desired, it may be downloaded onto a shore-based computer. Data download must be fast and require minimal manpower. The biofeedback system must produce outputs that cause a reduction in risk of injury. The system will withstand harsh marine environments with minimum downtime. If worn on the body, the system will be washable using standard hand-washing techniques.

PHASE I: Develop the system concept to assess the feasibility of approach and technology readiness. Areas to consider include: biofeedback data requirements, sensor requirements and selection, sensor placements, sensor network communications architecture, embedded systems software architecture, data processing software architecture, detailed calibration approach, systems integration and human-systems integration. Build breadboard and brassboard components to demonstrate the concept.

PHASE II: Build field-testable prototype systems that demonstrates sensor data collection, low-power operation, sensor network communications, and integration with higher level platform capable of housing biofeedback system. Collect data on actual SBU training missions at site to be determined by USSOCOM to demonstrate potential capabilities and utility to SOF operators.

PHASE III DUAL USE APPLICATIONS: A rugged, accurate, untethered motion sensor suit has great commercial potential. In the health science field, it could be applied to the in-situ study of sports injuries, such as the causes for noncontact anterior cruciate ligament injuries in athletes, especially young female athletes where such injuries are approaching epidemic proportions. For military markets, the system may be used for training dismounted infantry in complex motions either directly via a biofeedback approach or as a tool in validating virtual environments.

REFERENCES:

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Greenwald RM, France EP, Rosenberg TD, Toelcke T: Significant Gender Differences in Alpine Skiing Injuries: A Five Year Study, Skiing Trauma and Safety: Tenth International Symposium, ASTM STP, 1266, RJ Johnson, CD Mote (ed), ASTM, Philadelphia, PA 1995

Greenwald RM, Toelcke T: Significant Gender Differences in Alpine Skiing Injuries: A Profile of the Knee Injured Skier, Skiing Trauma and Safety: Eleventh International Symposium, ASTM STP, 1289, RJ Johnson, CD Mote (ed), ASTM, Philadelphia, PA 1997

KEYWORDS: Biofeedback, shock mitigation, small boat unit, training

SOCOM02-008 **TITLE**: Special Operations Forces Combatant Craft Signature Reduction

TECHNOLOGY AREAS: Ground/Sea Vehicles

OBJECTIVE: Elimination of large wake and “rooster tail” expressions that increase the likelihood of detection and compromise the stealthiness of Combatant Craft when operating a high speeds.

DESCRIPTION: When operating at moderate to high speeds, the propulsion systems of current Combatant Craft produce wake or “rooster tail” expressions that are highly detectable by modern sensor systems. Reducing the radar cross section of the craft must be accompanied by the reduction of these propulsor induced disturbances above the surface of the water. Future generations of Combatant Craft must have propulsors that allow them to operate at all speeds with minimum risk of detectability due to wake or “rooster tail” effects.

PHASE I: Identify at least one candidate propulsor that will shows promise in eliminating highly detectable wake and “rooster tail” effects, while not significantly impacting the navigation draft of the candidate Combatant Craft. Conduct modeling and simulation to predict overall performance and mission effectiveness for a candidate Combatant Craft equipped with such a propulsor in the areas of speed, range, maneuverability, sea keeping, mission effectiveness and transportability. Additionally, provide cost and schedule estimates and a top level plan to modify a candidate Combatant Craft with the proposed propulsor(s) and conduct feasibility testing during Phase II.

PHASE II: Install the proposed propulsor(s) on the candidate Combatant Craft and conduct testing aimed at demonstrating the reduction and/or elimination of detectable wake and “rooster tail” effects.

PHASE III DUAL USE APPLICATIONS: Above propulsor(s) will have pleasure boat appeal ("Special Ops derived"), to help eliminate wakes and associated damage to boats and property. Other law enforcement applications include USMC, US Army, and USCG craft where detectability is an issue.

KEYWORDS: Propulsors, wake effects, detectability, signatures, modeling and simulation

SOCOM02-009 **TITLE**: ANALOG/VIDEO COMMUNICATIONS LINK

TECHNOLOGY AREAS: Information Systems Technology

OBJECTIVE: Special Operation Forces (SOF) tactical users lack an off the shelf configurable package that permits them to easily tailor a system to their data and communication needs. Currently, a system must be configured and built each time data must be moved.

This SBIR will research, design and build a family of inexpensive, rugged, small, low power tactical data/communication links for deployed SOF personnel. The system will use selectable transmission types that have a low probability of intercept/detection (LPI/LPD).

DESCRIPTION: LPI/LPD communications is very important to the SOF (and military) community. Frequency hopper spread spectrum (FHSS) is no longer considered to be LPI/LPD. Newer technologies, such as direct sequence spread spectsorum (DSSS) and ultra-wide modulation, could potentially enhance SOF data links.

This SBIR will build a family of inexpensive data link/communication options for deployed SOF personnel. This SBIR will research the newest technologies in LPI/LPD signals and the latest in video and audio compression; then recommend AT LEAST two configurations for moving communications (such as voice) and data both in short and long haul configurations. This will become part of a ¡§toolbox¡¨ available to SOF.

The design is foreseen to work in two different scenarios:

<< First, as a JTWS receiver to receiver communicator, allowing the soldier to either send data/information to a fellow soldier and/or permitting voice communications. This will be accomplished by the easy installation of a card transceiver (Cxcvr) on a selected source such as a JTWS receiver or his body worn computer.

<< Second, as a way to place a sensor (such as a motion detector) and have the data transmitted back to the soldier's JTWS receiver (or body worn computer). This will be accomplished by the easy installation of a sensor transceiver (Sxcvr) on a selected source such as a sensor, and a transceiver on a selected receiving base station (Cxcvr), which will probably be a JTWS receiver.

For the Sxcvr, the proposer will design very small, low power transceivers to be connected to any source (unattended aerial vehicle (UAV), camera, etc.). For the Cxcvr, the transceivers will be placed on a PCMCIA and CPCI cards for use with a JTWS receiver or inserted into a computer. Thought should be given to how the proposer will have a robust design to allow connection to varied sources. The transceivers should be capable of passing any analog (including voice) and digital data. This data will be sent via the LPI/LPD link, in a format proposed by the researcher (most likely TCP/IP). The transceiver should have software variable compression capability. When used with a sensor, the Sxvcr will be DC powered from a small internal battery, and have the capability of being powered externally (e.g. from the sensor's power).

A plus would allow multiple transceivers to relay signals. If using TCP/IP, the transceiver should have a unique selectable IP address. The system should be capable of at least sending live video at 30 frames per second (pfs) 640x480 resolution video (requirement) in near real time. Innovative proposals will permit base and/or relay stations to automatically relay data.

The "base" or receive station can be anything from a wearable computer on a roaming SOF operator to a true base station located at a safe location. The Cxvcr (with or without its antenna), decompression hardware, etc. will be implemented on at least PCMCIA and C-PCI (16 bit) card formats. These can then be inserted into a laptop, wearable computer, or custom designed base station. The RCVR should have a built-in antenna, but allow for a higher gain external antenna.

The "base" station will use NT compatible software (requirement) and have as an objective to be operating system independent and be Joint Threat Warning System (JTWS) Component Architecture and Framework (JCAF) compliant. Note: SPAWARSYSCEN Charleston (SSC-C) Code 71 can assist the bidder with the JCAF software. Information on JCAF is found in the reference below.

When configuring the system for use, the user should be permitted to choose the modulation type by connecting the desired transceiver, then installing the correct Cxvcr into the base station (if space permits, would prefer both chosen LPI/LPD modulation types be on the same card) and configuring the system with pull down menus. A plus would allow the link to establish at full power, then automatically lower power until data can still be sent with an acceptable error rate. A plus would allow the link to continuously monitor itself and adjust the power level according to conditions. Innovative proposals will permit one Cxvcr at the base station to receive more than one Sxvcr sensor at a time.

Proposers should budget for a single day trip to Tampa, Florida for a Phase 1 kickoff meeting.

Successful proposals will use novel technology to achieve substantial enhancements to equipment size, weight, performance, reliability, power consumption, data rate speeds, and/or cost or offer new ways of computing, communicating, sensing or displaying information.

Successful proposals will use novel ideas to improve soldier usability, create future commercial markets, and lower future costs of upgrades to the system. Pluses include:

<< Employees who have operational experience in the tactical and/or SOF arena;

<< Incorporation in Phase 2 of Wolfpack technologies, funds permitting;

<< Fully demonstrating the proposing 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 expertise in communications, fabrication, and LPI/LPD signals.

The proposal should detail the firm's experience in innovative advanced software design and familiarity on working with hardware. The proposer should be prepared to deliver products in accordance with the general information outlined in each of the phases as listed below:

PHASE I: The proposer in Phase 1 will perform an in-depth research of the latest in communications, modulation, compression, and LPI/LPD signal type technologies. The proposer will then recommend at least two configurations to be able to communicate in two modes, Line of Sight (LOS) and over the horizon. Efforts should focus on technological approach for addressing the requirement. Research, document, and give an estimated price per unit of a short haul and beyond the horizon capability. A demonstration of the two types chosen (but not necessarily in final form) will be seen as a plus.

PHASE II: Develop system design after significant interaction with SOF tactical users that specify how they want the system to be used. Preference should be given to commercial off the shelf (COTS) parts/equipment to minimize the per unit cost in Phase III. Develop system prototypes numbering at least the following:

<< Four Cxvcr of chosen modulation/configuration type 1, two on PCMCIA card format and two on 32 bit C-PCI card format (if space permits, both types can be put on one card).

<< Four Cxvcr of chosen modulation/configuration type 2, two on PCMCIA card format and two on 32 bit C-PCI card format (if space permits, both types can be put on one card).

<< Four Sxcvr of the two chosen modulation/configuration types. Connection to what types of sensors for testing will be decided at the start of Phase 2.

<< A small "base" station using a PC104 format computer, with PCMCIA and/or C-PCI slots.

Integration and testing will be on any platform the Proposer chooses. Final demonstration will use a Digital Receiver Technology (DRT) receiver (although the attempt should be made to allow the software to be used on any platform). SOCOM will provide two DRT's as GFE for at least two weeks for the final test.

Will be required to demonstrate in a realistic tactical environment using two Sxvcr sending data at the same time from two different sources to a soldier, and show soldier to soldier communication. Conduct limited testing to prove feasibility over a seven-day mission scenario.

PHASE III DUAL USE APPLICATIONS: This system is designed primarily for SOF tactical operations, and has application in at least two PEO-IIs programs. It will also have application with the other military services (Marines and Army have expressed interest) and law enforcement agencies. With the explosion of wireless technologies, a company could easily spin this product line off in the commercial world.

REFERENCES:
DARPA: Small Unit Operations. http://www.darpa.mil/ato/programs/suosas.htm
"Wolfpack Hunts Down Enemy Emitters," AFCEA Signal Magazine, December 2001, pgs. 57-59. Magazine info: www.afcea.org/signal or signal@afcea.org
Darpa's Wolfpack program: www.darpa.mil/ato/programs/wolfpack.html
POC for JCAF is Charles Frasch, SPAWAR Systems Charleston, cfrasch@spawar.navy.mil, 843-218-4734.
For an unclassified copy of the JTWS Operational Requirements Document (ORD), see the SITIS page for instructions.

KEYWORDS: RF, VIDEO, LINK, COMMUNICATIONS, DSSS, FHSS, FREQUENCY HOPPER, SPREAD SPECTRUM, C-PCI, PCMCIA, ULTRA WIDEBAND

SOCOM02-010 **TITLE**: Frequency Hopper/DSSS Detection

TECHNOLOGY AREAS: Information Systems Technology

OBJECTIVE: Research and design algorithms that will enable detection of (threshold) and demodulation (objective) of frequency hopper spread spectrum (FHSS) and Direct Sequence Spread Spectrum (DSSS) signals on a software definable receiver. If hardware is needed, plug and play technology in the PCMCIA and/or C-PCI formats will be used.

DESCRIPTION: SOF tactical users lack a software package that permits them to monitor spread spectrum and other advanced wideband signals. The commercial and government use of these types of signals is exploding. SOF operators cannot currently monitor these kinds of communication in a small package; being able to do so can and will save lives.

This SBIR will fund the research and design of algorithms that will detect and identify (requirement), and demodulate (objective) spread spectrum, and in particular frequency-hopping signals. These algorithms will be implemented into the Joint Threat Warning System (JTWS) software definable receivers. JTWS uses the Digital Receiver Technology (DRT) family of receivers. Proposer should design and implement any needed electronics onto the C-PCI and/or PCMCIA formats, which the DRT receivers use. Software will be written for the NT operating system. However, innovative proposals will design for algorithms that can be used easily on any platform or on any operating system.

Proposer should include a design that will allow for easy upgrades as new signals/signal variants come available in the future. Proposer should also allow for detection of variants of the same signal type that occurs in different parts of the world.

Proposer should incorporate the new Joint Cryptologic Architecture Framework (JCAF) into its design. Information on JCAF can be obtained from Navy SPAWAR Systems Charleston, Mr. Charles Frasch, cfrasch@spawar.navy.mil.

Potential bidders should acquire a copy of the Joint Threat Warning System (JTWS) Operational Requirements Document (ORD) for more information on requirements. JTWS ORD can be obtained from widdoed@socom.mil, with request for JTWS ORD in the subject line. Proposers should budget for a single day trip to Tampa, Florida or Baltimore, MD for a Phase 1 kickoff meeting.

Integration and testing will be on the Digital Receiver Technology (DRT) family of receivers, although the attempt should be made to allow the software to be used on any platform to increase commercialization.

Successful proposals will use novel ideas to improve soldier usability, create future commercial markets, and lower future costs of upgrades to the system. Pluses include:

<< Employees who have operational experience in the tactical and/or SOF arena;

<< Detection of other advanced signals such a 802.11, bluetooth, and ultra-wideband.

<< Fully demonstrating the proposing company's past and present experience;

<< Supplying references on products/programs (particularly government program managers);

<< Giving detail on its proposed technologies to show expertise.

<< Showing expertise in frequency hopper/spread spectrum detection and demodulation.

The proposal should detail the firm's experience in innovative advanced software design and familiarity on working with hardware, especially receivers. Proposers should be prepared to show their expertise to later solve some of the harder problems, such as encryption and bandwidth. The proposer should be prepared to deliver products in accordance with the general information outlined in each of the phases as listed below:

PHASE I: Research and report on FHSS and DSSS variant types used throughout the world, in preparation for a smart Phase II design. Develop system and algorithm design on one of those variants to show expertise. All efforts should focus on technological approach for addressing the requirement.

PHASE II: Develop full version of the algorithms and incorporate as many algorithms as possible into the DRT family of software definable receivers. Funds permitting, look into other advanced signals. Conduct limited testing to prove feasibility over a seven day mission scenario. SOCOM will provide a DRT receiver as GFE.

PHASE III DUAL USE APPLICATIONS: This system is designed primarily for SOF tactical operations, and has application in at least two PEO-IIs programs. It will have wide interest with the other military services, intelligence community, and law enforcement agencies. A successful Phase II will result in the developing company being one of the leaders in small frequency hopper monitoring equipment.

REFERENCES:
For an unclassified copy of the JTWS Operational Requirements Document (ORD), see the SITIS page for instructions.

KEYWORDS: COMMUNICATIONS, DSSS, FHSS, FREQUENCY HOPPER, SPREAD SPECTRUM, C-PCI, SOFTWARE DEFINABLE RADIO, SOFTWARE

SOCOM02-011 **TITLE**: HF to UHF Camouflaged Antenna

TECHNOLOGY AREAS: Information Systems Technology

OBJECTIVE: SOF tactical users lack a high frequency (HF) to ultra high frequency (UHF) type of antenna package that permits them to clandestinely monitor communications.

This SBIR will research, design and build a family of rugged, inexpensive tactical antennas for deployed SOF personnel in two different versions; one as a tent and the other as camouflage netting.

DESCRIPTION: Development of transparent or non-traditional antennas offers placement possibilities not formerly possible. The designer will use the latest in antenna technologies to design a series of transparent antennas that can receive HF up to at least UHF frequencies.

This SBIR seeks to design and build a family of antennas that to the casual observer looks like an ordinary military tent and/or camouflage netting. Proposals will use novel technology and antenna theory to permit a "normal" size camouflaged tent or net to be a receiving antenna. Due to the long wavelengths of HF, proposer will need to use innovative antenna technologies to maximize sensitivity from a smaller than the optimum antenna.

We envision a readily available supply of camouflage antennas that have different characteristics, such as omni-directional versus directional; HF, VHF, and/or UHF, etc. Innovative proposals will allow the user to easily configure the antennas to maximize for the reception desired (for example, the ability to zip individual camouflage together to create the antenna package desired, and could be zipped in "parallel" or "series" to get the desired frequency range and/or extra gain).

For the tent version, the tent should look like any military issue tent to the normal observer.

For the camouflaged netting version, the netting should look like any military issue netting, and could be placed over any structure or possible bushes/trees.

Both would permit SOF to connect their receivers to the tent or netting to receive RF signals. Proposer may incorporate an antenna into existing tents/netting or make a designed antenna look like a tent/netting. Proposer should include designs made of lasting materials, due to the expected rough treatment in the field.

Also, a transmitting antenna version will be needed, with the capability of transmitting at least 100 Watts in the HF frequency range.

Innovative proposals will permit future integration of netting or tent parts to allow reception up into the GHz range (e.g. to receive satellite transmissions), or if costs permit included as part of this SBIR.

A desirable addition integrated into this package would be a very small, high dynamic range preamplifier for the 20MHz and higher frequency range. The preamp should have the capability of being DC powered either through the coaxial cable, or an external DC connection.

The proposer should attempt to use as much as possible the latest in commercial off the shelf (COTS) and Government off the shelf (GOTS) equipment and provide for future upgrades as technology and requirements change.

Proposers should allow for a single day trip to Tampa, Florida or Baltimore Maryland for a Phase 1 kickoff meeting.

Successful proposals will use novel ideas to improve soldier usability, create future commercial markets, and lower future costs of upgrades to the system. Pluses include:

<< Employees who have operational experience in the tactical and/or SOF arena;

<< 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 expertise in antenna theory and application.

Successful proposals will use novel technology to achieve substantial enhancements to equipment size, weight, performance, reliability, power consumption and/or cost.

PHASE I: Effort should focus on technological approach for addressing the above requirements, to include the proposed antenna technologies and ideas for antenna design. This should result in the delivery of a preliminary Systems Design Document (SDD). Providing modeling simulations of the intended design and any sample antennas would be a plus. Accompanying the SDD would an in-depth cost estimate for developing two prototype systems in Phase II for use in developmental test and evaluation.

PHASE II: Significant interaction with SOF tactical users will be required to ensure that the system being designed will meet their needs. Develop system prototypes (at least 2 of each antenna design). Will be required to demonstrate in a realistic tactical

environment with the users partially through the program. User input will then be included into the final design. Range testing will be needed to verify VSWR and Gain specifications. Conduct final limited testing to prove feasibility over a seven day mission scenario.

PHASE III DUAL USE APPLICATIONS: This system is designed primarily for military tactical operations, and has application in at least two USSOCOM programs. It will also have application with the other military services and law enforcement agencies. In addition, an enterprising company could spin this product off into the commercial market as an advanced antenna product, with uses, for example, in wireless communications area.

KEYWORDS: HF, VHF, UHF, HIGH FREQUENCY, VERY HIGH FREQUENCY, ULTRA HIGH FREQUENCY, ANTENNA, ANTENNAS, CAMOUFLAGE, TENT, NETTING.

SOCOM02-012 **TITLE**: Threat Warning Software

TECHNOLOGY AREAS: Information Systems Technology

OBJECTIVE: SOF tactical users lack a dynamic software package that will give Special Forces a smart threat warning capability. Having this capability will save lives during dangerous missions.

The purpose of this SBIR is to research, design and create a threat warning software package that will be the basis for future SOF technology. This will be accomplished by researching the latest in software technologies, and incorporating graphic maps with direction finding (DF) information, in order to smartly design a system that will be dynamic enough to allow SOCOM to keep up with technology changes.

DESCRIPTION: USSOCOM is currently developing its next generation of Intelligence gathering and threat warning equipment, under the Joint Threat Warning System (JTWS) program. In order to keep up with the fast pace of technology, JTWS is using software definable receivers (SDRs) and plug and play technology. The Ground, Maritime, and Air versions will use the same baseline hardware. JTWS uses standard Compact PCI (C-PCI) and PCMCIA card slots, and an NT operating system. It is hoped that this SBIR will be the starting point to encourage companies to voluntarily build accessories and capabilities for this detection system.

One important aspect of the threat warning software will be its detection of ¡§threat¡¨ signals. The software should be able to detect and ID signals as threat or friendly, and include this into a database that can be built and shared. Further, the software should have the flexibility to learn and be configurable by any user to behave as the user wants. An equally important aspect of the software is a provision for Battlefield Mapping, and the software should incorporate NIMA, UAV and other mapping data into the overall picture. This will allow for overlaying map data with locating information (e.g., Line of Bearing or DF) into the threat warning picture. A plus would allow the user to automatically download the latest in map information (e.g. over the internet) for inclusion into the database.

JTWS uses the Digital Receiver Technology (DRT) family of software definable receivers, although the software should be dynamic enough to permit use of other receivers. JTWS (and DRT) uses an NT operating system. Innovative proposals will allow the software to be operating system independent.

The software will attempt to be Joint Component Architecture and Framework (JCAF) compliant. This software package will be the first commercial software designed for JCAF; this research will be an interactive design that improves portability and the JCAF design. The SBIR winner will work with SPAWARSYSCEN Charleston (SSC-C) Code 71to make JCAF a better design product. If the Proposer feels that he has a better solution than JCAF, this should be documented.

The software will have an open architecture software system that will permit future hardware and software upgrades and will permit easy incorporation of other equipment and software that SOF might desire.

Proposers should budget for a single day trip to Tampa, Florida or Charleston, SC for a Phase 1 kickoff meeting.

Integration and testing will be on the Digital Receiver Technology (DRT) family of receivers, although the attempt should be made to allow the software to be used on any platform.

Successful proposals will use novel ideas to improve soldier usability, create future commercial markets, and lower future costs of upgrades to the system. Pluses include:

<< Employees who have operational experience in the tactical and/or SOF arena;

<< Fully demonstrating the company's past and present experience;

<< Supplying references on proposing company's products/programs (particularly government program managers);

<< Integration of Specific Emitter Identification (SEI) technology;

<< Giving detail on its proposed technologies to show expertise.

<< Showing expertise in target identification and/or smart software design;

<< Experience with battlefield mapping.

The proposal should detail the firm's experience in innovative advanced software design and familiarity on working with hardware, especially receivers. Proposal should list clearance information, and ability to handle classified information (we do not expect the contract to be classified, but some information in Phase 2 may be classified). The proposer should be prepared to deliver products in accordance with the general information outlined in each of the phases as listed below:

PHASE I: Selected participant(s) will research past/present target identification technologies and the latest in smart software, and report on the pros and cons of different possibilities that could be used to meet SOF requirements. Then propose a system software threat warning design for the JTWS. By the end of Phase 1, contract participants should have a limited amount of software written that will demonstrate the proposal, including the look and feel.

PHASE II: Significant interaction with SOF tactical users will be required to ensure that the system being designed will meet their needs. The program will be run in phases, in order to get the hardware and software out to the users for feedback. Will be required to demonstrate in a realistic tactical environment with the users partially through the program. A DRT receiver will be provided GFE to the Phase II contractor.

PHASE III DUAL USE APPLICATIONS: A number of organizations in the Intelligence Community have teamed together on the JTWS system. These teaming organizations are very interested in this SBIR. Although this SBIR is designed primarily for military tactical operations, it will also have applications with the other military services and law enforcement agencies. An enterprising company could spin this product off into the commercial market as an advanced signal search product, with uses, for example, in wireless communications area. In addition, JCAF has a good possibility of being the standard for tactical operating systems; the winner of this SBIR would be in position to capitalize on this market by being a JCAF consultant or developing more applications that are JCAF compliant.

Acquisition Programs Supported: Joint Threat Warning System, PEO-115

REFERENCES:
POC for JCAF is Charles Frasch, SPAWAR Systems Charleston, cfrasch@spawar.navy.mil, 843-218-4734.
For an unclassified copy of the JTWS Operational Requirements Document (ORD), see the SITIS page for instructions.
Digital Receiver Technology (DRT) web page and contact info: www.drti.com,
Mr. Acie Vickers, 301-916-5554 x103.
"Smarter Web," MIT Technology Review, November 2001, pgs. 52-58. Magazine info: www.technologyreview.com
"Wolfpack Hunts Down Enemy Emitters," AFCEA Signal Magazine, December 2001, pgs. 57-59. Magazine info: www.afcea.org/signal or signal@afcea.org
Darpa's Wolfpack program: www.darpa.mil/ato/programs/wolfpack.html
MiDAS, Military Digital Analysis System, by Defence Research Establishment Ontario (DREO), http://www.dreo.dnd.ca/pages/factsheet/ew/ew017_e.pdf

KEYWORDS: Threat Warning, software, JCAF, SIGINT, NT, Operating System, database, receiver, software definable receiver, SDR, threat, warning, SEI, battlefield mapping, emitter.

SOCOM02-013 **TITLE**: Portable Signal Identification Training

TECHNOLOGY AREAS: Information Systems Technology

OBJECTIVE: This concept describes the creation of a portable, lightweight threat warning training system that will fulfill the need for experienced threat warning soldiers.

Whether on foot or in vehicles, whether on the move or still, it is imperative that our Armed Forces know where hostile forces are located. As technology races ahead and new technologies are created that threaten our forces, it becomes imperative that sufficient training be provided. Currently most training is on the job, where soldiers learn while on maneuvers. Most soldiers are not trained to recognize all threat signals, and do not have the time or means to learn all of the signals that they should. Technology can now permit quick and efficient training that will save lives.

DESCRIPTION:
This SBIR will research and build a portable signal training system prototype contained in an easy to use software/hardware package. SOCOM envisions two different training scenarios:

1. The soldier sits down in front of a laptop computer containing the training system;

2. Live signal collection is simulated by the training system "transmitting" (via cable or over the air) to a soldier using his preferred signal detection system.
The laptop and "signal generator" (in this SBIR, this term is used to define what will generate the signal, not the classic signal generator. It is up to you, the proposer, to decide what will best generate the signals) should be able to simulate any kind of threat signal to include domestic and foreign cellular, radar, INMARSAT, HF Comms, etc. (Desired signals will be specified with user input). An option should be included to choose up to at least 50 test signals, then transmit them in order or random with selectable dwell and duration times. Creativity by the proposing companies is encouraged. The system should contain an external signal input to permit a user to insert custom signals to be modulated. Other possibilities include simulated GPS locations, NIMA map data input with signals coming from different directions, and any other input that the trainee's monitoring equipment can receive. Innovative designs will allow easy insertions of future upgrades and/or signal types. The subject author has been told there are software libraries of signals available that could be run on a DSP, which would save money and hardware size.

A smart software package will need to be created to allow a database of signals to be built, added to, and easily accessed.

Scenario 1 (requirement):
This configuration will allow a soldier to sit in front of a laptop and use the training system. Proposer initiative is encouraged, but as a minimum, the laptop display should teach the soldier what the spectral display and sound of a signal is like.

Scenario 2 (objective):
The purpose of scenario 2 is to now take this database and transmit it to the soldier, permitting a soldier to be trained using his/her own receiving equipment using the simulated signals. This allows the trainer and trainee to train for both signals and the equipment. Innovative proposals could even allow design or incorporation of receiver training into the system (receiver of choice for this SBIR is the Digital Receiver Technology (DRT) family of receivers.

The system should be able to be setup in any environment, from a field to a city or base. It should have the capability to train from a laptop alone, transmit via cable to a receiver, transmit from one antenna, or from a series of antennas arranged in a circle or line and be quickly configured, reconfigured, and dismantled.

Possible scenarios for the multiple antenna include a soldier in a boat, vehicle, or with a backpack learning to recognize signals using a single antenna in front of him; a soldier positioned inside a circular antenna field wearing his threat warning or any receiving radio system (even vehicular); air receiving system (e.g. in a helicopter) that flies by the antennas that are placed in a line with different signals emitting from each. All of these scenarios will permit trainees to practice reception and identification using live threat signals.

An innovative proposal would permit the computer to generate "threat" and "non-threat" signals and permit these signals to be transmitted off of select antennas (when more than one is used). By allowing this as he moves, the soldier can learn and practice what signals are threats. By transmitting only on certain antennas, the soldier can also practice direction finding (DF) skills. The circle of antennas could also be placed around a live training exercise, further enhancing the realism of the exercise.

The base package should be composed of a laptop computer running NT, a "signal generator", and a communications package that will send the generated signal to an antenna chosen by the trainer. The antenna package will contain at least 8 easily deployed antenna packages that can be used individually or configured in a line or large circle (at least 1 mile) and be programmed to transmit the generated signal individually or collectively. Innovative designs will permit the circle to be enlarged and/or use more or less antennas in the array and design the software to recognize this and to automatically configure itself.

Each antenna package should contain the receiving and transmitting antennas, electronics, and base in one easy to carry package. Personnel will be able to easily install the antenna package(s) by inserting it/them into or on the ground. The antenna electronics will be powered by either a DC or AC source, and include the option to power by commercial AAA, AA, C, or D size batteries. Innovative proposals will include rechargeable batteries with an AC input and small solar charging panel that will run the electronics and charge the batteries during the day.

Innovative designs will include self-test software to test antenna connection(s), and will assist personnel with correct placement of the antennas if using in a circle. User friendly software will permit trainers to quickly choose signal types, line of bearing, signal level, etc. while the trainee is collecting signals from the threat warning system.

If the training location is in a Radio Frequency (RF) "quiet" area, the system should also be capable of creating non-threat or random signals.

The base package should be able to communicate with all antenna packages using wireless technology. The base package transmitting to the closest antenna package and this package relaying to the next closest antenna package is acceptable, and may be desirable. This communication can either be:

- Analog (the "signal generator" transmits out of band to the antenna packages where the signal will be upconverted and/or downconverted into the band of the receiving), or

- Digital (the "signal generator" transmits the signal to the antenna packages that would have unique IP address and could relay the signal among themselves). The signals will then be transmitted from the appropriate antenna(s).

A late request from a SOCOM Component for a training system similar to the above has been received by the topic author, and is included below as an objective to incorporate these requirements as well: "The system will be capable of providing real time imagery, sensor data collection, communications and photo/video imagery. The system will continually record and assess student performance and at predetermined "level of knowledge", increase the tempo and complexity of subjects. Instructional data will be transmitted from the Subject Matter Expert (SME) and instructor to the student via this system. Students will be given a series of tasks to perform using situational data provided and have the ability to mine additional data, i.e., and season specific movement routes for infiltration and exfiltration. The system will be capable of displaying up-datable friendly and enemy situation data, video/ photos and fingerprints of selected individuals. It will be mission and case based intelligent tutoring systems Subject Matter and instructor controlled oversight and control. The student will determine the best alternative(s) to perform tasks, based on the presentation and a series of alternative solution sets. Students will be given the opportunity to true/false situations prior to implementation, determine the best alternative/s to perform the assigned tasks.

The application of this system will include, but will not be limited to subjects taught in the Special Forces Course, Civil Affairs and PSYOP courses where subjects require demonstration and performance.

The system will make use of industries "packet data protocols" for communications application, expanding traditional messaging, to data, facsimile, imagery, live video, data compression and query capability to databases to elicit responses of graphic and other data. To further link this system to industry standards capabilities such as, packet switching " Asynchronous Transfer Mode (ATM)" and those supporting protocols enabling efficient use of available bandwidth, i.e., "bandwidth on demand". This will be a student employed training system/s. Maintenance and replacement costs must be kept to a minimum and will not require the addition of technologies for low probability of detection/ exploitation and interception of communications."

Building and marketing this training system as a base system with add-ons for different customers is acceptable, and may end up being desirable (e.g., some customers may not want the antenna package).

Preliminary discussions with users indicates extreme interest across many Services, especially if the designer can design a robust, easy to use system at a decent cost.

Successful proposals will use novel ideas to improve soldier usability, create future commercial markets, and lower future costs of upgrades to the system. Pluses include:
- Employees who have operational experience in the tactical and/or SOF arena;
- 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 expertise in target identification and/or smart software design.
- Experience with battlefield mapping/incorporating maps into signals intelligence.
- Knowledge of signal software libraries, and a plan to easily integrate them into the training system, saving development time and money.

The proposal should detail the firm's experience in innovative advanced software design and familiarity on working with hardware. The proposer should be prepared to deliver products in accordance with the general information outlined in each of the phases as listed below:

PHASE I: Perform a study to evaluate current commercial technologies that could fulfill the above requirements. Research to determine if a current library of signals exists and is available that could be generated with this system (this would allow users to

import signals at any time and save future cost). The study will concentrate on yielding the best system at the lowest power consumption, ease of use, and production cost. Begin work on database and training software. Develop design for submission for Phase II. Provide an estimate of per system cost at phase III.

PHASE II: Design and build, or modify existing COTS hardware/software, to perform and/or support the desired functions. Build two to four prototypes to conduct extensive user testing that demonstrates ease of use, data and environmental compliance, and successful performance of desired functions. Innovative proposals will find commercial interest that would fund a Phase III production run. An enterprising company could work with SOCOM's Threat Warning Software SBIR being run in parallel to have this SBIR have the same look and feel to better train SOF.

PHASE III DUAL-USE APPLICATIONS: This system could be used effectively by a wide portion of military, police, FBI, and others who need to increase real life training practice or test new monitoring equipment. This training and testing could include hand held, backpack, maritime and vehicular monitoring systems. This SBIR could be spun off to have wide civilian portable wireless applications.

Keywords: ANTENNA, COMMUNICATIONS, TRAINING, THREAT WARNING, THREAT, SIGNAL, SIGNAL GENERATOR, WIRELESS, BLUETOOTH, RF, RADIO FREQUENCY, DIGITAL SIGNAL PROCESSING, DSP