DARPA goes deep with ASW sensor network

■ BY RICHARD SCOTT

KEY POINTS
- DARPA revives SOSUS sub surveillance under DSOP
- Increased depth of the array poses comms challenges

The US Defense Advanced Research Projects Agency (DARPA) has disclosed plans for a deep ocean sensor network that could provide a long-range anti-submarine surveillance capability sufficient to protect 'blue water' Carrier Strike Group operations.

This new initiative, which envisions a distributed system of sensors and sources on or near the ocean floor, harks back to the SOSUS (Sound Surveillance System) deep-water long-range detection capability deployed by the US Navy during the Cold War. It also signals a revival in interest in blue-water anti-submarine warfare (ASW), an area that has largely taken a back seat in the two decades since the end of the Cold War and the demise of the erstwhile Soviet submarine fleet.

SOSUS used chains of bottom-mounted hydrophone arrays, connected by undersea communication cables to facilities on shore, to achieve long-range detections and cue area ASW forces. It is thought that DARPA's latest effort is looking at a deep-water sensor system that would afford a greater level of tactical utility.

In a Broad Agency Announcement (BAA) for Deep Sea Operations (DSOP) released on 15 January 2010, DARPA's Strategic Technology Office suggests that as "technology drives peer-nation parity in traditional domains, the deep ocean offers an unused operational space to achieve significant gains in strategic capability". Indeed, its preamble suggests that the 'inner space' of the deep seas remains an unused and under-exploited operational domain in the same vein as air and space once were.

DARPA's objective is to introduce surveillance that operates at extreme ocean depths in order to detect quiet submarines overhead. While specialist deep sea research submersibles can descend to more than 4,000 m, submarine pressure hulls are generally engineered for crush depths in the order of 300-400 m for conventional boats, and 450-600 m for nuclear-powered boats.

According to DARPA: "Such surveillance should exploit the unique propagation and signal advantages afforded by operating in the deep ocean. The presumption is that the deep ocean offers advantages for sonar; however, non-acoustic solutions that benefit from deep ocean operations are acceptable as well."

However, the agency acknowledges that the notional DSOP construct "is challenged by the ability to achieve long-range detection and classification; the means to communicate underwater over long distances; and the ability to manage energy to endure. These challenges are magnified by extreme conditions of pressure, temperature, and isolation that constrain solutions".

The DSOP programme will, says DARPA's BAA, "develop systems of configurable technology to achieve ASW surveillance needs over large, operationally relevant, deep ocean areas". It characterises the solution space as one that: operates with sensors or sources near the ocean bottom; exploits the advantages of distributed nodes; configures to a range of operations, environments, and time scales; and adapts to the mobility of the surface assets or evolving threats.

DARPA envisages a multiphase effort, with the current BAA seeking proposals for Phase 1 activities to be submitted by 1 March 2010. These comprise architecture studies for system concepts from which performance thresholds, subsystem technologies and development risks can be derived to "help shape programme direction in subsequent phases".

Critical enabling technologies will include: sensors and processing; communications (between nodes and between nodes and airborne, seaborne or terrestrial assets); mobility; and energy (harvesting, resupplying or storage). "For the architecture study, multiple options within these technology sets should undergo system level trade analysis," DARPA says.

Multiple Phase 1 study awards are planned, with each expected to last six months and worth in the range of USD150,000 to USD800,000. Options will be incorporated in each contract for additional at-sea testing.

Czech Republic bolsters convoy protection in Afghanistan with RCIED deployment

The Czech armed forces have begun fielding new STAR-V mobile remote-controlled improvised explosive device (RCIED) jammer systems, ready for deployment to the Czech military contingent in Afghanistan, *writes Michal Zdobinsky*.

The systems will be carried aboard IVECO Light Multirole Vehicles (LMVs) to provide a 'bubble' of protection for convoys.

STAR-V was developed and produced in the Czech Republic by URC Systems and is the latest in the STAR (STAvebnicový Rušič – Modular Jammer) family of jammers. The system has a total weight of 85 kg and a power output of 740 W.

It features Direct Digital Synthesizer (DDS) technology to make digital multisweeps of the jamming signal in several frequency sub-bands. This enables it to open up several communication channels for friendly radio traffic in one of the frequency sub-bands.

It works across the VHF, UHF and DSC frequencies, as well as the GSM (Global System for Mobiles) and UMTS (Universal Mobile Telephone System) mobile phone and WiFi bands. It has an open-architecture, building-block structure to ease future upgrades and tailor the individual transmitting subsystems depending on the specific type of mission.

Czech soldiers in Afghanistan already use a smaller, portable version in the shape of the STAR-Manpack jammer, which has an output of up to 40 W and is largely used to cover small explosives ordnance disposal (EOD) teams or special units, who operate away from the protective 'umbrella' of their vehicle.

The base unit contains a 27 V lithium iron phosphate (Li-Fe) battery pack – providing between 60 and 90 minutes of operation, depending on mode in use – and the control module has slots for two independent wideband transmitting modules with individual antennas. A total of four modules are available for those slots – each of up to 20 W transmitted output – selected by the user in line with the expected mission type. Together with those two modules, accumulator and antennas, the pack weighs 23 kg and measures 33x66x20 cm.

The manpack system is quite versatile and can be used in a vehicle mount, drawing its power from the vehicle. URC Systems is now also running trials with it fitted to a small unmanned ground vehicle.

Beyond this, the company began development of a new 'responsive' jammer in 2009, able to track and detect the activity of an enemy setting an IED and quickly assess the firing signal to provide a high-probability jamming solution.

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■ The STAR-Manpack is used to cover EOD teams.