WolfPack - Archived 9/2008

Outlook

- DARPA sponsored development of distributed RF SIGINT and communications/radar jammer

- Phase IV contract nearing completion, Phase V to begin, with goal of creating smaller, lighter, more efficient unit

- System continues to be important part of future U.S. Army plans, and could even be incorporated into Future Combat Systems (FCS).

- Due to limited information regarding the program, Forecast International will archive this report in 2008

Orientation

Description. The program known as WolfPack funds developing technologies that will enable radio-frequency-spectrum dominance against advanced communications and radar systems in the tactical battlespace.

The program will develop technologies and architectures for ground-based, close-proximity, distributed, networked systems to augment existing electronic warfare systems.

Sponsor

Defense Advanced Research Projects Agency
  DARPA/ATO
  3701 N Fairfax D
  Arlington, VA 22203-1714
  Tel: + 1 (703) 696-2444
  Fax: + 1 (703) 696-2208
  Web site: http://www.DARPA.mil

Status. Phase IV demonstration complete. Transition to the Army expected.

Application. Light, Airborne, and Air Assault divisions, Armored/Mechanized divisions and Armored Cavalry regiments.

Price Range. A goal is for the unit cost to be less than $2,000, based on a purchase of about 10,000 units.

Price is based on an analysis of contracting data and other available cost information, and on a comparison with equivalent items. Individual acquisitions may vary, depending on program factors.

Contractors

Prime

BAE Systems Electronics & Integrated Solutions	http://www.eis.na.baesystems.com, 65 Spit Brook Rd, Nashua, NH 03061-0868 United States, Tel: + 1 (603) 885-4321, Fax: + 1 (603) 885-2772, Prime

Comprehensive information on Contractors can be found in Forecast International's "International Contractors" series. For a detailed description, go to www.forecastinternational.com (see Products & Samples/Governments & Industries) or call + 1 (203) 426-0800.

Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 22 Commerce Road, Newtown,

WolfPack

CT 06470, USA; rich.pettibone@forecast1.com

Technical Data

	Metric	U.S.
Dimensions		
Maximum size planned	15.2 x 10.2 cm	6 x 4 in
Weight		
Maximum planned	2.7 kg	6 lb
Characteristics		
Frequency	20 MHz to 15.0 GHz	
Power	Several watts	
Range	4.8 km	3 mi
Battery life	2 months	

Design Features. DARPA expects that the advanced radar systems and future tactical communications systems using frequency-agile, low-power, packet-networked technologies will challenge traditional, stand-off electronic warfare approaches. The WolfPack program will develop technologies that will enable the U.S. to deny the enemy use of communications and radars throughout the battlespace. The networked system will comprise autonomous, ground-based monitors/jammers that are cooperatively linked to avoid disruption of friendly military and protected commercial radio communications and radars.

The system is being designed to provide SIGINT and radar emitters operating at frequencies ranging from 30 MHz to 20 GHz without disrupting friendly military and commercial communications. A WolfPack network will be able to provide commanders with good, up-close information on hostile force communications and sensors from a distance. In addition, while most jammers tend to use some type of brute force to overcome targeted systems, saturating the area for friend and foe alike, WolfPack will be more selective, jamming hostile communications links while allowing its own forces to be able to continue to fully use theirs. This capability will be important when forces are operating in proximity to one another.

The miniaturized, unattended ground sensors will be fitted with "smart" electronics to detect, identify, and jam communications and radar threat signals. They will geolocate, identify, and report on the types of signals they are in contact with (including several previously unknown signals). WolfPack will be able to determine a jamming response on its own.

WolfPack uses BAE Systems' Signal Intelligence Diamond Software Architecture™ and will be interoperable with the Adaptive Joint C^4ISR (command, control, communications, and computers, intelligence, surveillance and reconnaissance) node program (AJCN). BAE Systems is currently helping develop AJCN for the U.S. Department of Defense program.

Operational Characteristics. Military planners believe that future battlefields will have no borders, but instead have pockets of military forces interspersed with civilians. As a result, the U.S. military will no longer be able to use blanket jamming techniques to neutralize enemy emitters. At the same time, advanced frequency-hopping, peer-to-peer communications systems are being developed, challenging electronic support measures (ESM) and jammers alike. Hence, DARPA is looking for new approaches for demonstrating low-power, distributed RF spectrum-monitoring technologies to hold enemy communications and radar emitters at risk through the tactical battlespace.

The most recent systems are 12-inch-tall, unattended cylindrical sensors. The small rugged cylinders can be launched or even air-dropped into an area. Once deployed, the individual "wolves" (sensors) self-organize into "packs" to determine optimum detection and jamming strategies. In each "pack," a gateway provides data to users, and the system can detect, locate and jam a wide variety of threat signals.

WolfPack Ground Units

Source: BAE Systems

Program Review

This U.S. electronic warfare program moved from concept development to the technology exploration and system definition phase with the release of the Broad Agency Announcements (BAA) by DARPA in February 2001. The plan was to award a series of contracts to develop key technologies for the WolfPack program.

DARPA to Develop 'Close Approach Electronic Warfare' Equipment

The WolfPack program has been a five-phase DARPA effort to identify and validate key technologies for spectrum dominance. Phase I of the program assessed the validity of the WolfPack concept and alternative technologies and system architectures, and was used to define the program scope and areas of technical emphasis. The program is meant to improve survivability and situational awareness. The improved WolfPack system will be able to suppress enemy air defenses, and RF communications systems and networks.

The goal for FY00 was to develop an effective and affordable architecture and conduct system-level trades to develop subsystem requirements. The optimum use of legacy systems for IPB (intelligence preparation of the battlefield) and cueing was to be determined, along with the potential modifications required for coordinated spectrum access.

Five companies were selected for WolfPack's Phase II:

- AIL Systems, Deer Park, New York – Electrically Small, Gain Efficient, Broad Bandwidth Antenna Element.

- BBNT Solutions LLC, Cambridge, Massachusetts – Innovative Concepts for Flow Analysis for Selective Target Jamming (FASTJAM).

- Information Systems Laboratories Inc, Vienna, Virginia – Advanced Geolocation Techniques.

- Rockwell Collins, Cedar Rapids, Iowa – Miniaturized "Comb" Direct-Sampling Sensor/ Signals Intelligence Receiver Technology.

- Statistical Signal Processing Inc, Napa, California – Multi-path Mitigation for Geolocation.

In addition, two Phase III contractor teams were selected to pursue a comprehensive system design to address RF communications and radar threats:

WolfPack

- BAE Systems, Information and Electronic Warfare Systems, Nashua, New Hampshire, with team members Advanced Power Technologies Inc, Herrick Technology Laboratories, Telcordia, M/A-Com, Syracuse Research Corp, and George Mason University.

- Raytheon C^{3}I Systems, Falls Church, Virginia, with team members SAIC, JBISoft, Information Systems Laboratories, and YarCom.

Phase III contractors developed alternative system architectures and developed and demonstrated core technologies critical to their system designs. They emphasized high-efficiency, sub-resonant antenna design; low-powered, wideband signal collection and processing capabilities; ad hoc networking solutions and high-performance routing algorithms; and distributed algorithms for detection, geolocation, and characterization of radio frequency emitters.

DARPA encouraged the contractors to incorporate technologies developed in other DARPA programs, as well as those from other contractors, to meet their broad system needs.

Efforts in FY01 demonstrated enabling antenna and signal processing technologies. Participants completed system design and performance analysis, conducted proof-of-concept demonstrations of high-speed signal detection and identification algorithms, and verified low-duty-cycle, low-power jamming techniques with bench-top experiments.

In FY03, additional funding was added from the Defense Emergency Response Fund for the development of an accelerated WolfPack capability. The accelerated funding would be used to mature enabling technologies for potential development of a rudimentary WolfPack-like system.

Multiple Uses

Potentially used as a Distributive Suppression of Enemy Air Defense (DSEAD) asset, these rudimentary, close proximity WolfPack systems could permit non-lethal disruption of enemy radar systems.

WolfPack could become an adjunct of the U.S. Army's PROPHET electronic warfare program. The MLQ-40(V)2 is designed to map an entire electronic battlefield by collecting and analyzing signals. Systems like WolfPack could then be used to knock out enemy emitters based on analysis of intercepted signals.

According to government documents, the goal of WolfPack designers during FY04 was to conduct initial component demonstrations in order to improve the design based on the initial demonstrations. This effort absorbed a small part of the FY04 and FY05 FCS funding.

During demonstrations on June 16 and 17, 2004, officials from DARPA; the U.S. Army, Air Force, Navy, and Marines; and other government representatives viewed WolfPack at work on an outdoor range located near BAE Systems' plant in Merrimack, New Hampshire. The successful Advanced Technology Development tests were the second in a series of four demonstrations that would lead to additional development and eventual fielding to support Army commanders' real-time battlefield intelligence needs.

These demonstrations established that the technology to achieve close-in, low-cost, expendable electronic warfare systems is maturing enough to allow a new generation of military capabilities.

Development Near Completion

In early 2005, BAE completed its final demonstration of the current phase of the WolfPack program for DARPA and other government officials at the Fallon Range Training Complex in Nevada.

The final successful demonstration of Phase IV consisted of three segments, each focusing on operational scenarios that tasked the deployed WolfPack with detecting, identifying, geolocating and jamming both radar and communication emitters.

The next phase (Phase V) of the program will improve and increase functionality while creating a smaller, lighter and more power-efficient WolfPack. DARPA is developing long-term plans with the U.S. Army for deployment via airborne and deep-launch devices, and is working with the U.S. Air Force to use WolfPack to suppress enemy air communications. Initial discussions with the U.S. Navy are under way regarding application of WolfPack in littoral and force protection missions.

The demonstration by BAE Systems represented the completion of a two-year, $23 million contract from DARPA's Advanced Technologies Office (ATO). BAE Systems is in negotiations for the next phase.

In January 2006, BAE Systems sent its WolfPack sensors system into the air on a vertical takeoff and landing unmanned aerial vehicle (UAV). The exercise was meant to demonstrate the ability of battlefield sensors to be self-deploying, self-relocating, and self-recovering.

Funding

U.S. FUNDING

	FY05 QTY	FY05 AMT	FY06 QTY	FY06 AMT	FY07 QTY	FY07 AMT	FY08 QTY	FY08 AMT
PE#0603764E LNW-03 FCS	-	57.6	-	90.8	-	10.1	-	0.0

All $ are in millions.

Note: In FY06, the WolfPack effort was turned over to the U.S. Army. It is one of several technologies being developed to support the FCS program.

Contracts/Orders & Options

Contractor	Award ($ millions)	Date/Description
Phase IV BAE Systems	22.9	Mar 2003 – Mod to previously awarded transaction for Phase IV of the WolfPack program. Completed March 2005. (MDA972-01-9-0019)
BAE Systems	5.1	Feb 2005 – Mod to previously awarded contract for hardware and software improvements to WolfPack systems. Completed November 2005. (MDA972-01-0019, P00018)
BAE Systems	11.0	Jul 2006 – Mod to a previously awarded contract for development and demonstration of a WolfPack based on a miniaturized WolfNode. Work will be completed in January 2008.

Timetable

Month	Year	Major Development
Mar	2001	Full proposal submission deadline, BAA closing date
Jun	2001	Phase II contracts (5), Phase III contracts (2)
Apr	2002	Joint Phase II/Phase III Technical Assessment
Oct	2002	Phase II Critical Technology Review
Sep	2003	Phase II Technology Performance Review
	FY03	Demonstration of testbed units, prototype design reviews, Phase IV started
1Q	FY03	Phase IV solicitation planned
Mar	2003	Phase IV contract awarded (final phase)
	2004	DARPA program concludes with demonstration of WolfPack subsystems in a field environment
4Q	FY04	Full integration into a prototype system, system test
	FY05	Termination of DARPA funding
Apr	2005	Final Phase IV demonstration
	2006	Service-led Advanced Technology Demonstration
	2010	Anticipated fielding

WolfPack

Worldwide Distribution/Inventories

This is a **U.S.**-only program.

Forecast Rationale

No Developments Made Public

For the second straight year, no major developments have been made public about the WolfPack system. The system continues to be an important part of future U.S. Army plans and could even be incorporated into the Future Combat Systems (FCS) program. Currently, the WolfPack is listed as part of the FCS program, but does not have any funding line of its own. Therefore, it cannot be tracked specifically.

Because of this lack of information, Forecast International will archive this report, as of 2008. However, FI will continue to monitor the program and notify customers about any developments. If the program begins to receive more funding and publicity, then this report will be re-issued at that time.

IED Threat Continues

Improvised Explosive Device (IED) protection remains an important goal of the U.S. military. The longer American and allied troops serve in Iraq, the more important this goal this will be. Using mobile jammers is one method of protecting troops from IEDs. Because of this, work on the WolfPack will most likely continue. However, the Army is studying other ways to protect troops from IEDS, including better vehicular armor, which seems to be the favored option at this time. It's possible that funding may be transferred from the WolfPack program to armor development programs.

Ten-Year Outlook

This report will be archived in 2008 if there are no new developments.

*   *   *