

C⁴ISR

JOURNAL

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**ALL-AROUND
RADAR**
Advances in artillery surveillance 24



And the winners are ...

C4ISR Journal

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C⁴ISR COVER STORY

2008
 BIG
 25
 AWARDS
Presented By
 C⁴ISR
 JOURNAL



SHEILA VEMMER, C4ISR JOURNAL

William Toti of Raytheon, right, is presented with the Sensors award by C⁴ISR Journal Editor Ben Iannotta.



BOB LENNOX, C4ISR JOURNAL

David Vos of Rockwell Collins accepts the award in the Innovations category.



SHEILA VEMMER, C4ISR JOURNAL

The Network Systems award is accepted by Dwight Lee of General Dynamics C4 Systems.

The top 5

C⁴ISR Journal names winners from 'Big 25' finalists

By BEN IANNOTTA

Five diverse ISR efforts now have something in common. They are winners of the inaugural C⁴ISR Journal awards.

Journal staff honored the "Big 25" finalists and revealed the five winners from those finalists at the magazine's awards banquet Oct. 16 in Arlington, Va., outside Washington, D.C.

The five winning selections from the "Big 25" finalists were made by a six-person committee of retired Air Force Brig. Gen. John Douglass, defense analyst Loren Thompson of the Lexington Institute and senior editors of Army Times Publishing Co., the C⁴ISR Journal's parent company. The winners are:

SENSORS: The Raytheon-built **Predator-Reaper video pods**, known formally as Multispectral Targeting Systems, provide a critical bird's-eye view to uniformed intelligence analysts and commanders in Afghanistan and Iraq. When U.S. officials talk about a shortage of ISR equipment, oftentimes they are referring to these video systems. William Toti, deputy vice president for intelligence, surveillance and reconnaissance at Raytheon, accepted the award, saying: "Our Predator full motion video

has been in great demand in the war and has proven to be one the most valuable ISR systems available to the U.S., British and other allied forces."

INNOVATIONS: The **Automatic Supervisory Adaptive Control software** automatically adapts an aircraft's flight profile to cope with damage to its control surfaces.

Adaptive controls have the potential to significantly improve "the reliability of both manned and unmanned aircraft so the two can safely coexist in the same airspace," said the software's developer, Dave Vos, senior vice president of control technologies for Rockwell Collins.

NETWORK SYSTEMS: In the first months of the Iraq insurgency, Army officials arranged for contractors to rush computer processors, metal shelters and satellite dishes into the field to give soldiers Internet Protocol-based communications. These Joint Network Nodes have been upgraded and renamed the Warfighter Information Network-Tactical

(WIN-T), Increment 1. "We were extremely pleased that the Army had the trust in us to produce this program for them on the tight time frame which they needed it," said Dwight Lee of General Dynamics C4 Systems.

PLATFORMS: The **Virginia-class submarines**, built by Northrop Grumman Shipbuilding and General Dynamics Electric Boat, are emerging as important ISR platforms in the age of irregular warfare, although details of their ISR missions remain highly classified. Accepting the award were Northrop Grumman's C.J. Ihrig, director of business development for submarines, and Karl Hasslinger, director of Washington operations for Electric Boat.

ORGANIZATIONS AND AGENCIES: In early 2007, the U.S. Army set up a rotating task force of experts to apply airborne imagery, signals intelligence and weapons to the problem of "neutralizing" the cells of insurgents who were planting improvised explosive devices in Iraq. **Task Force ODIN** — for observe, detect, identify, neutralize — is in the process of spreading its work to Afghanistan. In Iraq, insurgents found in the act of planting IEDs have been killed in blinding rocket explosions, or their networks have been disrupted. "Task Force ODIN is such a team effort in the Army, it's an honor to represent this team on this award," said Army Maj. Robert Kadavy, the action officer for Task Force ODIN. ■

'Big 25' 2009

Nomination forms and information about the 2009 awards will be available at: <http://www.c4isrjournal.com/awards-nominate>.



BOB LENNOX, C4ISR JOURNAL

Maj. Robert Kadavy accepts the Agencies and Organizations award on behalf of the U.S. Army's Task Force ODIN.



BOB LENNOX, C4ISR JOURNAL

C.J. Ihrig, left, of Northrop Grumman Shipbuilding, and Karl Hasslinger of General Dynamics Electric Boat accept the Platforms award from Ben Iannotta.

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FINALISTS

Once a year, we recognize those C4ISR efforts that are making the biggest difference on the battlefield or in the defense of civilians against terrorists, insurgents and rogue states. We divided the task into five categories: **Sensors** — devices that gather ISR data; **Innovations** — technical breakthroughs that could pay off soon, if they are not already doing so; **Network systems** — net-

works or information hubs that route ISR information or make sense of it; **Agencies and organizations** — government offices or groups addressing intelligence-related problems; **Platforms** — the aircraft, ships or vehicles that carry sensors. We will announce the winner in each category at our Oct. 16 awards banquet in Crystal City, Va. These are the finalists in each category, presented in alphabetical order:

SENSORS

Apache Arrowhead. Earlier this year, Lockheed Martin engineers traveled to Iraq and installed 24 Arrowhead vision systems on U.S. Army Apache helicopters in the span of 30 days. As of March, every deployed Apache battalion in Iraq and Afghanistan had the system, which consists of a dual-view, forward-looking infrared camera, a black-and-white television camera and an electric-zoom capability. Arrowhead managers had overcome delays and technical problems in the program, and feedback from Apache pilots to Lockheed Martin has been good. "We can now not only detect and identify the enemy, but we can now discern his will," one pilot reportedly told the Army's Arrowhead manager earlier this year.

BuckEye. When the U.S. Army's Topographic Engineering Center needed a small camera that could be mounted quickly onto Cessnas and helicopters to look for improvised explosive devices in Iraq, it turned to Flight Landa-ta Inc., a manufacturer of digital cameras located in North Andover, Mass. Later, the Army added a lidar camera manufactured by Optech of Toronto. Today, there are only three BuckEye systems in the field, but they are a useful tool for the Multi-National Corps-Iraq and the Combined Joint Task Force-101, based at Bagram Air Base, Afghanistan. Their images are unclassified, making it easy for soldiers to access them, and they depict detail as fine as 6 inches across, the kind of detail soldiers crave before attempting to capture insurgents or terrorists.

Lynx 2 Synthetic Aperture Radar. Though designed to spot moving ground targets from UAVs, the latest versions of this General Atomics radar are noteworthy for another reason. The first six Lynx 2 radars were scheduled to be delivered to the Iraqi Air Force in September for use on its manned King Air 350 planes made by Hawker Beechcraft. The next eight Lynx 2 radars will be installed on the U.S. Army's version of the Predator B, the Sky Warrior. General Atomics will build the rest on the assumption it will find customers. The original Lynx radars were designed for General Atomics by the U.S. Energy Department's Sandia National Laboratories.

Predator-Reaper Full-Motion Video System. Raytheon's electro-optical and infrared video cameras, known formally as Multispectral Targeting Systems, have proved to be among the most valuable ISR systems available to



OHB-SYSTEM ILLUSTRATION

The SAR Lupe satellite constellation gives Germany a dedicated space-based surveillance capability.

U.S., British and other allied forces. As much as anything, a shortage of Predator-Reaper full-motion video relative to the growing demand prompted U.S. Defense Secretary Robert Gates to create his ISR Task Force in 2008 to search for workarounds. In the meantime, Raytheon keeps working to improve its system and get it on more Predators.

SAR Lupe. In July, Germany and its Russian launch provider finished launching this five-satellite constellation built by OHB System space company of Bremen. These synthetic aperture radar satellites can see objects or terrain features as small as 1 meter across through clouds and at night. For Germany's Bundeswehr, they represent a new freedom. In the past, Germany had to buy satellite photos commercially or request intelligence cooperation with the U.S.

INNOVATIONS

Automatic Supervisory Adaptive Control. Civilian and military airspace regulators often ask: What happens if something goes wrong on a plane with no pilot aboard? The skepticism underlying that question has made it hard to shift intelligence UAVs from one flight path to another. Enter David Vos, the mathematical genius behind Athena Technologies, now part of Rockwell Collins. This year, Vos showed that a well-programmed onboard computer might in fact do a better job in an emergency than a human pilot. In April, he launched an 8-foot-long model of an F/A-18 and programmed 60 percent of its wing to fall off. The plane's Automatic Supervisory Adaptive Control computer shifted the orientation of the plane, in essence using the

fuselage as flight surface and landing safely.

Multiplatform Enclosure. Packing ever more powerful circuitry into UAVs and other intelligence aircraft generates more heat. Beefing up cooling systems or ruggedizing computer components is not an option on a UAV, and so SprayCool, based in Washington state, designed an enclosure that can hold multiple circuit boards and work with multiple aircraft. The enclosure bathes the boards in a continuous mist of Fluorinet, a coolant and cleaning agent made by 3M. The company's liquid-cooled enclosures are being installed in the Global Hawk, Predator and Sky Warrior UAVs, and the U-2 spy plane.

Operation Burnt Frost: The U.S. 193 Shootdown. In the span of about six weeks, the Lockheed Martin-led Aegis missile defense team modified software aboard the cruiser Lake Erie so that it could shoot down a 5,000-pound U.S. spy satellite that malfunctioned shortly after its launch in December 2006. The shootdown spoke volumes about the ability of the U.S. military and its contractors to adapt sensors and software to meet an unexpected threat, in this case hydrazine satellite propellant that, according the Pentagon and NASA, could have killed people on the ground.

Vehicle and Dismount Exploitation Radar (VADER). Eighteen months ago, Northrop Grumman, the Joint IED Defeat Organization and the Defense Advanced Research Projects Agency set out to build a radar that would be sensitive enough to spot a person and small enough to fit on a UAV. Earlier this year, engineers installed VADER on a Northrop Grumman test aircraft. In April, they flew the sensor over Maryland's Eastern Shore. VADER successfully spotted a test subject at "tactically significant ranges," Northrop reports. Soon, roadside bomb makers who think they

Learn more about the finalists and the awards banquet at <http://www.C4ISRJournal.com>.

2008 Awards

can escape under clouds or darkness might have one less way to hide.

Zephyr solar-powered UAV. QinetiQ, based in London, flew this experimental solar powered UAV over the Arizona desert for 3½ days in late July, raising the possibility that reconnaissance aircraft might be able to loiter over targets for days on end. The flight was an unofficial record for flight duration. For now, the officially monitored record belongs to a Global Hawk UAV that flew for 30 hours, 24 minutes in 2001. Zephyr's frame is made of lightweight carbon-fiber. It is designed to loiter at altitudes of 50,000 feet. The British Ministry of Defense funded development of Zephyr, and the U.S. has funded the flight demonstrations.

NETWORK SYSTEMS

Air Force Command and Control System Consolidated. This network developed by Integral Systems is helping the U.S. Air Force move away from expensive mainframe computing in its satellite control systems, which reduces the number of people required to operate satellites. It is used with the new Wideband Global Satcom satellites, which have dramatically increased the flow of data, including intelligence information, to Navy ships.

Command, Control, Battle Management, and Communications (C2BMC). These computer



U.S. NAVY

A modified Standard Missile-3 launches from the U.S. Navy Aegis cruiser Lake Erie to destroy a crippled U.S. spy satellite that posed a potential threat to people on the ground.

work stations are helping U.S. commanders in the Pacific Region and policymakers in Washington, D.C., plan how to defend U.S. forces and territory from missile attacks. The work stations are backed by a global network that supplies up-to-date information on the location and status of missile defense sensors and interceptors. Lockheed Martin is the prime contractor. Up next, Lockheed Martin will incorporate Global Engagement Manager software. During an actual attack, this software would calculate which systems make the most sense to fire so that no interceptors are wasted.

Ground-based Midcourse Defense, Battle Management System. If a country were to fire a long-range rocket toward the U.S. mainland or Hawaii, the U.S. has only one weapon that could conceivably knock it down: The interceptor rockets of Boeing's Ground-based Midcourse Defense System. U.S. commanders aren't sure the system would work in a complex attack, and the North Koreans and Iranians can't be sure either. Regardless, GMD's core battle management software, known as the Fire Control/Communications System, has shown great promise. Northrop Grumman engineers in Huntsville, Ala., developed the system under a contract with Boeing. Its job is to coordinate readings from multiple sensors, direct the interceptors toward their targets, and display real-time battle information to commanders. In a July sensor test, the system successfully integrated views of a dummy missile from four radars: an Aegis radar in the Pacific; a radar in Juneau, Alaska; the Beale Air Force Base radar in California, and the floating Sea-based X-Band radar in the Pacific Ocean.

Joint Network Node (WIN-T Increment 1). In the first months of the Iraq insurgency, U.S. Army officials at Fort Monmouth, N.J., and at the Army's Signal Center at Fort Gordon, Ga., arranged for contractors to rush new communications nodes into Iraq. Working outside the normal acquisition process, they acted as the system integrator. They purchased metal shelters and equipped them with Internet Protocol-based communications and satellite links, and delivered them to the fields within months. General Dynamics C4 Systems set up a training program at Fort Gordon. These JNNs provided a valuable communications link for intelligence and other information. Today, General Dynamics is upgrading the JNN network as Increment 1 of the Warfighter Information Network.

Wideband Global Satcom (WGS) System. Boeing has managed to turn this delayed, over-budget satellite development program into a major success. Now that the U.S. has launched the first of these geosynchronous satellites, the reviews from the initial Navy users have been impressive. The first WGS satellite is allowing ships in the Pacific to receive large intelligence, imagery and missile defense files without bringing the crew's In-



U.S. ARMY

The Shadow tactical UAV has been a workhorse for the U.S. Army and Marine Corps.

ternet access to a halt. The next satellite will be parked over the Indian Ocean to have a similar effect for forces in Iraq and Afghanistan.

AGENCIES AND ORGANIZATIONS

Future Combat Systems Army Evaluation Task Force. The Army sent a thousand soldiers to Fort Bliss, Texas, to put a subset of Future Combat Systems technologies, or spinouts, through real-world tests. Major tests started in July. The Army wants to see if it would be safe to field the spinouts by 2011, three years early. The task force is one way the Army is addressing Defense Secretary Robert Gates' challenge to avoid "next-war-itis," his term for focusing too heavily on future technologies.

NATO's Joint Air Power Competence Center. This center is applying urgent analysis to the interoperability problems facing the NATO alliance, problems that could indirectly cost innocent civilian and allied lives. As German Lt. Gen. Friedrich Wilhelm Ploeger told C4ISR Journal earlier this year, the center's Policy & Concept Development Branch provides a vital coordination role in the effort to reduce civilian and friendly-force casualties in Afghanistan. By helping to reduce the odds of miscalculations, the competence center is helping to wrest a public relations tool from the hands of the Taliban.

Space Protection Office. For years, a cadre of American neoconservatives, space advocates and almost no one else worried aloud about the susceptibility of commercial communications satellites, GPS satellites and U.S. spy satellites to attack. China's now-infamous anti-satellite test in January 2007 was an impossible-to-ignore wakeup call to



NORTHROP GRUMMAN

the broader defense and intelligence communities. On March 31, officials from the National Reconnaissance Office, which operates U.S. spy satellites, and the U.S. Air Force, which operates the GPS constellation, communications and missile warning satellites, signed a memo pledging to “provide decision-makers with strategic recommendations on how best to protect our space system and stay ahead of the threat.” One result is a “virtual office” with most of the work centered at Air Force Space Command in Colorado.

Task Force ODIN (Observe-Detect-Identify-Neutralize). In early 2007, the Army set up a task force in Iraq to spot insurgents in the act of planting improvised explosive devices and kill them with missiles or cannons fired from helicopters. The force uses full-motion video taken by Warrior Alpha UAVs and sometimes by manned C-12 surveillance planes to spy on suspected bombers. The planes fly high enough that their engines can’t be heard on the ground. Once officials determine that a suspect is planting a bomb, a strike is ordered. The U.S. has now adapted the method to Afghanistan as well. By targeting IED attackers so ruthlessly, Task Force ODIN almost certainly helped give impetus for the Sunni Awakening, which, together with the U.S. troop surge, has dramatically reduced violence in Iraq.

U.S. Air Force 3rd Special Operations Squadron. Tracking irregular fighters in Iraq and Afghanistan and targeting them without killing innocent civilians or sparking a popular backlash is one of the toughest missions facing U.S. forces. The job of the 3rd Squadron is to fly Predator UAVs, and starting next year, the Hellfire-armed Reapers, to

help U.S. forces accomplish that mission. Since its reactivation in 2005, the squadron has faced an inherent limitation: It has been operating from borrowed facilities at Nellis Air Force Base, Nev. Now, it has begun the process of moving its 250 people to a newly constructed control center at Cannon Air Force Base, N.M., and it must do this in the midst of surge operations without sacrificing combat capabilities. The UAV Communications Corp. has been finishing work at the site, and the first UAV missions were expected to be controlled from there soon.

PLATFORMS

Micro Air Vehicle (MAV). Soldiers in Iraq have begun using these wingless, hovering unmanned aircraft to patrol routes and search for improvised explosive devices. The 40-pound MAVs are designed to be portable, and they can carry video and infrared cameras. The MAVs, manufactured by Honeywell, are being considered for wider deployment as part of the early “spinout” technologies of the Future Combat Systems.

Raven B. In 2008, U.S. Marines in Iraq received training on the capabilities of this backpackable UAV, and they practiced throwing them, like javelins, into the air, according to the Multi-National Force-Iraq. The training was a significant milestone in the Marine Corps’ long-planned transition away from the older Dragon Eye UAVs toward this longer-endurance UAV produced by AeroVironment in California. The Raven Bs, already widely used by the Army, should give the Marines a longer and more detailed look over the hill for route planning and in battle.

Photonic mast systems greatly enhance the coastal surveillance capabilities of U.S. Navy Virginia-class attack submarines.

Shadow. In 2008, these catapult-launched UAVs built in Alabama by AAI Corp. passed the 300,000 cumulative flight-hour mark in service for the U.S. Army and Marine Corps in Iraq and Afghanistan. Together with the forthcoming Sky Warriors, Shadows are at the center of the Army’s decision to integrate UAVs with tactical forces as an alternative to reliance on UAV coverage from Air Force-operated Predators.

Sky Warrior Alpha. These Army versions of the General Atomics I-GNAT are providing persistent battlefield intelligence until the Army’s larger Predator-based Sky Warriors are delivered in 2009. For example, the Army’s Task Force ODIN has used them to scan roadways for improvised explosive devices to target those who planted them.

Virginia-class attack submarines. U.S. rivals are building new submarines, and terrorist or insurgent groups could try to infiltrate protected areas via coastal waters or attempt to block U.S. access to them with mines or debris. As much as anything, the new U.S. subs, in production by General Dynamics Electric Boat and Northrop Grumman, are surveillance platforms for coastal waters. Instead of traditional periscopes, the Virginia subs have “photonics mast systems” built by Kollmorgen of Northampton, Mass., using IR thermal imaging sensors from L-3 Cincinnati Electronics. These masts are packed with sensors. If terrorists or insurgents try to infiltrate coastal waters, or block access to them with mines or debris, the Virginia subs will be part of the defense. ■