# Fact Sheet

NORTHROP GRUMMAN

**For more information, contact:** John A. Vosilla
(516) 575-5119; cell: (516) 816-5354
John.Vosilla@ngc.com

*The E-2 Hawkeye as the solution to a nation's airborne early warning requirement*

## The Northrop Grumman Hawkeye:
## A history of achievements, a future of capabilities

The Northrop Grumman Hawkeye is a national asset. It can manage first responders as they act in natural disasters, can be the all-weather node in the sky in time of war and can police a nation's coast and shipping lanes to protect against maritime pirates and other air and sea-borne criminals.

The proof lies in the international usage of this powerful airborne early warning and battle management system. Seven nations fly it. Some have benefited from its capabilities for three decades or more and have shown their confidence in the Hawkeye by investing in the system to take advantage of new capabilities.

What drives the success of the Hawkeye system family? The E-2 not only continues in production but also continues in development. Support is a constant. Capabilities have been added regularly for decades.

This pattern of regularly adding capabilities to stay ahead of threats is well documented. The rugged, reliable Hawkeye 2000 is the latest of five generations aircraft built by Northrop Grumman since the mid-1940s. At that time, a TBF-3 Avenger was modified with the first-generation airborne search radar. This was followed in the mid-1950s by the E-1B. In 1964, the Navy took delivery of the first aircraft specifically designed for AEW, the E-2A Hawkeye. They flew combat missions in Vietnam combat from the USS Kitty Hawk and USS Ranger. E-2A's were modified to E-2B's with a then-new, programmable, high-speed digital computer.

The E 2C program began in 1968.

The E-2C prototype made its first flight in 1971, and the first 11 operational aircraft were delivered to the Navy two years later. Since then, deliveries have totaled more than 140 for the U.S. Navy and more than 30 for allied forces, which include Egypt, France, Japan, Mexico, Singapore and Taiwan. Five generations of significant system upgrades have been implemented, with other improvements interspersed along the way.

In the nearly four decades since E-2C production began it only stopped once, briefly, to move the production line to its present U.S. site in Florida.

But, more importantly, the U.S. Navy and Northrop Grumman keep adding to the capabilities of the Hawkeye, both by developing the new generations of the Hawkeye and by taking advantage of the Hawkeye 2000's intrinsic capability for system upgrades.

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An experiment conducted in the spring of 2005 exemplified that. In the so-called Q205 experiment, a Northrop Grumman Integrated Systems-United States Navy team proved that Internet Protocol (IP) and other commercial off-the-shelf tools could be used to build a low-cost network in a matter of weeks.

Q205 should interest national decision makers who are concerned with procuring systems that have application to missions beyond warfare. That's because the experiment was carried out in a homeland security scenario.

Basically, the team experimented with centralized and decentralized control in a network-centric environment. They investigated the value of RF-enabled, network-centric, IP-based communication between disparate U.S. Department of Defense and homeland security/homeland defense agencies.

They experimented with the effectiveness and ease of use of non-proprietary, open architecture solutions for network-centric warfare.

The open architecture network employed commercial, standard networking hardware and software products and government off-the-shelf (GOTS) hardware and software. Communications passed through wide-band radio IP links (RIPL), low throughput RIPLs, virtual message format-enabled UHF, and a terrestrially based Internet backbone linked everything.

The team linked a Navy E-2C Hawkeye aircraft, a United States Air Force Joint STARS aircraft, a Navy F/A-18 Hornet and a Navy EA-6B Prowler. A surrogate Global Hawk Maritime Demonstrator capability and five ground nodes along the east coast of the United States were also integrated to represent other intelligence, surveillance and reconnaissance, battle management command and control, sea-based, and shore-based command nodes.

Two web services-based tools were the only software added by Northrop Grumman. One mechanized the battle-management command and control decision flow process. The other opened E-2C maintenance data to the network. But both used commercially available, browser-based, add-in components.

The U.S. Navy and Northrop Grumman employed battle management command and control software collaboration tools and openly architected, web service-based battle management collaboration tools and Cisco "Mobile Routing" technology.

With those and other tools the team was able to serve imagery information to all participants in an RF-enabled network. They established direct IP communications between the Joint STARS, EA-6B and, at the center of it all, E-2C aircraft to exchange imagery and chat.

The entire system was designed, installed and tested in six months.

There were two flights and five ground tests over two-weeks. The experiment captured numerous technical data points that verified the speed and accuracy of machine-to-machine communications while using Internet Protocol radios.

During the experiment there were direct digital communications between the F/A-18 and E-2C such that digital 9-Line targeting data were communicated via machine-to-machine methods. The Hawkeye sent and received digital target imagery.

Initiated by intelligence reports of a possible (though simulated) attempt by terrorists to enter the United States by water and cause havoc using surface-to-air missiles, the various players in the

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network searched the waters of the Chesapeake Bay and out into the Atlantic, detected inconsistencies, confirmed and targeted the threat, and eliminated it.

This phenomenal success proved how easy it was to build a sophisticated yet low-cost network-centric warfare capability around today's Hawkeye aircraft.

Nonetheless, the true value of Hawkeye can only be proven in real world operations.

Such proof was delivered after Hurricane Katrina struck the city of New Orleans on Aug. 29, 2005 with winds in excess of 140 mph. Sections of the levees that protected New Orleans failed and 80 percent of the city was under 20 feet of water, knocking out parts of the power grid and air traffic control infrastructure.

The Hawkeyes were among the first on the scene. From then on, the U.S. Navy, U.S. Air Force and other governmental organizations depended on the E-2Cs for support to communicate with the Gulf region. Six Hawkeye aircraft from one Navy reserve and two Navy squadrons coordinated the rescue effort of people isolated and threatened by flood waters.

According to the Navy, the Hawkeye system's unparalleled radar and communications suite was used to monitor airspace, locate stranded victims, direct rescues, locate standing buildings, identify space for safe landings and provide direction for aircraft activity in the area.

The E-2Cs helped evacuate victims from the New Orleans Convention Center, the Superdome, highway overpasses and roofs of homes. Hawkeye crews also coordinated food drops at a city hall and a grocery store where hungry and dehydrated citizens had congregated. During a two-hour period on Sept. 4, Hawkeye crews coordinated the rescue of more than 400 people, two major food drops and four medical evacuations.

The Hawkeyes were airborne around the clock for about a week after the hurricane hit, controlling the airborne rescue effort, which included the helicopter rescues that became regular images in the news coverage of the catastrophe. They also managed the ancillary traffic, such as news helicopters and official's aircraft, and supported Navy and Air Force missions, including airborne command-and-control coverage for Air Force One during President George W. Bush's visits to the area.

The contributions to the defense of a nation by the Hawkeye system are only limited by the requirements and creativity of its users. And, with the U.S. Navy's roadmap for future development – most of which has historically been made available to international Hawkeye customers – new capabilities, ongoing support and low life cycle cost will continue to pay dividends for all who are part of the E-2 Hawkeye family.

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