

The P-8A Poseidon is built on the Next-Generation 737-800 commercial jet aircraft platform, with Next-Generation 737-900ER (Extended Range) wings and two jet engines. Designed to replace the aging four-engine turboprop P-3 platform, this aircraft gives the U.S. Navy the capability to go higher, farther and faster than its P-3s can.



# The ruler of the sea

## Why the P-8A Poseidon is important to the U.S. Navy—and to the way Boeing business units work together

By DEBBY ARKELL

Just as German submarines made significant technological leaps during World War II, so too is the manner in which those submarines are countered. With the Boeing P-8A Poseidon, the U.S. Navy's long-range airborne antisubmarine capability is fully centering on the latest jet-age technology.

The P-8A is a new approach to critical-mission maritime patrol. Launched in June 2004 with a system development and demonstration contract for the Navy, the two-engine turboprop-powered P-8A will replace the fleet's aging P-3 turboprop aircraft with 108 of the state-of-the-art submarine-seeking aircraft.

Boeing Commercial Airplanes and Integrated Defense Systems are working together to design, build and deliver this new, modern aircraft, which is based on the Next-Generation 737-800 airframe. These business units have teamed before on other commercial-to-military programs, such as the C-40 military transport and Wedgetail, an Airborne Early Warning and Control system. But the approach BCA and IDS are undertaking on the P-8A program represents a new and vastly improved business model. Boeing leaders said the new approach was central to the company's winning this business—and that it represents a sterling example of how parts of Boeing can work together as one company to record tremendous achievements.

"The new BCA and IDS business model for producing these aircraft was a key factor in winning the competition to provide a P-3 replacement to the Navy," said Mo Yahyavi, vice president, P-8A Poseidon program, for BCA. "Our new way of doing business from this point forward will produce substantial cost savings, giving us the competitive advantage on cost, and enhance quality. It is now part of our system and processes for military airplanes, and we will never go back."

### A NEW BUSINESS MODEL

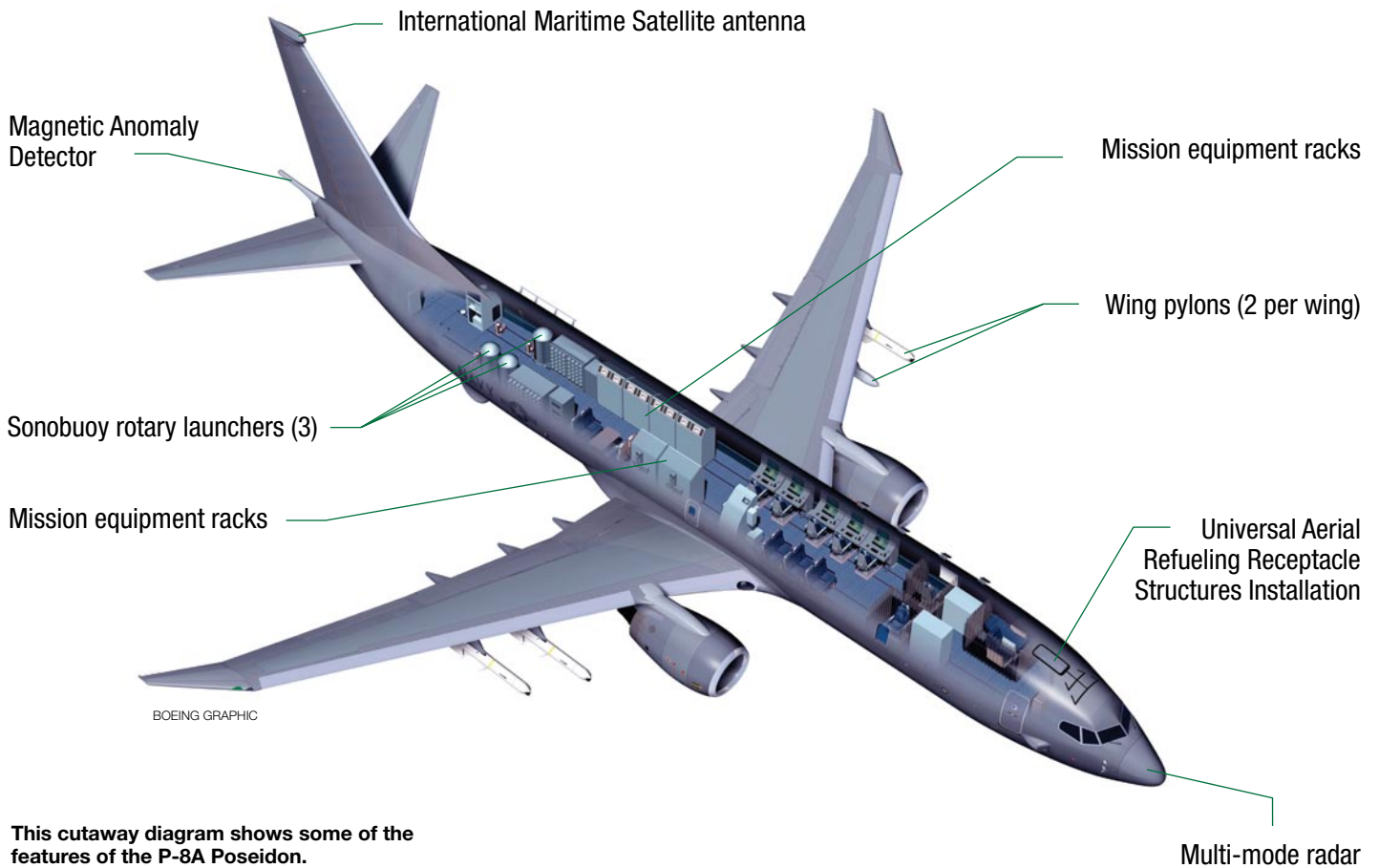
Ever purchased a family car? Think about what you'd feel if the dealer said you had to buy a station wagon first and then have it configured to the model you wanted—and that you'd have to pay for this extra work. Yet until now, that's essentially what Boeing's military customers did for their aircraft based on commercial platforms. The customer bought a commercial aircraft, removed unneeded sections and systems, and replaced them with the needed military components.

The P-8A is changing all that by becoming the first commercial-to-military platform built "in line" on a commercial airplane production line. This new production line in Renton, Wash., will replicate the already efficient 737 production system, with one major difference: the line will comply with International Traffic in Arms Regulation requirements, which are protections to ensure that non-U.S. persons can't gain access to sensitive U.S. military data or products (see box on Page 15).

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BOEING GRAPHIC

# P-8A Poseidon



This cutaway diagram shows some of the features of the P-8A Poseidon.

## Meet the P-8A

U.S. Navy pilots around the world agree: the four-propeller P-3 is a venerable platform—a turboprop aircraft based on the Lockheed L-188 airframe—and has a tremendous safety record. For more than 40 years it's been a Navy workhorse. However, the worldwide fleet of P-3s is aging rapidly, and time has come to upgrade this antisubmarine aircraft.

The Boeing P-8A Poseidon has a lot of advantages over the P-3, said Pat Nash, P-8A Business Development manager for IDS and a former P-3 pilot.

The P-8A is built on the Next-Generation 737-800 commercial jet aircraft platform, with Next-Generation 737-900ER (Extended Range) wings and two jet engines. Above all else, Nash said, this design gives the U.S. Navy the capability to go higher, farther and faster than its P-3s can.

The P-8As is air-refuelable, allowing the aircraft to remain airborne for more than 20 hours. And the aircraft also has a lot more room inside, meaning the P-8A has room for growth and systems upgrade or expansion. That makes the aircraft very versatile. “This is an advantage because you always find other things for the aircraft to do,” Nash said.

The P-8A design also improves upon the antisubmarine-warfare mission capabilities of the P-3. Sonobuoys are one of several mission systems used in antisubmarine warfare. They are transported aboard the aircraft and then deployed to passively or actively “listen” for objects in the water.

Sonobuoys can be programmed to control how long they'll sit in the water before they sink and to specify transmission channels and desired depth. The P-3 carries 48 sonobuoys externally in its belly and 36 inside. The P-8A can carry 120 of them inside the aircraft. “On the P-3 you have to select all information for the sonobuoys that go in the belly before flying,” Nash said. “On the P-8A, all of them are internal to the aircraft so information can be selected in real time on the mission.”

Because the P-8A can fly higher, the aircrew will be able to monitor more buoys in the water and cover a greater search area.

The P-8A features various sensors. The P-8A will have dedicated antennas to detect radio signals from the sonobuoys and acoustic processors to translate audio data into visual information to the mission operators. It also features electro-optical/infrared capability; a next-generation radar in the nose of the airplane with multiple maritime search and weather-avoidance modes; and a magnetic anomaly detector. This digitized system detects disturbances in the earth's magnetic field made by metallic objects such as submarines. Electronic surveillance equipment detects radar, and a self-protection suite determines whether the aircraft is in danger, to counter those threats.

The P-8A also has the capability to carry 11 weapons: two on each wing, two in the open air on the fuselage forward of the wing and five in an internal bomb bay aft of the wing.

—Debbly Arkell

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“Instead of modifying a completed commercial aircraft into a military one, the P-8A will be built by Commercial Airplanes employees on a new ITAR-compliant production line, using our existing production system,” Yahyavi said. “BCA and IDS designers are working together using common tools to establish manufacturing and design requirements.”

The P-8A is based on a Next-Generation 737-800 commercial jet enhanced with Next-Generation 737-900ER (Extended Range) wings (see Page 14 for more on the P-8A’s physical characteristics and capabilities). Spirit AeroSystems in Wichita, Kan., will deliver the fuselage sections via rail car to Renton, where the sections will be unloaded into tooling on the ITAR-compliant line. There, a small team of Commercial Airplanes employees will assemble the P-8A just as they would a commercial jet—only with elements specific to the Navy customer.

“Two-thirds of the parts for the P-8A are commercial parts,” said Jack Zerr, Boeing vice president and P-8A program manager for IDS. “Yet there also are bomb racks, an aerial refueling port, electrical sensors and more than 100 antennas on the aircraft—allowing a tremendous amount of communications capability—packaged into the platform.”

Once complete, the aircraft will be delivered to IDS. The “green” airplane will fly to an ITAR-compliant facility at Boeing Field in Seattle. There, IDS workers will install the aircraft mission systems and perform functional testing and validation under U.S. Navy regulations prior to delivery.

**OPPORTUNITY KNOCKS**

This assembly process sounds simple. But the design and production of this aircraft requires a tremendous amount of coordination between the government customer and the Boeing businesses. It also requires bridging what some call “cultural gaps” along the way.

From concept definition to the start of production, BCA and IDS have had to develop ways to ensure both business units were using common processes and tools, such as the design tools CATIA and Enovia. Establishing common approaches to the design process—in a way that accommodates requirements of both businesses and the Navy—also has been a learning process. In the past, IDS has tended toward an ongoing dialog with its military customers to continually enhance its products; BCA tends toward complete up-front definition prior to the production commencing.

Perry Moore, Commercial Airplanes P-8A Manufacturing Operations director, agreed it’s a challenge. But it’s a way of work that holds promise for the future.

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**A look inside the P-8A demonstration trailer, which last summer played a significant role in demonstrating the capabilities of the new antisubmarine warfare platform to customers and strategic partners.**

GAIL HANUSA PHOTO



**What is ITAR?**

The manufacture of U.S. military products must comply with a U.S. government requirement called International Traffic in Arms Regulations. ITAR constraints include physical protections and data protections to ensure that non-U.S. persons can’t gain access to sensitive U.S. military data or products.

As a result, the new ITAR-compliant production line in Renton, Wash., has fences and badge readers at entrances to ensure that only U.S. people are able to access the areas where P-8A Poseidon work is performed. Non-U.S. persons must be at least 10 feet (three meters) away at all times—unless those people are from approved nations or programs. An example: Australian and Turkish nationals would be allowed near a 737 Airborne Early Warning and Control aircraft manufacturing area, as their nations are customers of the product.

ITAR also requires Boeing to protect data in addition to providing physical protections. This means computer systems must have a firewall so only U.S. people can access the data, and all drawings and documents must be properly marked and controlled.

“The biggest challenge with ITAR compliance was to organize ourselves,” said Mo Yahyavi, vice president, P-8A program, for Commercial Airplanes. “We typically have not had to protect data like this before. Security and training have been a top priority—getting people to understand what it means, what our regulations are, and how to respect the new requirements.”

ITAR compliance applies to international suppliers as well: international suppliers or subtier suppliers must obtain licenses through the U.S. State Department to work on the program. “It’s complicated, but it’s a very exciting program,” said Yahyavi. “It’s challenging for all of us, but we believe our customer will be very pleased with the product they get.”

—Debby Arkell

# What's coming next

Here's a look at past and scheduled milestones for the P-8A Poseidon program.



**October 2006:** First concrete pour for new International Traffic in Arms Regulations-compliant production-line tooling at the Boeing facility in Renton, Wash.

**2007:** Critical design review complete (firm configuration)  
**End of 2007:** Begin building first small parts

**First quarter 2008:** Front spar build (wing production) begins; first fuselage on dock from Spirit AeroSystems

**Third quarter 2008:** First airplane delivered to Integrated Defense Systems

**2009:** First flight

**2013:** Initial Operational Capability (first fully equipped P-8A squadron)

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“It requires the synergy of two cultures to break new ground and build a military airplane in line. The biggest challenge is to keep the ITAR-compliant production line aligned with the 737 production system and still accommodate the military customer,” he said. “We’re getting there, and once we do, we will be able to apply this business model and lessons learned to the 767 Tanker program, should we win a contract.”

## MISSION CRITICAL

With a decision on the tanker program due later this year, the P-8A program is very important to Boeing’s businesses—and to the U.S. Navy customer. A key part of Boeing’s growth strategy is tied to commercial-to-military derivatives and finding ways for BCA and IDS to work together even better to meet military customers’ requirements.

“It goes without saying that from the IDS perspective, we need another big platform. It’s very important for the defense side of our business,” Zerr said. “And Commercial Airplanes’ growth strategy is directly tied to [programs like this] as well. So this program is a big deal for Boeing.”

This year will be a big year for the P-8A program, as production systems are put in place on the new line, drawing releases are

completed, and first parts are produced. Before beginning full production on the U.S. Navy’s 108 units, the program will begin first with building five test aircraft—two for static (ground) tests, and three for flight tests. One will fly airworthiness tests, and the other two will test mission capabilities.

“Together the Navy and Boeing are following the right principles and smart practices to ensure successful delivery of the P-8A aircraft to the warfighter,” said Capt. Joe Rixey, program manager for Naval Air Systems Command’s Maritime Patrol and Reconnaissance Aircraft. “Good planning and an open communication policy between the government-industry team have contributed to our accomplishments so far. We are all aware of the fleet’s undeniable need for the P-8A and are looking forward to first flight in 2009.”

Boeing also is aggressively pursuing additional contracts with international customers that operate P-3s.

“People on both sides are enjoying working on this program, doing new and different things,” Zerr said. “We’ve been able to attract many of the best and brightest in Boeing, and we have tremendous respect for the talent on this program.” ■

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## A new way

Although Boeing Commercial Airplanes and Integrated Defense Systems have worked on many derivative military aircraft programs, the P-8A Poseidon features a new and vastly improved business model. Here’s a quick look at some of the streamlined steps of this new model.

Before the P-8A	On the P-8A
IDS acquires a new commercial airplane from BCA to modify into a military platform.	BCA builds a military airplane on an International Traffic in Arms Regulation-compliant production line using Boeing Production System processes for delivery to IDS.
IDS removes unneeded sections and systems of the commercial jet—and installs the needed military components.	Many military-specific elements are already built into the product by BCA. IDS workers will only need to install the aircraft’s mission systems and perform functional testing and validation.
IDS conducts ongoing dialog with its military customers to continually enhance its products; BCA works to define product up-front prior to the production commencing.	BCA and IDS use a working-together approach to understand the military customer’s requirements and product definition.



In January, the KC-767 Tanker successfully extended its boom and made a series of dry contacts with a B-52 aircraft. The KC-767 is another of many notable derivative aircraft Boeing has produced for military customers.

## Derived from excellence

The P-8A Poseidon is the latest among the many derivative aircraft Boeing has produced for military customers. Here's a quick look at some other noteworthy derivative aircraft.

### KC-767 Tanker

**Mission:** In-flight refueling

**Customers:** Japan Air Self-Defense Force, Italian Air Force

**Airframe:** 767

The KC-767 continues the refueling heritage that Boeing started with its KC-10 and KC-135 aircraft. The first tankers for Italy and Japan are scheduled for delivery this year. In addition, Boeing is competing for a contract to build next-generation tankers for the U.S. Air Force.

### C-40A Clipper Military Transport

**Mission:** High-priority cargo and passenger airlift

**Customer:** U.S. Navy

**Airframe:** 737-700C

The C-40A is certified to operate in three configurations: all passengers (121 passengers), all cargo (up to eight pallets), or a combination configuration (up to three cargo pallets and 70 passengers). Boeing delivered the ninth Clipper to the Navy in May 2006.

### C-40B Special-Mission Aircraft

**Mission:** Airlift with an office-in-the-sky environment

**Customer:** U.S. Air Force

**Airframe:** 737-700C (Boeing Business Jet)

The C-40B offers an office-in-the-sky environment for U.S. combatant commanders and other senior government officials. The aircraft provides those aboard with secure, in-flight broadband connectivity to enhance communications, productivity and security.

### C-40C Operational Support and Team-Travel Aircraft

**Mission:** Transportation support for government officials

**Customer:** U.S. Air Force

**Airframe:** 737-700C (Boeing Business Jet)

Boeing has already delivered three C-40Cs to the Air National Guard and is scheduled to deliver another three aircraft to the Air Force Reserve Command this year.

### C-32A Executive Transport

**Mission:** Executive transport

**Customer:** U.S. Air Force

**Airframe:** 757-200

Boeing has built four C-32As, which are used to carry the U.S. vice president, members of the U.S. Cabinet and Congress, and other government officials traveling on government business. The fleet is based at Andrews Air Force Base, Md., and is operated by the 89th Airlift Wing (see page 30 of the March 2006 *Boeing Frontiers*).

### 737 Airborne Early Warning & Control (AEW&C)

**Mission:** Airborne surveillance, communications and battle management

**Customer:** Australian Defence Force, Republic of Turkey, Republic of Korea Air Force

**Airframe:** 737-700

The critical sensor on the 737 AEW&C is the Multi-role Electronically Scanned Array radar, built by Northrop Grumman. The radar can track airborne and maritime targets simultaneously and can help the mission crew direct the control of high-performance fighter aircraft while continuously scanning the operational area. The 737 AEW&C aircraft for Australia are for the Project Wedgetail program; the aircraft for Turkey are part of the Peace Eagle program.

### 707 Airborne Warning and Control System (AWACS)

**Mission:** Airborne surveillance, communications, battle management

**Customer:** United States, NATO, United Kingdom, France and Saudi Arabia

**Airframe:** 707-320B

E-3 707 AWACS represents the world's standard for airborne early warning and control systems. E-3 fills the needs of both command and control (C2) functions for tactical and air defense forces. It provides a highly mobile, survivable surveillance and C2 platform.

### 767 Airborne Warning and Control System (AWACS)

**Mission:** Airborne surveillance and command and control functions

**Customer:** Japan Air Self-Defense Force

**Airframe:** 767-200

The 767 AWACS continues the tradition of airborne surveillance and command and control functions that began in 1977 with the first 707 AWACS delivery. Boeing delivered a total of four 767 AWACS to Japan in 1998 and 1999.