Q400

Bombardier Specialised Aircraft Solution

Surveillance Over the High Seas, *Fast* and Slow

by **Isaak Zulkarnaen**

Airborne maritime patrol plays a big part in military tasks such as maritime surveillance, reconnaissance, and anti-surface vessel and anti-submarine warfare. These tasks involve searching for, locating, identifying, tracking and reporting contacts of interest. The non-military tasks also include long-range search and rescue, mostly searching for ships and aircraft in distress.

During the Cold War, the United States and its allies employed large number of maritime patrol aircraft (MPA) to track down Soviet nuclear ballistic submarines. Due to the long duration of maritime patrol and the need to carry a suite of detection equipment and back-up crews, MPAs were mostly converted or modified civilian airliners that had long endurance and more importantly low loiter speed necessary for anti-submarine operations. MPA usually employed sonobuoys and magnetic anomaly detectors (MAD) to detect their quarry, which then could be attacked by homing torpedoes although current versions are also armed with anti-ship missiles for anti-surface warfare roles and an extensive defensive suites for self defence.

The classic MPA, the Lockheed P-3 Orion, which has been in service since 1962 and remains in the same role in large numbers, may well continue for another decade at least. Two other classic MPAs, the Tupolev Tu-142 and the Dassault-Breguet Atlantique also remain in service, albeit in smaller numbers. However, the traditional "sub-hunting" role for the MPA has radically changed since the end of the Cold War with an increased focus on littoral warfare and operations other than war. The evolving role of the MPA means that the platforms must demonstrate increased flexibility and have a broader range of capabilities than they were initially designed for. Navies of different countries have been reconsidering their maritime patrol objectives. This is due to the need to support littoral operations and smaller defence budgets. Thus, the MPA community is currently experiencing a significant period of development and acquisition, as there is a significant requirement to replace and upgrade the current fleet with new platforms or upgrading of current platforms.

Advances in engine technology has also opened up the MPA platforms to jet aircraft although for the smaller military forces, cheaper turboprops remain a budgetary consideration. Another platform being marketed for maritime patrol duties especially for homeland security duties such as coast guard and border protection is the amphibious aircraft. Meanwhile, in the shift towards unmanned platforms, a number of high altitude long endurance (HALE) unmanned aerial vehicles have been proposed as buddy platforms to augment manned MPA operations. The tentative steps towards unmanned platforms are mostly undertaken by the major nations especially the United States. Here, ***ADJ*** looks at some maritime patrol aircraft being proposed for the Asia-Pacific region.

Turboprops

Due to their cheaper initial procurement and operating costs, turboprop planes remain the market leader for maritime surveillance duties. As with legacy MPAs, most of the aircraft in the market are modified civilian airliner, which translates to lower operating and procurement costs.

The ATR 72 ASW is a derivative of the proven ATR 72-500 commercial aircraft integrating the maritime patrol capabilities of ATR 42 MP in addition to Anti-Submarine Warfare (ASW) and Anti-Surface Warfare (ASuW) capabilities. The ATR 72 ASW can execute patrols with a mission range of 1,100km for more than 2 hours with a total mission endurance of roughly 9 hours. With a 360km mission radius the airplane can remain on station for 7 hours. Equipment options include synthetic aperture radar; a rotary sonobuoys launcher and a MAD system for detecting submarines; as well as chaff and flare for passive defence. The aircraft can be armed with two depth charges; torpedoes to engage hostile submarines; and two AM39 Exocet anti-ship missiles to engage surface ships.

Turkey has ordered ten ATR 72 ASW airplanes from Alenia Aeronautica, valued at US$219 million with deliveries slated to commence in 2010. The Pratt & Whitney Canada PW100 turboprop engine family is the primary power plant for the ATR 72 family with the latest variant the PW127 powering the newest ATR 72-500 aircraft. Wide use of composite in latest models has translated into reduced airframe weight and improved overall performance.

The Q Series

Bombardier Specialised Aircraft Solution (SAS) Q-Series aircraft provide the endurance and flexibility needed to loiter in a given area or shadow a target for longer periods of time. Ideal for maritime patrol, the rugged and reliable Q-Series aircraft is used around the globe for coastal surveillance, air and marine interdiction, and airspace security. The Q Series is a family of turboprop passenger aircraft outstanding by its durability and low noise emission.

The latest addition to the Q-Series is Q400 with a greater seating capacity, higher cruise speed of 360 knots, longer fuselage and longer range. The Q400 turboprop aircraft is powered by two Pratt & Whitney Canada PW150A rated at impressive 1,846Kw each. The propulsion system includes two high efficiency Dowty Aerospace all-composite, six-bladed propellers.

The engines are the key for the Q400's better performance compared with other Q Series aircraft and the majority of existing turboprop aircraft. The Q400 is available in three models with different maximum gross weight and payload capacity. Apart from maritime patrol, the multi-role Q400 can be configured for high altitude surveillance and domain awareness; command, control and communications and tactical and strategic reconnaissance.

With its knowledge and expertise, Bombardier SAS will be able to integrate and install the most complex systems based on its customer specifications. These include the latest radar, forward-looking infrared (FLIR), countermeasures and secure communication systems. Bombardier also offers specific options not normally found on other aircraft, including air-operable door; observation windows; drop hatch; launch tubes and emergency equipment. The Q-series aircraft is already on duty in Australia, Sweden, Japan, Canada and the United States for the Department of Homeland Security.

Spanish Persuader

Another twin turboprop touted for maritime patrol is the CN-235, available in two versions with different avionics system: the CN-235MP Persuader developed in Spain by EADS/CASA and the CN-235MPA developed in Indonesia by Dirgantara (formerly IPTN). The maritime patrol variant is in service with Spain, Ireland and Turkey (manufactured by EADS CASA) and Indonesia, Brunei and the United Arab Emirates (manufactured by Dirgantara). The CN-235 was developed by Airtech, or Aircraft Technology Industries, formed by CASA (now EADS CASA Military Transport Aircraft) and IPTN (now Dirgantara) of Indonesia to develop a turboprop aircraft for both the civil and military market. In July 2002, the US Coast Guard selected the CASA CN-235-300M for its maritime patrol requirement. The first of 36 aircraft, designated HC-235A, was delivered to Lockheed Martin (the prime contractor) for integration of the mission systems in December 2006. Operational evaluation began in 2007. It was reported that a total of 36 aircraft are to be in service by 2017. Apart from the US, CASA also received orders from Colombia and Spain while Thailand ordered the MPA version from Dirgantara. A single CN-235 MPA aircraft was delivered by Dirgantara to the Indonesian Armed Forces in June 2008.

The Spanish developed CN-235 MP Persuader is fitted with the Northrop Grumman APS-504 (V) 5 radar. The Indonesian-developed CN-235 MPA is equipped with the Seaspray 4000 from BAE Systems, the AN/APS-134 from Raytheon or the Ocean Master 100 from Thales. Both variants can be equipped with three hard-points on each wing which can carry anti-ship missiles or torpedoes and are fitted with two General Electric CT-9C3 turboprop engines each developing 1,305kW. CASA has also developed a bigger version of the 235, the CN-295 Persuader, which flew for the first time in 1998. With its stretched fuselage, the CN-295 has a 50% more payload than the 235 and is fitted with the newer PW127G turboprops.

CASA says that both aircraft perfectly adapt to the maritime patrol missions, with high manoeuvrability at low altitude and outstanding mission performance, as they were designed on the basis of frequent low-level flights, for maritime surveillance and tactical operations. The Persuader offers an outstanding multi-mission capability, thanks to the use of the rear ramp. Cabin equipment can be easily unloaded allowing the transport of additional seats, palletised or bulk cargo. If required by customer missions, the aircraft can be equipped with an easy-to-install palletised mission system that allows most of the cargo cabin to be used for transport. Compared to the smaller 235, the 295 can fly up to 12 hours for surveillance with six under-wing weapon stations.

CASA maritime surveillance solutions incorporate state-of-the-art mission sensors integrated with the FITS (Fully Integrated Tactical System): surveillance radar with automatic tracking and imaging modes, state-of-the-art IR/EO turret, and specific communication for the exchange of mission data and images. Other integrated sensors, depending on customer's mission requirements, are: Automatic Identification System (AIS), IFF interrogator, data-link, ESM/ELINT, acoustics and MAD. It should be noted that the CASA FITS has also been installed in modernised versions of the venerable Orion MPAs sold to the German Navy and the Brazilian Air Force. The upgrade included new Electronic Support Measures (ESM), radar and acoustic sensors, new data management system and a new communication suite.

Saab 2000 MPA

Saab

New Nordic Offerings

The newest turboprop aircraft-systems package proposed is the Saab 2000 maritime patrol aircraft and the Saab 340 maritime security aircraft. The Saab 2000 MPA encompasses all the key ingredients of a successful maritime patrol aircraft—long range, long endurance, fast transit time, high dash speed and long time on station. With 350-knot (TAS) high-speed dash capability, the aircraft can arrive at an incident quickly and stay on station for extended periods of time providing continuous surveillance coordination and communication.

The Saab 2000 MPA is designed from the outset to work together with the Saab 2000 Erieye AEW&C. Benefiting from the maritime oversight the new Erieye system can deliver, tasked identification and surveillance of maritime targets of interest, a game changing technology shift in the airborne surveillance arena. Either working together with the Saab 2000 Erieye AEW&C or conducting completely independent patrol missions from an unsupported remote airfield, the Saab 2000 MPA is equipped to do the job. The flexibility of the design allows the Saab 2000 MPA to conduct operations throughout the entire spectrum of missions ranging from civil or military maritime surveillance—through to warfighting scenarios including surface strike and anti-submarine warfare.

A state-of-the-art sensor suite and Mission Management System will firmly place this aircraft on the MPA map. Similarly equipped to the Saab 2000 Erieye AEW&C, the Saab 2000 MPA will feature AIS, SPS, ESM, RWR, MAW, and LAW to name just a few. Whether focusing on the tactical and "Total Surveillance" advantages the two aircraft bring, or the economies of scale that come from operating a common platform type, the Saab 2000 MPA is an integral part of a national airborne surveillance solution.

Based on the popular Saab 340 airframe, the Saab 340 maritime security aircraft (MSA), meanwhile, is a medium range civil or military MSA. The Saab 340 MSA is an updated and improved version of the Saab 340 SAR-200 in service with the Japan Coast Guard. Saab officials said that being a "proven-in-service" product for civil and military operators this MSA equals value for money.

Building on the work performed for the Japanese customer, they said that Saab is updating the 340 with additional improvements including sensor integration with a mission management system and renaming it the Saab 340 MSA, to better reflect its new mission spread. The 340 MSA strikes the perfect balance between value and capability for civil and military brown-water maritime surveillance.

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Featuring enhanced sensors such as the FLIR Systems Star Safire Electro Optical Sensor (EOS), AIS, and the Telephonics RDR-1700B maritime surveillance radar, managed via a mission system, the Saab 340 MSA provides a competitive and affordable MSA solution. The practical flexible "quick-change" interior allows for true multi-mission capability. Roles include MSA, personnel transport and police transport.

Jet Aircraft Platforms

In the past, MPAs were usually fitted with turboprops as jet engine technology had yet to produce power plants which were suited for the long endurance flight and low loiter speed typical of an airborne submarine hunter. However, as jet engine and aerospace technologies matured, specially modified jetliners or business jets may well replace turboprops for the maritime surveillance roles. Among the first jet aircraft to be selected for maritime patrol duties are the Boeing P-8A Poseidon long-range maritime patrol aircraft which is a derivative of the 737-800 airliner and, on a smaller scale, the Embraer P99, which is based on the EMB-145 regional jet.

The Poseidon

The selection of the Boeing 737 multi-mission aircraft (MMA) was announced in July 2004 with the contract award covering the manufacture of five trial aircraft over the next eight years. Boeing's P-8A Poseidon test aircraft T-1 successfully completed its first flight on Apr 25. The integrated Navy/Boeing team will begin formal flight-testing of the P-8A during the third quarter of this year. Before that, Boeing will paint the aircraft, install additional flight test instrumentation and conduct a series of ground tests. The P-8A, a derivative of the Next-Generation 737-800, is built by a Boeing-led industry team that includes CFM International, Northrop Grumman, Raytheon, Spirit AeroSystems and GE Aviation. The team currently is assembling and testing the first five P-8As. The US Navy plans to purchase 108 P-8As to replace its fleet of nearly 200 P-3C aircraft. Initial operational capability is planned for 2013.

P-8A Poseidon's first flight.

Boeing

The P-8A is intended to conduct anti-submarine warfare, shipping interdiction, and to engage in an electronic intelligence (ELINT) role. This will involve carrying torpedoes, depth charges, Harpoon anti-shipping missiles, and other weapons. It will also be able to drop and monitor sonobuoys. It is also designed to operate in conjunction with the Broad Area Maritime Surveillance unmanned aerial vehicle.

In early 2009, India inked a $2.1 billion deal with Boeing for the supply of eight customised P-8A Poseidon, designated P-8I, for use by the Indian Navy. India will get its first P-8I towards end-2012 or early-2013, with delivery of the remaining seven aircraft expected to be completed by 2015-2016. Under the contract, India has an option to order four to eight more such planes. The P-8Is will replace Indian Navy's ageing fleet of eight Russian Tu-142M maritime reconnaissance aircraft.

Embraer's P-99

Embraer

Brazil's P99 and Canada's Bombardier Specialised Aircraft Solutions

Another jet aircraft adapted for the specialised role of maritime surveillance is Embraer's P99. The Brazilian aircraft manufacturer touted the P-99 as a new-generation Maritime Patrol and Anti-Submarine Warfare aircraft. The P-99, the latest addition to Embraer's Intelligence-Surveillance-Reconnaissance (ISR) System, features characteristics such as high levels of operational efficiency, mission performance and survivability, even in the most adverse theatre; commonality with other special versions, such as the EMB 145 AEW&C and EMB 145 RS/AGS; baseline aircraft commonality with over 900 regional aircraft currently in operation worldwide, providing high levels of availability and reliability. An Advanced Mission System allows the P-99 to be configured according with customer needs. Apart from maritime patrol duties, the multi-role P-99 is adaptable for other duties including ASW, ASuW, Electronic Warfare, Electronic Support Measures, electronic and communication intelligence; search and rescue; law enforcement (anti-smuggling, anti-piracy and anti-drug); fisheries patrol and Exclusive Economic Zone surveillance.

The P-99 carries four under-wing hardpoints which can be fitted with a variety of torpedoes and/or anti-ship missiles. Mexico was the launch customer for this variant followed by deliveries to the Brazilian Air Force.

Canada's Bombardier Specialised Aircraft Solutions offers three ultra-long range jets for specialised missions from homeland security to maritime patrol duties. These aircraft include the Global Express XRS and Global 5000; Challenger 300, 500 and 600 series and Learjet 40 XR, 45XR and 60XR. Bombardier Global aircraft fly faster and farther, and climb quicker than any other business jet in their class. Their spacious cabins offer maximum flexibility for VIP transport and air ambulance requirements. Their higher ground clearance supports mission sensor installations, while their damage-tolerant airframes provide superior structural integrity.

With excellent loiter time capabilities at low speeds and high altitudes, the Global aircraft provides greater look-down capability. Under certain conditions, Global aircraft can fly over 16 hours without refuelling. These advanced aircraft are suitable for missions ranging from low-level flight inspection to high-level surveillance. With their impressive range and endurance, Bombardier Challenger aircraft are equally suited to special missions. Their spacious cabins provide a working environment with ample space for operator consoles and mission system electronics.

Challenger aircraft accommodate numerous cabin configurations from high-density passenger seating to multiple workstations and the traditional VIP interior. High dash speed, long endurance, low altitude manoeuvrability and the ability to carry external stores make the Challenger an effective platform for missions such as flight inspection and ISR (intelligence, surveillance and reconnaissance). Governments benefit from the multi-mission flexibility of one of the world's most popular executive transport aircraft.

France's Dassault Aviation is among the first airframe makers adapting business jets for maritime patrol duties. Its most well known aircraft is the Falcon 20 series with the HU-25 Guardian being the US Coast Guard version. Dassault's latest offering is the Falcon 900 MPA, which according to Dassault is the result of 50 years of know-how gained by the company in aeromaritime operations. It encompasses the best of the available technologies in the fields of airframe, avionics, engines and mission systems. It is a new concept of high performance, low cost and low risk long range maritime patrol aircraft. The concept of the Falcon 900 MPA builds up directly on lessons learnt from the Atlantic family of long-range MPAs. The Falcon 900 MPA derived from the Falcon 900DX, the latest version of the Falcon 900 family of business jets. The state-of-the-art Thales' AMASCOS mission system and sensors suite, as well as the airframe has growth potential to meet new requirements throughout the life of the aircraft.

Amphibious Aircraft

Due to their ability to land and take off from water, amphibious planes are ideally suited for search-and-rescue duties in the littoral. Combining this ability with latest sensors and avionics will enable amphibians to perform roles usually undertaken by the more traditional MPAs.

One such amphibian is Russia's Beriev A-40/Be-42. It is the world's largest amphibious airplane. It was originally developed to meet the requirements of the Soviet Union's Navy for a single platform to replace Be-12 and Il-38 maritime patrol and ASW aircraft.

CL-415MP

Bombardier

The A-40/Be-42 is powered by two D-30KPV turbofan engines rated at 26,500-pound of thrust each, equipped with booster turbojets and mounted over the fuselage between the wings and the tail. Its stability and controllability in the water is remarkable due to variable rise hull. Its development began in the early 1980s and by 1989 the aircraft had achieved operational capability within the Soviet Union's Navy.

The Beriev design bureau also envisaged the development of new variants powered by turboprop engines in lieu of turbojets. The A-45 was the designation for ASW variant powered by turboprop engines, the Be-40P was a 105-seat airliner and the Be-40PT was a combination cargo/passenger airplane. However, these developments were put on hold after the Soviet Union's collapse. It is estimated that between 20 and 50 A-40/Be-42/Be-200 aircraft have been produced for the Commonwealth of Independent States (CIS) and export customers. The A-40 was dubbed "Mermaid" by NATO and the Be-42 is also known as Albatross. The A-40 aircraft is a variant specifically designed to suit Anti-Submarine Warfare (ASW) missions and is equipped with torpedoes, mines and depth charges which are carried inside an internal weapons bay. The A-40 aircraft is capable of taking off and landing on ground and water with waves of up to 2.2 metres in height. The A-42PE is an amphibian aircraft based on the A-40 which is powered by two D-27 turboprop engines provided by Ivchenko-Progress. The A-42PE is intended as a patrol and search and rescue aircraft.

More promising is the Beriev Be-200, an amphibious multirole turbofan aircraft designed by the Berieva Aviatsionnyi Kompaniya (Beriev Aviation Company), with the Russian Irkutsk Aircraft Production Association (IAPO) responsible for the production engineering development phase of the programme. The first flight took place in 1998 and the aircraft was first seen in the west at the 1999 Paris Air Show. The Beriev Be-200 was first developed for firefighting missions. It can start, take-off and land on water and can carry a load of 12t of water. Be-200 aircraft belonging to the Russian Ministry of Emergency Affairs were deployed to fight forest fires in Greece in 2007. The aircraft was also deployed to fight forest fires in Indonesia. It was reported that the Russian Navy has announced plans to acquire four Be-200 aircraft for search and rescue (SAR) operations. A military version, equipped with the Sea Dragon ASW system, is also being considered. IAPO (now part of the Irkut Corporation) has cooperated with EADS to market the aircraft with western systems such as the Rolls Royce BR715 engines.

Another amphibian in the maritime patrol role is Bombardier's CL-415MP, a variant of the rugged Bombardier 415 amphibious aircraft, which can be equipped with a state-of-the-art surveillance suite that includes two side-looking airborne radars, one forward-looking infrared, an airborne maritime surveillance system and other avionics and communication equipment. This versatile mission-specific aircraft combines a state-of-the-art surveillance suite with direct water intervention capabilities. It offers exceptional low-level, low-speed manoeuvrability. This makes it the perfect choice for a wide range of special missions on inland, coastal and offshore waters. The CL-415MP can be used in a variety of specialised missions such as search and rescue, environmental protection, coastal patrol and transportation. It is fitted with sophisticated sensors to locate and identify vessels, people in distress and pollutants.

Malaysia ordered two CL-415MP aircraft for the Malaysian Maritime Enforcement Agency (MMEA) for surveillance and search-and-rescue duties, with the first aircraft delivered in early 2009. Since delivery of the first Bombardier 415 aircraft in 1994, Bombardier Aerospace has delivered 67 Bombardier 415 aircraft to Croatia, France, Greece, Italy, Canada and Spain, with 42 aircraft in operation in the Mediterranean region.■