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DECEMBER 2000 $3.50
NAVY LEAGUE OF THE UNITED STATES
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World's MPA Fleets: The Only Constant Is Change

New Missions for Aging Airframes

Most of the world's operators of the P-3 Orion maritime patrol aircraft have initiated structural refurbishment or mission-system modernization programs to sustain the multimission capabilities of the aircraft well into the 21st century.

RAYTHEON

By DAVID READE

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No warfare community has undergone more change since the end of the Cold War than the international maritime patrol aircraft (MPA) community. With the de-emphasis of open-ocean antisubmarine warfare, MPA operators worldwide have oriented their existing MPA fleets toward new mission areas. Advances in sensors and weapons demonstrated in the Gulf War and in NATO operations in the Balkans verified the utility of MPA in new or re-emphasized joint-force mission areas such as maritime (surface) and littoral surveillance, overland reconnaissance, real-time intelligence-gathering, and long-range strike.

The multimission capabilities always resident in MPA have been dramatically enhanced by new avionics and an emphasis on interoperability with joint forces. Digital imaging sensors, precision GPS (global positioning system) navigation, satellite communications, and the huge processing power of modern computers have synergistically increased MPA contributions across the warfare spectrum. Gone are the stand-alone operator/sensor stations of the early submarine hunters. Today, versatile multifunctional workstations, combined with improved data fusion, tailor aircraft to each particular mission.

MPA aircraft have become the universal surveillance platform of choice for many NATO and nonaligned nations worldwide that also are trying to do more with less. Most international MPA platforms, aged beyond 30 years and some with 1960s-vintage mission-system technologies, are undergoing some kind of replacement and/or modernization program. Few of these programs encompass the development of new aircraft. Most consist of modernizing existing platforms either through structural refurbishments and some mission-system upgrades or through acquisition and modernization of surplus airframes.

The Durable Orion

The P-3 Orion, the world's premier maritime patrol aircraft for more than 35 years, is currently in the throes of various life-extension programs and mission-system upgrades to extend its operational service life to 2025 and beyond. The future of the P-3—which serves in the navies or air forces of more than 16 nations—depends on two areas of concern: (1) the structural soundness of the airframe; and (2) mission-system upgrades.

The P-3 airframe is an inherently fatigue-resistant structure, as proven by its extensive service history. Overall, the worldwide P-3 fleet has recorded more than nine million flight hours with no known cracks due to fatigue alone. Environmental and operational wear and tear as well as factors relating to the aircraft's original manufacturing, however, have combined to significantly degrade the material condition of the Orion's airframe. Corrosion has been determined to be the principal culprit affecting the operational readiness of

P-3s worldwide. The U.S. Navy has pioneered the development of measures to extend the operational service life of the current fleet of Orions as the service proceeds down the road toward an ultimate replacement of the aircraft.

The Navy also has instituted a sequence of programs to combat the effects of corrosion. The first—the Sustained Readiness Program (SRP), initiated six years ago—addressed the high-corrosion areas of the P-3 and preemptively replaced, upgraded, and refurbished key structural elements to restore the aircraft's condition and repair corrosion damage.

Unfortunately, the P-3s inducted into SRP were in far worse material condition than previously anticipated. Imperfections in the production processes in the original manufacturing permitted corrosion to degrade the aircraft's material condition. The need for additional repairs caused considerable delays and increases in costs, pushing the program into cancellation after only 13 aircraft were completed. The U.S. Navy no longer views the SRP, as originally conceived, as the best and most economical approach.

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A P-3 Orion goes through refurbishment at Raytheon's Greenville, Texas, facility. The later-suspended Sustained Readiness Program revealed corrosion more serious than anticipated on P-3 airframes. A service-life extension program, expected to begin in 2002, will encompass installation of new airframe structures, including new wings and a new empennage.

SLAP/SLEP and AIP

While SRP was in work, the U.S. Navy established a Service-Life Assessment Program (SLAP) to determine the Orion's true fatigue-life condition. All data collected will be used to create measures to extend the service life of the aircraft to 2025 through implementation of a service-life extension program (SLEP) that will encompass installation of a new wing, new empennage, and other key airframe structures carried over from the SRP program. Additionally, SLEP will include installation of a new electrical load system and an updated cockpit with modern glass displays and an associated flight-management system compliant with the Global Air Traffic Management program.

The P-3 SLEP is expected to begin in 2002, with the first "SLEPed" aircraft scheduled to enter fleet service by 2007. Due to the heavy operational demands of the P-3 fleet, the first 10–13 aircraft—P-3C nonupdated and Update I airframes—to be inducted into the SLEP program will be pulled from desert storage.

Concurrent with SLEP the aircraft will be upgraded to the U.S. Navy's Antisurface Warfare Improvement Program (AIP) configuration. Lockheed Martin's AIP, sometimes viewed as a mission-system upgrade, is really a mission-capability upgrade of the P-3C. The AIP program includes addition of the ASP-137B(v)5 imaging radar, a new infrared (IR) sensor, satellite communications, the AAR-47 missile warning system, the ALE-47 chaff/flare survivability system, the OASIS (Over-the-Horizon Airborne Sensor Information System) tactical information system, and an electro-optical (EO) surveillance sensor to the existing Update III mission suite.

The AIP also upgrades several existing systems, adding a new direction-finding antenna for the aircraft's ALR-66 ESM (electronic surveillance measures) and an associated pulse analyzer; new universal displays and controls at a number of sensor-operator positions; an upgrade to the existing CP-2044 mission computer; and the capability to launch AGM-84E SLAMs (Standoff Land-Attack Missiles) and AGM-84H SLAM-ER (Expanded-Response) missiles and the AGM-65 Maverick.

MMA Over the Horizon

The U.S. Navy awarded contracts last summer to four companies—Raytheon, Lockheed Martin, Boeing, and Northrop Grumman—for proposals for the next-generation MPA, the Multi-mission Maritime Aircraft (MMA), envisioned as the replacement for the P-3C and the EP-3E electronic reconnaissance aircraft. Boeing has proposed a variant of the company's 737 airliner; Northrop Grumman has proposed a combination of an MPA and unmanned aircraft. Raytheon and Lockheed Martin both have proposed remanufactured P-3s.

Findings of a 1999 concept study led to the Navy issuing a tentative endorsement of a remanufactured P-3 as the best-value solution, but the other options are still being evaluated. The U.S. Navy's MMA selection is key to what other nations may do to upgrade or replace their P-3 fleets. In the meantime, other international P-3 operators have announced or begun their own life-extension and mission-system upgrade programs. Following is a status report on the programs already initiated.

Norway: Lockheed Martin has upgraded four Royal Norwegian Air Force P-3C Update III aircraft under an Upgrade Improvement Program (UIP) based on the U.S. Navy's AIP. The UIP includes the installation of the CP-2044 computer, the APS-137B(v)5 imaging radar, an EO surveillance-system sensor, the global positioning system, satellite communications, and new acoustic processor and receiver systems. Additionally, the aircraft's ESM system is upgraded and encompasses a dedicated ESM operator station. Other UIP improvements include a chaff/flare dis-

pensing system and a radar/laser warning system for self-defense.

The Netherlands: Despite a series of defense budget cuts, the Royal Netherlands Navy (RNLN) has won approval for its Capabilities Upkeep Program (CUP), also based on the AIP. The CUP program—closer to the scope of the Norwegian UIP upgrade—will improve the ASUW capability of the RNLN's P-3C Update II.5 aircraft, upgrade their acoustic suites, and provide a level of standardization and interoperability with the U.S. Navy P-3C Update III configuration. The CUP is expected to encompass mission systems and sensors common to the Norwegian UIP, and to include further cockpit enhancements, a new Star Safire IR/EO sensor, the AAR-47 missile-warning system, and the ALE-47 chaff/flare dispensing system.

The CUP—contracted to Lockheed Martin—is scheduled to completely upgrade seven of the RNLN's 13 P-3Cs. Another three will be partially equipped for special surveillance missions in the Caribbean, and the remaining three will be withdrawn from service and offered for sale.

Australia: One of the most significant P-3 mission-system upgrade programs established in recent years is the "Sea Sentinel" upgrade of the Royal Australian Air Force's Orion fleet, now designated AP-3Cs.

The Sea Sentinel refurbishment program—conducted by Raytheon—was initiated in 1995 to reduce aircraft weight as part of a planned life-extension process. The integration of newer, lighter, more sophisticated mission systems and sensors—which replaced older, heavier, less capable, and insupportable mission avionics and reduced the impact on the airframe's fatigue index—achieved most of the 3,200-pound reduction stipulated by the Australian requirements.

Sea Sentinel's mission-system components include an improved data-management system, modern multimode radar, and advanced communications and navigation systems as well as a sophisticated acoustic processing system. Additional modifications include installation of an upgraded electronic flight-instrumentation system (EFIS)—a "glass" cockpit—with an associated flight-management system, and a new interior tactical compartment layout incorporating new lightweight, multifunctional sensor operator workstations.

The first Sea Sentinel AP-3C flew on 19 May 1999; even as it was nearing completion, preparations were begun for the modification, using Raytheon-designed kits, of the remaining fleet of aircraft at the in-country facility of Raytheon's primary subcontractors Boeing/Asta. Once fully operational, the AP-3C is expected to be the most sophisticated P-3 MPA in the world.

New Zealand: Since cancellation of the second phase of the Rigel project in 1990, the Royal New Zealand Air Force (RNZAF) has striven to upgrade its six P-3K Orions. Several service-life assessment studies identified aircraft deficiencies and obsolete mission systems. One study, of the aircraft's fatigue index, prompted the establishment (in 1996) of Project Kestrel, a program to replace the aircraft's wings, horizontal stabilizers, and other fatigue-critical structures, and to guarantee airframe life through 2030. The first Kestrel P-3K flew in 1998; the sixth is expected to be completed by the end of 2000.

In 1999, after further studies had determined the need for a new state-of-the-art mission suite, the RNZAF established the requirements for a complete mission-systems upgrade for its P-3Ks. The proposed upgrade—Project Sirius—was to have included a new digital imaging radar, an advanced ESM, a new acoustic processor, IR/EO surveillance sensor, a new digital magnetic anomaly detector (MAD), a new navigation and communications suite with secure data link, a self-defense capability, and a modernized cockpit. At the heart of Project Sirius were a fully integrated state-of-the-art data mission computer and multifunctional workstations with high-resolution color displays and controls.

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Raytheon's "Sea Sentinel" mission-systems upgrade for the Orions of the Royal Australian Air Force will make the RAAF fleet the most sophisticated MPA force in the world.

VIA DAVID READE

A Canadian Air Force CP-140 Aurora maritime patrol aircraft. Canada's CP-140 fleet is slated for reductions, but a 10-year incremental modernization program is underway.

The New Zealand Ministry of Defence (MOD) had originally selected Raytheon Systems Company as the preferred vendor for Project Sirius. But on 23 August 2000 the New Zealand cabinet formally announced the new Labor government's decision to concentrate its efforts on strengthening the New Zealand Army's capabilities at the cost of the RNZAF's maritime-surveillance capabilities. In effect, the government canceled the proposed Project Sirius and also had called into question the requirement for an aerial maritime-surveillance capability in the future.

A group of senior cabinet ministers has been directed to investigate and report on both the military and civil missions of the P-3K to consider alternative ways of meeting operational requirements. The report is expected by February 2001, and conceivably could lead to a reversal of the MOD decision.

Spain: The Spanish Air Force (SAF) has vied for a mission-systems upgrade since the mid-1980s for its fleet of 1960s-vintage P-3A/B Orions, which are plagued by supportability issues. Spain initiated a P-3 upgrade program in 1987, only to have budget cuts reduce the scope of the program to a piecemeal system-by-system project.

In recent years a new comprehensive modification program—encompassing a new data mission system and a host of sensors developed by Spanish aerospace companies—has been proposed. CASA (Construcciones Aeronauticas SA), taking the lead, is to integrate its new fully integrated tactical system (FITS) into the SAF P-3s to merge state-of-the-art mission systems.

Portugal: Portugal is currently developing an upgrade program to extend the service life and mission capability of its six P-3P Orions to the year 2025. The Portuguese P-3 upgrade—better known as the Life Extension and Capabilities Improvement Program (LECIP)—is unique among the non-U.S. Orion programs in that it proposes to structurally upgrade the airframe, in a manner similar to the U.S. Navy's SLEP, as well as to improve the aircraft's mission suite. The mission system upgrade will include installation of new maritime surveillance sensors, modern navigation and communication gear, and a new state-of-the-art data mission system.

Canada: After cancellation of Canada's Aurora Life-Extension Project (ALEP) in June 1997 because of financial constraints, a re-evaluation prompted the incremental implementation of the ALEP initiatives over the next 10 years. The new Aurora Incremental Modernization Project (AIMP) encompasses the original ALEP improvements—installation of a new data-management system, advanced imaging radar, acoustic processor, a new MAD, a new ESM (electronic surveillance measures) system, an EO system, and a self-defense package; it also includes plans for installation of new navigation and communications systems incorporated into an upgraded cockpit.

VIA DAVID READE

A comprehensive upgrade program will modernize Spain's older fleet of P-3A/B Orions. State-of-the-art mission systems will be integrated into the aircraft by CASA.

In the meantime, Canada is preparing to reduce its MPA fleet: All three CP-140A Arcturus aircraft and at least two of its 18 CP-140 Auroras will be withdrawn from service.

Four nations—Chile, Argentina, Greece, and Thailand—have purchased refurbished Orions in recent years; four others—Brazil, Taiwan, and potentially Germany and Italy—are considered strong possibilities as future operators of refurbished Orions.

The Brazilian Air Force is seeking to purchase approximately 12 P-3 aircraft through the U.S. Navy's Foreign Military Sales (FMS) program. These aircraft, suitably upgraded to modern standards, would give Brazil the ability to extend its reach farther out into the South Atlantic.

Taiwan is considering the P-3 to replace its aging twin-engine S-2 Trackers. Although Taiwan was locked out of U.S. defense appropriations for FY 2000, it has included the P-3 in its defense requirements for 2001, and hopes also to use the FMS route.

Germany and Italy—which had planned to participate in the canceled program for the U.S. Navy's proposed successor to the P-3, the P-7A—have joined together to explore a viable replacement platform for their aging Atlantique I MPAs. An estimated 24–26 aircraft are required, 10–12 for Germany and 14 for Italy. Dassault Aviation is offering a modernized new Atlantique. Raytheon Systems Company and Lockheed both are proposing remanufactured and upgraded Orions—the P-3 Procyon and the Orion 21, respectively. BAE Systems has suggested an export of its MRA.4 Nimrod MPA being developed for the Royal Air Force (RAF).

BAE is converting 21 MR.2 Nimrods into the MRA.4 version, which features a remanufactured fuselage, new wings and engines, and an advanced mission system based on Boeing's Tactical Management System. The MRA.4 is scheduled for its first flight in June 2002 and is expected to be fully operational with the RAF by March 2006.

Long-range MPA will endure well into the 21st century as the multimission platform of choice into the 21st century. Even the aerospace industry has changed to meet the challenges of keeping the MPA available in the years ahead. There are currently more aerospace companies involved in rework to sustain, extend, and upgrade the world's MPA fleets than there are producing new replacement aircraft. ■