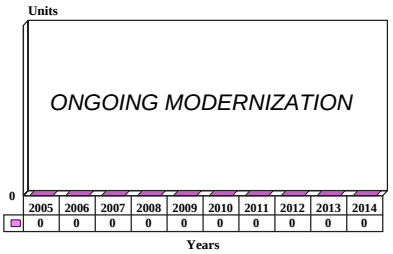
Lockheed P-3 Orion - Archived 1/2006

Outlook

- Boeing to develop new 737 Multimission Aircraft as P-3C replacement
- Status of some current upgrades uncertain following 737 MMA selection
- Ex-USN P-3s becoming available for refurbishment/resale overseas

10 Year Unit Production Forecast
2005 - 2014



Orientation

Description. Land-based, four-engine, turboprop-powered anti-submarine warfare/maritime patrol aircraft.

Sponsor. United States Navy Naval Air Systems Command, Washington, DC, USA.

Licensee. Kawasaki Heavy Industries Ltd, Aircraft Division, Gifu, Japan.

Status. Production completed.

Total Produced. Lockheed and Kawasaki produced 647 and 101 P-3s, respectively, through 1997.

Application. Long-range, land-based, anti-submarine warfare and maritime patrol; electronic counter-measures; electronic intelligence

Price Range. According to U.S. Department of Defense (DoD) budget documents, the FY87 (last year of USN procurement) unit cost was $50.4 million. Kawasaki-built P-3C estimated at $76.5 million in 1994 U.S. dollars.

Contractors

Lockheed Martin Aeronautics Company, 86 South Cobb Dr, Marietta, GA 30063 United States, Tel: 1 (770) 494-4411, Fax: 1 (770) 494-6263, Prime

Rolls-Royce Corporation, http://www.rolls-royce.com/northamerica, PO Box 420, 2001 South Tibbs Ave, Indianapolis, IN 46206-0420 United States, Tel: 1 (317) 230-2000, Fax: 1 (317) 230-6763 (T56-A-14)

Astronautics Corporation Of America, http://www.astronautics.com, 4115 N Teutonia Ave, PO Box 523, Milwaukee, WI 53209-6731 United States, Tel: 1 (414) 449-4000, Fax: 1 (414) 447-8231, Email: busdev@astronautics.com (Flight Indicator)

BAE Systems North America - Information & Electronic Systems, Division HQ, http://www.iesi.na.baesystems.com, 65 Spit Brook Rd, Nashua, NH 03061-0868 United States, Tel: 1 (603) 885-4321, Fax: 1 (603) 885-2772, Email: randal.e.morger@baesystems.com (SSQ-71 (XN-1) Sonobuoy Development)

Bombardier Aerospace, http://www.bombardier.com, 400 Côte-Vertu Rd West, Dorval, H4S 1Y9 Quebec, Canada, Tel: 1 (514) 855-5000, Fax: 1 (514) 855-7401 (Out-Board Wing Box)

Honeywell Aerospace, http://www.honeywellaerospace.com, 1944 East Sky Harbor Circle, Phoenix, AZ 85034 United States, Tel: 1 (602) 231-1000, Fax: 1 (602) 365-2075 (APN-194 Radar Altimeter)

Technical Data

Design Features. Cantilever, low-wing monoplane powered by four conventional turboprop engines in tractor configuration. Aircraft employs traditional light alloy metal construction and mechanical flight controls.

	Metric	U.S.
Dimensions		
Length overall	35.61 m	116.833 ft
Height overall	10.27 m	33.708 ft
Wingspan	30.37 m	99.667 ft
Cabin length[(a)]	21.06 m	69.083 ft
Cabin width	3.30 m	10.833 ft
Cabin height	2.29 m	7.5 ft
Weight		
Operating weight, empty	27,890 kg	61,491 lb
Max normal T-O	61,235 kg	135,000 lb
Max permissible T-O	64,410 kg	142,000 lb
Capacities		
Std fuel, usable	34,826 liters	9,200 gal
Max expendable load	9,071 kg	20,000 lb
Performance		
Take-off run to 15 m (50 ft), max TOW	1,673 m	5,490 ft
Max mission radius, no time on station[(b)]	3,835 km	2,070 nm
Mission radius, three hours on station[(c)]	2,494 km	1,346 nm
Service ceiling	8,625 m	28,300 ft
Econocruise speed @ 7,620 m (25,000 ft)[(d)]	608 kmph	328 kt

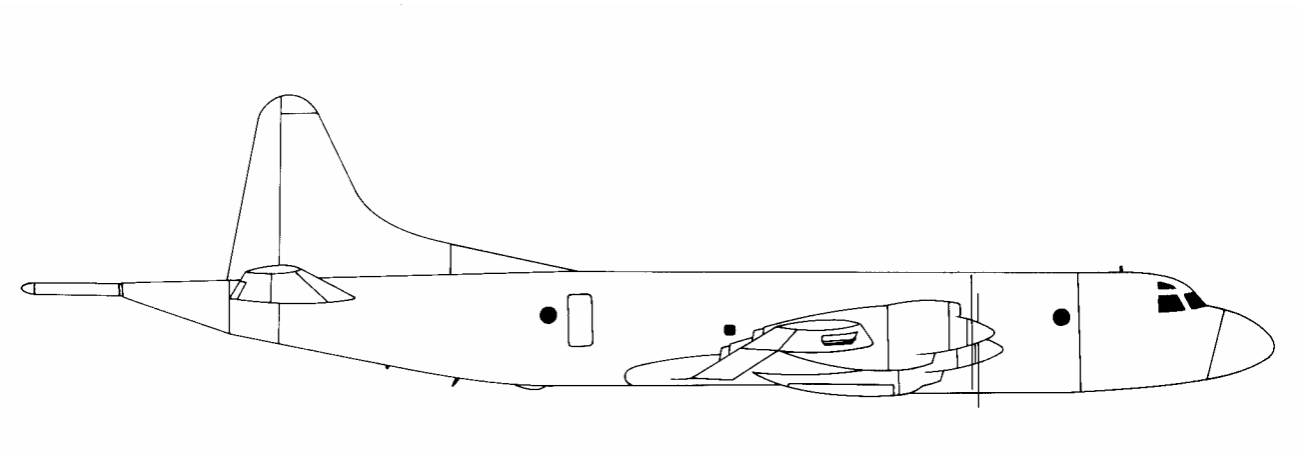
Propulsion

P-3C (4) GM Allison Gas Turbine Div T56-A-14 single-shaft, axial-flow turboprop engines, rated 3,661 ekW (4,910 eshp), each driving a four-bladed Hamilton Standard 54H60 constant-speed propeller. Engines are also license-built in Japan by Ishikawajima-Harima Heavy Industries Co Ltd, Aero-Engine & Space Operations, Tokyo, Japan, under the designation T56-IHI-14.

Armament

Weapons bay accommodates a 907 kg (2,000 lb) mine, three 453.6 kg (1,000 lb) mines, three Mk 57 depth bombs, eight torpedoes, or combination of two Mk 101 nuclear depth bombs and four torpedoes. Ten underwing pylons accommodate up to 7,257 kg (16,000 lb) of bombs, torpedoes, mines, and rocket pods.

[(a)]Excluding flight deck and electrical load center.
[(b)]At max normal T-O weight.
[(c)]At 457 m (1,500 ft).
[(d)]At AUW of 49,895 kg (110,000 lb).



LOCKHEED P-3 ORION

Source: Forecast International

P-3 ORION

Source: Lockheed Aeronautical Systems

Variants/Upgrades

P-3A. Initial production version. First flew in April 1961. Powered by Allison T56-A-10W rated at 3,356 kW (4,500 ehp).

WP-3A. Weather reconnaissance variant of P-3A. Four delivered to USN in 1970.

P-3B. Follow-on production version powered by T56-A-14 engines. A total of 124 were built.

EP-3B. P-3Bs modified to electronic warfare configuration.

P-3C. Advanced P-3 version. Currently in production. First flight made in September 1968.

Orion 2000. The Royal Air Force Maritime Patrol Aircraft variant offered to the U.K. as a Nimrod replacement, this updated version was to feature the same

Allison AE2100 engine that will power the C-130J, a two-man cockpit, and updated cockpit displays and flight control and navigation systems. Lockheed would have teamed with U.K. suppliers, which would have acquired work shares on any future P-3 sales over and above the RAF aircraft. Lockheed's contender would have been delivered to the RAF from early 2001 onward. The U.K. selected BAe's proposal to extensively upgrade the RAF's existing Nimrods instead.

EP-3C. Electronic warfare version under development by Kawasaki for Japan.

EP-3E. Ten A and two B models were converted to the EP-3 reconnaissance and electronic warfare configuration some years back. These aircraft are readily identified by canoe-shaped radars above and below the fuselage and by the ventral radome mounted forward of the wing. The Navy has identified a need for 15 similarly equipped EP-3Es to augment this aging force, and in June 1986, the service awarded Lockheed a $20.8 million contract for the Conversion in Lieu of Procurement (CILOP) of 12 existing P-3Cs to the EP-3E configuration. Five conversions had been completed and redelivered to USN by October 1992, at which time the project was suspended.

RP-3A. U.S. Navy P-3 modification for survey work.

RP-3D. USN P-3 modification for survey work.

UP-3A. USN P-3s configured for utility missions.

UP-3C. JMSDF Kawasaki P-3 configured for electronic warfare training support missions.

UP-3D. Redesignated JMSDF Kawasaki NP-3 configured for test evaluation missions.

VP-3A. USN P-3s configured for VIP transport.

WP-3D. Two aircraft configured for airborne research. Produced for U.S. National Oceanic and Atmospheric Administration.

P-3F. Six aircraft produced for Iran. Deliveries completed in 1975. Similar to P-3C.

Canadian CP-140 Aurora. Canada has purchased and received 21 CP-140 variants of the Orion. These aircraft are fitted out with most of the electronics equipment developed for the USN/Lockheed S-3A Viking. The heart of the aircraft's control system is the UNIVAC AYK-10 nav/tactical computer. Canadair handled the largest share of Canadian work on the CP-140s (about $238 million in value), including the outer and center wing box, the aft fuselage, the nose and aft radomes, machined parts, the wingtips, and the search stores rack. Enheat Ltd supplied the rudder, weapons bay doors, and elevators; Fleet Industries provided the aircraft flight station; wing components were supplied by Bristol Aerospace; and IMP Aerospace Ltd provided the aircraft's wire harness. Other Canadian firms that participated were CAE Industries, Canadian Marconi, Litton Systems of Canada, Northwest Industries, Spar Aerospace, and Hermes Electronics.

P-3 Sentinel AEW&C Orion. Lockheed modified a P-3B formerly operated by Australia into a prototype Airborne Early Warning & Control (AEW&C) platform, fitted with the GE APS-125/138 radar that equips the Grumman E-2C. The radar is housed in a dorsally mounted rotodome. The aircraft reportedly has a patrol endurance similar to that of the Boeing E-3A AWACS. A prototype flew in mid-1984, and the complete system was flight tested at the end of 1985. In May 1987, the U.S. Customs Service purchased a single P-3 AEW&C, the Sentinel, and also took out three options, all of which have been exercised.

Orion 21/MMA. Lockheed Martin's proposed MMA, this would have featured extensive mission systems upgrades to existing P-3C airframes, possibly fitted with a new wing. Orion 21 lost MMA competition to variant of Boeing 737 BBJ.

Program Review

Background. The P-3C Orion is the third derivative of the first dedicated land-based U.S. Navy ASW aircraft, which was the subject of a U.S. Navy competition won in 1958 by Lockheed. Lockheed flew a P-3A prototype, based upon the commercial Electra, in August 1958 and began initial deliveries of this model in August 1962. A total of 157 P-3As and 144 P-3Bs were built before the improved P-3C, which flew in September 1968, entered USN service in 1969.

The P-3C is the U.S. Navy's current long-range, land-based ASW aircraft. It carries a 12-man crew and features an advanced ASW system known as A-NEW, the core of which is the Sperry (Unisys) UNIVAC ASQ-114 computer. This system handles all ASW, aerial navigation, and weapons delivery functions.

Japanese Licensed Program. The Japan Maritime Self-Defense Force (JMSDF) has acquired 105 Orions, including four aircraft assembled by Kawasaki from kits supplied by Lockheed. Kawasaki delivered the final aircraft in 1997. Other Japanese firms involved in this effort included Mitsubishi (forward and aft fuselage), Fuji (wings), Shin Meiwa (nose and tail surfaces), Nippi (engine nacelles), and Ishikawajima-Harima (licensed

production of the Allison T56 powerplants). The first JMSDF P-3C squadron became operational in 1983.

Major Update/Modification Programs. The U.S. Navy P-3 Orion has undergone several improvement/ modification programs over the course of its production life, as have those aircraft operated by overseas air arms. The current major programs are described below.

P-3C Critical Obsolescence Program. A new start in FY04, this is a $245 million effort aimed at sustaining the P-3C complement until the replacement MMA becomes fully operational. Planned improvements will cover airframe, avionics, and propulsion-related subsystems.

Navy funding documents call for procurement of 150 improvement kits through FY10, but only three aircraft are listed for upgrades, all in FY05.

Special Structural Inspection Kits. A planned new start in FY05, this $325 million effort calls for procurement of 103 kits to replace components based on remaining fatigue life of the aircraft. Funding charts show four aircraft upgrades scheduled for FY05, with none beyond that time.

Update III Block Upgrade. This project provides the Navy with a significantly improved ASW acoustic detection and classification capability. The mod includes new processors, receivers, displays, and recorders, and was originally planned to apply the USQ-78 upgrade to 160 P-3Cs.

The Update III effort was funded at $1.7 billion through FY04, inclusive, and total program costs are estimated at $1.27 billion. Fifty-three modifications were completed through FY04, with two slated for FY05.

Navy budget documents call for an additional $103.6 million for this project in the post-FY08 period, but this effort may be scaled down following the 737 MMA finalist selection.

ASuW Upgrade. A new start in FY94 with funding of $58.4 million, the Anti-Surface Warfare Improvement Program (total estimated cost is $2.87 billion) was to enhance the capability of 144 P-3Cs in the anti-surface role. The program had been funded at $1.13 billion through FY04, at which time 64 aircraft had been upgraded, with another four scheduled in FY05. An additional $1.7 billion is planned in FY09 and subsequent years.

ASuW systems include the APS-137(V)5 high-resolution inverse synthetic aperture radar for long-range target detection/classification; an upgraded version of the Loral ALR-66 ESM; and a long-range electro-optical day/night imaging sensor for targeting, continuous surveillance, and battle damage assessment. In addition, the aircraft's ASQ-212 mission computer will be upgraded, and the aircraft will be enhanced with the ability to carry Hughes AGM-65D imaging infrared Maverick missiles. For self-protection, aircraft are also being fitted with the ALE-47 chaff/flare dispensers and the AAR-47 missile warning receiver.

The originally planned scope of this project may be significantly impacted by the Navy's upcoming MMA program.

Australian P-3C Upgrade. In April 2004 FLIR Systems of Portland, Oregon, was awarded a $7 million contract to supply 10 Star Safire III thermal imaging systems to upgrade RAAF AP-3Cs. Five aircraft had already been fitted with the Star Safire II system

Deliveries began in May 2004, and all systems are to be installed by early 2005.

The RAAF also plans a $14.3 million program to acquire an unspecified number of self-protection jamming pods to equip its Orions. Expected to be completed in the 2005/06 timeframe, the project will include upgrades to the aircraft's electronic support measures system to provide additional signal processing capability.

Canadian CP-140 Upgrade. The Canadian Department of National Defence has initiated the Aurora Incremental Modernisation Project (AIMP) to convert 18 CP-140 maritime patrol aircraft into long-range patrol and strategic reconnaissance platforms. This program consists of 22 individual projects and will cost about $600 million through its completion in 2009.

The AIMP is broken down into three basic elements: the comm/nav replacement group, the computer and sensor replacement group, and a follow-on upgrade group. The first group of projects, completed in 2004, consisted of nav and flight instruments, radios, SATCOM, and a communications management system.

In 2003 MacDonald, Dettwiler and Associates (MDA) of Canada was awarded $128 million to provide a new imaging and surveillance radar for the CP-140. Production of the system will begin in 2007. MDA has since subcontracted (for up to $60 million) Telephonics Corp to provide the APS-143B(V)3 Ocean Eye surveillance radar for the project. In August 2003 Lockheed Martin's Systems Integration unit received an additional $47.3 million contract for 24 ALQ-217 electronic support measures systems to be delivered by mid-2006.

Lockheed Martin Canada won a $42 million contract in mid-2003 to supply new electro-optical/infrared imaging systems for the CP-140 upgrade.

As part of the AIMP, Canada also wants to replace the aircraft's underwater acoustic system ($20 million), to

further update its EW defensive systems ($39 million), and to install a SATCOM system ($13 million).

The AIMP is expected to be completed by 2010.

Spanish Navy Upgrade. In mid-1999, Construcciones Aeronauticas SA (CASA) received a $101 million, five-year contract to install its Fully Integrated Tactical System (FITS). The contract called for redelivery of the first modified aircraft at the end of 2003, two more in 2004, and the final two in 2005. Other Spanish firms involved in the update include Elco, Espelsa, Indra, and SAES.

The FITS installation consists of a central tactical processor linked with five identical and multifunction crew consoles, each with its own RISC processor, 20-inch-high resolution display, two touch plasma screens, keyboard, and trackball. The system also includes a cockpit presentation screen, recording and data-loading units, and weapons and sonobuoy management systems. The aircraft are also being fitted with a new radar, IFF system, and electronic warfare system from Indra.

Brazilian P-3 Upgrade. Brazil acquired 12 ex-USN P-3A/B models in 1999, and EADS CASA has been selected to perform a major mission systems upgrade on nine of these.

The upgrades will include installation of the CASA-developed FITS, a new radar and FLIR sensor, and a Thales integrated cockpit. The aircraft will also receive a new electronic support measures system, Link 11 datalink capabilities, and an updated nav system. The first upgraded aircraft, to be redesignated P-3BR, is to be delivered in mid-2007. Program costs are estimated at $325 million.

Netherlands Capability Upkeep Program. The Netherlands Ministry of Defense contracted with Lockheed Martin to carry out a Capability Upkeep Program (CUP) on seven P-3Cs. Work, to be completed in 2006, consists of new sensors, including an APS-137B(V)5 imaging synthetic aperture radar and the ALR-66C(V)3 ESM, and a new communications suite featuring VHF, UHF, secure tactical and SATCOM facilities.

In 2003 the Netherlands decided to disband its P-3C contingent and in mid-2004 Germany agreed to buy eight of the 13 Dutch P-3s, reportedly to include five in the CUP configuration. Deliveries are scheduled to begin in the autumn of 2005 and to be completed in the spring of 2006.

Portugal has purchased the Netherlands' remaining five Orions; two of these will incorporate the CUP upgrade.

CNS/ATM Upgrade. The Navy will perform Communications Navigation Surveillance/Air Traffic Management (CNS/ATM) upgrades to 150 P-3C aircraft in a $147 million program launched in FY01. Equipment to be retrofit includes an integrated central processor, an air data computer, and an electronic flight display system.

Current plans call for four upgrades through FY05; the service has not penciled in an upgrade schedule beyond that point. As with several other P-3 upgrades, this program may be scaled down following the 737 MMA downselect.

EP-3E JASA. The Joint Airborne SIGINT Architecture (JASA) mod upgrades the capabilities of the Sensor System Improvement Program (SSIP) of the EP-3E. It includes the SINCGAR upgrade, which incorporates a low band capability that enhances collection capability and adds the common data link, permitting the aircraft to share data with ground, air, and ship-based operators.

Sixteen aircraft are being upgraded in a $368 million project, of which $167.3 million was authorized through FY04, inclusive. Prototype installation took place in FY01, five aircraft were upgraded in FY04, and two more are scheduled for FY05.

In 2003, the Navy said it had decided to replace its EP-3s with the yet-to-be-selected platform to serve as the U.S. Army's Aerial Common Sensor (ACS). This may preclude or significantly alter the future direction of the JASA project.

RNZAF Upgrade. The New Zealand Ministry of Defence chose L-3 Communications Integrated Systems to upgrade the com/nav and tactical systems on six RNZAF P-3Ks.

The tactical system upgrade is budgeted at $101 million to $148 million, while the com/nav upgrade will be worth $40 million to $68 million.

A formal contract was expected at the end of 2004; the upgrades are expected to be performed between 2006 and 2008.

RoK Upgrade. Korea Aerospace Industries (KAI) is expected to be prime contractor for a mission system upgrade of eight ex-U.S. Navy P-3Bs acquired by Korea. It is believed that either L-3 Communications or Lockheed Martin will be selected to provide the actual mission equipment.

Taiwan Upgrade. In mid-2004 Taiwan's cabinet approved the purchase of 12 ex-U.S. Navy P-3Cs for $1.6 billion. Lockheed Martin was expected to receive the contract to upgrade the aircraft's mission systems, with AIDC, Air Asia, China Airlines, and the Evergreen Aviation Technologies subsidiary of EVA Air all likely to seek subcontracting work on the project.

Indian Navy Upgrade. India began negotiating to buy eight surplus U.S. Navy P-3B models in September

2003. New Delhi discussed the required refurbishment and mission systems upgrade with Lockheed Martin on an on-again/off-again basis throughout 2004 but no contract had been announced by November of that year. It appears likely a contract will be signed, and Lockheed Martin will upgrade the aircraft to P-3C standard.

Funding

U.S. FUNDING

	FY02		FY03		FY04		FY05(Req)	
	QTY	AMT	QTY	AMT	QTY	AMT	QTY	AMT
P-3 Mods	-	195.5	-	167.8	-	139.2	-	135.0
EP-3E Mods	-	120.2	-	57.6	-	55.4	-	28.3
RDT&E								
PE#0604221N	-	6.0	-	0.9	-	14.6	-	9.6
Total	-	321.7	-	226.3	-	209.2	-	172.9

All $ are in millions.

Recent Contracts

Contractor	Award ($ millions)	Date/Description
Lockheed Martin Tactical Systems	60.0	Jul 2004 – indefinite-delivery/indefinite-quantity contract for three P-3C Update II.5 AIP kits; work to be completed in October 2005.

Timetable

Month	Year	Major Development
Sep	1968	P-3C prototype first flight
Late	1969	P-3C entered USN service
	1975	Update I modifications introduced
Aug	1977	Update II modifications introduced
Jan	1979	Australian order (10 units) completed
Feb	1979	First CP-140 Aurora rolled out
May	1980	Initial CP-140 delivery
Mar	1981	CP-140 deliveries (18 units) completed
Feb	1983	First flight of Kawasaki-built P-3C
May	1984	Introduction of Update III into fleet service
	1988	LRAACA selection
Early	1990	P-7 LRAACA contract with Lockheed terminated
Late	1992	Update IV project terminated
	1995	Lockheed line closed
Late	1997	Kawasaki licensed production ends

Worldwide Distribution

(As of October 1, 2004)

Country	Quantity	Type
Australia	19	P/AP-3C
Canada	21	CP-140/140A
Japan	5	EP-3C
	80	P-3C
Korea, South	8	P-3C
New Zealand	6	P-3K
Norway	2	P-3N
	4	P-3C
Pakistan	3	P-3C
Portugal	6	P-3P
Spain	2	P-3A
	4	P-3B
Thailand	3	P-3B
United States	228	P-3C
	8/5	EP-3E/A
	8	UP/VP-3A

Forecast Rationale

Several ongoing U.S. Navy P-3C upgrades, in particular the Update III Block Upgrade and the ASuW modification, may be cut short or otherwise revised following the Navy's selection of the 737 MMA as the P-3C successor in early 2004. The new MMA is expected to become operational around 2012.

The U.S. P-3C fleet is expected to be cut to about 148 aircraft by late 2006, and a respectable portion of the 70+ being retired may well find buyers on the international market. Lockheed Martin will make an aggressive effort to provide upgrade and systems integration work as these aircraft are transferred. The manufacturer has estimated a P-3 life extension and modernization market of $1+ billion over the next 20 years.

Countries recently acquiring, or interested in acquiring, their first P-3s include Germany, Greece, India, the Republic of Korea, and Taiwan. Others will follow suit in the years ahead.

Ten-Year Outlook

No further production forecast.

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