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AUSTRALIA'S P-3 REFURBISHMENT PROGRAM

BY DAVID READE

The end of the Cold War has had far reaching effects on the maritime patrol missions of many nations. The ASW priority is becoming secondary to the traditional MPA roles like ocean surveillance and Anti-Surface Warfare operations.

One such nation where maritime patrol is infinitely vital to its national security, is Australia. Australia's defense self-reliance policy gives priority to developing and maintaining capabilities for defense of its territories and promotes strategic stability and security throughout the southern pacific region.

Royal Australian Air Force's fleet of P-3 Orion Maritime Patrol aircraft are a vital component of their security. In order to maintain their capabilities, the Australian Orions are scheduled to receive a well-deserved upgrade which will increase the operational mission effectiveness and extend fatigue life.

After an intense study, the RAAF recently announced a P-3 Refurbishment Program to achieve these desired improvements. Similar in goal to that of the American "AIP Improvement Program", the RAAF program encompasses replacement of older, heavier and less capable insupportable sensors, avionics and equipment. These replacements will enhance the Australian Orions' primary ocean surveillance mission, ASUW and Over-The-Horizon Targeting (OTH-T) capabilities.

The program, designated AIR 5276, will optimize the aircraft radar and infrared sensors and enhance the ASW acoustics. The new radar system will be capable of periscope detection, target classification with tracking and stand-off targeting on high or low altitude surveillance profiles. Other fea-

tures will include both weather avoidance and navigation assistance modes and will be compatible with the onboard tactical data processor.

The ASW system, acoustics and MAD components will be maximized for detection, localization and tracking of conventional diesel and quiet nuclear submarines in a shallow water environment.

Other planned improvements encompass a new communications suite including SATCOM and upgrading the navigation to incorporate GPS.

The program will incorporate ongoing Australian Orion programs with a target configuration that includes the current Electronic Support Measures (ESM) upgrade and new Digital MAD program components prior to the initiation of AIR 5276. The ESM system, designated ALR-2001 ODYSSEY, a joint Australian/Israeli (AWADI) program includes new avionics and significant airframe modifications to the existing fleet of RAAF Orions. The ESM system is tasked with creating and managing an electromagnetic tactical surveillance plot. It has capabilities for detecting ship transmissions and radar pulses while scanning for hostile weapon targeting systems. The ESM also assists in passive OTH-T for the aircraft's Harpoon anti-ship missile system.

ALR-2001 ODYSSEY components consist of numerous under-fuselage and wing-tip sensor antenna arrays and new interior electronic racks for avionics. A 19" color Telegraphics display and control unit will be installed in a new sensor opera-



ORIONS OWNED AND OPERATED BY THE ROYAL AUSTRALIAN AIR FORCE RAAF ORION BuNo LIST

BuNo	RAAF #	COMMENT - LOCATION
154605	A9-605	P-3B sold to Australia as a replacement aircraft for 155296, later traded back to Lockheed. Now US Customs Services #2 P-3 AEW&C Orion.
155291	A9-291	P-3B sold to New Zealand in 1985. Now a RNZAF P-3K Orion (NZ 4206)
155292	A9-292	P-3B traded back to Lockheed. Now a P-3P (4801) with the Portuguese Air Force
155293	A9-293	RAAF P-3B - Now Portuguese P-3P (4802)
155294	A9-294	RAAF P-3B - Now Portuguese P-3P (4803)
155295	A9-295	RAAF P-3B - Now Portuguese P-3P (4804)
155296	A9-296	STRIKE (4-11-68) Moffett Field, CA P-3B crashed on landing and was destroyed by fire during RAAF acceptance trials
155297	A9-297	RAAF P-3B - Now Portuguese P-3P (4805)
155298	A9-298	RAAF P-3B - Now Portuguese P-3P (4806)
155299	A9-299	RAAF P-3B - traded back to Lockheed and re-engineered as the AEW&C prototype. Now the US Customs Service #1 P-3 AEW&C
155300	A9-300	STRIKE (1-27-84) Edinburgh S.A. Scrapped after a fuselage (oxygen system) fire and stripped of useful parts. Later the Bravo supplied its wings to a USN P-3C that was being rebuilt. Now the fuselage is used as a mock-up simulator with Australia's DSTO RDT&E Facility
160751	A9-751	Produced as a USN P-3C, but renumbered on the Lockheed production line for Australia's first P-3C Update II.
160752	A9-752	RAAF P-3C II.5
160753	A9-753	RAAF P-3C II.5
160754	A9-754	STRIKE (4-26-91) Cocos Is. (Ditched)
160755	A9-755	RAAF P-3C II.5
160756	A9-756	RAAF P-3C II.5
160757	A9-757	RAAF P-3C II.5
160758	A9-758	RAAF P-3C II.5
160759	A9-759	RAAF P-3C II.5
160760	A9-760	RAAF P-3C II.5
162656	A9-656	First RAAF P-3C II.5 delivered to Australia in 1984.
162657	A9-657	RAAF P-3 II.5 ESM program prototype
162658	A9-658	RAAF P-3C II.5
162659	A9-659	RAAF P-3C II.5
162660	A9-660	RAAF P-3C II.5
162661	A9-661	RAAF P-3C II.5 T56 Smoke Reduction testbed
162662	A9-662	RAAF P-3C II.5
162663	A9-663	RAAF P-3C II.5
162664	A9-664	RAAF P-3C II.5
162665	A9-665	RAAF P-3C II.5 has experimental three tone paint scheme.
152758	*****	An ex-USN P-3B versatile testbed aircraft with the Naval Air Test Center (NATC) - Now selected by Australia to be modified as a "TAP-3 Orion" for pilot training and logistical-utility transport
153434	*****	Ex-USN P-3B selected by Australia as a TAP-3
153439	*****	Ex-USN P-3B selected by Australia as a TAP-3

ORIONS OF AUSTRALIA

tor position located across from Sensor Station 3 on the P-3 Charlie. The newly modified, dedicated ESM "Sensor 4" operator station will also contain the IRDS system, allowing the Sensor 3 operator to concentrate on radar and MAD systems management.

Utilizing dedicated ESM operators is a growing trend in MPA. Portuguese Orions have a two-man Sensor Station with one operator responsible solely for ESM. The US Navy and other Orion operators are also considering similar ideas for a devoted ESM operator in future enhancement programs.

The RAAF P-3 Refurbishment program will delete 3500 lbs of current RAAF P-3C's payload without sacrificing any of the aircraft's missions capabilities; it could even increase them while reducing the weight. Weight reduction is an important program requirement as it increases fatigue life per the RAAF's study.

The study also indicated that a great percentage of the operational hours of the aircraft were devoted to aircrew training, logistical support and utility transport. So, in an additional effort to extend fatigue life, a program was developed that resulted in the recent purchase three ex-US Navy P-3B Orions.

The TAP-3 conversion/modification program begins with stripping out all the sensors, avionics, equipment racks, sonobuoy launching system and associated plumbing from the ex-USN Bravos. After standard depot level maintenance work is performed, the modification will include a cockpit conversion to the P-3C II.5 flight station configuration. This configuration includes NAVCOM systems with dual LTN-72 Inertial Navigation systems, AN/ARN-118, LTN-211 OMEGA and dual AN/ARN-140 VOR system, as well as the P-3C Horizontal Situation Indicator and electronic control amplifier.

The aft section of the aircraft will encompass strengthened floor panels with additional seating tracks running from the new navigators position (old radio operators station) all the way back to the old galley area. A new interior, all gray wall coverings and trim will also be installed. There is even a provision for a proposed cargo door modification to accommodate light transport. The aircraft are scheduled to be modified by NADEP Jacksonville with induction into the strip hanger by the fall of 1994.

AIR 5276 will be an open and



effective competition within the industry, awarding the tender that provides the best solution to fulfill the project's functional requirements. The tender will be required to provide non-development systems, in an as-soon-as-possible

concept fitting program criteria that includes initial and extended warranted components and support for the life of the aircraft.

The program dictates that the proposed enhanced avionics must be able to



be operated and maintained within Australia's diverse climatic conditions, ranging from wet rainy tropical regions to hot and dusty desert areas, without degradation.

The program is scheduled to modify 18 of the remaining 19 of the original 20

RAAF P-3s. Once the modification is completed, the RAAF plans to officially re-designate them as AP-3C - the "A" for Australia! ★

BACKGROUND

Australia's Orion experience began in 1968 with the purchase of ten P-3Bs from Lockheed to replace aging P-2 Neptunes. In 1978, the RAAF began another purchase, this time of P-3Cs to replace its last remaining P-2 Neptunes. This marked the first foreign export of the P-3C model, which was configured to that of the US Navy's Update II. Later, they were equipped with the Marconi AQS-901 acoustic signal processor and display system.

To keep up with advances being made in Soviet submarine technology, the RAAF initiated a study in 1980 to investigate upgrading their ten P-3B Orions to match the capabilities of their new P-3C Update IIs. The results of the long study indicated that modifying the older P-3Bs would not be cost effective. Eventually, an agreement was reached on a proposal to purchase new aircraft, using the Bravos in trade to offset the cost.

Deliveries began in 1985. The new Charlie Orions were similar to the US Navy's Update II.5 configuration. Again they added a Marconi AQS-901 acoustic system. These aircraft are often identified with a P-3W designation; the "W" is for maintenance purposes to denote slight differences in parts required in repair between the two groups of P-3C aircraft in the RAAF inventory and is not an official type-designation.

With 12,000 miles of coastline and 2,400,000 square miles of territorial waters, extending from the south pole to just north of the equator, across the International Dateline to the tip of India, the RAAF Orions conduct a long range, multi-mission activity, that includes Ocean surveillance, ASUW and ASW operations. Their two squadrons, No. 10 and No. 11 rotate permanent detachments to the Royal Malaysian Air Force Base, Butterworth, providing aircraft and flight crews to fly Foreign Government "Surveillance Assistance" missions. They also participate in joint military exercises with American forces in the Indian Ocean and South China Sea.

As a civilian responsibility, the RAAF participates in protection of their Economic Exclusion Zone. The Australian EEZ surveillance flights guard against intrusion by illegal foreign fishing vessels that violate their native fishing zones. One of their P-3s is dedicated to quick response standby for emergency SAR missions and for customs support flights.



RAAF

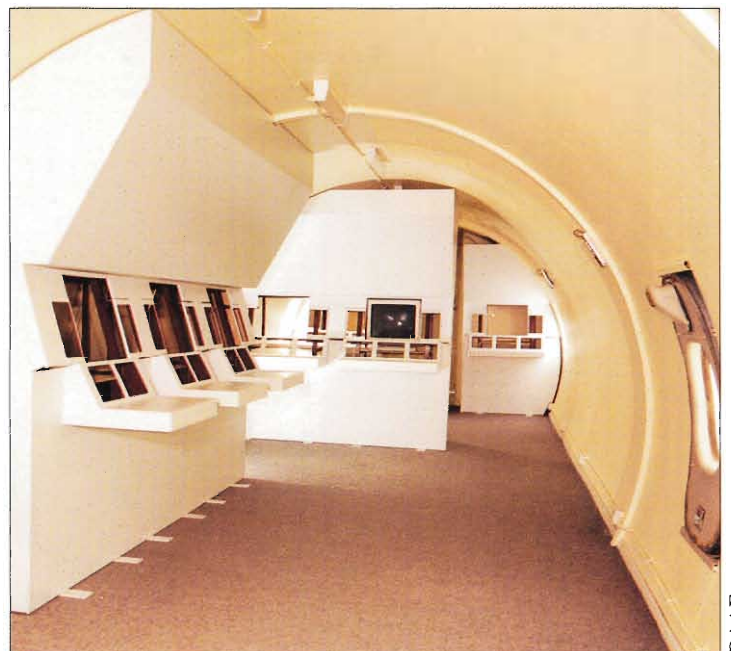
P-3 bureau number 155300 designated A9-300 by the Royal Australian Air Force, was saved from the scrap pile after a cockpit fire. Its new life will provide R&D for Australia's Defense Science and Technology Organization.

OLD 300

by David Reade

Throughout the past thirty years of P-3 Orion Maritime Patrol aircraft utilization by the USN and over a dozen other nations, certain P-3s have attained some notoriety. A9-300 is one of these Orions.

"Old 300" is the endearing nickname given to a Royal Australian Air Force P-3B Orion that has recently been refurbished by the air operations division of the Defense Science and Technology Organization - Aeronautical Research Laboratory, Australia's aviation research, development, test and evaluation facility. The grounded Bravo has now been developed as an advanced systems mock-up simulator. Officially known as "ORACL", short for Orion Avionic Concept Laboratory, the P-3 serves as a full scale mock-up demonstrator of various cabin layouts. This provides for ergonomic studies of current and future baseline configurations, investigating advanced alternative, functional workstation and display concepts. ORACL simulations include standard P-3C displays and distribution system software programs, as well as advanced technology demonstrations, such as intelligent displays, sensor data fusion and artificial intelligence. Improved operational and prototype sensor system integration can also be tested and evaluated by ORACL. The Orion demonstrator is currently simulating "TDS", the P-3C Tactical Data System simulation program, to help define enhancements and improve-



RAAF

Inside view of their new mockup officially referred to as ORACL for Orion Avionic Concept Laboratory.

ments for the proposed RAAF Orion upgrade program.

Old 300 has quite a unique history. A9-300 (155300) was one of the last of ten P-3Bs built and delivered to Australia by Lockheed in May 1968. It served faithfully until 27 January 1984, when a liquid Oxygen system fire broke out during ground maintenance work at RAAF Base Edinburgh.

Australia was, at the time, in the process of trading-in its Bravos to Lockheed for an equal number of P-3C Orions.

The forward fuselage/cockpit area of the Orion was damaged beyond repair and was stripped of usable parts. Later, some of these parts found their way to Portugal along with six other RAAF Bravos, sold to that country via Lockheed. The aircraft proceeded to sit at Edinburgh until September 1987, when it was moved to the DSTO located adjacent to the base.

Meanwhile, in the United States, another page of Old 300's history was about to be written. In February 1988, a P-3C Orion crash landed at NAS Cecil Field, Florida. The Orion had been diverted from NAS Jacksonville after the aircraft's landing gear was sheared off during an aborted landing on a runway under construction. The crash damage was extensive, with the port and starboard wings totaled.

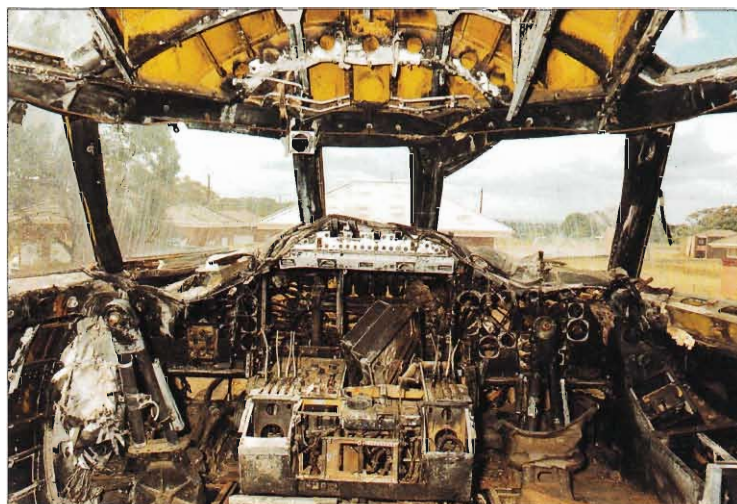
After some long discussions between NADEP (Naval Aviation Depot) engineers, it was determined that the aircraft could be repaired and flown again, so a call went out for a pair of wings.

Eventually, Old 300, back in Australia, was selected as the donor, giving up her wings for the stricken Charlie. The wings were removed and flown by USAF C-5 Galaxy transport aircraft to the jet base at NAS Cecil field. From there the wings were transported by truck through the streets of Jacksonville to NADEP JAX where the work was to be done.

After the wings were attached and substantial work was completed on the underside of the Navy Charlie, the historical roll out of P-3C (157330) commenced in November 1990. Nicknamed "Phoenix - Pride of NADEP", the Charlie Orion then resumed its naval service - with borrowed wings of a southern friend.

Last year, the DSTO began work on the leftover fuselage. The shell of the Orion was refurbished, replacing the burnt metal skin and completely refinishing the interior. Operator station mock-up units with touch sensitive electro-luminescent panels were installed. The airframe is now positioned in the open between two lab buildings at the DSTO facility and is the only P-3 in existence with a permanent ramp accessible entrance. The sensor input generator is cabled into the fuselage from a nearby DSTO lab building, as well as cooled air and electrical power to run the onboard systems.

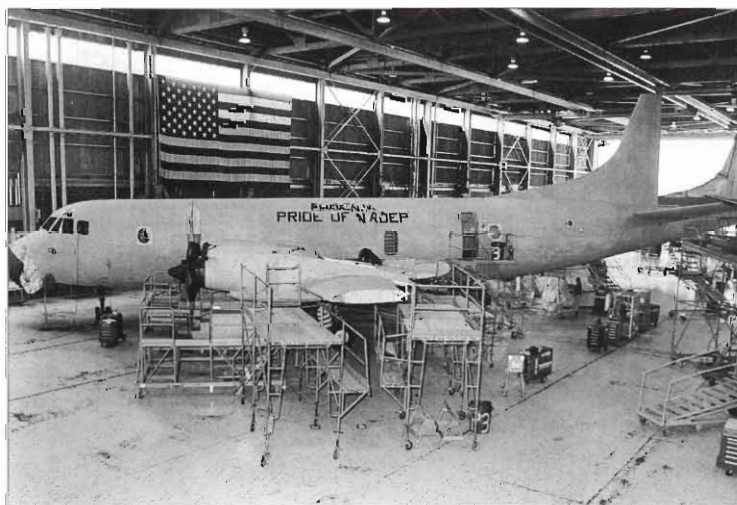
Old 300 is again serving Australian military aviation by providing for the development of future avionic systems. ★



Devastation resulting from a liquid oxygen system fire during ground maintenance work.

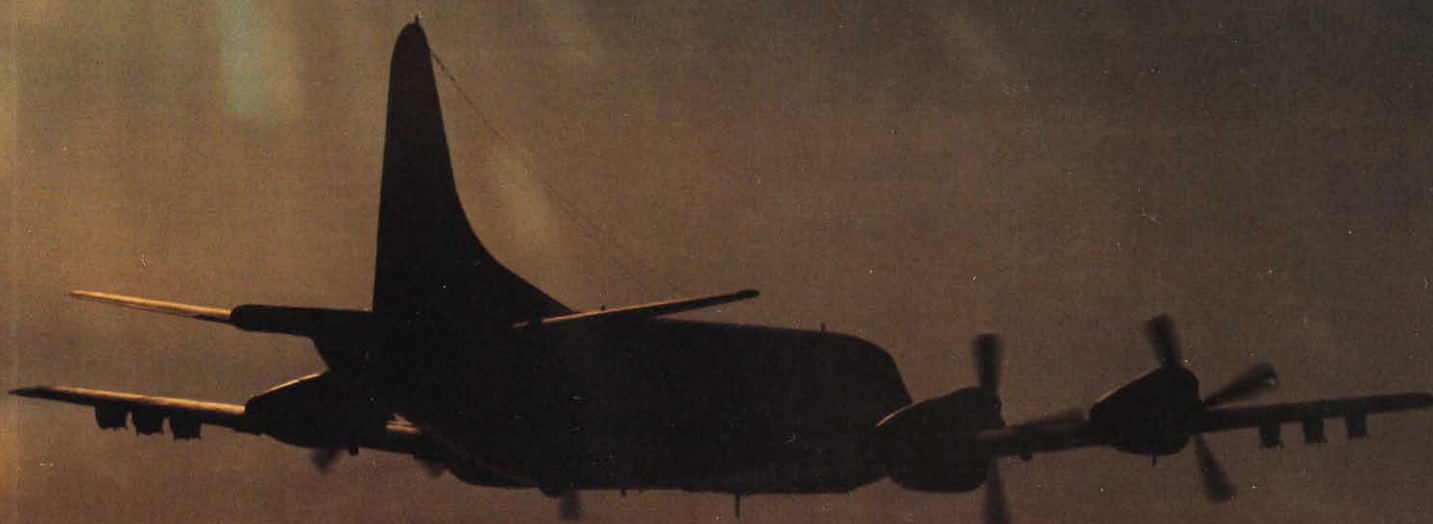


All that is left of A9-300 after wing donation to USN P-3C No. 157330, being lowered for permanent installation.



Nearly a "strike," the P-3C U111 Mod is now sporting A9-300's wings and was last seen flying with VP-17.

AIP



ASUW IMPROVEMENT PROGRAM

by David Reade

An Anti-surface Warfare Improvement program has been initiated to enhance the mission effectiveness of existing P-3C Update III configured Orions. New and upgraded onboard avionics will be integrated to maximize both ASUW and survivability. The focus of the program will be improved standoff, over-the-horizon targeting capacity and interoperability with command, control, communications and intelligence networks and increased access to pertinent real-time tactical data.

AIP is a commercial contract opportunity based on military specifications to utilize only non-developmental, off-the-shelf electronic systems that will be selected for rapid employment and minimized size, weight and power/cooling requirements.

The program begins with a target configuration that consists of a P-3C Update III production model or Update III retrofit modified baseline aircraft. Installation should be in place for the AN/ASQ-212 Data Processing System with the CP-2044 computer, Global Positioning System (GPS) and wiring should be in place for the AN/ALR-66(v)3 Electronic Support Measures (ESM) system prior to program initiation. Some 68 Orions fitting this criteria will be selected for the program.

A few specifics of the AIP follow. The existing APS-115 radar will be replaced by the APS-137 ISAR (Inverse Synthetic Aperture Radar), an imaging radar making identification of the target possible. This ISAR has higher resolution than current fleet installed units.

At the heart of AIP is the OASIS III, over-the-horizon Airborne Sensor Information System. This is the third generation of the OTH-T (Targeting)/C3I system that proved successful in the Gulf War with Iraq, having directly targeted half of the enemy vessels sunk during the conflict.

OASIS III deletes the need for its usual workstation position by integration into the TACCO, NAVCOM and operator stations. Information is displayed through new color high resolution 19 inch screens with programmable entry panels, trackballs and standard electro-mechanical keyboards. These new universal displays and controls accept and display non-acoustic information (IRDS, ESM, Radar) using a switching interface for connecting OASIS III OTH-T data at each of the workstations.

The advanced OTH-T system combines ISAR and GPS information to create an accurate tactical plot of the battle area and can transmit vital targeting data on tactical link networks via SATCOM to selected tactical command centers. OASIS III can also relay targeting coordinates directly to another strike plat-



"Outlaw Hunter" an OTH/C3I prototype Orion has been selected as the AIP testbed.



An OASIS II equipped Orion showing the GPS (black) and SATCOM (white) antennas.



The APS-137 ISAR will replace the APS-115 radar.

T.K. Holh

Texas Instruments

form with more appropriate weapons to attack hostile contacts.

AIP incorporates upgrades to several existing onboard systems. the CP-2044 computer adds increased processing to accommodate additional system interfaces for the ISAR, GPS and SATCOM.

The ALR-66(v)3 ESM suite for passive detection, classification and targeting of electromagnetic signals generated by unknown contacts, is enhanced by a pulse analyzer. It provides fine frequency analysis and location of contacts from short duration signals. The ESM system will also receive a new DF spinning antenna incorporated into modified pod of the existing ALQ-78 ESM.

The AAR-36 IRDS (Infra Red Detection Set) will receive a new A-Focal Lens to increase its range.

The communications upgrade is extensive and proposes to minimize the number of components, space, weight and power requirements. The upgrade provides for all the tactical networks (OTCIXS, TADIXS-B, TRAP and dual receive TRE links) to transmit and receive tactical and targeting information without interfering with HF, UHF and VHF radios.

This C3I capability is further enhanced by the modification of the current wideband SATCOM data and voice system to a narrow band SATCOM DAMA unit. Secure voice communication will be available at more than one tactical station.

A new addition in a roll-on, roll-off package, dubbed "Cluster Ranger" is a standoff stabilized long range electro-optical surveillance system utilized for the collection of airborne high resolution intelligence imagery. The operator station will be located in the aft starboard observer position and the optical subsystem component installed in the TACCO station window, which would be modified to optical quality. There will also be an interface through the central computer to the communications suite for the real-time transmission of still and video imagery to tactical command centers. Thirty-six Cluster Ranger sets are planned.

The more formidable weapon the P-3 becomes, the more concern there is for its survivability. A requirement for the AAR-47 Missile Warning System has been identified with an auto-link to the ALE-47 Countermeasures Dispensing System. The provisions include modifications for equipment racks, pre-wiring for quick installation of control boxes and cutouts for external placement of system components.

In addition, an explosive-suppressant foam material will be incorporated into fuel tanks to reduce the aircraft vulnerability to weapon or shrapnel hits.

The ASUW Improvement Program will have obvious benefits beyond surface warfare capability. It will also provide a link for closer joint operations and increased interoperability and coordination between surface, subsurface and other airborne assets without compromising its ASW capability. For a low-cost, comprehensive enhancement program, it ensures a truly multi-mission MPA platform for required Navy joint force response. ★



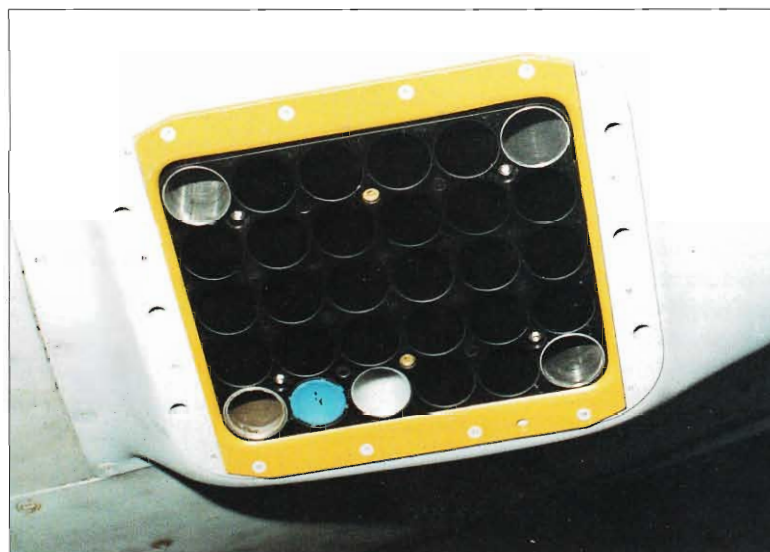
U.S. Navy

Fore and aft installation of the ARR-47 Missile Warning System



U.S. Navy

Fore and aft installation of the ARR-47 Missile Warning System



U.S. Navy

For Survivability the ALE-47 chaff, flare and jammer dispensing component will be installed on the aft inboard engine nacelles.

ACRONYMS AND ABBREVIATIONS

AIP	ASUW Improvement Program
ASUW	Anti-Surface Warfare
ASW	Anti-Submarine Warfare
B/TRAP	TADIX-B/TRE Related Applications
CFE	Contractor Furnished Equipment
CRS	Cluster Ranger System
CTT/H-R	Commander Tactical Terminal/Hybrid-Receive
DAMA	Demand Access Multiple Address
ESM	Electronic Surveillance Measures
FOTC	Force Officer in Tactical Command
GFE	Government Furnished Equipment
GPS	Global Positioning System
HCR	Hard Copy Recorder
ICD	Interface Control Drawing
ICS	Inter-Communications System
IDS	Interface Design Specification
INS	Inertial Navigation System
IR	Infrared
IRDS	Infrared Detecting Set
ISAR	Inverse Synthetic Aperture Radar
MATT	Multi-Mission Advanced Tactical Terminal
MWS	Missile Warning System
NDI	Non-Development Item
OASIS	Over-The-Horizon Airborne Sensor Information System
OTCIXS	Officer in Tactical Command Information Exchange System
OTH-T	Over-The-Horizon Target
PEP	Programmable Entry Panel
PRI	Pulse Repetition Interval
PSK	Phase Shift Key
R&M	Reliability and Maintainability
R/T	Receiver/Transmitter
RF Plate	Radio Frequency Plate
S&V	Survivability and Vulnerability
SIMOP	Simultaneous Operations
SLC	Satellite Link Controller
TADIXS	Tactical Digital Information Exchange System
TDP	Tactical Data Processor
TIBS	Tactical Information Broadcast System
TRAP	TRE Related Applications
TRE	Tactical Receive Equipment
TWS	Track-While-Scan
UCI	User-Computer Interface
UHF	Ultra-High Frequency
UIII	Update III
VME	Versa Module Europe
ZFW	Zero Fuel Weight



The CP-2044 (AN/ASQ-212) Data Processing System Computer.