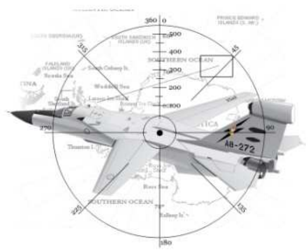
SHOTGUN ONE

ADF V.2.1 RESEARCH SHEETS

KERRY PLOWRIGHT



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AVIATION

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F/A-18 HORNET

57 F/A-18A fighters and 18 F/A-18B two-seat trainers, with 71 in service, and 4 lost to crashes. In 2014 it eqips three combat Sqadrons.

General Features

Manufacturer Boeing (originally McDonnell-Douglas)
Role Multi-role fighter
Crew One or two
Engine Two low-bypass F404-GE-400 turbofans (7,258kg thrust each)
Airframe Length: 17.1m, height: 4.7m
Wingspan 12.4m
Weight 10,660kg basic, 20,412kg maximum
Speed Mach 1.8 (2,200km/h)
Range Ferrying 2,700km (without refuelling)
Interdiction over 1,000km
Combat radius 740km
Ceiling Above 45,000 feet

Weapons

- AIM-120 AMRAAM active radar guided missiles - AIM132A?
- AIM-7 Sparrow radar-guided long-range missiles
- AIM-9 Sidewinder infra-red seeking missiles
- Harpoon anti-ship missiles
- conventional and laser-guided bombs
- M61 20mm nose-mounted cannon

Avionics

- Hughes APG73 multi-mode radar
- GPS
- inertial navigation system
- VHF omni-directional range/instrument landing system
- two mission computers
- head-up cockpit display
- multi-functional cathode ray tube displays

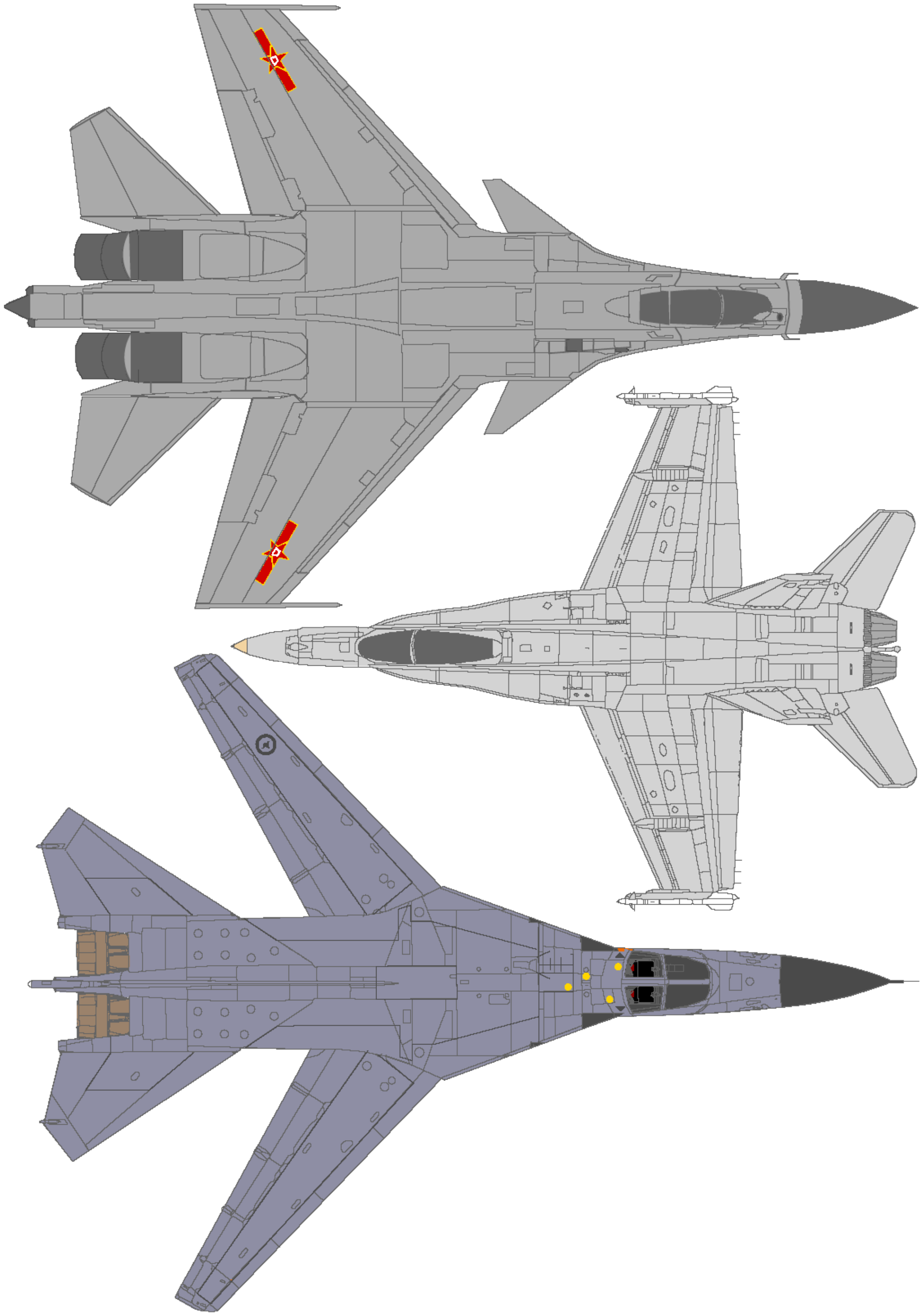
The Royal Australian Air Force purchased 57 F/A-18A fighters and 18 F/A-18B two-seat trainers, with 71 in service, and 4 lost to crashes. The first F/A-18 was delivered to the RAAF on October 29, 1984.

Squadrons

No. 3 Squadron - McDonnell Douglas F/A-18 Hornet (Air Defence)
No. 75 Squadron - McDonnell Douglas F/A-18 Hornet (Air Defence)
No. 77 Squadron - McDonnell Douglas F/A-18 Hornet (Air Defence)
No. 2 OCU - McDonnell Douglas F/A-18 Hornet (Training & Type Conversion)

16 operational aircraft per Squadron (2015)

Size Comparison of Sukhoi, F/A-18 and F111S



APG-73 RADAR – RAAF CLASSIC HORNET

Introduction

The APG-73 (Used in F/A-18) is an upgrade of the APG-65 with higher processor throughput, greater memory capacity, bandwidth, frequency agility, higher analogue/digital sampling rates, improved reliability and easier maintenance. When fitted with a motion-sensing subsystem and stretch waveform generator and special test equipment, the APG-73 can generate high resolution ground maps and make use of 'advanced' image correlation algorithms to enhance weapon designation accuracy. The APG-73 has been operational in U.S. Navy and Marine Corps F/A-18C and D aircraft since since 1992.

Advanced technology has provided the system with much better electronic counter-countermeasures, mainly through flexible software in the processors which allow the radar to adapt quickly to different threats. The programmable signal processor also allows the system to adapt quickly to new weapons or tactics by software changes rather than hardware modifications. Faster analogue-to-digital air-to-air conversion improves the radar resolution cell and the new signal processor improves Doppler resolution. This enables better discrimination between closely-spaced targets.

The signal processor throughput has been increased from 7.2 million operations/s to 60 million complex operations/s by the use of multichip gate arrays. The data processor function is a general purpose dual computer that provides mode control, antenna control, target tracking, and display processing. It operates at more than two million instructions/s with a two million word firm memory and a 256,000 16-bit working memory.

The travelling wave tube transmitter and antenna of the AN/APG-65 are retained in the APG-73, although there are long-term plans to replace the transmitter and antenna with a solid-state active array antenna.

Operational modes of the AN/APG-73:

Air-to-air modes

(a) velocity search for maximum detection range against head-on aspect targets
(b) range-while-search
(c) track-while-scan which provides the AIM-120 missile with a fire-and-forget capability when integrated with the F/A-18
(d) single target track
(e) assessment to separate closely-spaced targets.
(f) vertical acquisition which gives the ability to scan a narrow width vertically and lock on to the target within a specified range
(g) boresight acquisition which enables the pilot to point the aircraft at a target which the radar will then acquire automatically.

Air-to-surface

In the air-to-surface field the radar offers a high-resolution mapping feature which can be used with land or sea search modes for both moving and stationary targets. A special sea search mode enables the system to acquire and track ship targets, even in adverse sea conditions. A terrain-avoidance mode is included for low-level missions and an air-to-surface ranging mode for accurate delivery of weapons is available.

The APG-73 has the ability to detect airborne targets at more than 100 miles, distinguish low-flying or slow-moving targets "on the deck," pinpoint ships at sea, map the contours of the ground, and track ground targets. F/A-18Cs have synthetic aperture ground mapping radar with a doppler beam sharpening mode to generate ground maps. This ground mapping capability that permits crews to locate and attack targets in adverse weather and poor visibility or to precisely update the aircraft's location relative to targets during the approach, a capability that improves bombing accuracy.

AIM-120 AMRAAM – Classic Hornet, Rhino and F-111s

Introduction

Type Medium-range, air-to-air tactical missile Service history In service September 1991 Production history Manufacturer Hughes/Raytheon Unit cost $386,000 (2003); $299,000 (price for Lot 12 contract in April 1998; the previous price in Lot 11 was $340,000 each) Specifications Weight 335 lb (152 kg) Length 12 ft (3.66 m) Diameter 7 in (178 mm)

Engine High-performance directed rocket motor
Wingspan 20.7 in (526 mm) (AIM-120A/B) Operational
range AIM-120A/B: 75 km (45 mi)
AIM-120C-5: 105 km (65 mi)
AIM-120D-100 mi
Speed Mach 4 Guidance
system INS, active radar Launch
Warhead High explosive blast-fragmentation

Guidance System Overview

Interception course stage

AMRAAM uses two-stage guidance when fired at long range. The aircraft passes data to the missile just before launch, giving it information about the location of the target aircraft from the launch point and its direction and speed. The missile uses this information to fly on an interception course to the target using its built in inertial navigation system (INS). This information is generally obtained using the launching aircraft's radar, although it could come from an infra-red search and tracking system (IRST), from a data link from another fighter aircraft, or from an AWACS aircraft.

If the firing aircraft or surrogate continues to track the target, periodic updates are sent to the missile telling it of any changes in the target's direction and speed, allowing it to adjust its course so that it is able to close to self-homing distance while keeping the target aircraft in the basket (the radar seeker's field of view) in which it will be able to find it.

Not all AMRAAM users have elected to purchase the mid-course update option, which limits AMRAAM's effectiveness in some scenarios. The RAF initially opted not to use mid-course update for its Tornado F3 force, only to discover that without it, testing proved the AMRAAM was less effective in BVR engagements than the older semi-active radar homing BAE Skyflash weapon—the AIM-120's own radar is necessarily of limited range and power compared to that of the launch aircraft.

Terminal stage and impact

Once the missile closes to self-homing distance, it turns on its active radar seeker and searches for the target aircraft. If the target is in or near the expected location, the missile will find it and guide itself to the target from this point. If the missile is fired at short range (typically, visual range), it can use its active seeker just after launch, making the missile truly fire-and-forget. At the point where an AMRAAM switches to autonomous self-guidance, the NATO brevity code "PITBULL" would be called out on the radio, just as "Fox Three" would be called out upon launch.

Kill probability and tactics

General considerations

Once in its terminal mode, the missile's advanced electronic counter countermeasures (ECCM) support and good maneuverability mean that the chance of it hitting or exploding close to the target is high (on the order of 90%), as long as it has enough remaining energy to maneuver with the target if it is evasive. The kill probability (Pk) is determined by several factors, including aspect (head-on interception, side-on or tail-chase), altitude, the speed of the missile and the target, and how hard the target can turn. Typically, if the missile has sufficient energy during the terminal phase, which comes from being launched close enough to the target from an aircraft flying high and fast enough, it will have an excellent chance of success. This chance drops as the missile is fired at longer ranges as it runs out of overtake speed at long ranges, and if the target can force the missile to turn it might bleed off enough speed that it can no longer chase the target.

Lower-capability targets

This leads to two main engagement scenarios. If the target is not armed with any medium or long-range fire-and-forget weapons, the attacking aircraft need only to get close enough to the target and launch the AMRAAM. In these scenarios, the AMRAAM has a high chance of hitting, especially against low-maneuverability targets. The launch distance depends upon whether the target is heading towards or away from the firing aircraft. In a head-on engagement, the missile can be launched at longer range, since the range will be closing fast. In this situation, even if the target turns around, it is unlikely it can speed up and fly away fast enough to avoid being overtaken and hit by the missile (as long as the missile is not released too early). It is also unlikely the enemy can outmaneuver the missile since the closure rate will be so great. In a tail-on engagement, the firing aircraft might have to close to between one-half and one-quarter maximum range (or maybe even closer for a very fast target) in order to give the missile sufficient energy to overtake the targets.

If the targets are armed with missiles, the fire-and-forget nature of the AMRAAM is invaluable, enabling the launching aircraft to fire missiles at the target and then turn and run away. Even if the targets have longer-range semi-active radar homing (SARH) missiles, they will have to chase the launching aircraft in order for the missiles to track them, effectively flying right into the AMRAAM. If the target aircraft fires missiles and then turn and runs away, their own missiles will not be able to hit. Of course, if the target aircraft have long range missiles, even if they are not fire-and-forget, the fact that they force the launching aircraft to turn and run reduces the kill probability, since it is possible that without the mid-course updates the missiles will not find the target aircraft. However the chance of success is still good and compared to the relative impunity the launching aircraft enjoy, this gives the AMRAAM-equipped aircraft a decisive edge. If one or more missiles fail to hit, the AMRAAM-equipped aircraft can turn and re-engage, although they will be at a disadvantage compared to the chasing aircraft due to the speed they lose in the turn, and would have to be careful that they're not being tracked with SARH missiles.

Similarly armed targets

The other main engagement scenario is against other aircraft with fire-and-forget missiles like the Vympel R-77 (NATO AA-12 "Adder") — perhaps MiG-29s, Su-27s or similar. In this case engagement is very much down to teamwork and could be described as "a game of chicken." Both flights of aircraft can fire their missiles at each other beyond visual range (BVR), but then face the problem that if they continue to track the target aircraft in order to provide mid-course updates for the missile's flight, they are also flying into their opponents' missiles. Although in this regard the RVV-AE (which is the missiles export name or R-77 the official Russian Air force designation) does have an advantage as it is faster and has a greater range than the Amraam. Meaning that the Russian airplane firing it can in fact fire first, although it still needs to lead the missile towards the target as the missiles own radar seeker has a limited range (under 10km, as on Amraam). This is why teamwork is so important and advanced missiles with guidance systems with hand-off capability can help overcome this problem. This is also part of the reason why most tactics dictate holding on to missiles "until you see the whites of their eyes," or holding on to them for as long as possible.

If the enemy fires missiles at maximum range, you will be able to defeat them easily without having surrendered valuable ordnance yourself. The other main tactic would be to sneak up behind the enemy aircraft and launch missiles without them noticing, giving the launching aircraft sufficient time to leave the danger zone of the enemy after launching. Even if the enemy detects the launch and turns around, the speed and possibly altitude it loses during the turn puts its missiles at an energy disadvantage which may be sufficient for the other aircraft to defeat it. This typically requires excellent ground-control intercept (GCI) or airborne radar (AWACS — Airborne Warning and Control System) facilities in order to be successful.

AIM-9X Classic Hornet, Rhino and F-111S

Introduction

The AIM-9 missile began its existence as a contemporary of the AIM-7, initially used as a short-range heat-seeking weapon for bomber intercepts. The early AIM-9B was used by US Navy and Air Force, and widely licensed or cloned. By the mid 1960s the AIM-9 line split into unique Navy and Air Force variants, the Navy opting for gas cooled detectors in the D, G and H models, the Air Force thermo-electric cooling in the E and J models. The subsequent AIM-9L was a common variant, with all-aspect capability and gas cooling, introduced during the late 1970s, and based on the AIM-9H. The AIM-9P, based on the AIM-9J, remained in concurrent production. The last of the 'classic' Sidewinders, the AIM-9M was an improved evolution of the AIM-9L and remains widely used in AIM-9M-8 or -9 configuration, introduced during the 1980s.

Replacement for the AIM-9M

The replacement for the AIM-9M in US service and subsequently RAAF is the substantially new AIM-9X variant, sufficiently re-engineered to actually merit a unique designation and introduced to the F-15C/E, F-16C, F/A-18 series, F/A-22A and JSF. While the AIM-9X shares the rocket motor and warhead of the AIM-9M, it uses new fixed canards, a new digital seeker with an InSb FPA detector, and coupled steerable cruciform tails and exhaust vanes for thrust vector control. The FPA detector uses a Stirling cryogenic refrigerator rather than Joule-Thompson gas cooler. Launched from the LAU-127 or LAU-142, the AIM-9X uses a Mil-Std-1760 interface and is intended for use with the Joint Helmet Mounted Cueing System (JHMCS) helmet-mounted sight. While the AIM-9X replaces the AIM-9M throughout the US inventory, many users of the legacy models will continue to operate them into the foreseeable future.

F/A-18E RHINO

In 2014 24 F/A-18E/F Rhino equip No 1 and 6 Squadrons.

Introduction

The most notable change in the Super Hornet compared to the classic is its size, designed around an internal fuel (JP5) capacity of 14,700 lb, or 36% more than the F/A-18C/E. This most closely compares to the clean F-15C, which has around 10% less internal fuel than the Super Hornet.

The design is sized around a 36% greater internal fuel load than the F/A-18C, with the aim of retaining the established agility performance of the F/A-18C, resulted in a larger wing of 500 sqft area, against the 400 sqft area of the F/A-18C, a 25% increase. The consequent sizing changes result in a 30,885 lb empty weight (31,500 lb basic weight) aircraft, a 30% increase against the F/A-18C. Not surprisingly, the aircraft's empty weight is 8% greater than the F-15C, reflecting the structural realities of catapult launches and tailhook recoveries.

The larger F414 engine, a refanned and evolved F404 derivative, delivers 20,700 lb static SL thrust in afterburner, which is around 8% less than the F100-PW-220 in the F-15C.

Other differences include rectangular intakes for the engines, a reduced radar cross section (RCS), two extra wing hard points for payload, and other aerodynamic changes. One of the most significant of which is the inclusion of significantly enlarged leading edge extensions (LEX) which provide improved vortex lifting characteristics in high angle of attack maneuver, and reduce the static stability margin to enhance pitching characteristics. This results in pitch rates in excess of 40 degrees per second. In the end, the Super Hornet shared little with earlier F/A-18s aft of the forward fuselage. The Super Hornet has 42% fewer structural parts than the original Hornet design. Flight characteristics include being highly departure resistant through its flight envelope, and having high angle-of-attack with care free flying qualities for combat and ease of training.

The Super Hornet can return to an aircraft carrier with a larger load of unspent fuel and munitions than the original Hornet. The term for this ability is known as "bringback". Bringback for the Super Hornet is in excess of 9,000 pounds (4,000 kg).

Radar

New build Rhino's have APG-79 Active Electronically Steered Array (AESA) radar fitted. The APG-79 is considered to have slightly better range performance than the Joint strike Fighter's APG-81 AESA, but inferior to the F-22A's larger APG-77.

Avionics

While there are some similar cockpit items of the original Hornet, the Super Hornet features a touch-sensitive, up-front control display; a larger, liquid crystal multipurpose color display; and a new engine fuel display.[22] The Super Hornet has a quadruplex digital fly-by-wire system,[23] as well as a digital flight-control system that detects and corrects for battle damage.[19] Super Hornet production started with the APG-73 radar. The APG-79 AESA radar was introduced later (see the upgrade section below).

The AN/ASQ-228 ATFLIR (Advanced Targeting Forward Looking InfraRed), is the main electro-optical sensor and laser designator pod for the Super Hornet. Defensive systems are coordinated through the Integrated Defensive Countermeasures system (IDECM). The IDECM system includes the ALE-47 countermeasures dispenser, the ALE-50 towed decoy, the AN/ALR-67(V)3 radar warning receiver, and the ALQ-165 Airborne Self-Protect Jammer (ASPJ). Aircrew have the ability to use night vision goggles (NVG) for Super Hornet operations which means the aircraft interior and exterior lighting are NVG compatible. Also includes an improved AN/ALQ-214 jammer, and AN/ALE-55 Fiber-Optic Towed Decoy,

The RAAF version is delivered with the Dual-Cockpit Cueing System for both pilot and Weapon systems officer Joint Helmet Mounted Cueing System (JHMCS). The JHMCS provides multi-purpose aircrew situational awareness including high-off-bore-sight cueing of the AIM-9X Sidewinder missile. Shared Reconnaissance Pod (SHARP) is a high-resolution, digital tactical air reconnaissance system that features advanced day/night and all-weather capability.

General characteristics

* Crew: F/A-18E: 1, F/A-18F: 2
* Length: 60 ft 1¼ in (18.31 m)
* Wingspan: 44 ft 8½ in (13.62 m)
* Height: 16 ft (4.88 m)
* Wing area: 500 ft² (46 m²)
* Empty weight: 30,564 lb (13,864 kg)
* Loaded weight: 47,000 lb (21,320 kg) (in fighter configuration)
* Max takeoff weight: 66,000 lb (29,900 kg)
* Powerplant: 2× General Electric F414-GE-400 turbofans
    o Dry thrust: 14,000 lbf (62 kN) each
    o Thrust with afterburner: 22,000 lbf (98 kN) each
* Internal fuel capacity: F/A-18E: 14,400 lb (6,530 kg), F/A-18F: 13,550 lb (6,145 kg)
* External fuel capacity: 5× 480 gal tanks, totaling 16,380 lb (7,430 kg)

Performance

* Maximum speed: Mach 1.8+[10] (1,190 mph, 1,900 km/h) at 40,000 ft (12,190 m)
* Range: 1,275 nmi (2,346 km) clean plus two AIM-9s[10]
* Combat radius: 390 nmi (449 mi, 722 km) for interdiction mission [54]
* Ferry range: 1,800 nmi (2,070 mi, 3,330 km)
* Service ceiling >50,000 ft (15,000 m)
* Wing loading: 92.8 lb/ft² (453 kg/m²)
* Thrust/weight: 0.93

Armament

* Guns: 1× 20 mm (0.787 in) M61A1/A2 Vulcan cannon
* Hardpoints: 11 with a capacity of 17,750 lb (8,050 kg),with provisions to carry combinations of:
    Missiles:
        + 2× AIM-9 Sidewinder on wingtips
        + AIM-120C (D) AMRAAM
        + AIM-7 Sparrow/AIM-9X
        + AGM-84 Harpoon
        + AGM-88 HARM
        + AGM-65 Maverick missiles
    Bombs:
        + AGM-154 Joint Standoff Weapon
        + Joint Direct Attack Munition (JDAM)
        + Paveway laser guided bombs
        + Mk 80 series general-purpose bombs
        + Mk-20 Rockeye II and CBU-series cluster bombs

Photo: F/A-18E Super Hornet - USN

BOEING 737-700 WEDGETAIL

Six Wedgetail AEW&C aircraft are operated by No 2 Squadron from RAAF Base Williamtown, near Newcastle.

The Wedgetail provides is a system which combines a 250 NMI class 360 degree all altitude radar and ESM surveillance coverage and comprehensive digital and voice connectivity, and battle or mission management functions .

Specifications

Manufacture: Boeing
Airframe: Next-Generation 737-700
Power plant: Two CFM International CFM56-7B24 turbofans
Thrust: 27,000 pounds static thrust each engine
Length: 110 feet, 4 inches (33.6 meters)
Wingspan: 117 feet, 5 inches (35.8 meters)
Height: 41 feet, 2 inches (12.5 meters)
Radar: Northrop Grumman MESA electronically scanned array radar system, 360 degrees/Air and Maritime modes, 200+ nm range/All Weather, IFF 300 nm.
Nickname: "Wedgetail"

Primary function

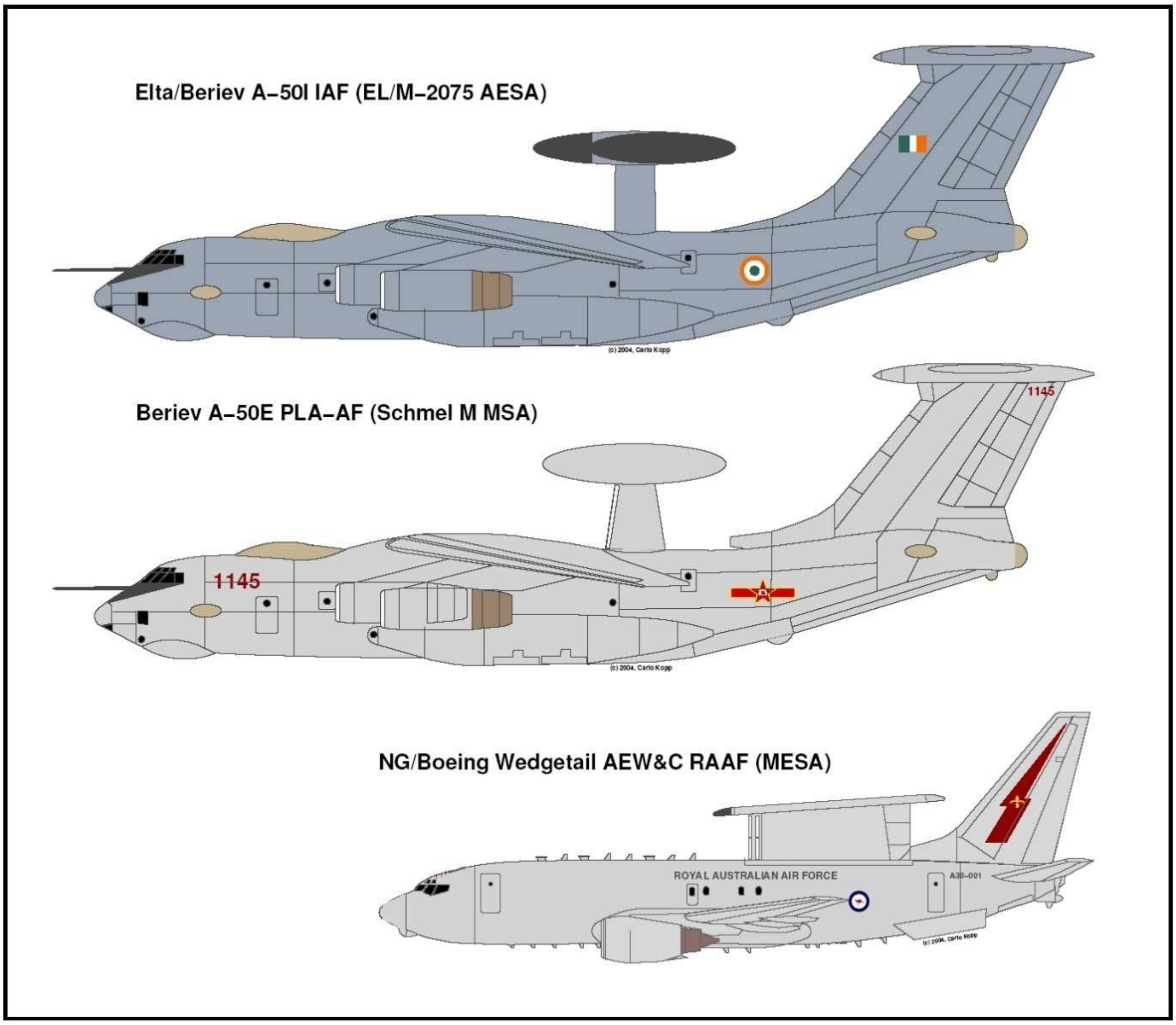
The RAAF Wedgetail aircraft will complement Jindalee Operational Radar Network and ground-based sensors, providing highly accurate data and flexible employment options to the modern air surveillance and combat environment. This will provide an excellent capability to support a layered air defence system, which is necessary to defend Australia. However, Wedgetail is not just a capability for the defence of Australia. The aircraft will be able to support deployed Australian Defence Force and allied assets at significant ranges, which will provide the Australian Government with a capability that can be used effectively to support coalition operations through the world if necessary.

General Features

Based on the Boeing 737-700 IGW, essentially a -700 fuselage mated with stronger -800 wings and undercarriage, this airframe is also the basis of Boeing's MMMA proposals for the AP-3C replacement. The aircraft has a cited dash speed of 460 KTAS, range of 3,000 NMI, time on station without refuelling in excess of eight hours, and an aerial refuelling receptacle to extend time on station. With turbofan propulsion the Wedgetail has a station altitude between 30,000 and 40,000 ft, providing an important advantage in low-level radar horizon distance against turboprop competitors. Low-level footprint is a critical parameter in both maritime air defence and cruise missile defence roles.

The internal layout is a forward fuselage mission deck with six operator consoles and cabinets with racked crypto, communications, ESM and data processing equipment, a centre fuselage crew rest area, and an aft fuselage radar/IFF equipment area). In all 10 operator consoles will be used. The ten multifunction consoles for operators provides significant growth potential for the system's roles and missions. The Wedgetail's software intensive system will permit the use of a wide range of flexible, graphics intensive synthetic display formats, which can fuse radar, ESM, datalink and digital mapping outputs. These demonstrator displays illustrate the style of presentation to be used. This technology permits rapid growth to incorporate off-board data sources such as UAVs, satellites and ground-based databases (Boeing).

The core of the mission avionic suite is the Northrop Grumman MESA L-band (1.215-1.4 GHz) surveillance radar with an integrated IFF capability, feasible due to the overlapping radio frequency band coverage of the radar function. The MESA is an active array (AESA) - an integrated Transmit-Receive (TR) module with internal phase shift and RF gain controls drives each antenna element.



While the radar can be used to sweep 360 degrees like a mechanically steered design, it can also focus all of its energy into a narrow threat sector to increase effective range performance, or it can timeshare between these two regimes to maintain 360 degree background coverage while increasing detection and tracking performance in a narrow sector of interest. The latter regime has proven very useful in naval Aegis radar operations in complex littoral environments.

The ability to focus energy into sectors permits higher update rates on target tracks, and higher track confidence levels against distant or faint targets. In an environment where larger supersonic combat aircraft and supersonic cruise missiles are common, this is a valuable capability. The MESA is supported by a communications/datalink suite and the ALR-2001 Electronic Support Measures (ESM) used to passively detect hostile emitters.

C-17 GLOBEMASTER HEAVY TRANSPORT

The Royal Australian Air Force has four C-17 Globemaster heavy transports. The Globemaster is operated by No 36 Squadron from RAAF Base Amberley, near Brisbane.

www.strategypage.com/military_photos

Introduction

The C-17 Globemaster is a high-wing four-engine heavy transport. It has three times the carrying capacity of the C-130 Hercules, allowing Australia to rapidly deploy troops, combat vehicles, heavy equipment and helicopters anywhere in the world. The Globemaster is large enough to transport the M1A1 Abrams tank, Black Hawk, Seahawk or Chinook helicopters, three Tiger armed reconnaissance helicopters or five Bushmaster infantry vehicles. The C-17 Globemaster significantly enhances our ability to support national and international operations, and major disaster relief efforts.

Boeing C-17 Globemaster III technical specifications

Manufacturer	Boeing
Role	Heavy multi-role transport and strategic airlift
Crew	Three; two pilots and a loadmaster
Engine	Four Pratt and Whitney PW2040 turbofans (40,440 lbs thrust each)
Airframe	Length: 53m, height: 16.8m
Wingspan	51.7m
Weight	72,500kg payload
Speed	800km/h (cruising speed)
Range	4,500km

Accommodation

Depending on configuration:

* 134 troops
* 90 stretcher patients
* tanks, helicopters, infantry vehicles

AP-3C Orion Maritime Patrol Aircraft

The Orion is the workhorse of No 92 Wing, located at RAAF Base Edinburgh, near Adelaide

Introduction

The Orion is the workhorse of No 92 Wing, located at RAAF Base Edinburgh, near Adelaide, who are responsible for conducting long-range surveillance missions within Australia's Exclusive Economic Zone and throughout the Indian and Pacific Oceans.

The Orion first entered military service in 1962, with the current P-3C first introduced in 1968. The significantly upgraded Australian Orions, designated AP-3C, were introduced into service in 2002 and are fitted with a variety of sensors, including digital multi-mode radar, electronic support measures, electro-optics detectors (infra-red and visual), magnetic anomaly detectors, identification friend or foe systems, and acoustic detectors.

The Orion may work alone, or in conjunction with other aircraft or ships. Wartime missions include locating and attacking enemy submarines and ships using torpedoes and Harpoon anti-shipping missiles. Orions also assist in search and rescue operations by conducting search and survivor supply (air drop) missions.

Orion flight training is conducted primarily in two simulators, the Advanced Flight Simulator and the Operational Mission Simulator.

Lockheed Martin AP-3C Orion technical specifications

Manufacturer	Lockheed Martin
Role	Long-range surveillance, anti-submarine and anti-ship warfare, search and survivor supply
Crew	Thirteen:

* two pilots (captain and co-pilot)
* two flight engineers
* tactical co-ordinator
* navigator/communication officer
* sensor employment manager
* six airborne electronic analysts.

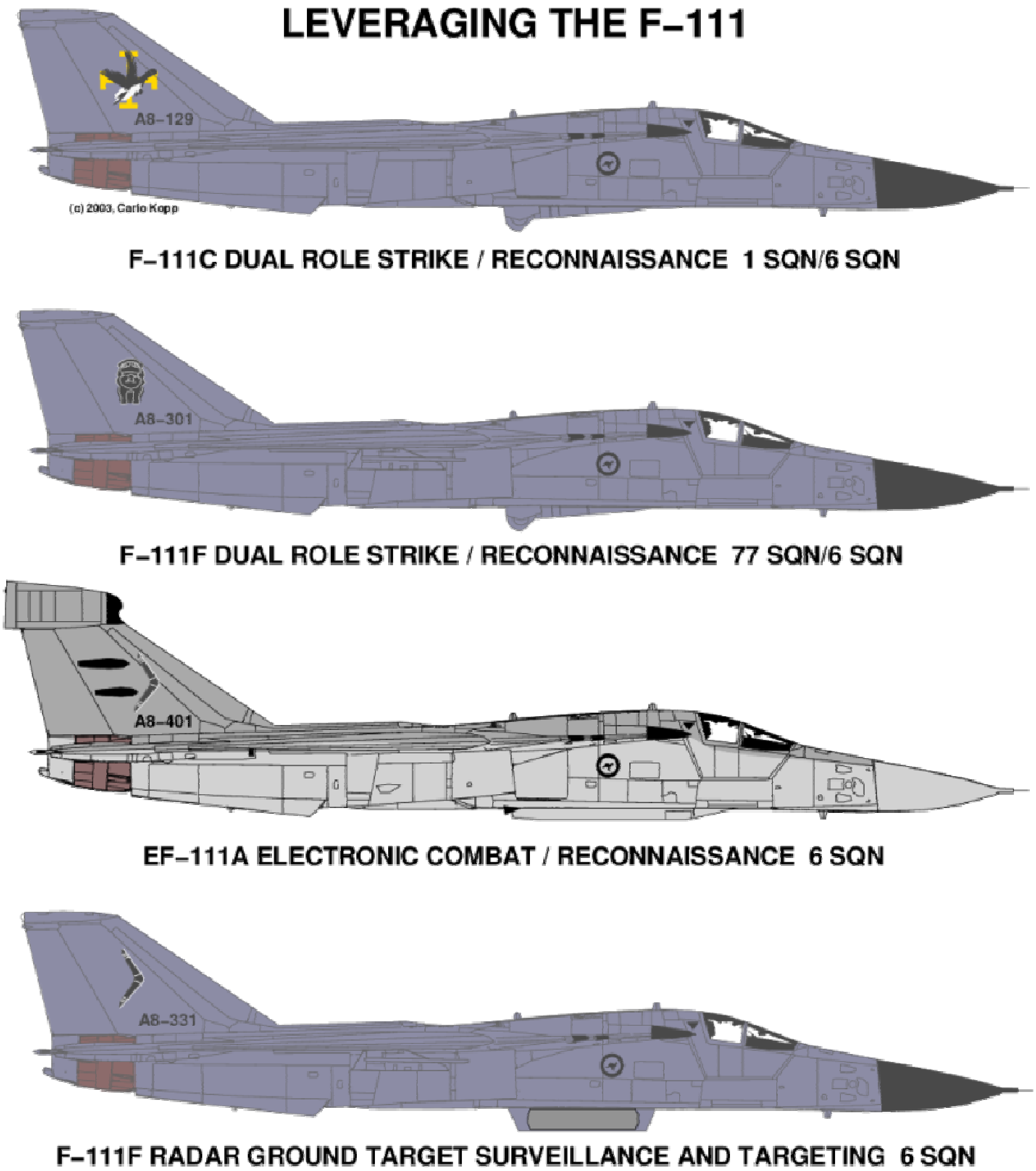
Engine	Four Allison T56-A-14 (4600 shaft horsepower each)
Airframe	Length: 35.6m, height: 10.44m
Wingspan	30.8m
Weight	61,200Kg maximum
Speed	750 km/h (405 knots) max, 650 km/h cruise (350 kts) at 26,000 feet, 370 km/h (200 kts) loiter
Endurance	15 hours

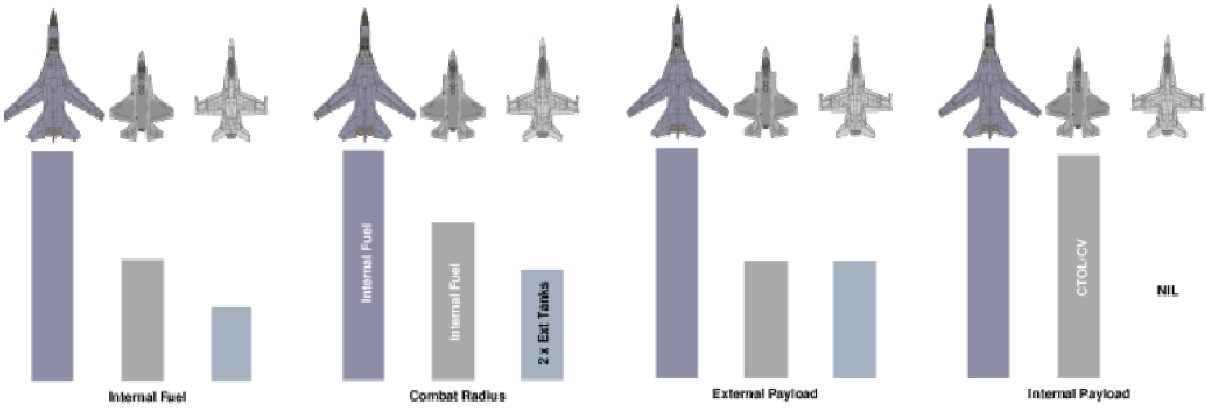
Weapons/ stores

* Mk 46 / MU 90 torpedoes
* AGM-84 Harpoon air-to-surface missiles
* Various sonobuoys and stores
* Air-Sea Rescue Kits
* Storpedoes
* Heliboxes

F111S – The Super Pig

Pre-retirement the F111 fleet was distributed in the following manner:





F–111 vs JSF vs F/A–18A – Parametric Comparison

(Provisional Data)

Intrduction

In 2008 a private company recognized the opportunity of upgrading retired F111 with off the shelf technologies driven out of the F22 and F35 projects. The commercial opportunity of developing an ultra fast, super cruise F111S with state of the avionics and weapons was irresistible. This was made more attractive with the availability of 295 USAF F-111 airframes collecting dust in an Arizona bone yard. More over, a virtual army of experienced F111 technicians and specialists were about to become available. With almost 300 aircraft, yielding around 4500 airframe-years of life billions of dollars could be potentially made selling the incredibly powerful aircraft relatively cheaply to other friendly air forces (Perhaps even the US) providing them instant strategic capability. Of all currently operational combat aircraft, the F111 returned the largest payoff in capability from an infusion of F-22/JSF/F/A-18E technology, such as power plants and internally carried munitions, as it has an internal bomb bay, more than twice the internal fuel capacity of most current types and a variable geometry wing.

For those nations not a little questionable, certain components would be swapped for less security sensitive technologies.

The upgrade logic was to replace unique components such as radar, mission avionics and engines with types common to large volume production fighters such as the, F/A-18E, F-22 and JSF. The F-111 electronic warfare package (ALR-62 RHAWS) was replaced with the highly capable BAeA ALR-2002A and a new technology internal jammer to replace the ALQ-94/137 DECM. The attack radar and terrain following radar were replaced with a combined TFR/multimode active array radar (AESA - Active Electronically Steered Array)

Specifications

AN/APG-77 Radar.

The AN/APG-77 radar is designed for air-superiority and strike operations and features a low observable, active aperture, electronically-scanned array with multi-target, all-weather capability. This is an active-element, electronically scanned (that is, it does not move) array of over 1000 finger-sized transmitter / receiver modules. Each module weights ca 15g and has a power output of over 4W. The APG-77 is capable of changing the direction, power and shape of the radar beam very rapidly, so it can acquire target data, and in the meantime minimizing the chance that the radar signal is detected or tracked.

Three radar arrays are placed in the nose of the aircraft (one facing forward and two facing sideways). Each wing root carries an infrared search and track system that operate through faceted windows. This is combined with TFR/multimode active array radar (AESA - Active Electronically Steered Array) adapted from the F/A-18E/F APG-79 (APG-73 RUG III)

Weapons Bay Pallete.

An internal weapon bay pallete was installed and became particularly useful, since it could be used for additional auxiliary fuel carriage while still providing enough space for launcher hardware, e.g. modified LAU-92 or LAU-142. up to four AIM-120C/D.

Performance

Role: Multi-role fighter bomber
Crew: One or two
Engine: Two low-bypass F404-GE-400 turbofans (7,258kg thrust each)
Airframe Length:
Wingspan
Weight 10,660kg basic, 20,412kg maximum
Speed Mach 2.5
Range ferrying 5,00km (without refuelling)
Operational radius 2500km

Weapons

Radar guided -120D Advanced Medium-Range Air-to-Air Missiles (AMRAAM).
AIM-132 ASRAAM
Aim-9x IR guided missile
Weapons bay pallete
1,000 pound GBU-30/32 Joint Direct Attack Munition (JDAM)

The end product of the upgrade was a long range / long endurance interceptor with around 37,000 lb of internal fuel. With 3-4 internal or semiconformal AMRAAMs and a clean wing, an operating radius well in excess of 1,000 NMI would be feasible, without aerial refuelling. Arguably an unbeatable deterrent to regional Tu-22 Backfire, Tu-142 Bear and Tu-16/H-6 Badger operators, and a useful interceptor against the numerous regional lower tier strike aircraft like the MiG-19/J-6 Farmer, J-8-II, MiG-23BM Flogger, Jaguar, Il-28/H-5 Beagle and Q-5, as well as tankers and transports.

A particular point in favour of the missileer capability in the F-111S fleet was that a favourite game played in times of crisis or tensions is the systematic baiting of opposing air defences by long range aircraft. The conventional response of launching air superiority fighters and supporting tankers can quickly result in massive expenditures in fuel, flying hours and airframe time to fend off repeated challenges. An F-111 configured as a missileer has the operating radius to cover such profiles very comfortably, with no need for tanker support, therefore largely defeating the purpose of baiting flight operations.

Supercruise

The F111S uses the F119 variant from the F-22 fan and core, and CTOL JSF or PYBBN nozzles. The F119-PW-100 is a much simpler engine 60% the parts count of the F100-PW-200 and reliability/maintainability/supportability 80% better than the F100-PW-200, with around one half of the required support equipment.

The key attribute of the F119-PW-100 is that it is capable of sustained supersonic cruise by use of a different operating cycle, advanced materials technology such as diffusion bonded titanium, and a significantly more effective internal cooling system in comparison with current engines. Genuine supercruising engines can maintain high dry thrust output at higher altitudes and Mach numbers, where conventional engines cannot deliver the needed dry thrust to sustain supersonic flight. Current technology demonstrations of the JSF119 using supercooling techniques have seen turbines operated at temperatures 200 to 250 deg C higher than the F100 turbine.

The value of sustained or long duration supercruise in combat operations cannot be understated. It not only provides aircraft with a significant energy advantage over hostile fighters, but effectively doubles productivity and operational tempo in long range bomb trucking operations - a major force structure issue with the new White Paper capability goals. Supercruise is a roughly twofold force multiplier in its own right, a fact reflected in the USAF push to field its new GSTF expeditionary strike force built around two squadrons of supercruising F-22s, two thirds or less the size of a reinforced conventional expeditionary fighter wing.

The basic aerodynamics of the F-111 are particularly well suited to supersonic cruise, especially with the variable wing and inlet geometries which are not a feature of the F-22 design, and the internal bomb bay which is a feature common to the F-22 and JSF designs. The option of sweeping the wings fully aft to 72.5 degrees results in a significant reduction in supersonic drag, against a conventional fighter with a fixed sweep angle, indeed the F-16XL supercruiser used a 70 degree sweep on its major inner wing planform.

Super Cruise Benefits

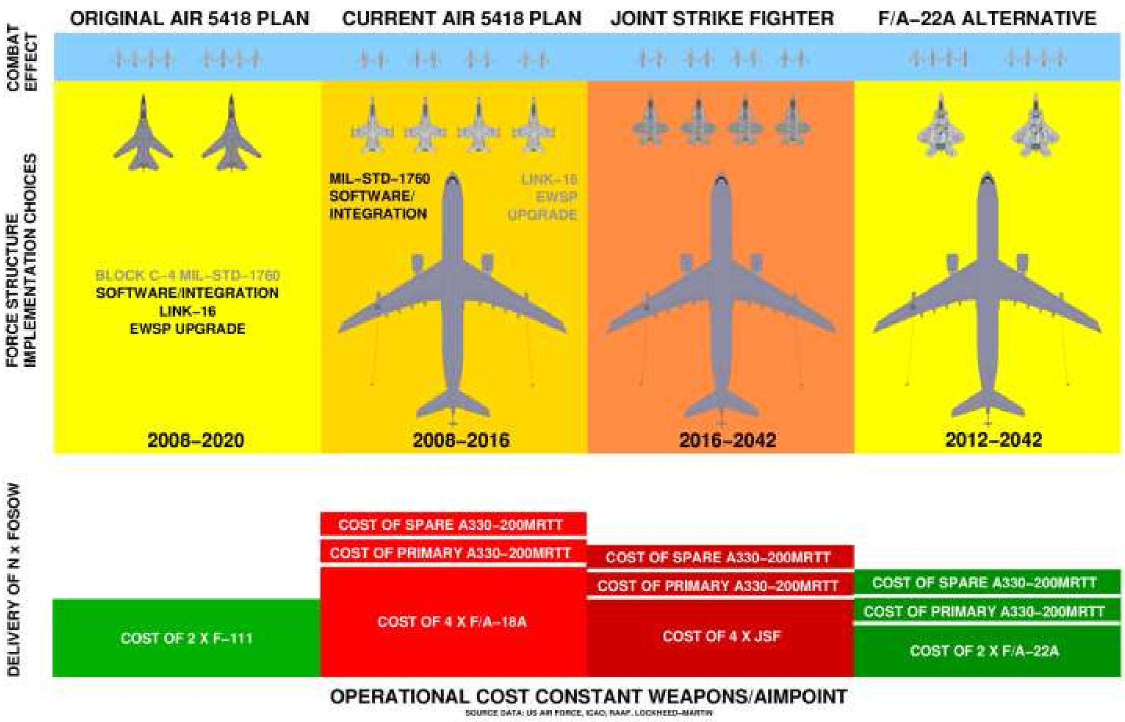
The benefits of super cruise were seriously underestimated and as a force multiplier the F111S quickly put to bed the skeptics and the ignorant.

- The aircraft could supercruise over large distances, thus almost doubling its productivity per 24 hour cycle and almost doubling the resulting operational tempo. A 4 hour sortie at 420 KTAS cruise became a 2-2.5 hour sortie with supercruising engines. A very long range 8-9 hour strategic strike sortie became a tolerable 4.5-5 hour sortie, sustainable without additional aircrew.
- Transiting at 45-50 kft and Mach 1.5 class speeds, the F-111 becomes very difficult to catch by most interceptors, and only the very best SAMs would perform well under such conditions, thereby collapsing the number of genuinely difficult threat environments down to AWACS supported MiG-29/Su-27/30 and double digit SAMs. With the AESA radar upgrade performed and the radar given the capability to jam centimetric band threats, the risks from forward quarter in-band threats such as interceptors and active radar guided SAMs in high altitude supersonic penetration were much reduced.
- At low level, the engines permitted sustained dry supersonic dash during penetration, with all of the advantages that confers in survivability, weapon toss range, persistence and heat signatures. Therefore the existing low level penetration tactics were able to be retained, in addition to new high altitude penetration tactics.
- With around 26 klb of static SL military dry thrust per engine, it is unlikely that afterburners would be required for hot and heavy takeoffs, thus saving considerable fuel. Indeed, given the experience with the F-22, afterburners were used very infrequently. The saved fuel offset the higher dry SFC in supercruise.
- The F119 is significantly more reliable and durable than the TF30, since it is two and one half generations beyond the TF30 in technology and materials. This results in reduced support costs over time especially in critical manpower. Commonality with the F-22 and JSF offered important economies.
- With the new technology engine it became feasible to adapt an existing Airframe Mounted Accessory Drive (AMAD) with new generators, hydraulic pumps and a Jet Fuel Starter (JFS) turbine. Replacing sixties technology accessories removed any long term supportability issues, while also reducing ground support crew hours required. The AMAD package used includes pumps for OBOGS and OBIGGS (oxygen and nitrogen generator) systems, the inclusion of which would reduced turnaround times, and improved damage tolerance, respectively.
- The rate of fatigue life consumption has been significantly reduced because a larger proportion of operational time was spent at higher altitudes, against the current regime of low level intensive operations, and medium level cruising. Engine wear and tear incurs at low altitudes, where particulates and water droplets are ingested.
- With the AESA radar upgrade performed the F-111's role has been expanded to encompass long range and long endurance interceptor tasks, with the required performance for a sustained long range supersonic dash intercepts against Badgers, Bears and Backfires and thus confer the same footprint coverage advantage delivered by the F-22.
- The arming of the F-111 with an internally carried GPS/inertial guided winged glide bomb, the JDAM-ER, a high altitude standoff range of 80 NMI or much better became feasible with a very cheap munition. This allowed the aircraft to launch its weapons from outside the envelope of almost every SAM in existence, and makes an intercept by a fighter even more difficult. Even a basic GBU-31 JDAM achieves a 20+ NMI glide range with a supersonic 45 kft launch thus defeating most older SAM systems.

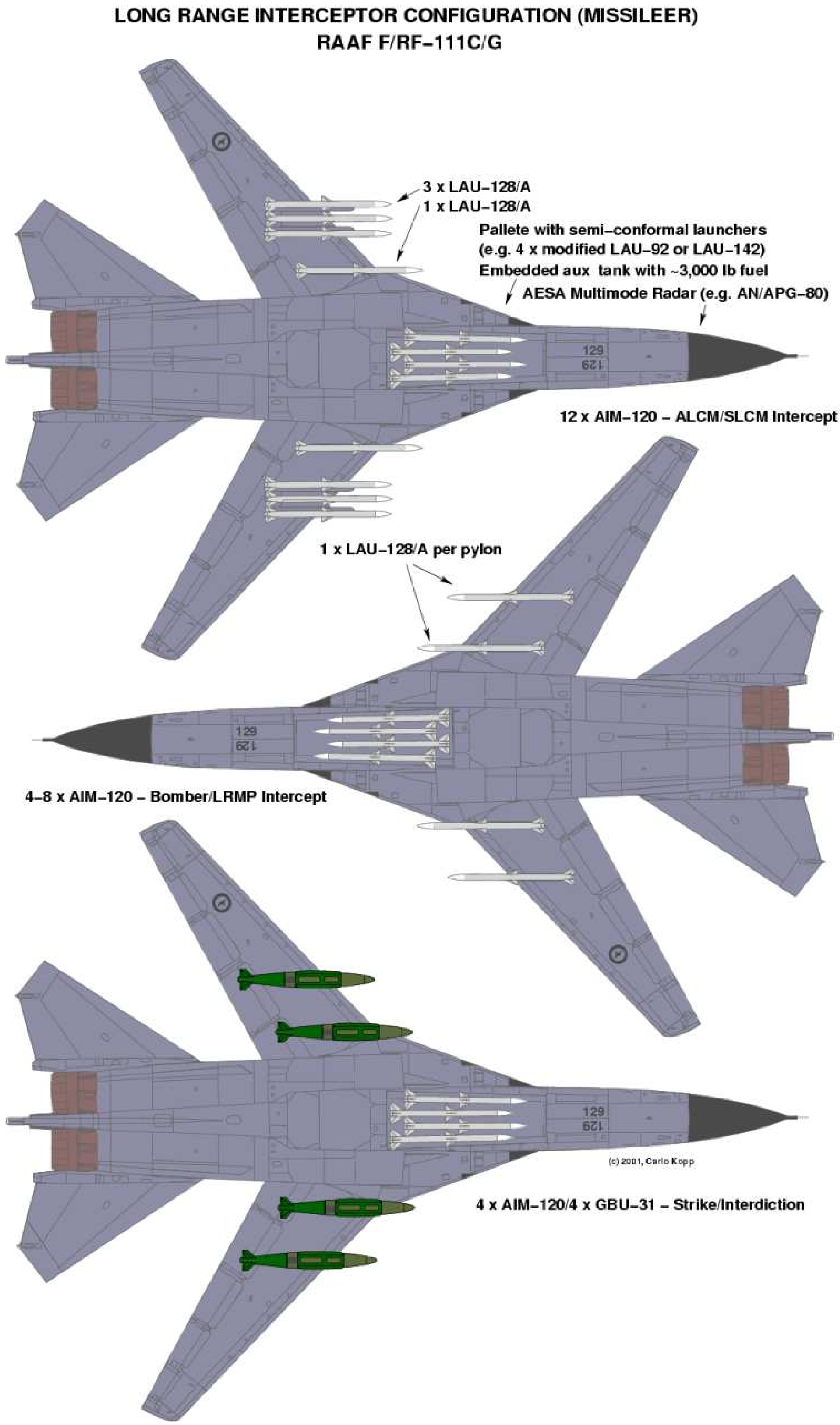
- The ARDU F-111G was used as a trial platform for USAF Small Diameter Bomb (SDB, formerly SSB/MMTD) and Smart Ejector Rack (SMER) supersonic test drops from the internal bay, resulting in the SDB family of weapons becoming a feature of the relifed F-111.
- Given that the F-111 bomb bay is deeper than that of the F-22, all of the internal weapons being used or devised for the F-22 are suitable for internal carriage by the F-111, yielding important interoperability and commonality benefits with the USAF.
- Adding judicious radar signature reduction into the survivability equation, given internal bomb carriage, reaction times for SAM operators, AWACS and fighters are significantly degraded - supercruise alone would halve the reaction time. Recent technological developments in applique laminates and inlet signature reduction techniques reduced the F-111's forward quarter radar signature well below contemporary reduced RCS production fighters.
- In supercruise, established high power support jamming pods are not an option. A revival of the EF-111A was the only viable way to provide support jamming for a supercruising fighter force. Two airframes were used for this purpose Provision of supercruising EF-111S escort jammers using current jamming equipment provided the ability to defeat all land based and naval SAM systems known to be in the region, as well the A-50 AWACS.
- THe super cruising F-111 was able to keep up with F-22 strike packages, as well as an F-22 fighter escort. This simplified operational planning, both for regional operations and coalition operations with the USAF. Indeed, a super cruising escort fighter is penalised by a subsonic cruising bomber, as the slowest aircraft in the package determines its transit speed to target.

An Easier Plane to Manage and Fly – The Start Up

An example of how the new avionics makes life simpler for the pilot is in the start up. The pilot simply places the battery switch 'on,' places the auxiliary power unit switch momentarily to 'start' and then places both throttles in 'idle.' The engines start sequentially right to left and the auxiliary power unit then shuts down. All subsystems and avionics are brought on line and built-in testing checks are made. Then the necessary navigation information is loaded and even the pilot's personal preferences for avionics configuration is read and the systems are tailored to those preferences. All of this happens automatically with no pilot actions other than the three steps. The airplane can be ready to taxi in less than 30 seconds after engine start.



OPERATIONAL ECONOMICS OF CRUISE MISSILE DELIVERY


LONG RANGE INTERCEPTOR CONFIGURATION (MISSILEER)
RAAF F/RF-111C/G
3 x LAU-128/A
1 x LAU-128/A
Pallete with semi-conformal launchers
(e.g. 4 x modified LAU-92 or LAU-142)
Embedded aux tank with ~3,000 lb fuel
AESA Multimode Radar (e.g. AN/APG-80)
129
12 x AIM-120 - ALCM/SLCM Intercept
1 x LAU-128/A per pylon
4-8 x AIM-120 - Bomber/LRMP Intercept
(c) 2001, Carlo Kopp
4 x AIM-120/4 x GBU-31 - Strike/Interdiction

Interoperability

The F111S possess a satellite communications capability that integrates beyond line of sight communications throughout the spectrum of missions it is tasked to perform. The F111S utilises the most modern tactical datalinks which provide the sharing of data among its flight members as well as other airborne, surface and ground-based platforms required to perform assigned missions.

Multi-Function Display System

Rockwell Collins's 8"x20" Multi-Function Display System (MFDS) provides the panoramic projection display for the F-111S. One-gigabyte-per-second data interfaces enable the MFDS to display six full motion images simultaneously. The adaptable layout is easily reconfigurable for different missions or mission segments. Projection display technology provides a high-luminance, high-contrast, and high-resolution picture with no viewing angle effect.

Changing the displays is only a matter of pressing a finger on different parts of the screen of the multi-function display, or MFD, to reconfigure or prioritize information or activate systems. The forest of toggle switches in previous fighter cockpits has been wiped clean from the F-35's interior landscape, with most of their functions moved to the touch screen. A few switches still sprout here and there, but the overall cockpit ambience is one of simplicity and calm, almost to the point of aeronautical *feng shui*. For example, finger-on-glass controls replace cockpit switches for selecting such functions as air refueling mode and flight control system tests. All radio, mission systems computers, and identification and navigation controls are on glass.

The large eight- by thirty-inch multifunction display (created by combining three eight- by ten-inch displays) can be customized and divided into many different-sized screens through an "elegant pilot-vehicle interface design." By touching the screen, the pilot can select a pair of eight- by ten-inch window displays, or four five- by eight-inch windows, or any combination of window sizes to project information based on its importance at any given moment.

The Integrated Control Panel (ICP) is the primary means for manual pilot data entry for communications, navigation, and autopilot data. Located in center top of the instrument panel, this keypad entry system also has some double click functions, much like a computer mouse for rapid pilot access/use.

Screen and Windows Functions.

The individual Windows on the MFDS can amongst other things be set to display:

1. Integrated Caution/Advisory/Warning (ICAW) data, communications/navigation/identification (CNI) data and serve as the Stand-by Flight instrumentation Group and Fuel Quantity Indicator (SFG/FQI).
2. The Stand-by Flight Group is always in operation and shows the basic information (such as an artificial horizon) the pilot needs to fly the aircraft. The SFG is tied to the last source of power in the aircraft, so if everything else fails, the pilot will still be able to fly the aircraft.
3. The Main Window is the pilot's principal display for aircraft navigation (including showing waypoints and route of flight) and Situation Assessment (SA) or a "God's-eye view" of the entire environment around (above, below, both sides, front and back) the aircraft.
4. Three other windows can display tactical (both offensive and defensive) information as well as non-tactical information (such as checklists, subsystem status, engine thrust output, and stores management).

To reduce crew workload in flight, the F111S incorporates a uniquely designed integrated caution, advisory and warning system (ICAW) taken from the F22. A total of 12 individual ICAW messages can appear at one time in this window display and additional ones can appear on sub pages or screens.

Two aspects of the ICAW display differentiate it from a traditional warning light panel. First, all ICAW fault messages are filtered to eliminate extraneous messages and tell the pilot specifically and succinctly what the problem is. For example, when an engine fails, the generator and hydraulic cautions normally associated with an engine being shutdown are suppressed, and the pilot is provided the specific problem in the form of an engine shutdown message.

The second is the electronic checklist. When an ICAW message occurs, the pilot depresses the checklist push button (called a bezel button) on the bottom of the UFD and the associated checklist appears on the left hand Secondary Multi-Function Display (SMFD). This function also provides access to non-emergency checklists for display to the pilot. In addition to the visual warning on the display, the aircraft has an audio system that alerts the pilot. A Caution is indicated only by the word "caution", while a Warning is announced with the specific problem - that is, "Warning. Engine Failure".

If multiple ICAWs occur, their associated checklists are selected by moving a pick box over the desired ICAW and depressing the checklist button. Associated checklists are automatically linked together so that if an engine failure occurs, the pilot will not only get the checklist for the engine failure procedure in-flight but also the single engine landing checklist. The pilot can also manually page through the checklists at any time from the main menu. This is particularly handy when helping a wing man work through an emergency.

Cockpit Display Symbology

The tactical information shown on the displays is all intuitive to the pilot-he can tell the situation around him by a glance at the screen. Enemy aircraft are shown as red triangles, friendly aircraft are green circles, unknown aircraft are shown as yellow squares, and wingmen are shown as blue. Surface-to-air missile sites are represented by pentagons (along with an indication of exactly what type missile it is) and its lethal range. In addition to shape and color, the symbols are further refined. A filled-in triangle means that the pilot has a missile firing-quality solution against the target, while an open triangle is not a firing-quality solution. The pilot has a cursor on each screen, and he can ask the aircraft's avionics system to retrieve more information. The system can determine to a 98% probability the target's type of aircraft. If the system can't make an identification to that degree, the aircraft is shown as an unknown.

The Inter/Intra Flight Data Link (IFDL) is one of the powerful tools that make the F-22, F-35 and the F111S more capable. Each aircraft can be linked together to trade information without radio calls with each aircraft in a flight or between flights. Each pilot is then free to operate more autonomously because, for example, the leader can tell at a glance what his wing man's fuel state is, weapons remaining, and even the enemy aircraft targeted. Classical tactics based on visual "tally" (visual identification) and violent formation maneuvers that reduce the wing man to "hanging on" may have to be rethought in light of such capabilities.

Hands-On Throttle and Stick (HOTAS)

The F-111S features two side-stick controllers (like an F-16) and two sets of two throttles that are the aircraft's primary flight controls. The GEC-built stick is located on the right console and there is a swing-out, adjustable arm rest. The WSO's stick folds away unless required as do the throttles which 'pop up' from a console between the crew. The stick is force sensitive and has a throw of only about one-quarter of an inch. The piloits throttles are located on the left console. Both the stick and the throttles are high-use controls during air combat. To support pilot functional requirements, the grips include buttons and switches (that are both shape and texture coded) to control more than 60 different time-critical functions. These buttons are used for controlling the offensive (weapons targeting and release) and defensive systems (although some, like chaff and flares, can operate both automatically and manually) as well as display management.

Life Support Ensemble

The F-111S life support system integrates all critical components of clothing, protective gear, and aircraft equipment necessary to sustain the pilot's life while flying the aircraft. In the past, these components had been designed and produced separately. The life support system components include:

- An on-board oxygen generation system (OBOGS) that supplies breathable air to the pilot.
- An integrated breathing regulator/anti-g valve (BRAG) that controls flow and pressure to the mask and pressure garments.
- A chemical/biological/cold-water immersion (CB/CWI) protection ensemble.
- An upper body counter pressure garment and a lower body anti-G garment acts a partial pressure suit at high altitudes.
- An air-cooling garment, which was to be used by pilots on the Army's RAH-66 Comanche helicopter provides thermal relief for the pilot.
- Helmet and helmet-mounted systems including C/B goggles and C/B hood; and the MBU-22/P breathing mask and hose system.

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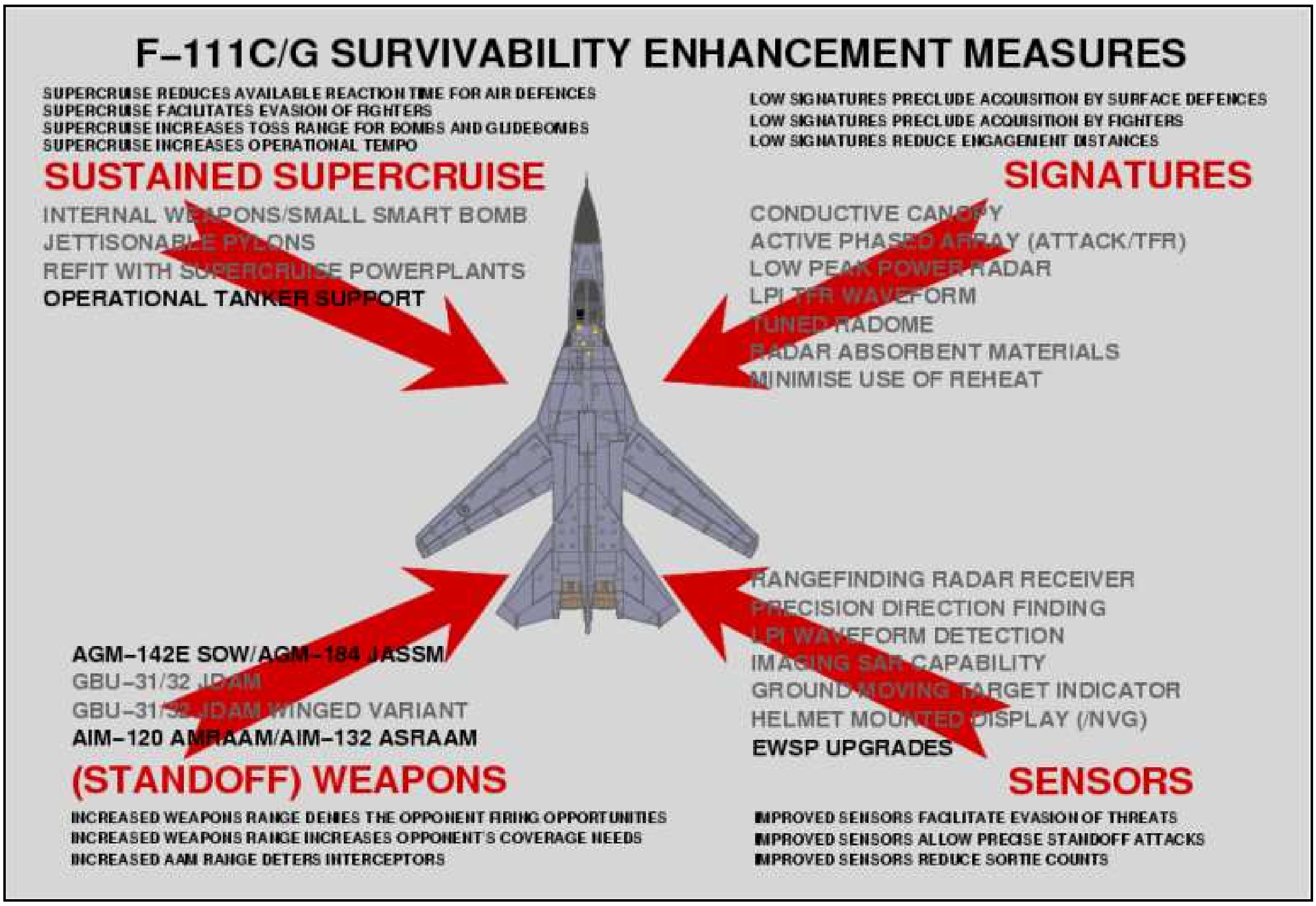
The chemical/biological/cold water immersion garment is to be worn by pilots when they fly over large bodies of cold water or into chemical/biological warfare situations.

ACES II Ejection Seat

The F-111S uses the same seat as the Raptor, improved version of the ACES II (Advanced Concept Ejection Seat) ejection seat that is used in nearly every other Air Force jet combat aircraft (F-16, F-117, F-15, A-10, B-1, B-2).



KC-30B MULTI-ROLE TANKER TRANSPORT

The RAAF operates five KC-30B tankers. No 33 Squadron, RAAF Base Amberley QLD.

The Royal Australian Air Force KC-30B Multi-Role Tanker Transports are five Airbus A-330s due to enter service in 2009 that are being modified for air-to-air refuelling and personnel transport. KC-30Bs will be capable of refuelling F/A-18 Hornets, F-111s, Airborne Early Warning and Control Wedgetails and Joint Strike Fighters, or transporting troops domestically or internationally.

The aircraft will be fitted with advanced aerial refuelling systems, comprising a 'fly-by-wire' boom refuel system and all-electric probe-and-drogue systems. In its transport role, the KC-30B will be capable of carrying 270 passengers. Under-floor cargo compartments will be able to accommodate 34,000kgs of military and civilian cargo pallets and containers.

Advanced mission systems will also be fitted. They include the Link 16 real-time data-link, military communications and navigation suites, and an electronic warfare self-protection system for protection against threats from surface-to-air missiles.

General characteristics

* Crew: 3: 2 pilots, 1 AAR operator
* Capacity: 226-280[12] troops
* Length: 59.69 m (195 ft 10 in)
* Wingspan: 60.3 m (197 ft 10 in)
* Height: 17.89 m (58 ft 8 in)
* Wing area: 361.6 m^2 (3892 ft^2)
* Empty weight: 120,500 kg (265,657 lb)
* Max takeoff weight: 230,000 kg (507,063 lb)
* Powerplant: 2× Rolls-Royce Trent 700 or General Electric CF6-80 turbofans, 316 kN (71,000 lbf) each

Performance

* Maximum speed: 880 km/h (475 knots, 547 mph)
* Cruise speed: 860 km/h (464 knots, 534 mph)
* Range: 12,500 km (6,750 nm, 7,770 mi)
* Service ceiling: 12,500 m (41,000 ft)
* Rate of climb: m/s (ft/min)

MQ-9 Reaper

Introduction

The MQ-9 Reaper (originally the RQ-9 Predator B) is an unmanned aerial vehicle (UAV) developed by General Atomics Aeronautical Systems for use by the United States Air Force, the United States Navy, and the British Royal Air Force. The MQ-9 is the Air Force's first hunter-killer UAV designed for long-endurance, high-altitude surveillance.

The MQ-9 is fitted with six stores pylons. The inner stores pylons can carry a maximum of 1,500 pounds (680 kilograms) each, and are "wet" to allow carriage of external fuel tanks. The mid wing stores pylons can carry a maximum of 600 pounds (270 kilograms) each, while the outer stores pylons can carry a maximum of 200 pounds (90 kilograms) each. An MQ-9 with two 1,000 pound (450 kilogram) external fuel tanks and a thousand pounds of munitions has an endurance of 42 hours.[5] The Reaper has an endurance of 14 hours when fully loaded with munitions.[1] The MQ-9 currently carries a variety of weapons, including the GBU-12 Paveway II laser-guided bomb and the AGM-114 Hellfire II air-to-ground missiles. AIM-92 Stinger air-to-air missiles and GBU-38 JDAM bombs have been added.

The Predator B provides the service an improved "deadly persistence" capability, with the UAV flying over a combat area night and day waiting for a target to present itself. In this role an armed UAV neatly complements piloted strike aircraft. A piloted strike aircraft can be used to drop larger quantities of ordnance on a target while a cheaper UAV can be kept in operation almost continuously, with ground controllers working in shifts, carrying a lighter ordnance load to destroy targets.

GENERAL CHARACTERISTICS

* Contractor: General Atomics Aeronautical Systems Incorporated
* Landing Type: runway
* Launch Type: runway
* Power Plant: Honeywell TP331-10 turboprop engine, 670 kW

PERFORMANCE

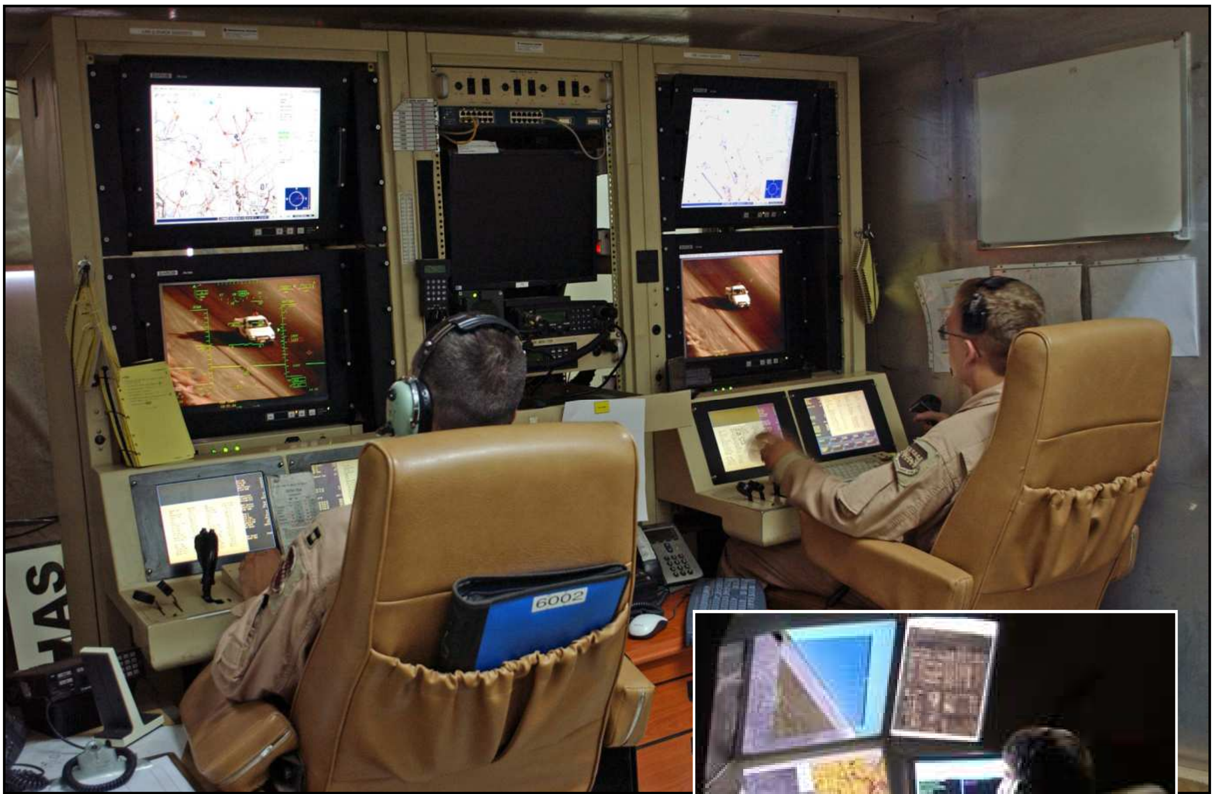
* Ceiling: 50,000 ft (15 km)
* Operational altitude: 25,000 ft (7.5 km) [26]
* Endurance: 16-28 h [27]
* Range: 3682 mi (3200 nmi, 5926 km)
* Fuel Capacity: 1,300 kg (3,907 lb)

* Length: 11 m (36 ft)
* Payload: 1700 kg (3800 lb)
* Maximum speed: 400 km/h (250 mph, 220 knots)
* Cruise speed: 160 km/h (100 mph, 85 knots) [28]
* Weight: 1676 kg (3700 lb) empty; 4760 kg (10,500 lb) max [29]
* Wingspan: 20 m (66 ft)

ARMAMENT

* 6 Hardpoints under the wings, can carry a payload mix of 1,500 lb. on each of its two inboard weapons stations, 500-600 lb. on the two middle stations and 150-200 lb. on the outboard stations.

* 2x AIM-9 Sidewinder air to air missiles
* 4x FIM-92 Stinger anti-aircraft missiles
* 2x AIM-120C AMRAAM air to air missiles
* 2x AGM-65 Maverick air to ground missiles
* 8x AGM-114 Hellfire air to ground missiles
* 2x GBU-12 Paveway II laser-guided bombs
* 2x GBU-38 JDAM air to ground bombs



UAV Operators at Balad Camp Anaconda, Iraq.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HERCULES C130J

The RAAF operate 12 C-130J and 8 C-130H. They are operated by No 37 Squadron, based at RAAF Base Richmond, near Sydney.

Introduction

The Lockheed Martin C-130J Super Hercules is an American four-engine turboprop military transport aircraft. The C-130J is a comprehensive update of the venerable Lockheed C-130 Hercules, with new engines, cockpit, and other systems. The Hercules family has the longest continuous production run of any military aircraft in history. During more than 50 years of service the family has participated in military, civilian and humanitarian aid operations. The Hercules has also outlived several planned successor designs, most notably the Advanced Medium STOL Transport contestants.

The **C-130J "Super" Hercules** is the newest version of the Hercules and the only model still in production. Externally similar to the classic Hercules in general appearance, the J model is a very different aircraft. These differences include new Rolls-Royce AE 2100 turboprops with six-bladed composite scimitar propellers, digital avionics (including Head-Up Displays (HUDs) for each pilot), reduced crew requirements (2 pilots — no navigator or flight engineer), increased reliability and up to 27% lower operating costs. The C-130J is available in a standard-length or stretched **-30** variant.

Lockheed Martin C-130H Hercules technical specifications

Manufacturer	Lockheed Martin
Role	Medium tactical and multi-role transport
Crew	Two pilots, navigator, flight engineer, loadmaster
Engine	Four Allison turboprops (4,190 shaft horsepower each) driving 4-blade propellers
Airframe	Length: 29.7m height: 11.8m
Wingspan	40.4m
Weight	70,450kg is the Max AUW (79,380kg is the Maximum Alternate AUW)
Speed	595km/h (normal operations)
Range	5,100km with 14,000kg payload
Ceiling	40,000 feet
Accommodation	

Depending on configuration:

* 92 troops
* 64 paratroops
* 74 stretcher patients and two medical attendants
* light armoured vehicles, artillery pieces or four-wheel drives

Lockheed Martin C-130J Hercules technical specifications:

Manufacturer	Lockheed Martin
Role	Medium tactical and multi-role transport
Crew	Two pilots, loadmaster
Engine	Four Allison AE2100D3 turboprops (4,590 shaft horsepower each) driving 6-blade variable pitch propellers
Airframe	Length: 34.37m, height: 10.1m
Wingspan	40.4m
Weight	79,380kg maximum (19,500kg payload)

Speed	625km/h (normal operations)
Range	5,100km with 18,155kg payload
Ceiling	35,000 feet

Accommodation/load depending on configuration:

* 128 troops
* 74 paratroops
* 74 stretcher patients and two medical attendants
* light armoured vehicles, artillery pieces or four-wheel drives
* two extra cargo pallets compared to C-130H (30% more)

DE HAVILLAND CANADA DHC-4 CARIBOU

12 in service – were supposed to be replaced in 2012, operated by No 38 Squadron from RAAF Base Amberley.

Introduction

The Canadian-designed and produced de Havilland Canada DHC-4 Caribou (known in the U.S. military as CV-2 and C-7 Caribou) was designed as a specialized transport with short takeoff and landing (STOL) capability. The Caribou was first flown in 1958 and although mainly retired from military operations, is still in use in small numbers as a rugged "bush" aircraft.

The Royal Australian Air Force DHC-4 Caribou is a versatile tactical light transport aircraft, capable of very short take-off and landings on unprepared runways. Its main operational role is tactical air transport in support of the Australian Army. The Caribou is operated by No 38 Squadron from RAAF Base Amberley, near Brisbane, and RAAF Base Townsville.

The Caribou is a twin-engined high-wing monoplane with full-span double-slotted Fowler flaps and fully-reversible propellers, which allow it to achieve its trademark steep approach and very short take-offs and landings. The high wing and distinctive high placement of the tail provide easy access to a large cargo compartment, while the low-pressure tyres permit operation on unprepared runways.

It is the last piston-engined aircraft in the Air Force and is our only aircraft to employ the Low Altitude Parachute Extraction System (LAPES), where up to 2000kg of sled-mounted cargo is extracted from the aircraft by a parachute from a metre above the ground.

The Caribou is equipped with GPS satellite navigation and night-vision equipment, giving it the capability to operate in any weather, day or night, to either land or drop soldiers and equipment by parachute with pinpoint accuracy. The Caribou is not pressurised and is not fitted with auto-pilot or weather radar.
Since 1997 the Caribou has participated in famine-relief operations in Papua New Guinea and Irian Jaya during Operations SIERRA, PLES DRAI and AUSINDO JAYA, as well as the tsunami-relief operation in PNG in 1999 and operations in East Timor and the Solomon Islands since 1999.

Although introduced in 1964 and employed in the Vietnam War, the Caribou is still recognised as one of the most capable short-haul transport aircraft in the world.

De Havilland Canada DHC-4 Caribou technical specifications:

Manufacturer	De Havilland Canada
Role	Light tactical transport
Crew	Two pilots, flight engineer
Engine	Two Pratt and Whitney radials (2000 horsepower each)
Airframe	Length: 22.5m height: 9.6m
Wingspan	29m
Weight	15,400kg
Speed	280km/h (cruise)
Range	2000km
Ceiling	28,000 feet or 13,000 feet with passengers

Accommodation capacity is 4 tonnes of cargo:

- two four-wheel drives or light artillery pieces
- 32 equipped troops seated
- 22 stretcher patients plus medical attendants

UH1 Iroquois

http://www.richard-seaman.com

The Bell Helicopter Textron UH-1 Iroquois, commonly (or officially in the United States Marine Corps) known as the "Huey", is a multipurpose military helicopter, famous for its use in the Vietnam War. The "U" stands for utility, in contrast to attack or cargo helicopters.

The UH-1 was developed from 1955 US Army trials with the Bell Model 204. The initial designation of HU-1 (helicopter utility) led to its nickname, Huey. The nickname became so popular that Bell started putting the Huey name on the anti-torque pedals.

The aircraft was first used by the military in 1959 and went into tri-service production in 1962 as the UH-1. The last were produced in 1976 with more than 16,000 made in total, of which about 7,000 saw use during the Vietnam War.

In Vietnam, 2,202 Huey pilots were killed and approximately 2,500 aircraft were lost, roughly half to combat and the rest to operational accidents.

Specifications (UH-1D)

- Crew: 1-4
- Capacity: 3,880 lb including 14 troops, or 6 stretchers, or equivalent cargo
- Length: 57 ft 1 in with rotors (17.4 m)
- Fuselage width: 8 ft 7 in (2.6 m))
- Rotor diameter: 48 ft 0 in (14.6 m)
- Height: 14 ft 5 in (4.4 m)
- Empty weight: 5,215 lb (2,365 kg)
- Loaded weight: 9,040 lb (4,100 kg)

- Max takeoff weight: 9,500 lb (4,310 kg))
- Powerplant: 1× Lycoming T53-L-11 turboshaft, 1,100 shp (820 kW)

Performance

- Maximum speed: 135 mph (220 km/h)
- Cruise speed: 125 mph (205 km/h)
- Range: 315 mi (510 km)
- Service ceiling 19,390 ft (Depending on conditions) (5,910 m)
- Rate of climb: 1,755 ft/min (8.9 m/s)
- Power/mass: 0.15 hp/lb (0.25 kW/kg)

Armament Variable, but may include a combination of:

- 2x 7.62 mm M60 machine gun, or 2x 7.62 mm GAU-17/A machine gun
- 2x 7-round or 19-round 2.75 in (70 mm) rocket pods

NH90 NFH - ASW / TRANSPORT HELICOPTER

Photo: Eurocopter. The Australian Army has 46

Introduction

The NATO Frigate Helicopter (NFH) is one of two versions of the NH90 twin-engine multi-role helicopter being developed by NH Industries. The other version is the NH90 TTH Tactical Transport Helicopter.

The NHI NH90 TTH is a medium sized, twin-engine, multi-role military, fly-by-wire helicopter manufactured by NHIndustries, a company established by Agusta, Eurocopter and Stork Fokker Aerospace. The NH90, which can be flown by a single pilot, is designed to operate by night and day and in poor weather. It has been ordered by several nations and entered service from 2007.

NFH: NATO Frigate Helicopter

The primary role of the NFH version is autonomous anti-submarine warfare (ASW) and anti-surface unit warfare (ASuW), mainly from naval ships. These aircraft are equipped for day and night, adverse weather and severe ship motion operations. Additional roles include anti-air warfare support, vertical replenishment (VERTREP), search & rescue (SAR) and troop transport.

TTH: Tactical Transport Helicopter

The primary role of the TTH version is the transport of 20 troops or more than 2,500 kg of cargo, heliborne operations and search & rescue. It can quickly be adapted to MEDEVAC/CASEVAC missions by fitting up to 12 stretchers or cargo delivery capability

Additional roles include medical evacuation (12 stretchers), special operations, electronic warfare, airborne command post, parachuting, VIP transport and flight training..

General characteristics

* Crew: 2 pilots

* Capacity: 20 troops/12 stretchers
* Length: 16.13 m (52 ft 11 in)
* Rotor diameter: 16.30 m (53 ft 5¾ in)
* Height: 5.23 m (17 ft 2 in)
* Empty weight: 5,400 kg (11,900 lb)
* Max takeoff weight: 10,600 kg (23,370 lb)
* Powerplant: 2× Rolls-Royce Turbomeca RTM322-01/9 turboshafts, 1,662 kW (2,230 shp) each
* Powerplant: 2× General Electric T700-T6E turboshafts, 1,577 kW (2,115 shp) each

Performance

* Maximum speed: 300 km/h (162 knots, 186 mph)
* Range: 800 km (TTH); 1,000 km (NFH) ()
* Service ceiling 2,960 m ()
* Rate of climb: 480 m/min ()

Armament Missiles: anti-submarine and/or Air to surface missiles (NFH version)

NH90 NFH ROLES

The primary missions of the NH90 NFH helicopter are in the autonomous Anti-Submarine Warfare (ASW) and Anti-Surface ship Warfare (AsuW) role.

In a typical four-hour 'relocation on call' operation, the helicopter would take: 35 minutes to reach the area of operation; 20 minutes releasing sonobuoys; two hours on surveillance in the area of operations; 30 minutes releasing torpedoes; and 35 minutes to return to ship and land, with 20 minutes in reserve.

In a typical four-hour 'screening' operation, the helicopter would take: 15 minutes to reach the area of operation; three hours and 30 minutes in the operations zone carrying out 11 consecutive cycles of ten-minute sonar dipping; and 15 minutes to return to the ship and land, with 20 minutes reserve.

In the anti-surface warfare role, the helicopter is capable of detection, tracking, classification, identification and attack of hostile ships, and has over-the-horizon capability. Secondary roles include Anti-Air Warfare (AAW), Vertical Replenishment (VERTREP), Search and Rescue (SAR), troop transport and mine laying.

COCKPIT AND AVIONICS SYSTEMS

The helicopter has a crew of three: the pilot and Tacco (the tactical coordinator responsible for mission management) and the Senso (sensor systems operator) in the cabin. The cabin of the NFH is equipped with an avionics bay with a sensor operator station and a tactical coordinator station, a dipping sonar and a sonobuoy launcher.

"The cabin of the NH90 is equipped with an avionics bay with a sensor operator station."

The NH90 has "fly-by-wire" all electric flight controls from Goodrich Actuation Systems and Liebherr Aerospace. This full authority quadruplex system increases the manoeuvrability of the aircraft while decreasing the weight. The avionics system is supplied by Thales Avionics and is based on a dual MIL-STD-1553B digital databus. The cockpit has five 8in x 8in colour multifunction liquid crystal displays for flight, mission systems and maintenance data. Honeywell Primus 701A weather radar is fitted.

The avionics package includes the Thales Topowl helmet-mounted sight and display which has a 40° field of view. Topowl also equips the Tiger and Rooivalk attack helicopters.

Under a contract awarded in January 2008, German NH90 helicopters will be fitted with EADS Defence Electronics MilOWS, a military version of the HELLAS laser-based helicopter obstacle warning system.

ARMAMENT

The NATO Frigate Helicopter can be armed with anti-submarine torpedoes, air-to-surface missiles and air-to-air missiles.

COUNTERMEASURES

The helicopters for France, Germany, Italy, Portugal and Finland are fitted with a self-protection suite from EADS Defence Electronics, which is also being supplied to the Tiger helicopter. The suite includes EADS AN/AAR-60 MILDS missile approach warning system, Thales TWE Threat Warning Equipment with integrated radar warning and laser warning receivers and MBDA Saphir-M chaff and flare dispenser.

Norwegian NFH are to have the ITT AN/ALQ-211 Integrated Radio Frequency Countermeasures (IRFCM) suite. Swedish helicopters will be equipped with an EW suite supplied by Saab Avionics, in conjunction with Avitronics of South Africa. Avitronics is jointly owned by Saab and Grintek.

"The NH90 is equipped with an integrated communications and identification management system. "

SENSORS

The NFH is equipped with a tactical Forward-Looking Infrared (FLIR) system mounted in the nose, a Magnetic Anomaly Detector (MAD) and a sonar suite. French Navy NFH will be fitted with the Flash Sonics sonar system from Thales Underwater Systems, which combines the Flash active dipping sonar with the TMS 2000 sonobuoy processing system.

The Norwegian and Swedish Navy NFH will also operate a version of the system, Flash-S, optimised for conditions in the Baltic Sea. Dutch, Italian and German NFH will be equipped with the Helicopter Long Range Active Sonar (HELRAS). The HELRAS dipping sonar is supplied by ELAC Nautik of Kiel, Germany, a subsidiary of L-3 Communications.

The NFH is equipped with a Thales European Navy Radar (ENR) 360° surveillance radar mounted under the nose. ENR is derived from Thales Ocean Master and has been developed in conjunction with EADS and Galileo Avionica. Swedish NFH will have AN/APS-143B(V)3 Ocean Eye multimode surveillance radar from US company, Telephonics. Ocean Eye has both SAR (Synthetic Aperture Radar) and ISAR (Inverse Synthetic Aperture Radar) imaging modes.

COMMUNICATIONS

The NH90 is equipped with an integrated communications and identification management system. The secure radio system provides air-to-air and air-to-ground communications. The TSC 2000 IFF (Identification Friend or Foe) supplied by Thales was developed under German and French cooperation. The helicopter is equipped with a Link 11 secure datalink.

PROPULSION

The NFH Helicopter is powered by two RTM 322-01/9 engines supplied by Rolls-Royce Turbomeca.

"The NATO Frigate Helicopter can be armed with anti-submarine torpedoes."

SIKORSKY UH-60 BLACK HAWK

AH-60L Battle Hawk: Export version for the Australian Army, operated by 5 Aviation Regiment, 171 Aviation Squadron and the School of Army Aviation.

Photo: Wikipedia

Introduction

The S70A-9 Black Hawk is operated by 5 Aviation Regiment, 171 Aviation Squadron and the School of Army Aviation. Its tasks include tactical transport of infantry soldiers, search and rescue, medical evacuation, disaster relief and external carriage of heavy equipment including artillery howitzers and light vehicles.

The Sikorsky UH-60 Black Hawk is a medium-lift utility or assault helicopter derived from the twin-turboshaft engine, single rotor Sikorsky S-70.

The Black Hawk series of aircraft can perform a wide array of missions, including the tactical transport of troops, electronic warfare, and aeromedical evacuation. A VIP version known as the VH-60N is used to transport important government officials (e.g., Congress, Executive departments) with the helicopter's call sign of "Marine One" when transporting the President of the United States.[2] In air assault operations it can move a squad of 11 combat troops with equipment or reposition the 105 mm M102 howitzer with thirty rounds of 105 mm ammunition, and a four-man crew in a single lift. Alternatively, it can carry 2,600 lb (1,170 kg) of cargo or sling load 9,000 lb (4,050 kg) of cargo. The Black Hawk is equipped with advanced avionics and electronics for increased survivability and capability, such as the Global Positioning System.

The unit cost varies with the version due to the varying specifications, equipment and quantities. For example, the unit cost of the Army's UH-60L Black Hawk is $5.9 million while the unit cost of the Air Force MH-60G Pave Hawk is $10.2 million.[3]

General characteristics

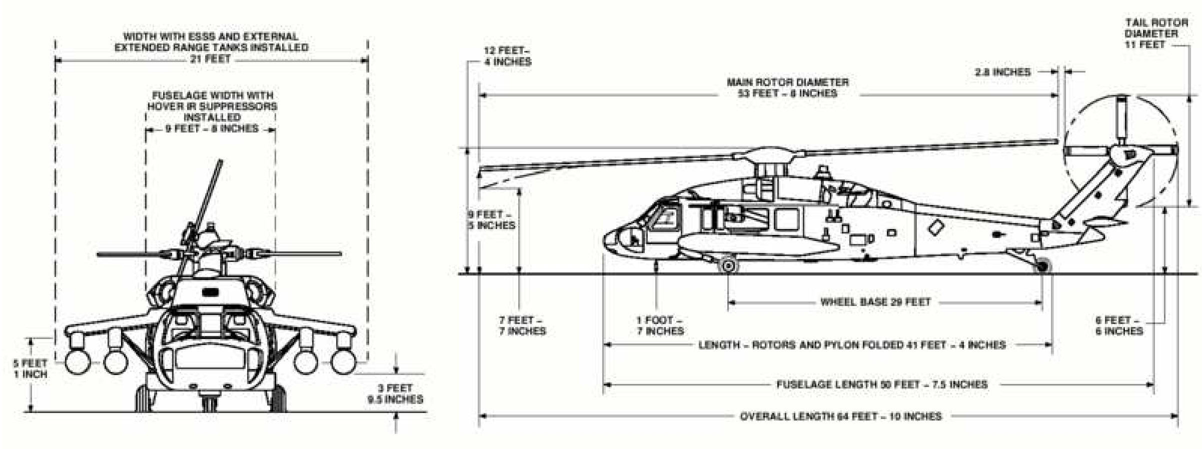
* Crew: 2 pilots (flight crew)
* Capacity: 2,640 lb of cargo internally, including 14 troops or 6 stretchers, or 8,000 lb (UH-60A) or 9,000 lb (UH-60L) of cargo externally
* Length: 64 ft 10 in (19.76 m)
* Rotor diameter: 53 ft 8 in (16.36 m)
* Height: 16 ft 10 in (5.13 m)
* Disc area: 2,260 ft² (210 m²)
* Empty weight: 10,624 lb (4,819 kg)
* Loaded weight: 22,000 lb (7,375 kg)
* Max takeoff weight: 24,500 lb (11,113 kg)
* Powerplant: 2× General Electric T700-GE-701C free-turbine turboshafts, 1,800 hp (1,340 kW) each

Performance

* Never exceed speed: 193 knots (222 mph, 357 km/h)
* Maximum speed: 159 kt (183 mph, 295 km/h)
* Cruise speed: 150 kt (173 mph, 278 km/h)
* Combat radius: 368 mi (320 nmi, 592 km)
* Ferry range: 1,380 mi[12] (1,200 nmi, 2,220 km)
* Service ceiling 19,000 ft (5,790 m)
* Rate of climb: 700 ft/min (3.6 m/s)
* Disc loading: 7.19 lb/ft² (35.4 kg/m²)
* Power/mass: 0.192 hp/lb (158 W/kg)

Armament

- Guns: 2× 7.62 mm (0.30 in) M60 machine guns or M134 miniguns (The Army is now replacing the M60 machine gun with the M240H machine gun.)
- Can be equipped with VOLCANO minefield dispersal system. See UH-60 Armament Subsystems for more information.



SIKORSKY S-70B-2 SEAHAWK HELICOPTER

RAN operates 16 Seahawks with No. 816 Squadron RAN

Introduction

The Sikorsky SH-60/MH-60 Seahawk (or Sea Hawk) is a twin turboshaft engine, multi-mission Navy helicopter based on the airframe of the UH-60 Black Hawk. The Seahawk is an integral part of the ship's weapons and sensor systems. With its unique sensor suite and integrated weapons systems the helicopter extends the combat radius of the ship by finding, localising and attacking where appropriate, surface or submarine targets either independently or in conjunction with other forces.

A typical Seahawk mission involves up to three hours of low level operations over the sea, day or night, in all weather conditions, often recovering to a ship's deck which pitches and rolls dramatically in heavy seas, and is generally wet with spray.

The Seahawk's sensors include: search radar, magnetic anomaly detector and sonics processing for both active and passive sonobuoys. Both forward-looking infra-red and electronic support measures are also to be fitted. The Seahawk's main weapon is the Mk46 anti-submarine torpedo.

Statistics

Length	19.8 metres
Height	5.2 metres
Width	16.4 metres (rotors spread)
Weight	9947 kg
Speed	330 kph
Range	1295 km
Crew	3 (Pilot, Tactical Coordinator, Sensor Operator)
Engines	Two GE T-700 Turboshaft

Weapon Systems

Two Mk46 Torpedo
One 7.62 machine gun

General Description

Fitted with a foldable four bladed main rotor and tail rotor pylon (to enable the aircraft to be stowed in the hanger aboard a frigate), the Seahawk is a conventional helicopter. However, it is an advanced anti-submarine warfare 'craft with a high level of integration of its tactical, navigation, communications and weapons systems.
The RAN operates 16 Seahawks. The Sikorsky Aircraft Division of United Technologies Corporation in Florida, USA, manufactured the first batch of eight aircraft. Aerospace Technologies Australia (ASTA) at Avalon in Victoria assembled a second batch of eight aircraft. The final aircraft was delivered to the RAN in 1992.

The S-70B-2 is powered by twin T700-GE-401C turbine jet engines. To detect submarines, it is equipped with radar, acoustic processor and magnetic anomaly detector and can use a wide range of expendable sonobuoys. The avionics system is built around a dual MIL-STD1553B data bus controlled by two computers. Once detected and classified, submarine contacts can be dealt with by launching Mk46 lightweight torpedoes.

In its role of anti-submarine warfare, the aircrew employs the aircraft's acoustic system to simultaneously monitor a number of sonobuoys, which are deployed from the aircraft in-flight. In the aircraft's role of anti-surface warfare, the lightweight radar is capable of automatically tracking contacts. The radar can detect targets at ranges far beyond the coverage provided by surface ships in a task force, with all information processed on board being capable of transmission in high-speed bursts (via secure data-link) to the operations rooms of the Navy's FFGs.

The aircraft's navigation suite, which integrates data from GPS, doppler and air-data computers, produces a constantly updated position which allows for accurate targeting for a ship's Harpoon missiles.
The aircraft is operated by a crew of three - one pilot (who is the aircraft captain), one observer and one aircrewman. In addition to its primary warfare roles, the S-70B-2, with its built-in winch and cargo hook, is also used extensively at sea to transfer personnel and for the vertical replenishment of stores to ships while they remain under way.

With minor modification, the aircraft is capable of being converted to a troop-carrying role, lifting up to 10 troops at a time. It also makes a capable maritime search and rescue platform capable of day and night rescues, as shown by rescues during the 1998 Sydney to Hobart yacht race. The Seahawk is expected to be the mainstay of the Fleet Air Arm for at least the next 20 years.

EUROCOPTER TIGER ARH

22 aircraft operated by 161st and 162nd Squadron

Introduction

The Eurocopter Tiger is an attack helicopter manufactured by the Eurocopter Group. In Germany it is known as the Tiger; in France and Spain it is called the Tigre. It is also designated the EC 665 or PAH-2.

Loadouts

Loadout	Outer holder	Inner holder	Inner holder	Outer holder
ATA	2x Mistral/Stinger	2x Mistral/Stinger	2x Mistral/Stinger	2x Mistral/Stinger
ATA LR	2x Mistral/Stinger	1x 350 litre drop tank	1x 350 litre drop tank	2x Mistral/Stinger
PGM-M	4x PARS 3 LR ATGM	4x PARS 3 LR ATGM	4x PARS 3 LR ATGM	4x PARS 3 LR ATGM
PGM-M	1x 22 SNEB 68mm Rocket/19 Hydra 70 mm Rocket	4x PARS 3 LR ATGM	4x PARS 3 LR ATGM	1x 22 SNEB 68mm Rocket/19 Hydra 70 mm Rocket
PGM-M	4x Euromissile HOT III	4x Euromissile HOT III	4x Euromissile HOT III	4x Euromissile HOT III
PGM-M	1x 22 SNEB 68mm Rocket/19 Hydra 70 mm Rocket	4x Euromissile HOT III	4x Euromissile HOT III	1x 22 SNEB 68mm Rocket/19 Hydra 70 mm Rocket
PGM-M	2x Mistral/Stinger	4x PARS 3 LR ATGM/HOT III	4x PARS 3 LR ATGM/HOT III	2x Mistral/Stinger
PGM-M LR	4x PARS 3 LR ATGM/HOT III	1x 350 litre drop tank	1x 350 litre drop tank	4x PARS 3 LR ATGM/HOT III
UG-R	1x 22 SNEB 68mm Rocket/19 Hydra 70 mm Rocket	1x 22 SNEB 68mm Rocket/19 Hydra 70 mm Rocket	1x 22 SNEB 68mm Rocket/19 Hydra 70 mm Rocket	1x 22 SNEB 68mm Rocket/19 Hydra 70 mm Rocket

Only most common loadouts presented.
The Tiger ARH (Armed Reconnaissance Helicopter) is the version ordered by the Australian Army to replace its OH-58 Kiowas and UH-1 Iroquois-based 'Bushranger' gunships.[3] The Tiger ARH is a modified and upgraded version of the Tiger HAP with upgraded MTR390 engines as well as a laser designator incorporated in the Strix sight for the firing of Hellfire II air-to-ground missiles. Instead of SNEB unguided rockets, the ARH will operate 70 mm (2.75 in.) rockets from Belgian developer, Forges de Zeebruges (FZ).

General characteristics

* Crew: 2 (pilot, weapon systems officer)
* Length: 14.08 m fuselage (46 ft 2 in)
* Rotor diameter: 13.00 m (42 ft 8 in)
* Height: 3.83 m (12 ft 7 in)
* Disc area: 133 m² (1,430 ft²)
* Empty weight: 3,060 kg (6,750 lb)
* Max takeoff weight: 6,000 kg (13,000 lb)
* Internal fuel capacity: 1,080 kg (2,380 lb)
* Powerplant: 2× Rolls-Royce/Turboméca/MTU MTR390 turboshafts, 873 kW (1,170 shp) each

Performance

* Maximum speed: 290 km/h with mast, 315 km/h without mast (157 knots, 181 mph with mast, 170 knots or 196 mph without mast)
* Range: 800 km (430 nm, 500 mi) combat
* Ferry range: 1,300 km (700 nm, 800 mi)
* Service ceiling 4,000 m (13,000 ft)
* Rate of climb: 10.7 m/s (2,105 ft/min)

Armament

* Guns:
  o 1× 30 mm (1.18 in) GIAT 30 cannon in chin turret (HAP, HAD, ARH) or
  o 1× 12.7 mm (0.50 in) or 20 mm (0.787 in) gun in pod (UHT)
* Rockets: Pods of
  o 19× 70 mm (2.76 in) SNEB (HAD), or
  o 19× 70 mm Hydra (UHT, ARH), or
  o 22× 68 mm (2.68 in) SNEB (HAP), or
  o 7× 70 mm SNEB or unguided rockets (HAD)
* Missiles:
  o 8× PARS 3 LR and/or HOT3 (UHT) or
  o 8× Rafael Spike-ER (Spanish HAD) or
  o 8× AGM-114 Hellfire anti-tank missiles (ARH, French HAD)
  o 4× AIM-92 Stinger air-to-air missiles (UHT, ARH) or
  o 4× Mistral air-to-air missiles (HAP, HAD)

CH-47D CHINOOK

The CH-47D Chinook is operated by C Squadron, 5 Aviation Regiment.

Photo: CH-47D Wikipedia

Introduction

The Boeing CH-47 Chinook is a versatile, twin-engine, tandem rotor heavy-lift helicopter. Its top speed of 170 knots (196 mph, 315 km/h) was faster than utility and attack helicopters of the 1960s and even many of today. Its primary roles include troop movement, artillery emplacement and battlefield resupply. There is a wide loading ramp at the rear of the fuselage and three external-cargo hooks.

The CH-47D was originally powered by two T55-L-712 engines, but most are now fitted with the T55-GA-714A. Models CH-47A, CH-47B, and CH-47C, all used the same airframe, but later models featured upgraded engines. With its triple-hook cargo system, the CH-47D can carry heavy payloads internally and up to 26,000 pounds externally, for example, bulldozers and 40-foot containers, at speeds over 155 mph (250 km/h). In air assault operations, it often serves as the principal mover of the 155 mm M198 howitzer, 30 rounds of ammunition, and an 11-man crew. Like most US Army helicopters, the Chinook has advanced avionics and electronics, including the Global Positioning System. The MH-47D and MH-47E variants are intended for special forces operations and have in-flight refueling, a fast-rope rappelling system and other upgrades. The MH-47D was an early special operations version for the US Army.

Specifications (CH-47D)

General characteristics

* Crew: 3: pilot, copilot, flight engineer
* Capacity:
    o 33-55 troops or
    o 24 litters and 3 attendants
    o 28,000 pounds cargo
* Length: 98 ft 10 in (30.1 m)
* Rotor diameter: 60 ft 0 in (18.3 m)
* Height: 18 ft 11 in (5.7 m)
* Disc area: 2,800 ft^2 (260 m^2)
* Empty weight: 23,400 lb (10,185 kg)
* Loaded weight: 26,680 lb (12,100 kg)
* Max takeoff weight: 50,000 lb (22,680 kg)
* Powerplant: 2× Lycoming T55-GA-712 turboshafts, 3,750 hp (2,796 kW) each

Performance

* Maximum speed: 170 knots (196 mph, 315 km/h)
* Cruise speed: 130 kt (137 mph, 220 km/h)
* Range: 400 nmi (450 mi, 741 km)
* Service ceiling 18,500 ft (5,640 m)
* Rate of climb: 1,522 ft/min (10.1 m/s)
* Disc loading: 9.5 lb/ft^2 (47 kg/m^2)
* Power/mass: 0.28 hp/lb (460 W/kg)

Armament

M-134, 7.62 minigun, M-240 7.62 machine gun