

# Air Force

## Capability Guidebook



# AIR FORCE







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## Foreword

This *Air Force Capability Guidebook* has been developed as a companion volume to *Air Force – Serving Australia’s Interests*. The guidebook provides detailed information on the skill sets and specialisations of Air Force’s people and the major capability systems employed by Air Force, or scheduled for acquisition for Air Force in the near future. It also details relevant defence projects for the upgrade of current Air Force capabilities and the acquisition of new capabilities. Finally, the guidebook lists pertinent details of weapons currently employed, or programmed for introduction for employment by, Air Force’s capability systems.

Together, *Air Force – Serving Australia’s Interests* and the *Air Force Capability Guidebook* provide a detailed explanation of Air Force’s *raison d’être*, its organisation and structure, capability systems both in Service and programmed, Defence projects of relevance and weapons available for, or programmed for, employment. I commend this guidebook to anyone with an interest in Air Force and the role of air power in Australia’s national security.



**Air Marshal Leo Davies, AO, CSC  
Chief of Air Force**

## Contents

Foreword	3
<b>Introduction</b>	<b>7</b>
<b>People</b>	<b>8</b>
<b>Aircraft and Capabilities</b>	<b>12</b>
<i>Air Combat</i>	<i>13</i>
Hawk 127	13
F/A-18A/B Hornet	14
F/A-18F Super Hornet	16
F-35A Lightning II	20
<i>Surveillance and Maritime</i>	<i>22</i>
E-7A Wedgetail	22
AP-3C Orion	24
P-8A Poseidon	25
Heron Unmanned Aerial System (UAS)	26
MQ-4C Triton Unmanned Aerial System	27
<i>Air Mobility</i>	<i>28</i>
C-130J Hercules	28
KC-30A Multi-Role Tanker Transport (MRTT)	29
C-17A Globemaster III	30
C-27J Spartan	31
CL-604 Challenger	32
737 BBJ	33

<i>Aviation Training</i>	<b>34</b>
PC-9/A	34
PC-21	35
KA350 King Air	36
<i>Other Capabilities</i>	<b>37</b>
Jindalee Operational Radar Network (JORN)	37
Joint Battlefield Airspace Control (JBAC)	38
Mobile Regional Operations Centre (MROC)	39
Vigilaire	40
Space Surveillance	41
Woomera Range Complex	42
Centralised Data Processing	43
Bushmaster Protected Mobility Troop Vehicles	44
Light Weight G-Wagon	45
Titan Firefighting Field Truck	46
Panther Airfield Fire Truck	47
Military Working Dogs	48
<b>Air and Joint Projects</b>	<b>49</b>
AIR 5077 Airborne Early Warning and Control (AEW&C) E-7A Wedgetail	49
AIR 5276 AP-3C	49
AIR 5333 New Air Defence Command and Control System (Vigilaire)	49
AIR 5349 Australian Super Hornet	49
AIR 5376 F/A-18 Hornet Upgrade (HUG)	49

AIR 5405 Mobile Regional Operations Centre (MROC)	50
AIR 5409 Bomb Improvement Program (BIP)	50
AIR 5428 Pilot Training System	50
AIR 5431 Air Traffic Management Systems	51
AIR 5438 Lead-In Fighter (LIF) Capability Assurance Program	51
AIR 5440 Air Lift	51
AIR 6000 New Air Combat Capability	52
AIR 7000 Future Maritime Patrol and Response Capability	52
AIR 7100 Medium Altitude, Long Endurance (MALE) UAS	52
AIR 8000 New Airlift	52
Joint Project (JP) 2025 Jindalee Operational Radar Network	52
JP 3024 Woomera Range Systems Remediation	53
JP 3027 Joint Direct Attack Munition (JDAM) Enhancement	53
JP 3029 Space Situational Awareness (SSA)	54
<b>Weapon and Technology Glossary</b>	<b>55</b>



# Introduction

Air Force produced the document *Air Force – Serving Australia's Interests* to provide its personnel, partners and those with an interest in air power, an understanding of Air Force's reason for being, and the structure and organisation in place to achieve its mission. This *Capability Guidebook* is a companion volume to *Air Force – Serving Australia's Interests*.

Air Force operates a wide variety of complex technological systems that enable it to apply potent and effective air power effects required by joint force commanders at the direction of Government. To be operated effectively, these systems require a diverse workforce with a wide variety of unique skill sets, in uniform, from the public service and from industry. Air Force's systems are able to employ a variety of weapons to achieve different effects to meet operational requirements.

Air Force's capability systems often have a service life of decades. The F/A-18A/B Hornet will have operated for well over 30 years when replaced by the F-35A Lightning II. Given the number and diverse nature of Air Force's systems, at any one time some will be evolving, some will be undergoing upgrade, some will be nearing the end of service life and replacement, and some new capabilities will be in the process of selection or introduction.

This *Capability Guidebook* outlines: the breakdown of skills and specialisations required by Air Force's people; the major

technological systems Air Force operates; current projects to improve, upgrade or replace Air Force capability systems, or acquire new capabilities; and the weapons available for Air Force to employ. This *Capability Guidebook* and *Air Force – Serving Australia's Interests* together give a full picture of Air Force's mission, structure, organisation, lay-down, personnel skills and specialisations, capability systems, relevant current projects and available weapons.



# People

An important factor in the generation of air power is Air Force's people. Generating, employing and sustaining potent and effective air power requires people skilled across all of the Fundamental Inputs to Capability (FIC); command and management, organisation, major systems, personnel, supplies, support, collective training and facilities and training areas. To ensure the required numbers of personnel with the required skill sets, Air Force is

comprised of a multitude of personnel in various trades which Air Force groups into musterings and specialisations. The logistics officer and the aircraft technician are just as important to the successful application of air power as the fighter pilot.

In addition to skilled personnel in uniform, Air Force requires appropriately skilled public service, contractor and industry personnel employed where necessary to complement the uniformed workforce.



## Air Force Job Families

The Air Force Job Family structure has been principally instituted for the purpose of employing a 'Family Approach' to allow employment groups who have similar roles/work to be grouped together for analysis purposes. The Air Force Job Families and each family's list of musterings and specialisations are detailed below:

### Air and Operations

Air Combat Officer	ACO
Flight Engineer	FLTENG
Airborne Electronics Analyst	AEA
Joint Battlefield Airspace Controller	JBAC
Air Surface Integration Officer	ASIO
Loadmaster (including Air Refuelling Operator)	LOADM (incl ARO)
Combat Controller	CC
Operations Officer	OPSO
Crew Attendant	CREWATT
Pilot	PLT

### Air Technical

Aeronautical Life Support Fitter	ALSFITT
Aircraft Technician	ATECH
Armament Technician	ARMTECH
Avionics Systems Technician	AVSYSTECH
Aircraft Structural Fitter	ASTFITT
Avionic Technician	AVTECH
Aircraft Surface Finisher	ASURFIN
Non-Destructive Inspection Technician	NDITECH
Aircraft Systems Technician	ASYSSTECH

### Engineering

Aeronautical Engineer	AERO
Armament Engineer	ARM
Airfield Engineer	AFENG
Electronics Engineer	ELECTR

### Force Protection and Discipline

Air Base Protection (RAAF Active Reserve only)	ABP
Ground Defence Officer	GRDEF
Airfield Defence Guard	ADG
Physical Training Instructor	PTI
Air Force Police	AFPOL
Security Police Officer	SECPOL
Air Force Security	AFSEC
Warrant Officer Disciplinary	WOD
Fire Fighter	FIREFTR

### Ground Technical

Communications Electronic Systems Technician	CESYTECH
Ground Mechanical Engineering	GME
Communications Electronic Technician	CETECH
Ground Support Equipment	GSE

## Health

Dental Assistant	DENTASST
Medical Officer	MED
Dental Officer	DENT
Nursing Officer	NURS
Environmental Health Officer	ENVH
Pharmacist	PHARM
Laboratory Officer	LAB
Radiographer	RADIOG
Laboratory Technician	LABTECH
Senior Dental Assistant - Preventative	SDAP
Medical Assistant	MEDASST
Specialist Reserve Health Reserve	SR HEALTH RESERVE

## Infrastructure Technical

Carpenter	CARPENTER
Plant Operator	PLANTOP
Electrician	ELECN
Plumber	PLUMBER
General Hand	GHAND
Works Supervisor	WKSSPVR

## Intelligence and Information Systems

Air Intelligence Analyst	AIA
Communications Information Systems Controller	CISCON
Air Surveillance Operator	ASOP
Intelligence Officer	INTEL

## Logistics

Cook	COOK
Motor Transport Driver (RAAF Active Reserve only)	MTD
Logistics Officer	LOG
Supply	SUP
Movements	MOV

## Support Operations

Air Force Imagery Specialist	AFIS
Personnel Capability Officer	PCO
Chaplain	CHAP
Personnel Capability Specialist	PCS
Executive Warrant Officer	EXECWOFF
Public Affairs Officer (RAAF Active Reserve only)	PAO
Legal Officer	LEGAL
Training Systems Officer	TSO
Musician	MUSICIAN

## Air Force Rank Insignia



# Aircraft and Capabilities

Having the required skilled people and ensuring all requirements of FIC are met are essential to the generation, employment and sustainment of air power. Actual air power effects are provided, however, by the technological systems Air Force employs to provide options for the Australian Government across the full spectrum of

conflict, up to and including high-end conventional warfighting.

A comprehensive selection of the technological systems that generate the capabilities that Air Force operates today, along with those that Air Force will operate in the near future, are listed in the following paragraphs.

## First Generation to Fifth Generation Fighter Aircraft

**1st generation** – Jet fighters of the immediate post-World War II and Korean War period.

**2nd generation** – Fighters with sustained transonic or supersonic dash capabilities, rudimentary fire control radars, and IR-guided air-to-air missiles.

**3rd generation** – By the late 1950s and 1960s, fighters were capable of sustained supersonic flight, carried improved fire control radars and semi-active radar air-to-air missiles, as well as the first generation of tactical electronic warfare systems.

**4th generation** – From the 1970s through to the 1990s, fighters employed more efficient and powerful turbofan jet engines, ‘look-down’ Doppler fire-control radars, fly-by-wire flight control systems providing high agility, integral and podded electro-optical/infrared targeting sensors, laser and GPS-guided precision weapons, active radar air-to-air missiles, head-up displays and improved electronic warfare systems. Although nearing their planned withdrawal date, this generation of fighters has endured the longest.

**5th generation** – Those aircraft more advanced than later 4th generation aircraft, including designed-in low observable shaping and materials, internal weapons bays, and a high degree of situational awareness through integrated sensors and networking. To date, the only operational 5th generation aircraft is the F-22A Raptor, although the F-35A Lightning II will meet these criteria.

**Note:** There are a few aircraft that have evolved to the point where some of their capabilities span the gap between the 4th and 5th generation categories, such as the Super Hornet. These aircraft are generally referred to as 4.5 generation fighters.

More information on fighter generations can be found in Pathfinder No 170 on the Air Power Development Centre website: [www.airforce.gov.au/airpower](http://www.airforce.gov.au/airpower)



# Air Combat

## Hawk 127

**Capability:** Lead-in fighter training

**Manufacturer:** BAE Systems

**Speed:** 1207 km/h

**Airframe:** 11.95 m long, 4.08 m high

**Wingspan:** 9.39 m

**Ceiling:** 50 000 ft (15.24 km)

**Ferry Range:** 1200 km

**Crew:** Two (pilot instructor and student or pilot and air combat officer)

**Weapons.** Air Intercept Missile (AIM)-9M infra-red missiles; practice, conventional and laser-guided bombs; and a 30mm cannon.

**Description.** The Hawk 127 aircraft prepares qualified Air Force pilots for operational conversion onto the F/A-18A/B Hornet and F/A-18F Super Hornet. While not an operational aircraft, the Hawk 127 can fly night and day missions to train fast-jet aircrew in air-to-air and air-to-surface operations. The aircraft also provides lower-

cost, fast-jet, close air support training and Navy air defence training. The Hawk 127 is a training and support aircraft that will be upgraded to ensure it can meet future aircrew training requirements for the F/A-18F Super Hornet and the F-35A Lightning II Joint Strike Fighter.

**Related Projects.** Project AIR 5438 Lead-in Fighter (LIF) Capability Assurance Program will upgrade the Hawk 127's avionics systems and ground-based simulators to train aircrew in sufficient numbers and of sufficient quality to meet Air Force's future fast-jet aircrew needs. The upgrade is necessary for the Hawk to remain effective through to its planned withdrawal date.

**Additional Information.** The Hawk 127 is operated by No 76 Squadron at RAAF Base Williamtown near Newcastle, New South Wales and No 79 Squadron at RAAF Base Pearce near Perth, Western Australia.



## F/A-18A/B Hornet

**Capability:** Air combat

**Manufacturer:** Boeing (formerly McDonnell Douglas)

**Speed:** Mach 1.8 (2200 km/h)

**Airframe:** 17.1 m long, 4.7 m high

**Wingspan:** 12.4 m

**Ceiling:** Above 45 000 ft (13.72 km)

**Ferry Range:** 2700 km (can be significantly extended with air-to-air refuelling)

**Combat Radius:** 740 km

**Crew:** F/A-18A – pilot; F/A-18B – pilot and instructor

**Weapons.** Air Intercept Missile (AIM)-120 Advanced Medium Range Air-to Air-Missile (AMRAAM) active radar-guided missiles,

AIM-132 Advanced Short Range Air-to-Air Missile (ASRAAM), Air-to-Ground Missile (AGM)-84 Harpoon anti-ship missiles, conventional and laser-guided bombs, GPS-guided Joint Direct Attack Munition (JDAM), laser JDAM, Air-to-Ground Missile (AGM)-158 Joint Air-to-Surface Standoff Missile (JASSM) and a M61A1 20 mm nose-mounted cannon.

**Description.** The F/A-18A/B Hornet entered service with Air Force in the mid-1980s. It has the ability to attack air, ground and maritime targets by employing a range of integrated systems, including precision guided weapons using a radar and infrared pod for sensing and targeting. The Hornet is capable of offensive and defensive counter





air operations, strategic attack, anti-surface warfare, close air support of ground troops, and air interdiction of enemy supply lines including shipping. There are currently 71 aircraft in service (75 were acquired, four lost in accidents).

**Related Projects.** *Project AIR 5376 Hornet Upgrade (HUG).* Commencing in the late 1990s, Air Force's F/A-18A and F/A-18B Hornets underwent the following upgrades.

- *Electronic Upgrades.* The major project elements were the replacement of the radar with the AN/APG-73, integration of the Joint Helmet-Mounted Cueing System, integration of Link 16 tactical data link, integration of the Litening Pod for target designation, and updating of the electronic warfare self-protection suite.
- *Structural Remediation Program.* This is an ongoing analysis and structural remediation activity to extend the life of the Hornet's airframe.
- *Project AIR 5418 Follow-on Standoff Weapon (FOSOW).* In this project, the Joint Air-to-Surface Standoff Missile (JASSM) was integrated onto the F/A-18A/B providing a long-range strike capability against high-value, well defended, surface targets. The JASSM strengths include stealth technology, an anti-jam GPS guidance system

and an infra-red seeker capable of selecting a specific aim point on the target. All JASSM weapons and support equipment have been delivered, with two successful in-service firings undertaken at Woomera Test Range in mid-2013. The JASSM capability achieved initial operational capability (IOC) in 2011 and full operational capability (FOC) in 2013.

- *Project AIR 5409 Bomb Improvement Program / Joint Project (JP) 3027 Joint Direct Attack Munition (JDAM).* Project AIR 5409 integrated the JDAM onto the Hornet, achieving FOC in July 2012. The JDAM 'strap-on' guidance kit converts ballistic bombs of various sizes into precision GPS-guided weapons. The weapons are suitable for both Hornet and Super Hornet aircraft. JP 3027 (JDAM Enhancements) will improve the utility and flexibility of the JDAMs by adding laser guidance kits, low collateral damage warheads and the DSTG-developed extended range wing kits.

**Additional Information.** The F/A-18A/B Hornet is operated by Nos 3 and 77 Squadrons (operational squadrons) and No 2 Operational Conversion Unit (a training squadron) at RAAF Base Williamstown near Newcastle, New South Wales and No 75 Squadron (an operational squadron) at RAAF Base Tindal near Katherine, Northern Territory.

## F/A-18F Super Hornet

**Capability:** Air combat

**Manufacturer:** Boeing (formerly McDonnell Douglas)

**Speed:** Mach 1.6 (1960 km/h)

**Airframe:** 18.3 m long, 4.9 m high

**Wingspan:** 13.6 m

**Ceiling:** Above 50 000 ft (15.24 km)

**Ferry Range:** 2700 km (can be significantly extended with air-to-air refuelling)

**Crew:** Two (pilot and air combat officer)

**Weapons.** Air Intercept Missile (AIM)-120 AMRAAM active radar-guided missiles, AIM-9X Sidewinder infra-red seeking missiles, Air Ground Missile (AGM)-84 Harpoon anti-ship missiles, AGM-154C Joint Standoff Weapon (JSOW), conventional and laser-guided bombs, GPS-guided and laser JDAMs, and a M61A2 20 mm nose-mounted cannon.

**Description.** Larger than the 'classic' F/A-18A/B Hornet, the F/A-18F 'Rhino' Super Hornet is a dual seat aircraft that delivers an advanced air combat capability for all air-to-air and air-to-surface operations. The Super Hornet can be armed with conventional, GPS and laser-guided weapons and, with its 11 weapon stations, is capable of carrying 14 515 kg of fuel and/or weapons in various configuration options. The F/A-18F enjoys increased combat

survivability through reduced radar signature and an integrated defensive electronic countermeasures suite. Equipped with APG-79 Active Electronically Scanned Array (AESA) radar, enhanced sensors and high bandwidth network connectivity, the F/A-18F Super Hornet provides the ADF with a true 4.5 generation fighter aircraft capability.

**Related Projects.** *Project AIR 5349 Australian Super Hornet* was established to de-risk the transition from the F-111s to the New Air Combat Capability. This Bridging Air Combat Capability involved the acquisition of 24 Super Hornet aircraft and associated support and weapons systems. Phase 1 acquired the aircraft while Phase 2 acquired the new weapons. Weapon enhancements under Joint Project JP 3027 and Project AIR 5409 will deliver a range of 'strap on' capabilities such as laser guidance kits which will provide improved flexibility and utility for precision-guided weapons and convert ballistic bombs of various sizes to precision weapons for use by both F/A-18F Super Hornet and F/A-18A/B Hornet.

**Additional Information.** The F/A-18F Super Hornet is operated by Nos 1 and 6 Squadrons at RAAF Base Amberley near Brisbane, Queensland.



## EA-18G Growler

**Capability:** Electronic warfare

**Manufacturer:** Boeing

**Speed:** Mach 1.8 (2200 km/h)

**Airframe:** 18.3 m long, 4.88 m high

**Wingspan:** 13.62 m

**Ceiling:** Above 50 000 ft (15.24 km)

**Ferry Range:** 3330 km (can be significantly extended with air-to-air refuelling)

**Combat Radius:** 1570 km (fully armed with external fuel tanks)

**Crew:** Two (pilot and air combat officer)

**Weapons.** Currently planned to employ AIM-120 AMRAAM active radar-guided

missiles, AGM-88 anti-radiation missiles (training variant only), ALQ-128 wideband receiver, ALQ-99 tactical jamming pods, AGM-154C JSOW and GPS-guided JDAMs.

**Description.** The E/A-18G Growler is a dual-seat, force-level electronic warfare (FLEW) aircraft capable of a wide range of electronic support (ES) and electronic attack (EA) actions in contested environments, as well as the ability to disrupt or jam a range of military electronics systems including radars and communication systems. The E/A-18G utilises the F/A-18F airframe, engines, avionics and sensors with additional



unique EA-18G EW sensors and associated equipment, to increase the survivability and effectiveness of ADF and coalition air, land and sea based forces.

The Growler airborne FLEW capability provides a new dimension to operations, unique to our region, which increases effectiveness and reduces the risk to ADF forces conducting operations across the land, maritime and air domains. The E/A-18G has nine weapon stations capable of carrying 13,600 kilograms of fuel, pods and/or weapons in various configuration options.

**Project Milestones.** In August 2012, the Government approved modification of 12 F/A-18F Super Hornets to EA-18G Growlers status via Foreign Military Sales (FMS). In

May 2013, as part of Air Combat Capability Transition Review (ACCTR), this approval was amended to allow the purchase of new-build EA-18G Growler aircraft under FMS. Subsequent approvals were given for an anti-radiation missile training capability, the mobile threat training emitter system (MTTES) required for aircrew training, Growler facilities, follow-on aircrew training and DSTG co-operative development with the USN.

Initial operational capability is planned for 2018 while full operational capability is planned for 2022.

**Additional Information.** The 12 EA-18G Growlers will be operated by No 6 Squadron which is located at RAAF Base Amberley near Brisbane, Queensland.

## F-35A Lightning II

**Capability:** Air combat

**Manufacturer:** Lockheed Martin

**Speed:** Mach 1.8 (2200 km/h)

**Airframe:** 15.7 m long, 4.40 m high

**Wingspan:** 10.7 m

**Ceiling:** Above 45 000 ft (13.72 km)

**Ferry Range:** 2220 km (can be significantly extended with air-to-air refuelling)

**Combat Radius:** 740 km

**Crew:** Pilot

**Weapons.** This aircraft is currently planned to employ AIM-120 AMRAAM active radar-guided missiles, AIM-9X Sidewinder IR missiles, Small Diameter Bomb I and II glide weapons, AGM-154 JSOW, Guided Bomb Unit (GBU)-12 laser-guided bombs, GBU-31 GPS-guided bombs and a 25 mm cannon. Significant numbers of advanced weapons will be developed for and employed by the F-35A Lightning II in the medium to long term.

**Description.** Defence White Paper 2013 reaffirmed Australia's commitment to introduce three operational squadrons and one training squadron of F-35A Lightning II aircraft to replace the fleet of F/A-18A/B Hornets. The F-35A Lightning II will deliver air power effects through control of the air, land and maritime strike and intelligence, surveillance and reconnaissance (ISR) in support of land and maritime forces.

The F-35A Lightning II incorporates comprehensive stealth technology, electronic protection, electronic attack and advanced countermeasures to survive in demanding threat environments. It has fused, multi-spectral sensors and advanced networking capabilities for an unprecedented level of situational awareness and when combined with advanced weapons, will deliver

increased lethality against heavily defended targets.

**Project Milestones.** Phase 2AB Stage 1 of *Project AIR 6000 New Air Combat Capability* was approved in 2009 to acquire 14 aircraft, equipment and support to start training in the US and prepare for operational test in Australia. Phase 2AB Stage 2 was approved in April 2014 to acquire an additional 58 aircraft (for a total of 72), equipment, facilities and support to replace the F/A-18A/B Hornet. Phase 2C will consider the acquisition of up to 28 additional F-35A Lightning II to replace the F/A-18F Super Hornet closer to the planned withdrawal date of that aircraft.

Australia signed the Production, Sustainment, Follow-on Development (PSFD) MoU in 2006 providing access for Australian industry to work on global production and sustainment. To date, Australian industry has secured over \$400 million in contracts with a conservative estimate of further opportunities worth over \$1.5 billion in the acquisition phase, although the potential appears higher.

In the May 2012 budget, a decision was taken to defer the acquisition of all but the first two Australian F-35A Lightning II aircraft by two years to reduce risk and contribute to financial savings in the forward estimates. This in turn deferred the planned Australian IOC from 2018 to 2020.

In December 2012, the first Air Combat Capability Transition Review (ACCTR) decided to extend the existing fleet of F/A-18A/B Hornets by two years to avoid a capability gap. In May 2013, the second ACCTR reaffirmed the commitment to replace the Hornet and also extended the existing fleet of Super Hornets to 2030, deferring consideration of additional F-35A Lightning II to replace Super Hornet until



closer to planned withdrawal. In September 2013, the Pooling Implementation Agreement was signed which cleared the way for Air Force pilot training to commence in the US from 2015.

**Dates.** Initial operational capability is 2020. Full operational capability is planned for 2023 and currently the planned withdrawal date is post-2040.

**Additional Information.** In July 2014 the first two Australian F-35A Lightning II aircraft rolled off the production line. Australia's first F-35A pilot commenced training in early 2015.

The 5th generation F-35A Lightning II with its advanced survivability, lethality and supportability will ensure Australia maintains a capability edge against current and emerging threats. The opportunity for regular upgrades in partnership with the US and other operating nations will ensure the F-35A Lightning II remains the dominant air combat capability well into the future.

The F-35A Lightning II aircraft will initially be stationed at RAAF Base Williamstown near Newcastle, New South Wales and RAAF Base Tindal near Katherine, Northern Territory, and later at RAAF Base Amberley near Brisbane, Queensland.



# Surveillance and Maritime

## E-7A Wedgetail

**Capability:** Airborne early warning and control (AEW&C)

**Manufacturer:** Boeing

**Speed:** Maximum 870 km/h, cruise 760 km/h

**Airframe:** 33.6 m long, 12.6 m high

**Wingspan:** 34.3 m

**Ceiling:** 41 000 feet (12.5 km)

**Ferry Range:** 2700 km (can be significantly extended with air-to-air refuelling)

**Endurance:** 10 h (without air-to-air refuelling)

**Crew:** Pilot, copilot, air combat officers, airborne electronics analysts and mission specialists

**Equipment.** Multi-role electronically scanned array (MESA) radar with range in excess of 400 km; EW self-protection measures including directed IR counter-measures, chaff and flares; ten mission consoles and communication systems such as high frequency (HF), very high frequency (VHF), ultra high frequency (UHF), Link 16 and UHF satellite communications.

**Description.** Entering service in 2009, Australia's 'eyes in the sky'—the E-7A Wedgetail—represents a new capability for the ADF, providing a key surveillance component of the networked defence force,

fusing and disseminating information to air, maritime and land forces to enhance their effectiveness and survivability. The Wedgetail detects and identifies vehicles within the battlespace and provides command and control direction for airborne assets as well as support and situational awareness of the battlespace to surface- and land-based anti-air warfare elements.

**Related projects.** Phase 3 of *Project AIR 5077 Airborne Early Warning and Control (AEW&C) E-7A Wedgetail* provided Defence with an AEW&C capability, with the provision of six aircraft and associated supplies and support. Given the AEW&C operational environment has evolved significantly since initial contract signature, as well as the complexity of the modern battlespace, the E-7A must remain interoperable with ADF assets and coalition partners. Phase 5A of this project—the AEW&C Interoperability Compliance Upgrade—will implement a range of improvements to ensure continued compliance and interoperability of the Wedgetail with ADF and coalition forces.

**Additional Information.** The E-7A Wedgetail aircraft is operated by No 2 Squadron at RAAF Base Williamstown near Newcastle, New South Wales.





## AP-3C Orion

**Capability:** Maritime intelligence, surveillance, reconnaissance and response

**Manufacturer:** Lockheed Martin

**Speed:** Maximum 750 km/h, cruise 650 km/h at an altitude of 7.92 km

**Airframe:** 35.6 m long, 10.4 m high

**Wingspan:** 30.8 m

**Ceiling:** 35 000 feet (10.67 km)

**Ferry Range:** 8900 km

**Endurance:** 15 h

**Crew:** Pilot, copilot, two flight engineers, three air combat officers and six airborne electronics analysts

**Weapons and Ordnance.** Mark 46 lightweight torpedoes, AGM-84 Harpoon anti-ship missiles, acoustic sonobuoys, maritime marker devices, Air-Sea Rescue Kit (ASRK) and survival aid heliboxes.

**Description.** The AP-3C Orion is capable of land and maritime surveillance, anti-submarine and anti-ship warfare, naval fleet support and search and rescue operations.

An aging aircraft, the oldest AP-3C will be over forty years old at its planned withdrawal date of 2019.

**Related Project.** *Project AIR 5276* is a multi-phased program to maintain the capability of the AP-3C. The most significant phase is the AP-3C Orion Capability Assurance Program 2 which received combined pass approval in the second quarter of 2013. This program will treat obsolescence, upgrade aircraft radios to maintain compliance with the latest ATC standards and replace a key fuselage structural component and the autopilot system.

**Additional Information.** The AP-3C Orion is operated by Nos 10, 11 and 292 Squadrons at RAAF Base Edinburgh near Adelaide, South Australia.

The Orion recently completed almost ten years of operational service in the Middle East, including 2400 missions with more than 3500 personnel completing tours of duty. The AP-3C continues to support Operation RESOLUTE to protect Australia's borders and offshore maritime interests.



## P-8A Poseidon

**Capability:** Maritime intelligence, surveillance, reconnaissance and response

**Manufacturer:** Boeing

**Speed:** Maximum 907 km/h

**Airframe:** 39.5 m long, 12.8 m high

**Wingspan:** 37.6 m

**Ceiling:** 41 000 feet (12.5 km)

**Range:** Combat radius is 2222 km with four hours time on station

**Ferry Range:** 7400 km but can be extended with air-to-air refuelling

**Endurance:** 10 hours but can be extended with air-to-air refuelling

**Crew:** Pilot, copilot, air combat officers, airborne electronics analysts and mission specialists

**Weapons.** Mark 54 torpedoes, AGM-84 Harpoon anti-ship missiles and self-protection measures.

**Description.** With four times the data processing capacity of Air Force's current

AP-3C Orions, the P-8A Poseidon will provide Air Force with a more advanced, manned Maritime Intelligence, Surveillance, Reconnaissance and Response (MISRR) capability. The Poseidon will support a full range of tasks, including anti-surface and anti-submarine warfare, maritime and overland ISR, electronic support, and search and survivor assistance.

**Project Milestones.** Initial operational capability is planned for 2019. Full operational capability is planned for 2021 and currently the planned withdrawal date is 2046.

Project AIR 7000 Future Maritime Patrol and Response Capability, Phase 2B, is tasked with the development and delivery of the manned MISRR capability.

**Additional Information.** The main operating base for the eight P-8A Poseidon will be RAAF Base Edinburgh near Adelaide, South Australia.



## Heron Unmanned Aerial System (UAS)

**Capability:** Interim intelligence, surveillance, reconnaissance and electronic warfare

**Manufacturer:** Leased from MacDonald Dettwiler and Associates

**Speed:** 180 km/h

**Airframe:** 8.5 m long

**Wingspan:** 16.6 m

**Ceiling:** Up to 30 000 feet (9.14 km)

**Endurance:** Up to 24 h

**Crew (on ground):** Pilot with up to seven operational staff to process, analyse and disseminate information from the Heron's many sensors.

**Equipment.** Motion-stabilised optical-imaging payload, satellite communications, synthetic-aperture radar, data link, UHF, long-range electro-optic electronic support measures, airborne data relay, aerial stills camera, maritime patrol radar and radio relay.

**Description.** The Heron UAS provides a high resolution, theatre-level intelligence, surveillance, reconnaissance and electronic warfare (ISREW) capability with real-time support to ground commanders. The Heron UAS capability was relocated to Australia at the completion of its role in Afghanistan to ensure continuity in medium altitude, long endurance UAS activities and to inform options under Project AIR 7100 Phase 2. This phase intends to acquire an enduring unmanned ISREW capability, including beyond line-of-sight operations.

**Additional Information.** The Heron UAS is operated by No 5 Flight which is based at RAAF Base Amberley near Brisbane, Queensland but conducts most of its flying operations from RAAF Base Woomera aerodrome, in South Australia.

Flying between 400 and 500 hours each month, the Heron UAS has provided commanders with a real-time ISREW capability since 2010. Over 18,000 hours were flown in support of operations in Afghanistan.

### UAV and UAS

An unmanned aerial vehicle (UAV) is the actual aircraft, which is flown by qualified pilots from a ground control station.

The UAS is the entire system—and not any one individual capability—that supports the aircraft. The system includes: the aircraft, the ground control station, communications systems, information analysis, maintenance, logistics and other support facilities.



## MQ-4C Triton Unmanned Aerial System

**Capability:** Maritime intelligence, surveillance and reconnaissance

**Manufacturer:** Northrop Grumman

**Speed:** 613 km/h

**Airframe:** 14.5 m long, 4.6 m high

**Wingspan:** 39.9 m

**Ceiling:** 50 000 feet (15.24 km)

**Ferry Range:** maximum range of 15 186 km

**Combat radius:** 3700 km with over 12 hours time on station

**Endurance:** 28 hours

**Crew (on ground):** Pilot, copilot and operational staff to analyse and disseminate information.

**Equipment.** Sensor suite that provides a 360-degree view of its surroundings.

**Description.** The MQ-4C Triton UAS will operate alongside the P-8A Poseidon to replace the aging AP-3C Orion capability. The Triton will provide Air Force with a more advanced unmanned maritime ISR capability. It is a high altitude, long endurance (HALE)

aircraft capable of all-weather surveillance and reconnaissance tasks over maritime and land environments. Reinforcements to the airframe and wing, along with de-icing and lightning protection systems allow the Triton to descend through cloud layers to gain closer views of ships and other targets at sea. With Australia's maritime area of operational interest covering over 1/7th of the world's oceans, the multi-mission Triton will be a critical complement to the P-8A Poseidon in maintaining a credible level of maritime awareness.

**Project Milestones.** Project AIR 7000 Future Maritime Patrol and Response Capability, Phase 1B, is tasked with the development and delivery of multi-mission UAS capability. Initial operational capability is planned for 2021. Full operational capability is planned for 2024 and currently the planned withdrawal date is 2050.

**Additional Information.** The main operating base for up to seven MQ-4C Triton UAS will be RAAF Base Edinburgh near Adelaide, South Australia.





# Air Mobility

## C-130J Hercules

**Capability:** Medium airlift

**Manufacturer:** Lockheed Martin

**Speed:** 625 km/h

**Airframe:** 34.4 m long, 10.1 m high

**Wingspan:** 40.4 m

**Ceiling:** Above 40 000 ft (12.2 km)

**Range:** 5100 km with 18 155 kg payload

**Crew:** Pilot, copilot and loadmaster

**Accommodation:** 128 troops, 60 paratroops, or 97 stretcher patients plus four medical staff.

**Description.** The C-130J is the latest generation of Hercules to provide global tactical and strategic air mobility of people, supplies, vehicles and equipment. The C-130J provides medium to long range air mobility with an excellent short field and semi-prepared airfield capability. Much like previous models, the C-130J has built on a legacy of airlift support to the ADF throughout the world, fulfilling roles

such as search and survivor assistance, aeromedical evacuation and humanitarian aid to Australian and neighbouring civil communities during natural disasters, and in the aftermath of the 2002 and 2005 Bali bombings.

**Related projects.** Project AIR 5416 Phase 4B will deliver enhanced self-protection to the C-130J.

Project AIR 5440 Air Lift will deliver a series of 'rolling' capability upgrades to address system obsolescence, provide a technology refresh to meet evolving communication, navigation and surveillance mandates and ensure the C-130J remains globally deployable with coalition forces.

**Additional Information.** Introduced in 1999, Australia's fleet of 12 C-130J Hercules aircraft is operated by No 37 Squadron at RAAF Base Richmond near Sydney, New South Wales.



## KC-30A Multi-Role Tanker Transport (MRTT)

**Capability:** Heavy airlift and air-to-air refuelling

**Manufacturer:** Airbus Military

**Speed:** 860 km/h

**Airframe:** 59.0 m long, 17.4 m high

**Wingspan:** 60.3 m

**Ceiling:** Above 41 000 ft (12.5 km)

**Range:** 14 800 km (can be extended by air-to-air refuelling)

**Crew:** Pilot, copilot, loadmaster (air refuelling operator), mission coordinator and up to eight crew attendants, depending on the mission

**Accommodation.** 270 passengers, 34 000 kg of cargo or various combinations of these.

**Description.** The KC-30A MRTT is an Airbus A330 with military modifications designed by Airbus Defence and Space for air-to-air refuelling (AAR) and long-range air transport. The major modifications to the aircraft include the installation of two wing pods for hose/drogue refuelling, an aerial refuelling boom system and military avionics, including mission planning computers and communications.

Able to remain on station up to 1800 km from base and offload 50 tonnes of fuel over four hours, the KC-30A is a force multiplier for other air power capabilities. Through its huge fuel offload capacity, it provides a range extension to receiver aircraft, such as the Hornet, Super Hornet and Wedgetail fleets. The KC-30A can also carry cargo loaded on military or civilian pallets and up to 270 passengers.

**Additional Information.** No 33 Squadron operates a fleet of five KC-30A MRTT aircraft from RAAF Base Amberley near Brisbane, Queensland. An additional two A330-200 aircraft have been purchased from Qantas and are awaiting modification to KC-30A standard in Spain.

In September 2014, one KC-30A aircraft deployed to the Middle East under Operation OKRA to provide AAR for RAAF and coalition aircraft conducting operations against Daesh. The aircraft has flown on average at least one mission each day and has offloaded approximately 36 tonnes of fuel on each sortie.



## C-17A Globemaster III

**Capability:** Heavy airlift

**Manufacturer:** Boeing

**Speed:** 830 km/h

**Airframe:** 53.0 m long, 16.8 m high

**Wingspan:** 51.8 m

**Ceiling:** 45 000 ft (13.7 km)

**Range:** 10 389 km carrying 18 143 kg payload (can be extended by air-to-air refuelling)

**Crew:** Pilot, copilot and loadmaster

**Accommodation.** 102 troops, or 54 ambulatory and 36 stretcher patients, or 75 tonnes of cargo depending on the configuration

**Description.** Eight C-17A Globemaster III aircraft provide a responsive global heavy airlift capability to allow Australia to rapidly deploy troops, supplies, combat vehicles, heavy equipment and helicopters anywhere in the world. The C-17A can carry approximately the equivalent of three C-130J Hercules or four semi-trailer loads of humanitarian aid.

**Additional Information.** Eight C-17A Globemaster III aircraft are operated by No 36 Squadron at RAAF Base Amberley near Brisbane, Queensland.

Australia originally procured four C-17A aircraft. This fleet size was limited in its ability to support concurrent operations therefore an additional two aircraft were ordered. The addition of the fifth and sixth C-17A doubled the number of aircraft available for operations and gave the ADF significantly improved availability, flexibility and responsiveness. Full operational capability of the six aircraft fleet was achieved in June 2013. In April 2015, the Prime Minister announced the purchase of two more C-17s, the last of which arrived in Australia in November of 2015.

Since delivery, the C-17A has supported an ADF air bridge to support Australian operations in the Middle East and provided rapid humanitarian assistance to New Zealand, Japan and Pakistan and the civil community in Australia. For example, the C-17A Globemaster III was instrumental in providing support to Bundaberg, Queensland following the floods in January 2013, including the critical re-supply of aviation fuel after the Bundaberg airport reserves had been depleted through the relentless rescue efforts of Army and civilian helicopters.





## C-27J Spartan

**Capability:** Light tactical airlift

**Manufacturer:** Alenia/L3

**Speed:** 540 km/h

**Airframe:** 22.7 m long, 9.6 m high

**Wingspan:** 28.7 m

**Ceiling:** 30 000 ft (9.1 km)

**Range:** 5246 km

**Crew:** Pilot, copilot and loadmaster

**Accommodation:** 40 troops, or 21 stretcher patients, or 8100 kg of cargo, vehicles or combinations thereof.

**Description.** The C-27J Spartan is a medium-sized military air transport aircraft derived from the Alenia G-222. The C-27J will significantly improve the ADF's intra-theatre airlift capability by using a greater range of airfields, both in Australia and in our neighbouring regions. Equipped with a modern avionics suite and sharing common engineering aspects with the C-130J Hercules, the C-27J features protection against ground fire and EW self-protection systems that enhance battlefield survivability. The size of the cargo compartment allows rapid transfer of loads—from the C-17A and

the C-130J aircraft—for delivery to austere airfields, thus enhancing efficiency in ADF air mobility support to the battlefield or natural disaster zone.

**Project Milestones.** Project AIR 8000 New Airlift Phase 2 seeks to acquire up to ten Spartan aircraft. The first C-27J was accepted by the RAAF on 1 July 2015. Initial operational capability is planned for 2016 and full operational capability is planned for 2018.

**Additional Information.** In anticipation of the introduction of the Spartan, No 35 Squadron was reformed in January 2013. The initial operating base for the C-27J Spartan is RAAF Base Richmond near Sydney New South Wales, but the final operating base will be RAAF Base Amberley near Brisbane, Queensland in conjunction with achieving full operational capability.

The first crews and maintenance personnel started training in the US during the fourth quarter of 2014. Training will continue in the US until the establishment of an Australian-based training system.



## CL-604 Challenger

**Capability:** Special purpose aircraft  
**Manufacturer:** Bombardier  
**Speed:** 870 km/h  
**Airframe:** 20.9 m long, 6.3 m high  
**Wingspan:** 19.6 m  
**Ceiling:** 41 000 ft (12.5 km)  
**Range:** 5600 km (with maximum fuel and reserves)  
**Crew:** Pilot, copilot and one crew attendant  
**Accommodation:** Nine passengers.

**Description.** Introduced into service in 2002, the two 737 Boeing Business Jet (BBJ) and three CL-604 Challenger aircraft support special purpose air transport for the Governor-General of Australia, the Prime Minister, other Government members and visiting heads of state. With their modern interior and an outstanding record for safety and efficiency, the BBJ and Challenger provide a high standard of VIP air transport.

The 737 BBJ is typically used for long-distance travel or for carrying larger numbers of passengers, but does on occasion perform air logistic support. The CL-604 Challenger is typically used for shorter tasks

to smaller airfields and does on occasion perform air logistic support.

**Additional Information.** The 737 BBJ and CL-604 Challenger are operated by No 34 Squadron at Defence Establishment Fairbairn at Canberra International Airport, Australian Capital Territory. On 24-hour standby and providing between 1200 and 1800 special purpose flights per year, No 34 Squadron maintains a high operational tempo, including planned international operations into large airports and domestic tasks into small country airports at short notice. With these two aircraft types, No 34 Squadron has carried members of the Royal Family, foreign dignitaries, heads of state, the Governor-General of Australia and Commonwealth politicians. Special purpose transport is provided in accordance with Commonwealth Government Guidelines for Entitled Persons to meet their official commitments.

Following the expiration of the current lease extensions, Air Force is investigating options to replace the BBJ and Challenger aircraft with a more modern, efficient and capable aircraft with the flexibility to better meet Government obligations.



## 737 BBJ

**Capability:** Special purpose aircraft

**Manufacturer:** Boeing

**Speed:** 850 km/h

**Airframe:** 33.6 m long, 12.5 m high

**Wingspan:** 35.8 m

**Ceiling:** 41 000 ft (12.5 km)

**Range:** 11 390 km (Canberra direct to Honolulu, Hong Kong or Tokyo)

**Crew:** Pilot, copilot and up to four crew attendants

**Accommodation:** 30 passengers in VIP configuration.



# Aviation Training

## PC-9/A

**Capability:** Tandem advanced trainer; forward air control

**Manufacturer:** Pilatus

**Speed:** 580 km/h

**Airframe:** 10.18 m long, 3.28 m high

**Wingspan:** 10.24 m

**Ceiling:** 25 000 ft (7.62 km)

**Ferry Range:** 1500 km

**Combat Radius:** 650 km

**Crew:** Two (student/instructor for training sortie or pilot/observer for a forward air control mission)

**Description.** Advanced pilot training is conducted at No 2 Flying Training School at RAAF Base Pearce near Perth, Western Australia using the Pilatus PC-9/A. Designed by Pilatus in Switzerland and built under license by Hawker de Havilland in Sydney,

the PC-9/A was introduced to the Air Force in 1987 as the primary trainer for Air Force and Navy pilots. Pilot training in the aircraft commenced in 1989. The PC-9/A is also operated by the Central Flying School at RAAF Base East Sale, Victoria for the training of flying instructors and is flown by the RAAF's Roulettes aerobatic team.

The PC-9/A is an exceptionally capable aircraft that has served the RAAF for over twenty years. In order to meet the training requirements for more advanced future aircraft, the PC-9/A will be replaced by the PC-21 under Project AIR 5428.

No 4 Squadron at RAAF Base Williamtown near Newcastle, New South Wales, also operates four PC-9/A aircraft for forward air control and joint terminal attack controller training.





## PC-21

**Capability:** Tandem Advanced Trainer;  
Forward Air Control

**Manufacturer:** Pilatus

**Speed:** 685 km/h

**Airframe:** 11.23 m long, 3.79 m high

**Wingspan:** 9.11 m

**Ceiling:** 25,000 ft (11.58 km)

**Ferry Range:** 1333 km

**Crew:** Two (Pilot/Instructor and Observer/  
Student)

**Description.** As part of the AIR 5428 Pilot Training System project, the PC-21 has been selected to replace Air Force's current PC-9/A and CT-4B aircraft. Air Force will accept 49 PC-21, of which 22 will go to RAAF Base East Sale. The first of the PC-21s will arrive in Australia in mid-2017. Training on the PC-21 will reduce conversion time to other platforms as pilots learn to fly in a 'glass' cockpit, which uses only electronic displays that are found in all RAAF operational aircraft.



## KA350 King Air

**Capability:** Multi-role light transport; low-level tactical/maritime navigation trainer

**Manufacturer:** Raytheon Beechcraft

**Speed:** 570 km/h

**Airframe:** 14.22 m long, 4.40 m high

**Wingspan:** 17.65 m

**Ceiling:** 35 000 ft (10.67 km)

**Ferry Range:** 3400 km

**Crew:** Two pilots or one pilot and one air combat officer

**Description.** The School of Air Warfare based at RAAF Base East Sale in Victoria

provides aviation training for Air Force air combat officers and Navy aviation warfare officers utilising a fleet of eight King Air aircraft operated by No 32 Squadron. The aircraft are fitted with console-based training and simulation equipment and supported by a suite of ground-based simulators.

No 38 Squadron operates an additional eight King Air aircraft from RAAF Base Townsville in Queensland, for air mobility support, pilot experience development, imagery acquisition and command and control.



# Other Capabilities

## Jindalee Operational Radar Network (JORN)

**Capability:** Wide area surveillance

**Description.** Australia's Jindalee Operational Radar Network (JORN) comprises three over-the-horizon radar (OTHR) systems located at Longreach, Queensland; Laverton, Western Australia; and Alice Springs, Northern Territory. The network is controlled by the JORN Coordination Centre located at RAAF Base Edinburgh.

JORN provides wide area surveillance of Australia's northern approaches at ranges of 1000 to 3000 km from the radar sites, and is used to conduct air and maritime surveillance in support of Australia's national

surveillance effort. However, the extent of available JORN coverage and actual system performance is highly variable and principally dependent on the state of the ionosphere (the upper levels of the atmosphere). Joint Project 2025 JORN, Phase 5, delivered a number of capability enhancements to bring all radars up to a common technological specification.

JORN was designed to detect air targets equivalent in size to the Hawk 127 aircraft or larger, and objects on the surface of the water equivalent in size to an Armidale Class Patrol Boat or larger. Conversely, the detection of small wooden vessels is highly improbable, given the typical size, construction and speed of such vessels.





## Joint Battlefield Airspace Control (JBAC)

**Capability:** Airspace management and air traffic control

**Description.** The ADF's airspace management (ASM) and military air traffic control (ATC) service is delivered by the JBAC officer workforce and the Australian Defence Air Traffic System (ADATS) capability. In addition to providing safe, efficient and flexible ASM and air base air traffic services (ABATS) for military aircraft at home and deployed locations, the JBAC workforce contributes an integral component of the national ATM architecture by providing ABATS for approximately 25 per cent of Australia's civilian aircraft movements, which occur in military-controlled airspace

surrounding Defence's 12 'controlled' air bases.

On deployment, the JBAC workforce provides ASM and ABATS for humanitarian aid and disaster relief in Australia and overseas, as well as ASM, ABATS and battlefield airspace control (includes de-conflicting aircraft and weapons such as artillery) in combat environments such as amphibious and land operations. The deployable capability includes a tactical air surveillance radar, control cabin and tactical air operations tower.

As part of a whole-of-government approach, the military ATC data and services are integrated into the national ATM network. The military and civilian ATC data is integrated into the air battle management (ABM) network to contribute to the national





recognised air picture, and the military ATC facilities provide limited back-up for the conduct of ABM operations.

Air Force has deployed its JBAC capability on a number of recent occasions. In July 2003, JBACs deployed to Iraq as part of Operation CATALYST to reopen Baghdad International Airport and provided air traffic services there for 12 months until indigenous controllers had been trained. Following the Indian Ocean tsunami in December 2005, JBACs deployed to Medan Airport in Sumatra to assist local controllers with the huge increase in aircraft movements bringing relief aid to the area.

**Project Milestones.** *Project AIR 5431 Future Air Traffic Control Surveillance Systems* has three phases. Phase 1 will acquire a number of deployable Defence Air Traffic Management and Control System

(DATMCS) to enable the ADF to provide a deployed ATC capability. Phase 2 will replace Defence's aging radar sensors and improve aviation safety through better reliability and performance. Phase 3 will acquire a fixed DATMCS to replace the existing systems at ADF fixed base locations and a simulator for the School of Air Traffic Control.

Initial operational capability is planned for 2016/17. Full operational capability is planned for 2020 and currently the planned withdrawal date is 2038.

**Additional Information.** JBAC locations include RAAF Bases Amberley, Darwin, Edinburgh, East Sale, Pearce, Richmond, Tindal, Townsville and Williamstown, RAAF Gin Gin (approximately 35 km northwest of RAAF Base Pearce), Naval Air Station Nowra and the Army Aviation Centre at Oakey.

## Mobile Regional Operations Centre (MROC)

**Capability:** Surveillance, identification, command and control

**Description.** Garrisoned at RAAF Base Darwin, the MROC provides a deployable and persistent air surveillance, information management, command and control (C2) capability. Deployable for several weeks or much longer, it provides options to the Government as an enabler to the networked force, including the planning and execution of coalition and allied air operations. An MROC crew is made up of teams of air combat officers and air surveillance operators.

**Project milestones.** *Project AIR 5405 MROC*, Phase 1 will replace the current MROC capability with a flexible and deployable aerospace surveillance and battlespace management (ASBM) capability

that meets the evolved technological requirements necessary for contemporary ASBM operations. Initial operational capability is planned for 2020 and full operational capability is scheduled for 2021.

**Additional Information.** The existing capability entered service in the 1980s and has been deployed on operations within Australia and overseas. An Air Force Mobile Control and Reporting Centre and Tactical Air Defence Radar System were deployed to Kandahar Airfield in Afghanistan, to provide control for military aircraft throughout Afghanistan from 5 August 2007 to 7 July 2009. Operating 24 hours a day, seven days a week for nearly two years, 75 personnel supported more than 196,000 aircraft movements.

## Vigilaire

**Capability:** Surveillance, identification, command and control

**Description.** Vigilaire provides the ADF with an integrated command, control and communications system within the RAAF air defence ground environment. This is an enabler for ABM which provides control of military air operations in an area of operations and may include the control and coordination of defensive counter air, offensive counter air, strategic attack, close air support and other warfighting or supporting air activities.

Vigilaire provides the ADF with a fixed and persistent—24 hours a day, seven days a week—surveillance and battlespace management capability. It is designed to provide an integrated Defence systems communications network and produces a comprehensive picture of air and surface activity over Australia and throughout the near region. Teams of air combat officers and

air surveillance operators pass surveillance information and battle management instructions to military forces operating across Australia.

**Project Milestones.** Project AIR 5333 New Air Defence Command and Control System, Phase 2 plans to incorporate emerging technologies and intelligence sub-systems to maintain the effectiveness of the Vigilaire capability in an evolving network-centric warfare environment and to assure long-term supportability. This phase will also consider the replacement of the ABM training facility at the Eastern Region Operations Centre (EASTROC), as well as enhanced simulation capability at both EASTROC and the Northern Region Operations Centre (NORTHROC). Initial operational capability is planned for 2024.

**Additional Information.** The RAAF has two regional operations centres located at RAAF Base Tindal (NORTHROC) and RAAF Base Williamstown (EASTROC).



## Space Surveillance

**Capability:** Space situational awareness

**Description.** The ADF is embarking on two joint projects with the US to introduce a space situational awareness (SSA) capability. This is a new capability which will grow and provide the ADF with an awareness of activities in space.

**Milestones.** Joint Project 3029 SSA involves two phases. Phase 1 (Space Surveillance) is the joint project to relocate a US-owned C-band radar to Australia. It will provide an awareness of space activities and determine if such activities will affect Australia's national interest. The radar will be based at the Harold E. Holt facility near Exmouth, Western Australia

and is expected to commence operation in 2016. Phase 2 (Space Telescope) involves Australia hosting the deployment of a space surveillance telescope (SST) to improve its ability to monitor space over the southern hemisphere. This highly advanced technology will enable the observation and detection of objects in space out to 36,000 km above the earth. The telescope will be based at the Harold E. Holt facility and is expected to commence operation in 2017.

**Additional Information.** The telescope, which will be operated by Australia on behalf of the US, will contribute to the US Global Space Surveillance Network, which provides warnings to all satellite operators of potential collisions with other satellites or debris.



## Woomera Range Complex

**Capability:** Weapons testing

**Location:** North-west of Woomera, South Australia

**Area:** Approximately 124,000 km<sup>2</sup> (roughly the size of England)

**Composition.** The Woomera Range Complex (WRC) is comprised of the Woomera Test Range (WTR) which includes the entire Woomera Prohibited Area (WPA) and the Woomera Restricted Airspace (above the WPA); the Nurrungar Test Area (just outside the WPA); and the village of Woomera including RAAF Base Woomera aerodrome and the village infrastructure.

**Description.** The WRC is widely recognised as a unique capability for secure testing of long range weapons, sensitive weapons systems and unmanned aerial systems (UAS). Providing a highly specialised operations environment in support of directed national and Defence objectives for the testing of war materiel, the WTR conducts research and experimentation and

test and evaluation on Australian and allied forces ground based weapons systems and aerospace weapons systems, including UAS and future sensitive weapons systems.

**Additional Information.** Joint Project 3024 Range Systems Remediation will replace WTR instrumentation systems, radars and infrastructure with modern commercial-off-the-shelf and military-off-the-shelf systems.

Under Part VII of Defence Force Regulation 35 the WPA is a declared prohibited area for the purposes of 'testing of war materiel'. The WRC is in high demand for weapons testing and other specialised activities, as it is the only range remaining in the western world in which next generation weapons systems can be tested safely, securely, and within the land borders of the range.

Defence use of the WPA is now operating under the Hawke Review's new shared-access model which balances Defence and non-Defence use of the WPA. The new shared-access model recognises Defence as the primary user of the WPA.





## Centralised Data Processing

**Capability:** Information Operations

**Location:** DSTG Edinburgh, South Australia

**Description.** Under a newly acquired capability, ISR data from both Australian and allied aircraft, including Heron UAS, Triton Multi-Mission UAS and P-8A Poseidon, can be received through a distributed ground station Australia (DGS-AUS). The data can then be processed, analysed and disseminated to various headquarters and other users through a central joint airborne ISR exploitation environment facility. Air Force-led and supporting the joint warfighting efforts of all ADF combat arms, DGS-AUS (interim) / DGS-AUS will deliver a centralised ISR processing, exploitation and dissemination (PED) capability, supporting

near real-time and time-critical operations. Centralised ISR processing allows a number of operations to be supported from one location and minimises risk to ADF personnel by reducing the need to forward deploy them to operational areas. Currently, an interim capability is on trial.

**Milestones:** For the interim distributed ground station, initial operational capability is planned for 2016 with full operational capability planned for 2017. The permanent facility should reach initial operational capability in 2019 and full operational capability in 2022.



## Bushmaster Protected Mobility Troop Vehicles

**Capability:** Expeditionary combat support (protected vehicle)

**Manufacturer:** Thales Australia

**Engine:** Caterpillar 7.2 litre diesel 3126E

**Length:** 7.1 m

**Width:** 2.3 m

**Height:** 3.25 m (to top of wire cutters)

**Maximum Road Speed:** 100 km/h (limited)

**Maximum Road Range:** 800 km

**Turning Circle:** 18.6 m

**Description:** The Bushmaster is a four-wheel drive (constant) on-road and off-road vehicle that is designed to transport 10 troops including a driver, together with their weapons and equipment. The Bushmaster can itself be transported by road, rail or air. The hull is a fully welded monocoque (or

single-shell) structure manufactured from armoured steel plate.

Two square hatches and a gun ring with hatch are fitted in the roof, and a single access door is located at the rear of the vehicle. Two mounting points for quick-connect, swing-arm gun mounts are fitted to the roof and are accessed through the rear hatches. External mounting points are provided for the installation of a grenade launching system.

**Additional Information:** The power train consists of a Caterpillar diesel engine coupled to a ZF six-speed automatic transmission. The vehicle is fitted with a Central Tyre Inflation System which provides a means of manually or automatically controlling the tyre inflation pressures based on terrain and vehicle speed, and to reduce the likelihood of tyre damage.



## Light Weight G-Wagon

**Capability:** Expeditionary combat support (general-purpose vehicle)

**Manufacturer:** Mercedes Benz

**Engine:** V6 turbo diesel

**Length:** 4.82 m

**Width:** 1.85 m

**Height:** 2.21 m

**Maximum Road Speed:** As per posted speed limits

**Fuel Tank:** 95 litres plus ancillary tank of 55 litres (total 150 litres)

**Description:** The G-Wagon provides high-mobility, general-purpose, road transport.

Available in several variants, it is an essential component of the support, sustainment, deployment and redeployment structure and can be used to transport combat supplies, materiel and replacement combat systems. The vehicles will accommodate a driver and a co-driver.

**Additional Information:** It can be used as a mobile command post or converted to an ambulance. Haulmark trailers provide the G-Wagon with extra payload capacity; the single-axle increases payload by 800kg and the tandem-axle provides a payload increase of 1500kg.





## Titan Firefighting Field Truck

**Capability:** Expeditionary combat support (fire fighting)

**Manufacturer:** E-One (US firm)

**Engine:** Detroit diesel

**Length:** 7.92 m

**Width:** 3.03 m

**Height:** 2.89 m

**Water Tank Capacity:** 2800 litres

**Fire Retardant Foam Capacity:** 400 litres

**Description.** The Titan is a four-wheel-drive vehicle used for aircraft rescue

firefighting and structural rescue firefighting in a deployed environment. Each vehicle is capable of continuous operation given sufficient supplies and personnel, and is capable of stationary fire fighting or 'pump and roll' operation using a roof-mounted turret. The Titan carries a crew of four in an air-conditioned cab, with breathing apparatus built into the seating.

**Additional Information.** UHF and VHF radios are fitted and the vehicle has visual and audio warning systems.



## Panther Airfield Fire Truck

**Capability:** Expeditionary combat support (fire fighting)

**Manufacturer:** Rosenbauer (Austrian firm)

**Engine:** Detroit diesel

**Length:** 11.75 m

**Width:** 3.30 m

**Height:** 3.60 m

**Water Tank Capacity:** 8500 litres

**Fire Retardant Foam Capacity:** 1300 litres

**Description.** The Panther is a high-performance six-wheel-drive vehicle which provides emergency response to aircraft incidents to save life and minimise damage.

It is an on- and off-road vehicle with digital controls and an air-conditioned cab for the driver and crew of three. A two-stage centrifugal pump can project water and foam to a range of 70 m. Each truck can project 6200 litres per minute from its roof and bumper-mounted cannons. The Panther is also equipped with a Minimax dry chemical powder firefighting system.

**Additional Information.** A quick-attack hose reel and discharge outlets enable fire fighters to conduct offensive aircraft rescue and fire fighting. Fully loaded, the Panther can accelerate to 80 km/h within 35 seconds.



## Military Working Dogs

**Capability:** Airfield defence

**Breeding:** RAAF breeding program, Amberley near Brisbane, Queensland

**Crew:** Military working dog handler

**Breeds:** German Shepherd and Belgian Shepherd Malinois

**Description.** Military working dogs and their handlers are responsible for providing security, crime prevention patrols, emergency response and intruder detection at RAAF permanent bases and deployed locations around the world. Both handlers

and their dogs are tested regularly to ensure readiness to deploy at any time.

**Additional Information.** Dogs and handlers are carefully matched to ensure many years of loyal service. Once matched, handlers and their dogs work together to maintain a high standard of fitness and training. The dogs are often from Air Force's own breeding program, and members of the public can volunteer to foster Air Force puppies.



# Air and Joint Projects

The technological systems that Air Force operates are all evolving, being upgraded, being replaced, or new systems are being introduced that provide new capabilities. In the following paragraphs, current air and joint projects relevant to Air Force capabilities are briefly described.

## **AIR 5077 Airborne Early Warning and Control (AEW&C) E-7A Wedgetail**

Phase 3 of this project involves the acquisition of six E-7A Wedgetail aircraft and associated supplies and support. The E7-A system reached full operational capability (FOC) in May 2015. Phase 4 aims to conduct studies and planning to assure the AEW&C capability meets Government requirements throughout the life of the aircraft. Phase 5A provides for an AEW&C interoperability compliance upgrade.

## **AIR 5276 AP-3C**

This project is a multi-phase program aimed to ensure the AP-3C Orion remains capable out to the planned withdrawal date of 2019. It includes an advanced flight simulator phase, several upgrade phases and a capability assurance program phase.

## **AIR 5333 New Air Defence Command and Control System (Vigilante)**

This project involves the replacement of the existing, interim, ground-based air defence command and control systems at the Eastern Region Operations Centre (EASTROC) at RAAF Base Williamstown and

the Northern Region Operations Centre (NORTHROC) at RAAF Base Tindal. AIR 5333 seeks to supply, install, integrate and support new data displays, processing equipment and communications switching equipment at the NORTHROC and the EASTROC.

## **AIR 5349 Australian Super Hornet**

This project involved the acquisition of 24 F/A-18F Super Hornet aircraft and associated support and weapons systems. Phase 1 acquired the aircraft while Phase 2 will acquire the new weapons, including the AIM-9X Sidewinder, additional AIM-120 AMRAAM missiles to provide a Beyond Visual Range missile capability and the AGM-154 JSOW capability.

## **AIR 5376 F/A-18 Hornet Upgrade (HUG)**

Phase 1: Communications, identification friend or foe (IFF), global positioning system (GPS) and mission computer were upgraded.

Phase 2.1: Fitment of new APG-73 radar.

Phase 2.2: Fitment of new cockpit displays, countermeasures dispensing system, helmet-mounted cuing system, multifunctional information distribution system.

Phase 2.3: Electronic warfare equipment upgrade.

Phase 3: Structural refurbishment of the wings and fuselage.

Upgrades to ground-based Hornet training and software systems such as Hornet aircrew training system, integrated avionics system support facility, integrated maintenance training system, joint mission planning system have also been carried out.

Associated minor projects were carried out including making the cockpit lighting compatible with night vision goggles and fitment of the air combat manoeuvrability instrument pod.

All work associated with the Hornet Upgrade project is complete.

### **AIR 5405 Mobile Regional Operations Centre (MROC)**

This project seeks to replace the current MROC capability based at RAAF Base Darwin. Although it still provides a deployable aerospace surveillance and battlespace management (ASBM) capability, including command and control, situational awareness and command support for the deployable Joint Task Force Headquarters, it is considered highly limited in its operational and logistical performance. The new MROC will contribute a significant ASBM capability for the defence of Australia and provide a mobile, offshore, area air defence command and control capability.

### **AIR 5409 Bomb Improvement Program (BIP)**

This project delivers an F/A-18A/B Hornet all-weather, autonomous, accurate, stand-off delivery of ADF general purpose bombs against a broad range of targets. This project has the following components.

- **Joint Direct Attack Munition (JDAM).** In October 2005, Australia contracted to purchase four variants of the JDAM. JDAM is a GPS-aided guidance kit that

is fitted to Air Force's 500 pound (Mk-82), 1000 pound (Mk-83) and 2000 pound (Mk-84) general-purpose bombs and 2000 pound penetrator bombs (BLU-109) to provide a precision air-to-ground weapon capability. The JDAM capability provides Air Combat Group with the ability to strike fixed and moving targets with precision in all-weather conditions, enhancing the efficiency of the F/A-18 Hornet and exposing fewer aircraft and aircrew to threats in an operational environment.

- **Bomb Rack Unit (BRU)-55.** In its original configuration, the F/A-18 Hornet can carry four JDAMs. Fitment of the BRU-55 weapon rack will double the maximum carriage capability of the Hornet to eight 500 pound or 1000 pound JDAM variants.

### **AIR 5428 Pilot Training System**

This project will provide the Air Force, Army and Navy with a new fixed-wing, pilot training system (PTS). The system will provide aircraft and training aids for flight screening and cover all facets of undergraduate pilot training from basic flying up to entry into Air Force lead-in fighter and operational conversion units. The project will update basic and advanced pilot training to increase the efficiency and effectiveness of the fixed-wing PTS. Specifically the system will:

- enable an increase in graduation numbers;
- generate pilot skills consistent with advanced 4th/5th generation aircraft;
- enable the withdrawal of current training media; and
- provide synthetic training systems such as flight simulators.

In September 2015, Lockheed Martin Australia was selected as the preferred



tenderer for the new PTS. The contract will see the Australian Defence Force's basic flying training delivered from RAAF Base East Sale, Victoria. The PTS will deliver 49 Pilatus PC-21 aircraft, with RAAF Base East Sale to become home to 22 of the new aircraft. The remaining PC-21 aircraft will be used for advanced flying training at RAAF Base Pearce, Western Australia. From 2019, the RAAF pilot training system will have an annual intake of up to 165 trainee pilots and will allow Defence to increase in the number of graduates from 77 to 105 pilots each year.

### **AIR 5431 Air Traffic Management Systems**

This project aims to replace the Australian Defence air traffic system to enable the ADF to provide airspace management and air traffic control (ATC) at fixed bases and in deployed, combat environments. Phase 1 will deliver a replacement rapidly deployable ATC radar system for use across a range of situations. Two types of deployable ATC radar systems are envisaged—one rapidly deployable for short durations such as assistance to humanitarian aid and disaster relief operations. The second for longer and larger-scale deployments at base bases in Australia or overseas to deliver normal air traffic services.

Phase 2 will acquire ATC surveillance sensors to replace existing Alenia radars at RAAF Bases East Sale and Tindal and the Army Aviation Centre at Oakey, and to replace the Australian Defence Air Traffic System radars at RAAF Bases Amberley, Darwin, Pearce, Townsville and Williamstown and Naval Air Station Nowra.

Phase 3 is a joint project with Airservices Australia to replace existing control tower systems with a harmonised national ATC system (termed 'OneSKY Australia')

consistent with the National Aviation White Paper 2009. Phase 3 demands a world's-first solution to meet disparate civil and military ATC requirements while delivering economy of scale and flexible use of airspace benefits for Defence, industry and Government. Airservices Australia is the lead agency for the procurement.

Phases 2 and 3 will run concurrently.

### **AIR 5438 Lead-In Fighter (LIF) Capability Assurance Program**

The first Hawk 127 entered service in Australia in 2001. Phase 1A of this project will upgrade the Hawk 127's avionics systems and ground based simulators to train aircrew in sufficient numbers and of sufficient quality to meet Air Force's future fast jet aircrew needs.

The five-year Phase 3 through-life support contract, with potential extensions out to 2026, will deliver deeper maintenance, engineering, full logistics and training systems support. The project is designed to ensure the LIF capability will meet the requirements of trainees progressing from current aircraft types to 5th generation combat aircraft such as the F-35A Lightning II Joint Strike Fighter.

### **AIR 5440 Air Lift**

Phase 2 C-130J Block Upgrade Program 8.0 will upgrade avionics, including air traffic management equipment, to assure C-130J aircraft access to civilian and military airspace around the world. Additional phases will upgrade the flight management system and the Global Positioning System. Link 16 datalink capability will be introduced to ensure the C-130J aircraft continues to be an effective military airlift asset.

### **AIR 6000 New Air Combat Capability**

The Australian Government remains committed to acquiring the 5<sup>th</sup> generation F-35A Lightning II aircraft, with three operational squadrons planned to enter service beginning around 2020 to replace the F/A-18A/B Hornet aircraft. Australia joined the System Development and Demonstration phase in October 2002 and subsequently joined the Production, Sustainment, Follow-on Development phase in December 2006.

Phase 2AB Stage 1 was approved in 2009 to acquire 14 aircraft, equipment and support to start training in the US and prepare for operational test in Australia. Phase 2AB Stage 2 was approved in April 2014 to acquire an additional 58 aircraft (for a total of 72), equipment, facilities and support to replace the F/A-18A/B Hornet. Phase 2C will consider the acquisition of up to 28 additional aircraft to replace the F/A-18F Super Hornet closer to its planned withdrawal date.

### **AIR 7000 Future Maritime Patrol and Response Capability**

This multi-phased project seeks to replace the AP-3C Orion aircraft with a mix of manned and unmanned elements. Phase 1B is the development and delivery of the MQ-4C Triton. Phase 2B is the development and delivery of a manned maritime ISR and response capability—the P-8A Poseidon aircraft. Phase 2C is the Increment 3 upgrade to P-8A which will be delivered by Phase 2B at the Increment 2 capability level. The manned and unmanned systems will have common areas where economies of scale are expected, such as facilities, mission analysis, ground-based operations support, and information analysis and exploitation.

### **AIR 7100 Medium Altitude, Long Endurance (MALE) UAS**

Experience with the leased Israel Aerospace Industries Heron UAS in Afghanistan has identified an ongoing requirement for a theatre-level intelligence, surveillance, reconnaissance and electronic warfare (ISREW) capability. Phase 1 of this project was to acquire the Heron unmanned aerial system (UAS) for operations in Australia to maintain and refine skills developed through operations in Afghanistan, and in preparation for a more capable platform under Phase 2. Air Force plans to satisfy this requirement, including beyond line-of-sight operations, through Phase 2 of this project. Air Force has embedded ADF personnel into the USAF's MQ-9 Reaper operational squadrons at Creech Air Force Base, Nevada.

### **AIR 8000 New Airlift**

This is a multi-phase project to acquire heavy airlift and battlefield airlift aircraft. Phase 2 seeks to acquire ten C-27J Spartan aircraft by the end of 2016. The first of these aircraft was accepted by Air Force in July 2015. Phase 3 saw the acquisition of four C-17A Globemaster III aircraft. The fourth aircraft was handed over to Australia in March 2008. The addition of a fifth and sixth C-17A aircraft were acquired under Phase 4 through the US Government foreign military sales program. Australia accepted its seventh and eighth C-17As in 2015.

### **Joint Project (JP) 2025 Jindalee Operational Radar Network**

JP 2025 is a multi-phase project to develop and deliver an operational over-the-horizon radar (OTHR) system. Phase 5 of this project delivered a number of capability enhancements to bring the Longreach and Laverton radars up to the current technological specification of the radar at



Alice Springs. Phase 5 also integrated the Alice Springs OTHR into the JORN. Phase 6 will incorporate new or upgraded sensor hardware and software, signals processing, data fusion, communications and information systems.

### **JP 3024 Woomera Range Systems Remediation**

This project will upgrade the Woomera Test Range (WTR) into a 'next-generation' test range. It will replace WTR instrumentation systems, radars and infrastructure with modern commercial-off-the-shelf and military-off-the-shelf systems. With specialised communications links into a wider allied network, the 'next-generation' WTR will become part of a wider world live-virtual-construction (LVC) specialised range network supporting highly complex simulation, testing, training and evaluation objectives. The completed project will provide significantly improved capabilities to support ADF test and evaluation needs well into the future.

### **JP 3027 Joint Direct Attack Munition (JDAM) Enhancement**

Phase 1 of this program will enhance the capability of the JDAM capability delivered by Project AIR 5409 Bomb Improvement Program (BIP). It will address capability gaps identified at the time of AIR 5409 and the lessons learned from the Middle East Area of Operations by providing a capability to attack moving targets and to reduce collateral damage.

This project will also introduce a production model of the JDAM Range Extension Kit developed from project AIR 5425 JDAM-Extended Range (JDAM-ER) concept technology demonstrator. The project will

provide Defence with the following capability improvements.

- Increase the range of the JDAM by development, flight demonstration and production of JDAM-ER range extension wing-kits.
- Acquire and integrate JDAM compatible DSU-38/B Precision Laser Guided System (PLGS) kits which create laser JDAM weapons when combined with standard JDAM tail kits.
- Acquire and integrate BLU-126/B low collateral damage (LCD) warheads into the weapons inventory.
- Acquire additional JDAM tail kits to be coupled with the JDAM-ER range extension wing kits, PLGS, and LCD warheads acquired above.
- Demonstrate and produce a dual-mode, extended-range (DMER) configuration of the JDAM-ER, which will combine the PLGS with the range extension wing kit.
- Acquire JDAM captive air training systems (JCATS) for training purposes.
- Update tactical mission planning systems to support operational deployments of the JDAM-ER, JDAM-DMER, LJDAM weapons and the LCD warhead.

The LJDAM and LCD capability will be integrated with both the F/A-18A/B and F/A-18E/F Super Hornet aircraft. The JDAM-ER and DMER will equip the F/A-18A/B Hornet only.

As of March 2013, all design reviews have been completed, the initial supply of BLU-126 warheads have been received, all PLGS deliveries are in inventory and the first test and evaluation flights of all weapon configurations have been successfully conducted.

### **JP 3029 Space Situational Awareness (SSA)**

This two-phase project involves the relocation of a US-owned C-band radar to provide space surveillance, and the

deployment of a space surveillance telescope to monitor space, on behalf of the US, over the southern hemisphere. The radar and telescope are expected to be operational by 2017.



# Weapon and Technology Glossary

**Air Intercept Missile–9M (AIM-9M) Sidewinder.** The 2.9 m long, 85 kg AIM-9M Sidewinder is a supersonic, infra-red homing, guided missile that provides the ability to attack from all directions, including head-on. Changes over early models meant an improved capability against infra-red countermeasures, enhanced background discrimination capability and a reduced-smoke rocket motor. These modifications increased its ability to locate and lock-on to a target and decrease the chance of missile detection.

**Air Intercept Missile–9X (AIM-9X) Sidewinder.** The 3 m long, 85 kg AIM-9X Sidewinder is a supersonic, infra-red homing, guided missile that provides full day and night employment, greatly enhanced manoeuvrability and an improved target acquisition, short-range air-to-air attack capability than earlier models.

**Air Intercept Missile–120 (AIM-120) Advanced Medium-Range, Air-to-Air Missile (AMRAAM).** The 3.6 m long, 157 kg AIM-120 AMRAAM provides an all-weather, active radar-guided missile with beyond-visual-range, air-to-air attack capability, as well as air defence support. Once the missile closes in on a target, its active radar guides it to an intercept.

**Air Intercept Missile–132 (AIM-132) Advanced Short-Range, Air-to-Air Missile**

**(ASRAAM).** The 2.9 m long, 87 kg imaging infra-red homing ASRAAM was designed as a replacement for the AIM-9 Sidewinder. It has longer range (50 km) and higher speed (mach 3+), but less manoeuvrability than the Sidewinder.

**Air-to-Ground Missile–84 (AGM-84) Harpoon anti-ship missile.** The Harpoon is a 3.8 m long, all-weather, over-the-horizon, sea-skimming, 519 kg weapon for use against surfaced submarines and ships. It uses active radar homing to locate its target.

**Air-to-Ground Missile–88 (AGM-88) High-speed Anti-Radiation Missile (HARM).** The AGM-88E is a tactical, supersonic, air-to-surface missile designed to home in on electronic transmissions coming from a ground-based radar system. Its 66 kg warhead is designed to destroy the transmitter. Air Force EA-18G Growler aircraft will carry a training version of the AGM-88.

**Air-to-Ground Missile–154 (AGM-154) Joint Stand-off Weapon (JSOW).** The JSOW is a 4.1 m long, 470 kg, medium range, highly survivable, precision-guided weapon for attacking defended targets from outside the range of standard anti-aircraft defences, to increase aircraft survivability. It is a low cost, highly lethal 'launch and leave' glide weapon that employs a Global Positioning System/inertial navigation system

for mid-flight guidance and an infra-red seeker for terminal guidance. It is capable of day/night and adverse weather operation.

**Air-to-Ground Missile-158 (AGM-158) Joint Air-to-Surface Standoff Missile (JASSM).** The JASSM is a 4.3 m long, 974 kg, semi-stealthy, long-range (over 370 km), turbojet-powered cruise missile. Its mid-course guidance uses the INS/GPS unit developed for the JDAM and JSOW guided bombs, with either a high-level or low-level (500 m) cruise altitude, followed by a steep dive on to the target using an imaging infra-red seeker.

**AN/ALQ-99 Tactical Jamming Pod.**

This pod is an airborne electronic warfare, integrated jamming system used on EA-18G Growler aircraft. The system is capable of intercepting, automatically processing and jamming received radio frequency signals. The system receivers can also be used to detect, identify and direction-find those signals, providing signals intelligence either automatically or manually.

**AN/ALQ-128 Wideband Receiver.**

This electronic warfare warning set is a countermeasure receiver used to give information through radar warning suites that allows it to provide active jamming against adversary radar threats.

**AN/ALR-56M Radar Warning Receiver.**

This receiver is the component of the electronic warfare system used to detect threat radars and provide situational awareness to the aircrew and improve survivability.

**AN/APG-73.** This is an all-weather, multi-mode, airborne radar system designed for both air-to-air and air-to-surface operations. It incorporates a variety of search, track and track-while-scan modes to give the pilot a complete look-down/shoot-down capability.

The AN/APG-73 is the radar that was fitted to the F/A-18A/B Hornets during the Hornet Upgrade Program.

**AN/APG-79.** The revolutionary AN/APG-79 AESA radar provides F/A-18F aircrew with powerful new capabilities. Entirely new from front-end array to back-end processor and operational software, the system substantially increases the capability of the F/A-18F Super Hornet. With more power than the APG-73, the APG-79 has much greater air-to-air detection range and allows tracking of significantly more targets. It also has a much better ability to identify targets and break out those that are closely spaced.

**Bomb.** A bomb is an aerodynamically-shaped metal container, usually fin-stabilised, filled with a high explosive, smoke, incendiary or chemical composition designed to be dropped from an aircraft.

**Conventional bomb.** A conventional bomb consists of five major parts: an outer casing, the inner explosive material, devices such as fins to stabilize the weapon in flight, one or more fuses to ignite the main charge, and a mechanism for arming the fuse or preparing it to explode. The outer case is most commonly made of metal and has a point at its nose. The explosive charge usually consists of trinitrotoluene (TNT) or other high explosives in combination. The fin assembly at the tail end of the weapon stabilises as it falls through the air.

**General-purpose bomb.** This is an air-dropped weapon intended as a compromise between blast damage, penetration, and fragmentation in explosive effect. They are commonly fitted with a guidance kit to create a precision-guided weapon.

**Glide bomb.** A glide bomb has aerodynamic surfaces to give it a much flatter, gliding, flight path than that of a conventional bomb

without such surfaces. This allows it to be released at a greater distance from the target, allowing a successful attack without the aircraft needing to pass within range of the target's anti-aircraft defences.

**Global Positioning System (GPS).** GPS is a space-based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth. However, to calculate positional data, the receiver requires an unobstructed line-of-sight to four or more of the system's satellites.

**Guided Bomb Unit (GBU) – laser guided.** A bomb with a laser guidance kit attached to it. When an operator illuminates a target with a laser designator, the weapon homes to a spot of laser energy reflected from the target. There are a variety of laser guided GBUs of different sizes, including the GBU-12 (225 kgs), GBU-16 (450 kgs) and GBU-24 (900 kgs).

**Guided Bomb Unit – GPS Guided.** A general-purpose bomb fitted with a Joint Direct Attack Munition guidance kit. There are a variety of GPS guided GBUs, including the GBU-31 (900 kgs).

**Guided Bomb Unit–39 Small Diameter Bomb I (GBU-39 SDB I).** This is a 110 kg precision-guided glide bomb for attacking fixed targets but with less collateral damage. The bomb uses GPS/INS guidance to fly to the target. The small size allows an aircraft to carry a larger number of weapons.

**Guided Bomb Unit–53 Small Diameter Bomb II (GBU-53 SDB II).** This is a 110 kg precision-guided glide bomb that can identify and strike mobile targets from stand-off distances in all weather conditions. The bomb uses GPS/INS system to guide itself into the general vicinity of a moving target with any necessary course corrections

provided using a data link. The bomb has three modes of target acquisition: active radar, infrared homing and semi-active laser.

**Inertial navigation system (INS) (synonymous with inertial guidance system).** INS is a navigation aid that uses a computer, motion sensors and rotation sensors to continuously calculate, via dead reckoning, the position, orientation, and velocity of a moving object without the need for external references.

**Joint Direct Attack Munition (JDAM).** JDAM is a tail kit that contains an INS and a GPS guidance control unit that converts existing unguided free-fall bombs into accurate, adverse weather 'smart' bombs. It enables employment of accurate air-to-surface weapons against high priority fixed and relocatable targets from fighter aircraft and can be directed against single or multiple targets on a single pass. Once released from the aircraft, it autonomously navigates to the designated target coordinates, which can be loaded into the aircraft before takeoff, manually altered by aircrew before weapon release, or automatically entered during target designation with onboard aircraft sensors. It can be launched from more than 25 km from the target with updates from GPS satellites to help guide the weapon to the target.

**Large Aircraft Infrared Countermeasures (LAIRCM).** This is an active countermeasure system designed to defeat threat missile guidance systems by directing a high intensity, modulated laser beam into the missile seeker. It automatically counters advanced infra-red missile systems with no action required by the aircrew.

**Laser-guided bomb.** This is an aerial weapon that uses semi-active laser homing to strike a designated target with greater



accuracy than an unguided bomb. It uses on-board electronics to track targets that are designated by laser and adjusts the weapon's glide path to precisely strike the target. Since it is tracking a laser reflection, not the object itself, the target must be illuminated by a laser

**Laser Joint Direct Attack Munition.** This is a JDAM tail kit with an added laser sensor giving the LJDAM the ability to attack moving, relocatable and maritime targets. The target must be designated by a laser from a separate source, either by ground forces, by a pod on the attacking aircraft, or by a separate support aircraft.

**Link 16.** Link 16 is a military tactical data exchange network which allows military aircraft as well as ships and ground forces to exchange their tactical picture in near-real time, as well as supporting the exchange of text messages, imagery data and providing two channels of digital voice.

**Link 22.** Link 22 is a secure digital radio link in the high frequency and ultra high frequency bands, mainly used by military forces.

**M61A1/M61A2 20mm nose-mounted cannon.** These are hydraulically driven, 6-barreled, rotary action, air cooled, electrically fired gun systems mounted in the nose of the F/A-18 Hornet and F/A-18F Super Hornet, with selectable rates of fire of either 4000 or 6000 rounds per minute.

**Mark 46 (MK-46) lightweight torpedo.** This is a 2.6 m long, 276 kg, air-dropped naval weapon designed to attack high-

performance submarines to a maximum depth of 365 m.

**Mark 54 (MK-54) torpedo.** This is a 2.7 m long, 230 kg naval anti-submarine weapon. The MK-54 is the next-generation of the MK-46 and can be released from most anti-submarine warfare aircraft or naval ships. The P-8A Poseidon uses a GPS-guided parachute kit to drop the Mk-54 from high altitude to track, classify and attack underwater targets.

**Missile.** A missile is a self-propelled weapon whose trajectory or course is controlled while in flight.

**Precision-guided bomb (synonymous with 'smart' bomb).** This is a guided, air-dropped weapon intended to precisely hit a specific target and minimise collateral damage.

**Sonobuoy.** A sonobuoy is a sonar or acoustic device used to detect submerged submarines that, when activated, relays information by radio. It may be active directional or non-directional, or it may be passive directional or non-directional.

**Torpedo.** A torpedo is a self-propelled, underwater munition containing explosives that detonates upon impact with the ship or submarine being targeted.

**Unguided bomb (synonymous with free-fall bomb or 'dumb' bomb).** This conventional, aircraft-delivered weapon does not contain a guidance system. When released, it follows a ballistic trajectory to the Earth.







