



DIRECTOR OF CORPORATE COMMUNICATION **RAF**
Equipment Factsheets



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TORNADO F3

- Long-range air defence interceptor.
- Variable sweep wing for high supersonic speed and high loiter duration.
- Autonomous all-weather and day/night air defence with beyond-visual-range engagement.
- Patrols for over 3 hours at 300nmls from base with Skyflash/Sidewinder/AMRAAM/ASRAAM capability.

The RAF's Counter-Air Operations Fighter is the Tornado F3. Originally a development from the Tornado GR1, the F3 was introduced as a long-range interceptor aircraft for defence of UK airspace. Changes in operational tasks, along with the experience gained during the Gulf War, led to a major Capability Sustainment Programme (CSP) of the aircraft. Tornado F3 is capable of carrying four Skyflash semi-active missiles and four AIM-9L Sidewinder passive Infrared air-to-air missiles. After CSP modification, the aircraft is further capable of replacing Skyflash with Advanced Medium Range Air-to-Air Missiles (AMRAAM) and Sidewinder with Advanced Short Range Air-to-Air Missiles (ASRAAM). Either 1500 litre or 2250 litre external fuel tanks may be carried along with air-to-air refuelling to increase the aircraft's endurance.

The Tornado F3 uses the BAE Systems Foxhunter multi-mode air-intercept radar to detect and target hostile aircraft. The situational awareness of the aircrew is enhanced by a Joint Tactical Information Distribution System (JTIDS), which complements the command and control capability provided by one U/VHF radio, one Havequick radio,

an HF system and a suite of IFF transponders and interrogators. JTIDS is a UHF line-of-sight system that can be supplemented by relay platforms and in some cases satellite communications. The aircraft's Radar Homing and Warning Receiver (RHWR) enhances threat detection and the F3 is defensively armed with chaff dispensers and infrared decoy flares.

There are four operational F3 squadrons and the Operational Conversion Unit. No 43(F) and No 111(F) Squadrons are based at RAF Leuchars, No 11(F) and No 25(F) Squadrons at RAF Leeming, while RAF Coningsby hosts No 56(R) Squadron, which is the F3 Operational Conversion Unit. A Tornado F3 Operational Evaluation Unit is also based at RAF Coningsby.

Specifications

Powerplant:	Two Turbo Union RB199
Thrust:	16,410lb each
Wingspan:	8.6 metres (28ft 2ins) to 13.91 metres (45ft 7ins)
Length:	16.7 metres (54ft 9ins)
Height:	5.95 metres (19ft 6ins)
Weight, Empty:	14,500kg (31,967lb)
Max T/O Weight:	28,000kg (61,729lb)
Fuel, Fuselage + wings:	4700kg
Fuel, Fin:	440kg
Fuel, Under-wing tank:	1200kg/l 800kg
Max Speed:	Mach 2.2 (800kts (921 mph))
Max Altitude:	above 50,000ft
G Limits:	+7.5





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TORNADO GR4

- Variable swept wing all weather strike or reconnaissance aircraft.
- Terrain following radar, forward looking infrared and night vision goggles give it a full night capability.
- Laser target marker allows self-designation of target for laser guided bomb operations.
- Full weapons capability including enemy air defence suppression.
- Infrared Reconnaissance system gives the GR4A a low-level tactical reconnaissance capability.

The Tornado GR4 is a variable geometry, two-seat, day or night, all-weather attack aircraft, capable of delivering a wide variety of ordnance. Powered by 2 Rolls Royce RB 199 Mk 103 afterburning turbofan engines, the Tornado is capable of low-level supersonic flight and can sustain a high subsonic cruise. The aircraft can fly automatically at low level using Terrain Following Radar when poor weather prevents visual flight. The aircraft is also equipped with Forward Looking Infrared and is Night Vision Goggle compatible making it a capable platform for passive night operations. For navigation the Tornado is equipped with an integrated GPS/Inertial Navigation System that can be updated from visual or radar inputs. The aircraft is also equipped with a Laser Ranger and Marked Target Seeker system that can provide accurate range information on targets and for ground designation.

The Tornado can carry up to three Paveway II, two Paveway III or Enhanced Paveway Laser Guided Bombs (LGB), and by using a Thermal Imaging Airborne Laser Designation (TIALD) pod it is able to self-designate targets for LGB delivery. The Tornado also has a Ground Mapping Radar to identify targets for the delivery of conventional 1000lb bombs and BL755 cluster bombs. All GR4 aircraft are capable of carrying the Air Launched Anti-Radiation Missile (ALARM), which homes on the emitted radiation of enemy radar systems and can be used for the suppression of enemy air defences. The Tornado is capable of carrying up to 9 ALARM missiles and can

carry a mixed configuration of ALARM missiles and bombs. When used in the reconnaissance role the GR4 can carry the VICON pod to provide detailed reconnaissance imagery. This will soon be replaced with the RAPTOR pod providing an even greater day and night capability in the reconnaissance role.

For self-protection the Tornado GR4 is normally armed with two AIM-9L Sidewinder short-range air-to-air missiles, together with a BOZ-107 Pod on the right wing to dispense chaff and flares, in addition to a Sky Shadow-2 Electronic Counter Measures pod on the left wing. The aircraft is also equipped with an integral 27mm Maser cannon capable of firing 1700 rounds per minute.

The Tornado will soon be equipped with both Storm Shadow and Brimstone. The Storm Shadow will allow the Tornado to make precision strikes in poor weather with a greatly increased stand-off capability from the target area. Brimstone will provide the Tornado with an effective anti-armour weapon, also capable of providing stand-off capability.

The Tornado GR4 is currently operated from two bases. The Operational Conversion Unit, XV(R) Squadron, is based at RAF Lossiemouth in addition to 12 Squadron, 14 Squadron and 617 Squadron. RAF Marham is the home to IIX(B) Squadron and 31 Squadron. II(AC) Squadron and 13 Squadron, also based at Marham, operate the Tornado GR4A, which is equipped with the Tornado Infrared Reconnaissance system providing a low level tactical reconnaissance capability.

Specifications

Wingspan:	8.6m (28ft 3in) to 13.91m (45ft 7in)
Length:	16.72m (54ft 10in)
Height:	5.95m (19ft 6in)
Weight, Empty:	14,000kg (31,000lb) (approx)
Max T/O Weight:	28000kg (62,000lb) (approx)
Fuel, Fuselage + wings:	4700kg (10,340lb)
Fuel, Fin:	440kg (970lb)
Fuel, Under-wing tank:	1200kg/1 800kg (2640/3960lb)
Max Speed:	Mach 1.3 (800kts IAS)
Max Altitude:	50000ft





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JAGUAR GR3

- Operates in Offensive Counter Air, Close Air Support and Tactical Reconnaissance roles.
- Recent major avionics, navigation and weapons systems upgrade.
- Full electro-optical reconnaissance capability at medium/low level.
- Laser target marking capability for self-designation or cooperative designation.

The RAF's Jaguar fleet has recently undergone a major upgrade programme and has been designated the Jaguar GR3. The upgrade gave it improved avionics, which included Global Positioning System and Terrain Referenced Navigation integrated into the aircraft's Inertial Navigation System, a Military Standard 1553 databus, internal and external Night Vision Goggle compatible lighting, and a new Head Up Display (HUD) and Head Down Displays. The weapons upgrade included a helmet-mounted sight and an Advanced Short Range Air-to-Air Missile (ASRAAM) capability. It can be rapidly deployed to conduct operations in the Offensive Counter Air, Air Interdiction, Close Air Support and Tactical Reconnaissance roles.

The RAF has three operational Jaguar squadrons, No 6, No 41(F) and No 54(F), and an Operational Conversion Unit, 16(R) Sqn, all based at RAF Coltishall. All three operational squadrons are able to conduct attack and reconnaissance operations, although No 6 Squadron and No 54(F) Squadron are primarily attack squadrons, while No 41(F) Squadron is primarily a reconnaissance squadron.

The Jaguar is capable of carrying 10000lb retard and freefall bombs, BL755 and RBL755 cluster bombs, Paveway II and Paveway III Laser Guided Bombs (LGB) and CRV-7 rocket pods. For self-defence it is equipped with a Skyguardian Radar Warning Receiver, an Electronic Countermeasures pod, and chaff and flare dispensers. It also carries two 30mm ADEN cannon and two AIM-9L Sidewinder air-to-air missiles (carried over-wing). It can be fitted with an external fuel tank on the centreline pylon, or two tanks under the wings. In the reconnaissance role it can carry the BAE recce pod containing conventional wet film sensors and an Infrared Line Scan, or the VICON recce pod fitted with a variety of wet film and Electro Optical (EO) sensors. It can also carry the Thermal Imaging Airborne Laser Designation (TIALD) pod for self-designation or co-operative designation of targets during LGB operations.

RAF Jaguars participated extensively in the Gulf War, and have subsequently been involved in many operations in the Middle East and the Balkans. They deploy regularly for exercises to North America, Europe and the Middle East, operating in widely diverse conditions ranging from desert sand to arctic snow.

JAGUAR RECONNAISSANCE POD (JRP) - GPI ELECTRO-OPTICAL (EO) POD

The JRP, sometimes termed GP1 EO pod, is mounted on the centreline pylon of the GR3A aircraft. It contains various electronically scanned 'push-broom' sensors and an Infrared Line Scanner (IRLS). All sensors record to analogue SVHS tapes that are fully exploitable by a software based Ground Imagery Exploitation System. Whilst the JRP has many different camera fit options, it is generally operated either in a medium or low-level mode. The IRLS is common to all camera fits and is mounted at the rear of the pod where it offers horizon-to-horizon coverage. In the medium-level mode one camera is mounted in the nose of the pod, which can be rotated 180° from horizon to horizon. In the low-level mode, one fixed depression EO camera is normally mounted on each side of the pod.

The pod is designed to be used in a fully automated mode against known targets pre-planned on the Jaguar Mission Planner (JMP). However, the pod maintains a facility to be manually controlled by the pilot in the aircraft if it is required against targets of opportunity. Whilst medium-level operations are conducted by all three front-line Jaguar squadrons, only 41(F) Squadron operates the JRP in the low-level tactical reconnaissance role.

Specifications

Powerplant:	Two Turbomeca/RR Adour 104 (upgrading to MK 106)
Thrust:	8,040lbs
Weight:	Max TO 15,700kg (34,612lb)
Wingspan:	8.69m (28ft 6in)
Length:	16.83m (55ft 2in)
Height:	4.89m (16ft 1in)
Fuel, Internal:	3,337kg (7,357lb)
Fuel, External:	2,844kg (6,270lb) in three drop tanks
Max Speed:	917kts (1056mph) at 36,000ft
Max Altitude:	14,000m (46,000ft)





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HARRIER GR7

- Multi-role combat aircraft capable of vertical/short take off and landing.
- Part of Joint Force Harrier, operating from land bases or aircraft carriers.
- Comprehensive weapons capability including bombs, rockets or missiles.
- Can operate at night, at low level, using night vision goggles.
- Cockpit gives navigation and weapons information on colour displays.

The Harrier GR7 is a single seat, multi-role combat aircraft that is capable of operating in extreme environments and from a wide selection of locations, including deployed air bases and aircraft carriers. The GR7 will shortly undergo a series of major improvements, with changes to both the avionics and to the engine and will be redesignated the GR9. The old GR3 model famously saw operation with the Royal Navy during the Falklands Campaign in 1982 and the GR7 of today maintains its maritime links by working as part of Joint Force Harrier (JFH). In its role as part of JFH, the RAF's GR7 force remains ready to deploy anywhere in the world with the RN's Sea Harriers as part of a Naval task force.

The unique feature about the Harrier is its ability to vector its Pegasus engine thrust. This vectored thrust enables it to operate from short landing surfaces and to take off and land vertically. The engine exhausts its jet efflux out of 4 nozzles, which move in unison from a rearward pointing position for conventional flight to a position where they point directly below the aircraft to allow it to hover. The engine itself produces 21,500 lbs of thrust.

The flying controls work on the 'Hands-on-Throttle-and-Stick' system (HOTAS), enabling the most important weapons and avionics functions to be operated by the pilot without having to remove his hands from the controls. Information is displayed to the pilot through the Head Up Display (HUD) and is also presented on two Multi-Purpose Colour Displays (MPCDs). The pilot can use the MPCDs to display almost any system information, including the aircraft's position on a moving map display, and the weapon load he is carrying. They can also be used to display target picture information obtained from the aircraft's sensors. The picture from the Dual Mode Tracker (a six times magnification television camera that is mounted on the nose), or from the Maverick missile seeker head, can also be displayed, together with a Thermal Imaging Airborne Laser Designator (TIALD) tracking and target picture if a TIALD pod is carried. During night operations, the Forward Looking Infrared (FLIR) picture is presented on a MPCD and is also overlaid onto the HUD. All of the displays are compatible with night-vision goggles, which gives the Harrier its ability to operate at night, at low level.

The Harrier can carry the following weapons:

Paveway II and Paveway III laser guided bombs
CRV-7 rockets
Maverick missiles
1000lb bombs
540lb bombs
BL755 Cluster bombs
AIM-9 Sidewinder missiles

When flying at low level the Harrier cruises at 420kts (480mph) and then typically increases speed to 480kts (550mph) when delivering weapons. This gives it a low level combat radius of approx 250nm. When operating at medium level it cruises at 0.75 Mach and has a combat radius of approx 350nm. These ranges vary upon the tasking requirement and weapon load carried and can be greatly increased by the use of in-flight refuelling.

The Harrier is a very capable aircraft and has proven to be a valuable asset over the past few years in many campaigns including Bosnia, Kosovo and Northern Iraq.

Specifications

Powerplant:	RR Pegasus Mk 105
Thrust:	21,750lbs
Weight:	Max STO 14,061kg (31,000lb) Max VTO 8,595kg (18,950lb)
Fuel, Internal:	3519kg (7,759lb)
Fuel, External:	3661kg (8071lb) in four drop tanks
Wingspan:	9.24m (30ft 4in)
Length:	14.12m (46ft 4in)
Height:	3.55m (11ft 8in)
Max Speed:	575kts (661mph)





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E3-D SENTRY AEW 1

- Operates in air and sea surveillance and airborne command and control roles.
- Crew of 17 including a 10-man mission control crew.
- Flying at 30,000ft it can scan 312 square kilometres at ranges up to 280nm.
- Multi-mode lookdown radar separates targets from ground and sea clutter.
- Transmits information to ground or ship units using digital data links.

The RAF operates seven E-3D Sentry aircraft, including one in-use reserve spare, in the airborne surveillance and control role. The aircraft are based at RAF Waddington, where they are operated by Nos 8 and 23 Squadrons as the UK's contribution to the NATO Airborne Early Warning (AEW) Force. The E-3D also forms one arm of the UK surveillance triad of ASTOR, E-3D and Nimrod R1 aircraft. Whilst primarily procured as an AEW aircraft the E-3D has been extensively employed in the Airborne Warning and Control System (AWACS) role.

The E3-D Sentry, known to the RAF as the AEW Mk1, is based on the commercial Boeing 707-320B aircraft, which has been extensively modified and updated to accommodate modern, high-tech mission systems. Endurance is approximately 10 hrs (over 5000nm), although this can be extended using either drogue or boom air-to-air refuelling. The E3-D is the only aircraft in the RAF's inventory capable of air-to-air refuelling by both the American 'flying-boom' system and the RAF's 'probe-and-drogue' method.

The normal crew complement is 17, broken down into four flight deck crew, three technicians and a 10-man mission crew. The mission

crew comprises a tactical director (mission crew commander), a fighter allocator, two weapons controllers, a surveillance controller, two surveillance operators, a data manager, a communications operator and an electronic support measures operator. The Sentry's roles include air and sea surveillance, airborne command and control, weapons control and operations as an extensive communications platform.

The aircraft cruises at 30,000ft and 400kts and its Westinghouse AN/APY-2 high-performance multi-mode lookdown radar is able to separate airborne and maritime targets from ground and sea clutter. One E-3D flying at 30,000ft can scan over 312 square kilometres, it can detect low-flying targets or maritime surface contacts within 215 nautical miles and can detect medium-level airborne targets in excess of 280 nautical miles. The multi-mode capability of the radar provides lookdown surveillance to the radar horizon, electronic vertical scan of the radar beam to provide target elevation and beyond-the-horizon operation for long-range surveillance of medium and high-altitude aircraft. The aircraft's mission systems can separate, manage and display targets individually on situation displays within the aircraft, or it can transmit the information to ground and ship based units using a wide variety of digital data links.

Specifications

Powerplant:	Four CFM 56 2A-3
Thrust:	24,000lbs each
Wingspan:	44.98m
Length:	46.68m
Height:	12.7m
Max T/O Weight:	332,500lbs
Cruise speed:	360-400kts
Operating Altitude:	above 30,000ft





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VC10

- Dual-role passenger/freight or air-to-air refuelling aircraft.
- Carries 137 passengers or 45,000lbs (20,500kg) freight.
- Operates a two-station or three-station refuelling pod.
- Capable of refuelling tactical fast-jet or heavy strategic aircraft.
- Able to dispense 68 or 78 tonnes of fuel.

The VC10 CMk1K is a dual-role Air Transport (AT) and Air-to-Air Refuelling (AAR) aircraft. In the AT role, the aircraft is used for troop carrying, with accommodation for 146 passengers and 9 crew. The roles can be converted easily by use of a large cabin freight door on the forward left side of the aircraft into a dual-role passenger/freight or full-freight configuration. In its full-freight role the cabin is capable of holding up to 45,000lb (20,500kg) of palletised freight, or ground equipment and vehicles, on its permanently strengthened floor. The aircraft also has an aero-medical evacuation capability, where up to 68 stretchers can be fitted.

The aircraft were converted to the AAR role in 1993 with the addition of a Mk32 refuelling pod under the outboard section of each wing. The aircraft can carry up to 154,000lb (70,000kg) of fuel by utilising their original eight fuel tanks; which can be used to feed the aircraft itself or be dispensed to fast-jet receivers. It is capable of refuelling two aircraft simultaneously from the two under-wing pods. The VC10 CMk1K itself can be refuelled from a suitably equipped VC10K or Tristar tanker aircraft by the use of its air-to-air refuelling probe, which is permanently attached to the aircraft nose.

VC10 Mk K3 K4

The bulk of the RAF's single-role AAR fleet comprises VC10s of two different variants, the K3 and K4. Each aircraft is a 3-point tanker,

fuel being dispensed from either the 2 wing hoses or from the single fuselage-mounted Hose Drum Unit (HDU). The wing hoses can transfer fuel at up to 1000kg per minute and are used to refuel tactical fast-jet aircraft. The HDU can transfer fuel at up to 2000kg per minute and is usually used to refuel 'heavy' aircraft, although it can also be used by fast-jet aircraft.

Each tanker variant of VC10 carries a different fuel load. The K3 is equipped with fuselage fuel tanks, mounted in what was the passenger compartment, and can carry up to 78 tonnes of fuel. These internal tanks are missing from the K4, which has a maximum fuel load of 68 tonnes. Defensively the only counter measures for the aircraft are its recent change to a low infrared paint scheme (grey), a Radar Warning Receiver and a Matador IRCM missile protection system which comprises two infrared jammers mounted under the engines at the rear of the aircraft. The aircraft also has a very limited passenger carrying capability that is used almost exclusively to carry ground crew and other operational support personnel.

The VC10 is now reaching the end of its service life, but continual modifications maintain the aircraft as a significant asset, enabling the rapid deployment of troops, their weaponry and fast-jet fighter aircraft around the world.

Specifications

Powerplant:	Four RR Conway Turbojets
Thrust:	20,000lbs static thrust each
Crew:	Two pilots, navigator, air engineer, air loadmaster and stewards as required
Range:	8,000 Kilometres
Max speed:	Mach 0.86
Max Altitude	43,000ft





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TRISTAR

- Long-range passenger or freight carrying aircraft.
- Ferry range of 7,600nm and a passenger/freight range of 5,000nm.
- K1 and KC1s have an additional air-to-air tanker refuelling capability.
- Centre-line refuelling point capable of transferring fuel at 2000kg/min.

The RAF has a mixed fleet of eight Lockheed L-1011 Tristar aircraft, operated by No 216 Squadron from RAF Brize Norton, in Oxfordshire. The aircraft are used as long-range passenger or freight carrying aircraft or in the air-to-air tanker refuelling role. The KC1 aircraft have a maximum ferry range of 7,600nm, which could be extended by air-to-air refuelling (AAR), although this is not routinely practised. In their Air Transport (AT) role they can carry a mix of up to 160 passengers with baggage, or 44 tonnes of freight, over a range of 5,000nm.

The aircraft can also carry 136 tonnes of fuel, which, in the AAR role, is transferable through two centre-line Hose Drum Units (HDUs) at a fuel transfer rate in excess of 2,000kg/min. Although the aircraft carries two HDUs, only one HUD can be used at a time, thus restricting the aircraft to single point refuelling. On a typical AAR trail from the UK to Cyprus, the KC1 would accompany four fast-jet aircraft whilst

simultaneously carrying a freight load of 31 tonnes. The KC1 also has a large, side fuselage freight door and a roller conveyor system that permits freight loading and carriage on the main aircraft deck. The K1 is similar to the KC1, as it also has a single point AAR tanker capability, but it does not have the side freight-loading door. All K versions are capable of receiving fuel during flight from an AAR tanker aircraft.

The Tristar C2 and C2As retain their basic airline configuration of 266 seats (260 for passengers) with underfloor baggage space. All versions are capable of operating in the Aeromedical Evacuation role.

Specifications

Powerplant:	Three RR RB 211-524B4 turbofans
Thrust:	50,000lbs each
Wing Span:	50.09m (164ft 4in)
Length:	50.05m (164ft 2in)
Height:	16.87m (55ft 4in)
Weight empty:	242,684lb
Max TO weight:	540,000lb
Internal Fuel:	213,240lb
Max Speed:	520kts (599mph)
Range:	4200nm (max payload)





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CANBERRA PR9

- Photographic and electro-optic reconnaissance and aerial surveys in peacetime.
- Medium/high-level long-range oblique imagery in wartime.
- First introduced in 1962, but has received modern sensor updates.
- Sensors include survey, panoramic and long-range electro-optical cameras.
- Daytime reconnaissance role only.

No 39 (1 PRU) Squadron is the only remaining Canberra squadron in service with the RAF and is based at RAF Marham, in Norfolk. Its role in peacetime is photographic and electro-optic reconnaissance, strategic air reconnaissance to meet overseas intelligence requirements, aerial surveys within the UK and overseas, and occasional low-level tasks. In transition to war this becomes medium/high-level and long range oblique imagery, in support of UK or Coalition Operations. To achieve its task, the squadron operates four Canberra PR9 (Photographic Reconnaissance) aircraft. The PR9 was the final development of the Canberra airframe and first entered service with 39 Squadron in October 1962. Sensors and navigation equipment have since been updated, but the engines and airframe remain essentially the same.

Currently, the aircraft sensor fit includes a survey camera, a panoramic camera and a long-range electro-optical camera. The survey camera is mainly used to produce vertical images on 9-inch square negatives for mapping purposes. The panoramic camera, which can be directed to any position from the horizon to the vertical,

produces a swathe of negatives giving an oblique image of a target. The electro-optical camera can only produce oblique images, but they can be highly magnified and transmitted to ground stations via an on-board datalink. In addition to the sensor platform updates, the PR9 has a much enhanced navigation suite, and to enhance its survivability in operational theatres, it has been fitted with a Skyguardian Radar Warning Receiver and an Electronic Protective Measures suite, dispensing chaff and Infrared decoy flares from packs internally mounted in the underside of the wings. During its earlier life, the PR9 had a low and medium-level night reconnaissance capability using Infrared Line Scan equipment, but its current role is restricted to daytime reconnaissance.

With a crew of pilot and navigator, the aircraft regularly operates at heights above 40,000ft and can remain airborne for up to 4½ hours, although it cannot air-to-air refuel. The squadron recently saw operational service over Afghanistan and has continued to provide surveillance and survey imagery of Kosovo and the Balkans over the last six years.

Specifications

Powerplant:	Two Avon Mk 206
Thrust:	11,250lb (each)
Wing Span:	67ft 10ins
Length:	66ft 8ins
Height:	15ft 7ins (fin) 9ft 10ins (canopy)
Max TO weight	53,300lb
Max Speed	450kts (520mph)





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NIMROD MR2

- Only jet-powered maritime patrol aircraft in military service.
- Roles are anti-submarine and anti-surface warfare and search and rescue.
- Endurance of 10 hours, which can be extended by air-to-air refuelling.
- Crew of 13, which includes 'wet' and 'dry' sensor co-ordination teams.
- Can carry Sting Ray Torpedos, Harpoon anti-ship missiles, bombs and depth-charges.

The Nimrod MRI entered service in 1969, but was upgraded to MR2 standard in the early 1980s. While the flight deck and general systems remained the same, the Mission System was given a significant upgrade. The Nimrod carries out three main roles: Anti-Submarine warfare (ASW), Anti-Surface Unit warfare (ASUW) and Search and Rescue (SAR). It has an unrefuelled endurance of around 10 hours, which can be extended by the use of air-to-air refuelling. The operating crew comprises two pilots and a flight engineer, two navigators (tactical and routine), and an air electronics officer, who is sensor and communications co-ordinator. He is supported by a team of three 'wet' air electronics operators (AEOs) and four 'dry' AEOs. The 'wet' team monitor the aircraft's acoustic processors, which monitor active and passive sonobuoys, whilst the 'dry' team manage a wide range of avionics and weapon systems which are essential in delivering Nimrod's capability.

The Nimrod's offensive capability includes Sting Ray torpedos for use in the ASW role and Harpoon missiles for the ASUW role.

For SAR purposes the aircraft has a selection of air deliverable multi-seat dinghies and survival packs. For self-defence the aircraft can be armed with four AIM-9L Sidewinder air-to-air missiles carried under the wings.

The majority of Nimrod tasking comes from the Maritime Headquarters at Northwood. Peacetime work includes surface and sub-surface surveillance and the maintenance of a one-hour SAR standby in support of the Air Rescue Co-ordination Centre, collocated at Kinloss. The aircraft routinely operates over the sea down to 200 feet, but is limited to 300 feet at night or in bad weather.

Nimrod aircraft are operated by Nos 120, 201 and 201 Squadrons, which are all based at RAF Kinloss, in Morayshire. Kinloss is also the home of the Nimrod Operational Conversion Unit, No 42(R) Squadron.

Specifications

Powerplant:	Four Rolls-Royce Spey 250 turbofans
Thrust:	12,500lbs each
Wingspan:	35m (115 ft)
Length:	38.65m (126ft 9in)
Height:	9.14m (30ft)
Max TO weight:	184,000lbs
Internal Fuel:	84,000lbs
Max endurance:	9.5hrs (internal fuel)
Max Speed:	360kts (420mph)
Max altitude:	44,000ft





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HERCULES C-130

- Total fleet of 50 aircraft in four designations.
- Can carry up to 128 troops or 20 tonnes of freight over 2000nm.
- Provides tactical support to 16 Air Assault Brigade by day or night.
- Long range, up to 4000nm with air-to-air refuelling.
- Upgraded C-130J replacing 25 CMk1 and Mk3 aircraft.

The C-130 Hercules tactical transport aircraft is the workhorse of the RAF's Air Transport (AT) fleet and is based at RAF Lyneham, in Wiltshire, where it is operated by Nos 24, 30, 47, 70 Squadrons and 57(R) Squadron, the Operational Conversion Unit. The fleet totals 50 aircraft and is a mixture of CMk1/CMk3 aircraft and the new C-130J aircraft, designated CMk4/CMk5. The Hercules is used primarily to carry troops, passengers and freight and is capable of carrying up to 128 passengers, or 20 tonnes of palletised freight or vehicles up to 2000nmls. The maximum unrefuelled ferry range is 3,500nm, which can be extended to over 4000nm by air-to-air refuelling. In the Aeromedical Evacuation role either 64 or 82 stretchers can be carried. The other main role of the C-130 is Transport Support (TS), which is the support of 16 Air Assault Brigade via the aerial delivery of paratroops and stores by day or night airdrop.

The majority of aircraft are fitted with Defensive Infrared Counter Measure equipment, whilst some aircraft used for special tasks have an additional enhanced defensive aids suite comprising a Skyguardian Radar Warning Receiver, a chaff and infrared flare counter measure dispensing system and a missile approach warning system.

Hercules J Model - C Mk 4 / Mk 5

A total of 25 C-130 Mk1 and Mk3 aircraft are being replaced by the C-130J on a one-for-one basis. The C-130J has been modified and upgraded to include new propellers and engine control systems to give it increased take-off thrust and fuel efficiency. It also has a revised flight deck with modern glass-cockpit and Head Up Displays, thus allowing two-pilot flight deck operation, and a separate air loadmaster station in the cargo hold. The aircraft is restricted to an AT role pending clearance for wider use in the tactical TS role.

The defensive aids suite includes a missile warning system linked to the directional infrared counter measure system, a radar warning receiver and a chaff or flare countermeasure dispensing system. The defensive system protects the aircraft against surface-to-air and air-to-air infrared seeking threats that may be encountered during operations.

Specifications

Powerplant:	Four ALLISON AE 2100D3 turboprops.
Propeller:	Dowty R39 six-blade, variable pitch propeller.
Wing Span:	132ft 7in
Length:	CMk4 112ft 9in, CMk5 97ft 9in
Tailplane Span:	52ft 8in
Range:	3000 nm
Max Altitude:	32,000ft
Max Speed:	340kts (400mph)





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CHINOOK

- Used primarily for troop carrying or internal and underslung load carrying.
- Carries up to 54 troops or 10 tonnes of freight or vehicles.
- Equipped with modern avionics and an enhanced defensive aids suite.
- Full night operation capability using night vision goggles.
- Can be armed with two six-barrelled Miniguns and an M-60 machine gun.

The RAF operates the largest fleet of Chinook Support Helicopters after the US Army, with a total of 34 HC2s, 6 HC2As and 8 HC3s (the HC3 has yet to enter operational service). The Chinook Wing, which forms the heavy-lift element of the Joint Helicopter Command, is based at RAF Odiham in Hampshire. Odiham supports three operational squadrons, No 7 Squadron, No 18 Squadron and No 27 Squadron, and the Operational Conversion Flight (OCF). Number 7 Squadron has one operational flight, No 27 Squadron has two operational flights, and No 18 Squadron has two operational flights and the OCF.

The HC2 and 2A are used primarily for trooping and for load carrying (both internal and underslung) and can carry up to 54 troops or 10 tonnes of freight. The cabin is large enough to accommodate two Land Rovers, while the three underslung load hooks allow a huge flexibility in the type and number of loads that can be carried. Secondary roles include Search and Rescue and Casualty Evacuation (a total of 24 stretchers can be carried). The crew consists of either

two pilots, or a pilot and navigator, and two air loadmasters.

The aircraft are very well equipped for their varied roles and are fitted with a satellite Global Positioning System, an Instrument Landing System, comprehensive avionics which enable them to fly in airways, and an extensive radio suite. The aircraft has a full night-time capability when operated with night-vision goggles. The Chinook is well equipped with defensive aids and has a Radar Warning Receiver, an Ultraviolet and Doppler Missile Approach Warning System (MAWS), and chaff and flare dispensers which can be manually or automatically fired. The aircraft can be armed with two M-134 six-barrelled Miniguns and an M-60 machine gun.

The Chinook is a very capable and versatile support helicopter and has been involved in most of the recent UK Operations such as the Falklands Conflict, Northern Ireland, the Gulf War, peace keeping in Bosnia, Kosovo operations, evacuation of Sierra Leone and operations in Afghanistan.

Specifications

Powerplant:	Two Textron Lycoming T55-L712F
Normal cruise speed:	130kts (150mph)
Max airspeed:	160kts (185mph)
Endurance, Internal tanks:	2hrs
Endurance, External Tanks:	2hrs per tank (max 3 tanks)
Zero fuel weight:	12,200 kg
Weight, Normal MAUM:	22,700kg
Weight, Increased MAUM:	24,500kg





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PUMA HC1

- Twin-engined battlefield helicopter operated by Joint Helicopter Command.
- Capable of operating under temperate, desert or arctic conditions.
- Carries troops, freight or casualties in support of the front-line.
- Fitted with modern avionics and self-defence equipment.
- Full operational capability by day or by night.

The Puma HC1 first entered service in 1971, and the RAF currently has a fleet of 33 aircraft available to the front-line Support Helicopter Force. No 33 Squadron, based at RAF Benson, comprises two operational flights and the Operational Conversion Flight. One of the 33 Squadron flights carries a desert warfare specialist fit, while the other carries an arctic warfare specialist fit. The remaining Pumas are based at RAF Aldergrove in Northern Ireland, with No 230 Squadron.

The Pumas are used as battlefield helicopters within the Joint Helicopter Command and provide tactical troop and load movement by day or night. The aircraft can carry 16 fully equipped troops or up to two tonnes of freight. The other major role is that of casevac/medevac support for which up to six stretchers can be fitted.

Each aircraft is equipped with Global Positioning System (GPS), Instrument Landing System (ILS) and the necessary navigation equipment to permit flight in the civil airways system. The normal

crew of two pilots, or a pilot and navigator plus a crewman, are trained in procedural instrument flying and tactical low flying by day and by night using Night Vision Goggles. The aircrew and supporting groundcrew are trained to operate in sparse and inhospitable areas in all conditions from temperate to desert and arctic environments.

Defensively the Puma is being upgraded with a new Defensive Aids Suite (DAS). This DAS includes an integrated Radar Warning Receiver, an AAR47 missile approach warning system, an ALQ 144 infrared jammer and automatic chaff and flare dispensing equipment. Additionally, two cabin mounted 7.62 general-purpose machine guns can be fitted for use by the crewmen.

Specifications

Powerplant:	Two Turbomeca Turmo 3-C4
Thrust:	970kw (1300 SHP) each
Length:	14.08 metres
Width:	3.00 metres
Height:	4.535 metres
Rotor Span:	15.09 metres
Max AUW:	7,000kg (7,400kg for specific operational tasks)
Max Speed:	147kts (170mph)
Max Altitude:	10,000ft





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ASRAAM

Advanced Short Range Air-to-Air Missile

Aircraft

Tornado F3
Eurofighter

ASRAAM is a high speed, high agility, next generation, heat-seeking, air-to-air missile. Designed as a fire-and-forget missile, it is able to counter intermittent target obscuration in cloud as well as sophisticated IR countermeasures. Although ASRAAM is predominantly for use in the within-visual-range (WVR) arena, it also has a capability in the beyond-visible-range (BVR) arena. The missile uses an imaging IR seeker (manufactured by Raytheon in the USA) and will equip Tornado F3 and Eurofighter fleets.

ASRAAM is the world's first IR missile to enter service using a staring array detector, which detects the whole target 'scene'. The actual picture is very similar to a monochrome TV picture, and gives the missile excellent long-range target acquisition capability and enhanced performance against any employed countermeasures.

In a typical WVR engagement the missile is slaved to the target either visually or by aircraft sensors. The missile is then launched

and following release it accelerates to speeds in excess of Mach 3 whilst being guided to the target using its IR seeker. The missile can be fired at very high off-boresight angles, in either lock-before or lock-after launch modes. Because the missile has a fire-and-forget capability it allows the pilot to engage multiple targets with multiple missiles at the same time.

Specification

Primary Function:	Air-to-air Infrared missile
Length:	2.9m
Launch Weight:	87kg
Diameter:	16.6cm
Range:	Over 10nm
Speed:	Mach 3.5+
Guidance System:	IR staring array with modern autopilot





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AMRAAM

Advanced Medium Range Air-to-Air Missile

Aircraft

Tornado F3
Eurofighter

The AIM-120 advanced medium-range air-to-air missile (AMRAAM) is a new generation air-to-air missile built by the US Company Raytheon. The AMRAAM was initially procured for the Royal Navy's Sea Harrier; however, it was subsequently integrated onto the Tornado F3 as an enhancement to its Beyond Visual Range (BVR) capability. Eurofighter will also be equipped with AMRAAM when it enters RAF service. AMRAAM has an all-weather capability and is scheduled to be operational in the RAF beyond 2010.

AMRAAM is faster than Skyflash, which it replaces on the F3, and incorporates an active radar with an inertial reference unit and microcomputer system. This makes the missile less dependent upon the fire-control radar of the firing aircraft. Once the missile closes on a target, its active radar guides it to intercept, enabling the pilot to aim and fire several missiles simultaneously at multiple targets.

In a typical BVR engagement the missile is launched and guided

by inertial navigation, with command guidance updates from the firing aircraft via the data link. The missile then enters the terminal phase where its own radar detects the target and guides it to impact. In short-range mode, the missile can be launched 'active-off-the-rail', where the missile radar detects the target immediately after launch.

Specification

Primary Function:	Air-to-air Beyond Visual Range
Length:	3.66m
Launch Weight:	150.75kg
Diameter:	17.78cm
Wingspan:	52.58cm
Range:	Over 20 miles
Speed:	Mach 2.5+
Guidance System:	Active radar terminal/Inertial mid-course





Equipment Factsheets

SKYFLASH

Aircraft

Tornado F3

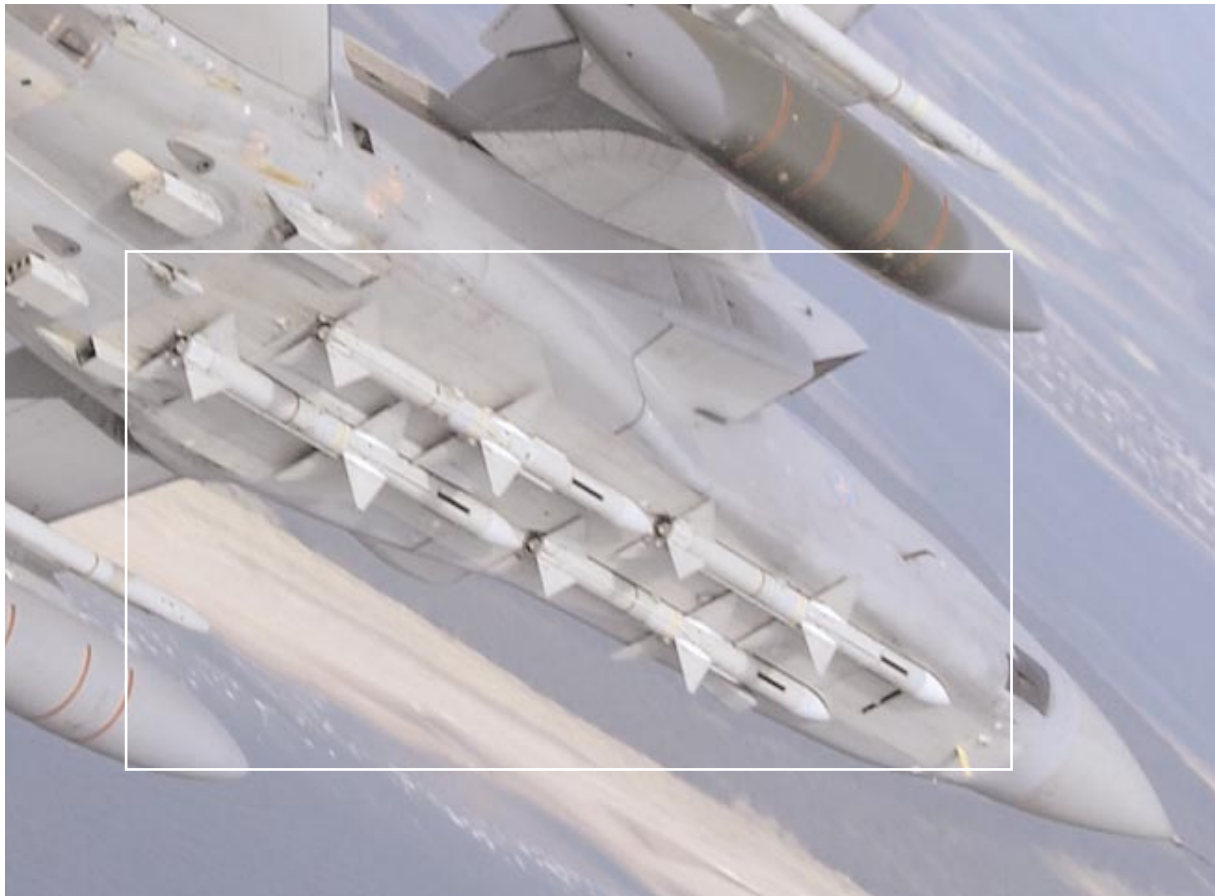
The Skyflash is a supersonic, medium range, air-to-air missile developed by the UK from the American AIM-7 Sparrow missile. The latest version of the missile has a boost-sustain, solid fuel rocket motor giving it a greater range than previous versions. The missile is capable of intercepting and destroying enemy targets in all weather conditions, with the ability to 'snap-up' or 'snap-down' to engage targets at ultra-high or low-level. It discriminates between separate target groups and can operate in a variety of countermeasure environments.

The missiles on the F3 are recessed into the underside of the aircraft and are launched by being forced down into the airflow on large rams. The missile utilises semi-active homing where the launch aircraft illuminates the target and the missile homes on the reflected energy. This semi-active guidance limits the launch aircraft's ability to manoeuvre until missile impact.

In a typical BVR engagement the missile is launched and semi-actively guides to the target. The missile has a proximity fuse, which detonates the warhead when it is close to the target. However, Skyflash can also be employed at shorter ranges, where the missile is optimised to ensure quick reaction times and maximum manoeuvrability after it has been launched.

Specification

Primary Function:	Air-to-air Beyond-Visual-Range
Length:	3.66m
Launch Weight:	208.24kg
Diameter:	20.3cm
Wingspan:	102cm
Range:	Over 20 miles
Speed:	Mach 2+
Guidance System:	Active radar terminal/Inertial midcourse





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AIM-9 SIDEWINDER

Aircraft

Tornado GR4 and F3
Harrier
Jaguar
Hawk
Nimrod
Eurofighter

The AIM-9 Sidewinder is a heat-seeking, short-range, air-to-air missile capable of operation from a vast array of aircraft types. Its main components are an IR homing guidance section, an active optical target detector, a high-explosive warhead and a rocket motor. The guidance section enables the missile to home in on the engine exhaust of target aircraft. The IR seeker permits the pilot to launch the missile then leave the area, or take evasive action, while the missile guides itself to the target.

The Sidewinder is the most widely used air-to-air missile in the world and is one of the oldest, least expensive and most successful missiles ever produced. It has been continually updated over the years and the AIM-9L and AIM-9M versions used by the RAF have a much-improved performance against IR decoys such as aircraft defensive flares.

The Sidewinder is a within-visual-range missile and would typically be slaved onto a target either manually by the pilot or using one of the aircraft's sensors. It is a 'dogfight' missile and so launches and arms itself very quickly, thus allowing it to be employed at very short range. Once launched, the missile is guided to the target using IR homing and then detonates once the target is inside the missile's lethal radius. Sidewinder is a fire-and-forget missile, allowing the pilot to fire multiple missiles at different targets.

Specification

Primary Function:	Air-to-air Infrared missile
Length:	2.87m
Launch Weight:	84.28kg
Diameter:	12.7cm
Wingspan:	63cm
Range:	Over 6nm
Motor:	Single-stage, solid-propellant rocket motor
Speed:	Mach 3+
Guidance System:	IR Reticule seeker with autopilot





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ALARM

Air Launched Anti-Radiation Missile

Aircraft

Tornado GR4

The Air Launched Anti-Radiation Missile (ALARM) is designed to destroy or suppress the use of enemy ground-based air defence radar systems. It first saw service during the Gulf War and has been in the weapon inventory of the Tornado ground attack aircraft ever since. Various combinations of between two and seven missiles can be carried on each aircraft. Since its original entry into service, radars have become increasingly more sophisticated in their ability to avoid detection and attack by anti-radiation weapons such as ALARM; consequently, the missile is currently being upgraded and the improved capability ALARM is now entering service with the RAF's Tornado squadrons.

The ALARM operates by homing onto the radar energy being emitted by the target radar in one of two ways. If the target is active and emitting radiation when the missile is launched, the ALARM will fly direct to the target. However, if the targeted radar is quiet when the missile is launched, the ALARM has the ability to loiter in the area until the radar switches on and then home onto the target.

Specification

Primary Function:	Air-to-ground tactical missile
Length:	430cm (169 inches)
Launch Weight:	265 kilograms (583 pounds)
Diameter:	244mm (9.6inches)
Guidance System:	Passive Radar Homing





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MAVERICK

Aircraft

Harrier

The Maverick missile, which is used by the Harrier GR7 as an anti-armour weapon, entered RAF service in early 2001 and is the latest addition to the RAF's inventory. The missile has a number of seeker heads available for use in a variety of operational scenarios. The RAF version carries an Imaging Infrared (IIR) seeker head, which allows the missile to be employed both by day and by night and in poor atmospheric conditions. The Maverick missile will complement the Brimstone missile that is about to enter RAF service with a Millimetric Wave all-weather seeker head.

The Maverick is a fire-and-forget weapon, which sends a picture from the IIR seeker head to the Multi-Purpose Colour Display (MPCD)

in the cockpit. The pilot identifies the target, locks the missile onto it and fires the missile once the target is in range. The Maverick will then home onto the target while the delivery aircraft carries out escape manoeuvres, thus minimising its exposure to enemy air defence systems.

Specification

Primary Function:	Air-to-ground tactical missile
Length:	259cm (102 inches)
Launch Weight:	280 kilograms (630 pounds)
Diameter:	31cm (12 inches)
Guidance System:	Imaging Infrared Seeker





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CRV-7 ROCKETS

Aircraft

Harrier
Jaguar

The CRV-7 is a multiple-function rocket weapon, which uses modular warheads fitted to a universal rocket motor. Each pod contains 17 rockets, which are ripple launched together at the target. The rockets are fitted with a high-explosive armour-piercing warhead for attack on

lightly protected installations and ships, or a Kinetic Energy Penetrator, which contains no explosives, but relies on its kinetic energy to destroy armoured targets. The CRV-7 rockets have a very high impact speed and may be fired up to 3 nm from the target.

Specification

Length: 4.3ft (1.3 m)
Weight: 24lb (11 kg)





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TIALD

Thermal Imaging Airborne Laser Designator

Aircraft

Harrier
Tornado GR4
Jaguar

TIALD is a second-generation laser designator pod, which initially entered service when it was still in the development stage in the Gulf War in 1991. The success of precision-guided weapons during the War showed there was a greater emphasis on the need to employ such weapons, which led to a requirement for more TIALD pods and for them to be used on a number of different aircraft platforms. The pod was modified to provide a TV sensor in addition to the Infrared sensor and following a further number of upgrades the current 400-Series pod is now flown on Tornado, Harrier and Jaguar ground-attack aircraft. A further upgrade is planned to the pod sensors and electronics, which will see it re-designated as the 500-Series pod.

The TIALD pod is initially pointed at the target by the aircraft navigation system. Once the pilot or navigator has identified the target on his display he will position it underneath the aiming cross and switch the pod into automatic tracking mode. At the appropriate moment during the attack the TIALD laser is turned on, which provides the bomb's guidance system with the information it requires to complete the attack. The whole process is recorded by the aircraft system and can be replayed after landing for analysis to assess the success of the mission.

Specification

Primary Function:	Laser Designator Pod
Length:	2900mm (114 inches)
Weight:	230 kilograms (507 pounds)
Diameter:	305mm (12 inches)





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1000LB GENERAL PURPOSE BOMB

Aircraft

Tornado GR1/4
Harrier
Jaguar
Eurofighter

The 1000lb general-purpose bomb has a unitary warhead, providing blast and fragmentation effects. It is a simple and robust design, little changed from those weapons released in World War II and there is a relatively large quantity of these weapons in the UK inventory. An unguided 1000lb general-purpose bomb is sometimes referred to as a 'dumb' bomb and is fitted either with a ballistic or a retard tail. A ballistic tail (known as slick) allows the weapon to be delivered with a degree of stand-off, whilst a retard tail allows the weapon to be delivered in close proximity to the target, making it more accurate. The retard tail contains a parachute that permits the delivery aircraft to escape the effects of its own weapons.

The 1000lb general-purpose bomb can be detonated in one of 3 modes: airburst, impact or post-impact delay. In airburst mode, the

weapon is fused to detonate a short distance above the ground, which provides the maximum fragmentation effect and is therefore suitable for attacking unprotected targets. In impact mode, the bomb is detonated as it reaches the target, which optimises the weapon's blast effects against unprotected installations. Post-impact delay mode enables the weapon to be fused to detonate after a very short delay in order to allow the weapon to penetrate the target structure. The delay is varied for each specific target to obtain maximum penetration of the weapon before detonation.

The 1000lb general-purpose bomb is also used as the warhead for the UK Paveway II laser guided bomb, and the new Enhanced Paveway II satellite guided bomb.

Specifications

Length:	6.5ft (2.0m)
Weight:	1000lb (454 kg)





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CLUSTER BOMBS - BL755 / IBL755 / RBL755

Aircraft

Tornado GR1/4
Harrier
Jaguar
Eurofighter

The RAF's inventory of cluster bombs look like normal bombs when attached to the aircraft, but when they are released they break open in the airflow and release 147 'bomblets' into the target area. The BL755 bomb dispenses its bomblets into the airflow shortly after the weapon leaves the aircraft, and on reaching their target they produce a plasma jet that can burn a hole through armour. In addition, the bomblet casing breaks into fragments that are capable of destroying soft-skinned vehicles and equipment. Recent improvements to the bomblets, with a designation of IBL755, include better reliability and

armour penetration capability. Both BL and IBL755 are delivered from low-level attacks.

RBL755 is a modification of the original BL755 to give the weapon an anti-armour capability when released from a medium-level attack. A ground-detecting sensor in the tail causes the bomblets to be dispensed after the weapon falls to a height just above the target.

The BL/IBL/RBL755 family of weapons are unguided. The bomblets are distributed in an approximately oval shape around the target with each weapon covering an area of approximately 150 metres by 60 metres.

Specification

Length: 8.0ft (2.45 m)
Weight: 600lb (272 kg)





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PAVEWAY LASER GUIDED BOMB (LGB)

Paveway II

Aircraft

Tornado GR1/4, Harrier, Jaguar, Eurofighter

The Paveway II LGB is essentially a 1000lb general purpose bomb with a seeker head fitted to the nose and with movable guide fins fitted to the tail. It is sometimes referred to as a 'smart' weapon as the precision-guidance package, produced in the United States, provides greatly improved accuracy over an unguided bomb. A laser is used to designate the required target and the bomb's guidance package then steers the weapon to the source of the reflected laser energy. Laser designation may be provided from the air using the Thermal Imaging Airborne Laser Designator (TIALD) pod, or from forces on the ground using a laser target designator. However, cloud cover over the target may obstruct the laser and prevent weapon guidance.

Specification

Length: 12.1ft (3.68m)
Weight: 1140lb (520 kg)

Paveway III

Aircraft

Tornado GR1/4, Harrier, Jaguar, Eurofighter

The Paveway III is a LGB fitted with a 2000lb hardened target penetrator warhead, which is steered by an improved precision-guidance package that follows the laser designation of a target. However, unlike the Paveway II, this weapon uses proportional guidance - the control canards on the front of the bomb move only the exact amount necessary to guide the weapon. This conserves energy, improves accuracy and increases the range of the weapon, thus allowing delivery aircraft to engage their targets with greater stand-off. When the weapon is released it flies a pre-programmed autopilot profile into the target area, using the energy given to it by the releasing aircraft.

Computer-controlled trajectory shaping during the final stage of the attack enables the Paveway III to penetrate a greater depth of reinforced concrete than Paveway II, which makes the Paveway III a very effective weapon against hardened targets.

Specification

Length: 14.4ft (4.39m)
Weight: 2490lb (1130 kg)

Enhanced Paveway

Aircraft

Tornado GR4

Lessons learned during the Kosovo conflict identified the requirement for the RAF to obtain a weapon to satisfy all-weather 24-hour tasking. The Enhanced Paveway (EPW) family of weapons was procured to meet this requirement and the EPWII entered service in 2001 and the larger EPWIII entered service in late 2002. Both EPWII and EPWIII are based on their laser-guided bomb variants and utilise the same warheads and fin sections. However, the EPW weapons have a modified guidance section to accommodate a Global Positioning System Aided Inertial Navigation System (GAINS).

Once released from the launch aircraft, EPW is fully autonomous in cases where cloud cover over the target may obstruct the laser and prevent weapon guidance. In these instances, it is steered to the target using satellite based Global Positioning System (GPS) information and guidance from its on-board inertial navigation unit. Where good weather permits, or rules of engagement are more stringent, crews may still guide the weapon to the assigned target using the legacy laser guidance contained within both weapons. Laser designation may be provided from the air using the Thermal Imaging Airborne Laser Designator (TIALD) pod, or from forces on the ground using a laser target designator. The EPWII includes a 1000lb general-purpose warhead; the EPWIII includes the 2000lb-class penetrator warhead. Both EPW variants have demonstrated the same degree of accuracy in their legacy laser mode (without the use of GAINS) as their predecessors, and highly accurate results have been achieved on trials using the GPS autonomous mode. The performance of this family of weapons will offer additional flexibility and provide increased stand-off range and improved launch aircraft survivability.





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RAPTOR

Reconnaissance Airborne Pod for TORnado

Built by BF Goodrich and fitted to the Tornado GR4 ac, RAPTOR is an Electro-Optical and Infra-Red pod with the ability to display images in the cockpit and to transmit these images via Data-Link to a ground station. Imagery is also recorded in the aircraft for post-flight analysis. The RAPTOR system is capable of imaging pre-planned targets, or 'target of opportunity' points of interest, and can image over 200 separate points in one sortie. The stand-off range of the sensor allows the points of interest to be imaged whilst the ac remains outside the area of highest threat. The RAPTOR pod is similar in size to a Tornado underwing fuel tank. The system has been in use operationally since Autumn 2002 and is performing extremely well. A total of five pods have been delivered to the RAF, with an additional three expected by the end of 2003.





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STORM SHADOW

Aircraft

Tornado GR4
Eurofighter Typhoon

Storm Shadow is a conventionally armed, long-range, stand-off, precision air to ground missile designed to neutralise high value targets while avoiding collateral damage. The missile can be deployed at day or night, in most weather and operational conditions, and has been developed to attack and destroy a wide variety of high value static targets. Typically, Storm Shadow will be used against well-defended, infrastructure targets such as port facilities, control centres, bunkers, missile sites, airfields and bridges that would otherwise require several aircraft and missions during the early phase of a conflict when air-superiority might not have been achieved.

Storm Shadow has been integrated on to Tornado GR4 and will be integrated to Eurofighter Typhoon when the aircraft enters service. The Storm Shadow missile is designed to have a long range, and to be used in a fire and forget mode. Target co-ordinates for the mission are programmed on the ground before flight, and after launch, the missile will find its way to the intended target autonomously allowing the launch aircraft to keep well clear of danger from enemy air defences.

Storm Shadow flies at an optimum cruising altitude, navigating by both digital terrain profile matching as well as GPS (Global Positioning

System) and inputs from an Inertial Measurement Unit. This multiple navigation system gives Storm Shadow exceptional navigational precision.

During the final target approach, an automatic target recognition system compares the actual scene with the programmed memorised scene. The designated target can therefore be positively identified, ensuring high terminal accuracy with the reduction of collateral damage.

Specification

Primary Function:	air-to-ground precision stand-off missile
Length:	5.10m
Launch Weight:	1,300kg (approx)
Wing Span:	3m
Range:	over 250km
Speed:	nominal Mach 0.8
Propulsion:	turbojet
Navigation:	inertial, GPS, with terrain profile matching

