

ARCHIVED REPORT

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BAE Systems Hawk

Outlook

- BAE Systems delivered the final Hawk trainer in 2022
- Recent advanced jet trainer contracts have gone to competing models
- Focus of Hawk program is now on maintaining and upgrading in-service fleet

Orientation

Description. Single-engine, two-seat trainer and single-seat light attack aircraft.

Sponsor. U.K. Ministry of Defence.

Licensees. Valmet Oy, Valmet Corp, Finland; Hunter Aerospace, Australia (assembly only); Federal Aircraft Factory, Switzerland; Hindustan Aeronautics Ltd, India.

Status. Production of new aircraft terminated; maintenance and support continues

Total Produced. Approximately 1,074 aircraft, including all variants, produced through 2023.

Application. Advanced jet training and light attack missions.

Price Range. Hawk 120/128 LIFT, estimated at \$27.5 million.



Indian Air Force Hawk Advanced Jet Trainer

Source: BAE Systems

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Subcontractor

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Cobham Ltd	http://www.cobham.com , 41-43 Basepoint Business Centre, Aviation Business Park, Christchurch, Dorset, United Kingdom, Tel: + 44 1202 822 020, Email: info@cobham.com (Weapon Carriage & Release Equipment)
Collins Aerospace Systems, Sensors & Integrated Systems	http://www.collinsaerospace.com , 100 Panton Rd, Vergennes, VT 05491-1008 United States, Tel: + 1 (802) 477-4000, Fax: + 1 (802) 877-4111 (Flight Instruments)
Collins Aerospace Systems, Interiors, Lighting Systems	http://www.collinsaerospace.com , Bertramstrasse 8, Lippstadt, Germany, Tel: + 49 2941 767 60, Fax: + 49 2941 767 6 8432 (Interior & Exterior Lighting Equipment)
Collins Aerospace Systems, Sensors & Integrated Systems	http://www.collinsaerospace.com , Clitford Rd, Southway, Plymouth, Devonshire, United Kingdom, Tel: + 44 1752 695695, Fax: + 44 1752 722095 (Air Speed Indicator)
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GKN Aerospace - Cowes	http://www.gknaerospace.com , Ferry Rd, East Cowes, Isle of Wight, United Kingdom, Tel: + 44 1983 294 101, Fax: + 44 1983 291 006 (Fuel Cell)
Hamble Aerostructures	http://www.aernnova.com/en/discover-hamble-aerostructures/ , Kings Ave, Hamble-le-Rice, Hampshire, United Kingdom, Tel: + 44 23 8074 4000 (Nose Cone; Pylon; External Fuel Tank; Chemically Milled Components - Unspecified; Gun Pod)
Honeywell Aerospace (UK)	http://aerospace.honeywell.com , 1 Forest Rd, Unit B, Bracknell, Feltham, United Kingdom, Tel: + 44 03144 656000, Fax: + 44 01344 656240 (Altitude Indicator)
Honeywell Aerospace Yeovil	http://www.honeywell.com , Bunford Ln, Yeovil, Somerset, United Kingdom, Tel: + 44 1935 457 181, Fax: + 44 1935 427 600, Email: sales.yeovil@honeywell.com (Environmental Control System; Oxygen & Hydraulic System Components; Oxygen System Components; Hydraulic System Components)
Leonardo Airborne & Space Systems	http://uk.leonardo.com , Sigma House, Christopher Martin Rd, Basildon, Essex, United Kingdom, Tel: + 44 1268 823 400, Fax: + 44 1268 883 140 (Gyroscope; ISIS Lead-Computing Sight)
Lockheed Martin UK	http://www.lockheedmartin.co.uk , 56 Lafone St, London, United Kingdom (Landing Gear; Powered Flying Control; Landing Gear Hydraulic System)
Martin-Baker Aircraft Co Ltd	http://www.martin-baker.com , Higher Denham, Buckinghamshire, United Kingdom, Tel: + 44 1895 832214, Fax: + 44 1895 832587, Email: information@martin-baker.co.uk (Mk 10B Ejection System; Rocket Pack System)
Northrop Grumman Italia SpA	http://www.northropgrumman.it , Via Pontina, Km 27800, Pomezia, Italy, Tel: + 39 06 911 91, Email: marketing@northropgrumman.it (AHRs)
Parker Meggitt Avionics	http://www.meggitt-avionics.co.uk , 20-26 Barnes Wallis Rd, Units 2-5, Titchfield Park, Fareham, Hampshire, United Kingdom, Tel: + 44 1489 483 300, Fax: + 44 1489 483 416 (Fatigue Load Meter; Instruments; Pressure Gauge; Instruments & Pressure)
Raytheon UK	http://www.raytheon.com/uk , Kao One, Kao Park, Harlow, Essex, United Kingdom, Tel: + 44 1279 426 862, Fax: + 44 1279 410413, Email: corporatecommunications@raytheon.co.uk (Mk 10A IFF Transponders for Finnish Aircraft; ILS & TACAN)
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Thales UK, HQ	http://www.thalesgroup.com, 350 Longwater Ave, Green Park, Reading, United Kingdom, Tel: + 44 118 943 4500 (ARC-164 UHF Radio Transceiver)
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Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 75 Glen Road, Suite 302, Sandy Hook, CT 06482, USA; rich.pettibone@forecast1.com

Technical Data

(RAF Hawk T2)

Design Features. Fully aerobatic jet trainer with swept vertical stabilizer and slightly downward-canted, swept horizontal stabilizers. The airframe is aluminum, with minimal use of composites. subsequently adapted to light strike and air combat roles. Aircraft is a conventional low-wing monoplane

	<u>Metric</u>	<u>U.S.</u>
Dimensions		
Length	12.43 m	40.7 ft
Height	3.98 m	13.1 ft
Wingspan	9.94 m	32.6 ft
Wing area	16.7 m ²	179.6 sq ft

Weight		
Empty	4,570 kg	10,075 lb
Max takeoff weight	9,100 kg	20,062 lb
Max payload	3,000 kg	6,614 lb

Performance		
Max level speed (sea level)	1,037 kmph	560 kt
Max rate of climb at sea level	3,597 m/min	11,800 fpm
Service ceiling	13,565 m	44,500 ft
G limits (internal fuel)	+8/-4 g	+8/-4 g

Propulsion
Hawk 128 AJT (1) Adour Mk 951 unaugmented turbofan, 6,500 lbst (29 kN) with Full Authority Digital Engine Control (FADEC) and target TBO of 4,000 hours.

Crew
Seating for two crew in tandem.

Variants/Upgrades

Hawk T.1, 1A, 50, 60 Series. First-generation two-seat trainers, powered by a Rolls-Royce Turbomeca Adour RT172 unaugmented turbofan, with thrust level depending on model.

Hawk 100. Developed from the Series 60 and incorporating a laser rangefinder, head-up display (HUD), radar warning receiver (RWR), inertial nav unit, hands-on throttle-and-stick (HOTAS), and multipurpose head-down display. Powered by Adour RT172 Mk 871 unaugmented turbofan, 6,270 lbst (27.88 kN). First flight occurred in February 1992.

Hybrid Hawk/Mk 67. Combines the engine and avionics of the Mk 60 with the nose and wing of the Series 100 two-seat light attack variant. The Republic of Korea ordered 20 in January 1990.

T-45 Goshawk. Two-seat advanced aviator training aircraft for the U.S. Navy. Codeveloped by McDonnell Douglas and British Aerospace. Total of 223 produced.

Hawk 200. Single-seat, dedicated light fighter/ground attack aircraft. Armed with two 25mm Aden cannon and equipped with multicolor displays, a passive warning system, Westinghouse APG-66H multimode

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radar, chaff dispensers, electronic countermeasures, and secure voice communications systems. Four underwing pylons accommodate a total of up to 3,500 kilograms (7,700 lb) of external stores. First flight in May 1986. Ordered by Indonesia, Malaysia, and Oman. Only 62 built.

Hawk T2/128 AJT/LIFT. Advanced jet trainer (also known as the "Lead-In Fighter Trainer," or LIFT, variant or as the "T2" or "T.Mk 2") derived from the Hawk 100 series. Upgrades include a more powerful Adour Mk 951 engine, a new glass cockpit similar to those found in modern fighters, and HOTAS controls. The U.K. MoD ordered 28 Mk 128s in October 2006. Two of the aircraft were flight test aircraft that were later converted to production-standard trainers.

Advanced Hawk Demonstrator. A modified Mk 120 prototype fitted with a new wing and updated cockpit avionics, plus additional combat capability. BAE Systems jointly funded the modifications with India's Hindustan Aeronautics Ltd to meet a potential

Indian requirement for more Hawk trainers. Other modifications include a single leading-edge slat that runs nearly the length of the wing to provide lower approach and landing speeds, improved stability at high angles of attack, a higher sustained turning rate, and a smaller turning radius. Elongating the vertical stabilizer by 9 inches reduces fuselage blanking in high-alpha maneuvering, and a new yaw-axis stability augmentation system prevents potentially adverse yaw.

Inside the cockpit, BAE Systems installed a large central display that can visually model the displays in other aircraft, including analog gauges found in older-generation aircraft. Armament could include up to 6,614 pounds (3,000 kg) of ordnance.

In February 2017, the Indian Air Force said it would not order the Advanced Hawk, leaving the future of the program in doubt.

The demonstrator made its first flight in June 2017, and the configuration could eventually enter service as part of a retrofit and upgrade program for operators.

Program Review

Background. The HS.1182 Hawk was chosen in October 1971 to replace the RAF's Jet Provost, Gnat, and Hunter aircraft in light attack and advanced pilot training roles. BAE, the result of the 1977 nationalized merger of British Aircraft Corp, Hawker Siddeley Aviation, Scottish Aviation, and Hawker Siddeley Dynamics, also offered ground attack variants for the export market.

In 1972, the British Ministry of Defence placed orders for 175 production aircraft plus a single pre-production unit. There were no prototypes as such; the first three production aircraft served in the development program.

Indian Production

India had been seeking an advanced jet trainer for more than 20 years. It selected the Hawk in the mid-1980s but did not sign a contract until 2004, when it ordered 66 new Hawk Mk 132s. The deal provided for 24 aircraft to be built in Britain, and the remaining 42 under license in India by Hindustan Aeronautics Ltd (HAL). BAE Systems completed delivery of all 24 Hawks built in the U.K. in early 2009, and the first HAL-assembled Hawk was handed over to the Indian Air Force in August 2008.

Production was slow at first. By December 2009, only five aircraft had been delivered, and the Indian Air Force complained loudly about the delay in receiving new trainers. During the latter part of 2009, it seemed

as if the IAF was ready to look elsewhere for trainers. The Indian MoD went so far as to issue a Request for Information to a number of other foreign trainer manufacturers.

However, by July 2011 HAL had turned out 28 aircraft, and the production rate was running at more than one aircraft per month.

The Indian government signed an agreement with BAE Systems in July 2010 to extend production of the HAL-built Hawk 132 by 57 jets (40 for the IAF and 17 for the Indian Navy). An order for an additional 20 aircraft to equip the IAF's Surya Kiran aerobatic display team was approved by India's Defence Acquisitions Council in November 2011, but as of December 2020, the Indian government had yet to sign a contract.

Broughton Line Closed

BAE Systems announced the impending closure of its Broughton, U.K., facility, where the Hawk is manufactured, in the fall of 2011. A spokesman told local media in November of that year that if BAE Systems received a new order for the Hawk, the work would be performed at BAE's facilities in Samlesbury and Warton, in Lancashire. The move to end production at Broughton was part of a wider restructuring that resulted from a cut in the production rate of the Eurofighter Typhoon, which BAE Systems also builds.

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T-X Bid Out of Reach

The Pentagon plans to buy hundreds of advanced jet trainers to replace elderly Northrop T-38s in the U.S. Air Force's inventory.

The Hawk once seemed like an excellent candidate to fill the requirement. BAE Systems had teamed up with Northrop Grumman to offer the Hawk for the program. Initially, BAE Systems was to serve as prime contractor, with Northrop Grumman serving as its manufacturing partner, building the aircraft on a production line in the U.S. However, in July 2014, the team decided to leverage Northrop Grumman's position as a major U.S. prime by making it the prime contractor for the bid. L-3 Link Simulation & Training and Rolls-Royce also joined the Hawk Advanced Jet Training System (AJTS) team.

The USAF released an initial Request for Information in March 2015 calling for a minimum sustained *g*-force rating of 6.5, with an objective of 7.5*g*. These figures are higher than the sustained *g* performance of both the F-35A Joint Strike Fighter and the T-38, and far above the 4.5*g* sustained requirement the Hawk was designed to meet.

In February 2017, Northrop Grumman and BAE Systems dropped out of the race for the T-X contract.

Boeing later won the contract in 2018 with a clean-sheet design.

Recent Contracts

Saudi Arabia signed a new contract with BAE Systems in May 2012 under the Saudi-British Defence Cooperation Program to support future aircrew training requirements. The deal, worth GBP1.6 billion (\$2.5 billion), includes the provision of 22 Hawk advanced jet trainers and 55 PC-21s. Deliveries of the Saudi Hawks, manufactured in Britain, ran during 2016-17. The new Saudi aircraft, which carry the designation Mk 165, are similar to the U.K.'s advanced jet trainers but feature a different datalink and radio system.

The Saudis signed for an additional 22 aircraft in February 2016. Delivery of the second tranche of aircraft was delayed by the Saudi government's decision to assemble the aircraft locally rather than in the U.K. The first Saudi-assembled Hawk rolled out at a facility in Dhahran in April 2019.

Oman ordered eight Hawk AJTs (i.e., Mk 128s) in December 2012. The order was part of a wider deal that included an order for 12 Eurofighter Typhoons.

BAE secured a firm order from **Qatar** for nine aircraft in June 2018. Deliveries began in 2021 and wrapped up in 2022.

Worldwide Distribution/Inventories

(as of December 2023)

Operator	Designation	Quantity
Australia Air Force	Hawk 127	33
Bahrain Air Force	Hawk 129	6
Canada CS	Hawk 115	17
Finland Air Force	Hawk Mk 51/51A	17
Finland Air Force	Hawk Mk 66	18
India Air Force	Hawk Mk 132	104*
India Navy	Hawk Mk 132	17*
Indonesia Air Force	Hawk 100	7
Indonesia Air Force	Hawk Mk 209	20
Kuwait Air Force	Mk 64	6
Malaysia Air Force	Hawk 108	4
Malaysia Air Force	Hawk 208	12
Oman Air Force	Hawk 100	3
Oman Air Force	Hawk 128	8
Oman Air Force	Hawk 200	10

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Operator	Designation	Quantity
Qatar Air Force	Hawk 127	9
Saudi Arabia Air Force	Hawk 65/65A	39
Saudi Arabia Air Force	Hawk 165	54*
South Africa Air Force	Hawk 128	23
United Arab Emirates Air Force	Hawk 102	12
United Kingdom Air Force	Hawk 128	28
United Kingdom Air Force (Red Arrows)	Hawk T.Mk 1	16*
United States Navy	T-45C	189

* Estimate

Forecast Rationale

BAE Systems completed deliveries of nine Hawk trainers to Qatar in 2022, leaving its order book depleted after it was unable to find new customers in recent years.

The Hawk competes primarily against the Leonardo M-346, Korea Aerospace Industries T-50, and Yakovlev Yak-130. It is the oldest design among the four aircraft, and its appeal in recent years has been limited to a shrinking number of Middle Eastern kingdoms. Boeing is developing the T-7A jet trainer for the U.S. Air Force's T-X trainer replacement program, and this all-new model is likely to dominate the jet trainer market once it enters service.

Meanwhile, HAL has suspended licensed production of a version of the Hawk 100 in India. The manufacturer delivered the last of 123 aircraft ordered by the Indian government in 2019. We once expected the Indian government to order more aircraft soon, either to expand the training fleet or to equip the Indian Air Force's Surya Kiran aerobatic display team, but a new order has yet to come through. While the Indian government may restart production of the Hawk in India at some point, we are currently not forecasting production of more aircraft at HAL.