# Boeing/BAE Systems T-45 - Archived 2/2010

## Outlook

- NAVAIR reported final T-45C for U.S. Navy delivered in late October 2009
- Navy may acquire additional units in the form of a proposed T-45D model, but no firm plans announced for a new requirement
- New orders are possible, but currently no backlog for the aircraft in either United States or international market

## Orientation

**Description.** Single-engine, two-seat advanced naval flight training aircraft.

**Sponsor.** U.S. Naval Air Systems Command, Washington, DC, USA.

**Status.** Production of the T-45C ended in 2009.

**Total Produced.** Through 2009, two prototypes and approximately 221 production aircraft were produced, including 83 T-45A models and 138 T-45Cs.

**Application.** Advanced pilot training and training for aircraft carrier operations.

**Price Range.** Average procurement cost, $26.62 million.

T-45 Goshawk

Source: U.S. Navy

Boeing/BAE Systems T-45

# Contractors

## Prime

| | |
|---|---|
| **Boeing Integrated Defense Systems** | http://www.boeing.com, PO Box 516, St Louis, MO 63166 United States, Tel: + 1 (314) 232-0232, Fax: + 1 (314) 777-1096, Prime |

## Subcontractor

| | |
|---|---|
| **BAE Systems Military Air Solutions** | http://www.baesystems.com, Warton Aerodrome, Preston, PR4 1AX Lancashire, United Kingdom, Tel: + 44 772 633333, Fax: + 44 772 634724, Email: media@baesystems.com (Fuselage Section; Wing Set; Main Landing Gear) |
| **Eaton Aerospace - Hydraulic Systems Division** | http://www.aerospace.eaton.com, 5353 Highland Dr, Jackson, MS 39206-3449 United States, Tel: + 1 (601) 981-2811, Fax: + 1 (601) 987-5255 (Yaw Damper Servo Actuator) |
| **Elbit Systems Ltd** | http://www.elbitsystems.com, Advanced Technology Center, PO Box 539, Haifa, 31053 Israel, Tel: + 972 4 831 5315, Fax: + 972 4 855 0002, Email: elbit-systems@elbit.co.il (Multifunction Cockpit Display) |
| **Fairey Hydraulics Ltd** | Claverham, Bristol, BS19 4NF United Kingdom, Tel: + 44 1934 835224, Fax: + 44 1934 835337 (Landing Gear Door Actuator) |
| **Goodrich Corp** | http://www.goodrich.com, Four Coliseum Centre, 2730 W Tyvola Rd, Charlotte, NC 28217-4578 United States, Tel: + 1 (704) 423-7000, Fax: + 1 (704) 423-7002, Email: corporate.communications@goodrich.com (Wheel & Brakes) |
| **Martin-Baker Aircraft Co Ltd** | http://www.martin-baker.com, Higher Denham, Near Uxbridge, UB9 5AJ Middlesex, United Kingdom, Tel: + 44 0 1895 832214, Fax: + 44 0 1895 832587, Email: information@martin-baker.co.uk (Ejection Seats) |
| **Rolls-Royce plc** | http://www.rolls-royce.com, 65 Buckingham Gate, London, SW1E 6AT United Kingdom, Tel: + 44 20 7222 9020, Fax: + 44 20 7227 9170 (Adour F405 Turbofan) |

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# Technical Data

**Design Features.** BAE Systems Hawk modified for aircraft carrier operation with strengthened landing gear and provisions for a nosewheel-tow catapult launch, an arrestor hook, and avionics and cockpit displays compatible with future Navy operational aircraft. Equipped with two fuselage side airbrakes, carbon-fiber composites for the nose cone, equipment bay access doors, and nosewheel doors, and general structural strengthening to accommodate stress of carrier operations.

| | Metric | U.S. |
|---|---|---|
| **Dimensions** | | |
| Length overall | 11.99 m | 39.34 ft |
| Height | 4.08 m | 13.39 ft |
| Wingspan | 9.39 m | 30.81 ft |
| **Weight** | | |
| Weight, empty | 4,619 kg | 10,184 lb |
| Max T-O weight | 6,363 kg | 14,028 lb |

**Performance(a)**

| | | |
|---|---|---|
| Max level speed(b) | 1,006 kmph | 543 kt |
| Service ceiling | 12,190 m | 39,993 ft |
| Ferry range(c) | 1,532 km | 826 nm |
| T-O to 15 m (50 ft) | 1,100 m | 3,610 ft |
| Design limits | +7.33/-3.0 | +7.33/-3.0 |

**Propulsion**

T45A (1) Rolls-Royce Turbomeca Adour RT172 Mk 871 two-spool, axial-flow, non-afterburning turbofan rated 26.0 kN (5,845 lbst). U.S. Navy designation is F405-RR-401. This engine is the standard on production aircraft. Prototypes were produced with the -400L rated at 5,450 lbst.

**Armament**

None, although provisions for weapons carriage are incorporated.

**Crew**

Two, seated in tandem.

(a) At maximum takeoff weight.
(b) At 2,440 meters (8,000 ft).
(c) Internal fuel only (20-min reserves).

# Variants/Upgrades

**T-45C.** Variant featuring Cockpit 21, from 84th aircraft. Two multifunction displays in each cockpit provide navigation, weapons delivery, aircraft performance, and communications data.

# Program Review

**Background.** The McDonnell Douglas (now Boeing)/ British Aerospace T-45 Goshawk is the result of a U.S. Navy program requirement known as VTXTS, which called for the development of an all-new carrier aviator training system encompassing the aircraft, simulators, electronics evaluation equipment, manuals, maintenance, and logistics support. The VTXTS would replace the Navy's Rockwell/North American T-2C Buckeye and McDonnell Douglas TA-4J Skyhawk advanced training aircraft. Concept exploration contracts were awarded in August 1980 to BAE/ McDonnell Douglas, Lockheed/Dassault-Breguet/ Dornier, Rockwell, Grumman/Beech, and Northrop/ Vought. In November 1981, the Navy selected the McDonnell Douglas design, based upon the successful and respected BAe Hawk. The program is currently referred to as the T-45TS (T-45 Training Systems). The Navy designation for the aircraft is T-45A, and the popular name is Goshawk.

McDonnell Douglas' Douglas Aircraft Co was the prime contractor and system integrator on the T-45TS program until 1989, when a decision was made to transfer all Goshawk work and responsibilities to McDonnell Aircraft, St. Louis, Missouri. McDonnell Douglas' major partners on the T-45 are British Aerospace plc as principal subcontractor, Honeywell (Sperry) for the simulators, and Rolls-Royce plc for the aircraft's Adour turbofan engine.

### *Alternative Engine*

During the early 1990s, the U.S. Navy considered an alternative powerplant for the T-45, and AlliedSignal offered its F124-GA-100. However, Rolls-Royce Turbomeca then upgraded the aircraft's F405-401, and in 1994, the Navy decided against qualifying an alternative engine.

In 1996, McDonnell Douglas selected the F124 to power its T-45A candidate for a Royal Australian Air Force (RAAF) requirement, and this engine flew in a leased T-45A that same year. At that time, the re-engined Goshawk was dropped from the RAAF competition, and the F124 was removed from the testbed aircraft. McDonnell Douglas and AlliedSignal were considering other possible markets for the F124-powered version, but the U.S. manufacturer was subsequently acquired by Boeing. Since then, Boeing has not announced any intention regarding an F124-powered T-45.

## Boeing/BAE Systems T-45

### *Glass Cockpit Fitted*

Beginning with aircraft number 84, delivered in October 1997, production T-45s are fitted with a digital glass cockpit. Retrofits of the new cockpit to earlier aircraft began in mid-1998. The upgrade included multifunction displays and the incorporation of a 1553B multiplex bus.

The Navy announced in March 2008 that it was adding a synthetic aperture radar to a limited number of T-45Cs to allow use as a trainer for weapons systems officers and crew members of Navy aircraft. The new virtual mission training system (VMTS) will emulate the capabilities of the Boeing F/A-18E/F Super Hornet's Raytheon APG-73 radar, with ground mapping, air-to-ground and air-to-air targeting modes, plus an electronic warfare training capability. The system will enter flight testing in FY10. Initial Operational Capability is scheduled for 2011.

# Funding

A total of 223 aircraft were procured through FY07. Recent and planned funding is as follows:

**U.S. FUNDING**

| | FY06 QTY | FY06 AMT | FY07 QTY | FY07 AMT | FY08 QTY | FY08 AMT | FY09 (Req) QTY | FY09 (Req) AMT |
|---|---|---|---|---|---|---|---|---|
| Proc | 6 | 233.7 | 12 | 374.8 | 0 | 32.3 | 0 | 0 |
| Mods | | 45.1 | | 35.8 | | 56.8 | | 67.7 |
| **Total** | **6** | **278.8** | **12** | **410.6** | | **89.7** | | **89.7** |

**Note:** The Navy planned no further buys after FY07. FY08 funding request covers costs associated with shutdown of aircraft production.

All $ are in millions.

# Timetable

| Month | Year | Major Development |
|---|---|---|
| May | 1978 | Preliminary study contracts let |
| Dec | 1979 | RFPs issued |
| Aug | 1980 | Concept exploration contracts let |
| Nov | 1981 | Hawk variant selected as winner |
| Feb | 1986 | Prototype construction begins |
| Apr | 1988 | First flight of initial prototype |
| Nov | 1988 | First flight of second prototype |
| Oct | 1990 | First production aircraft delivered to U.S. Navy |
| Dec | 1991 | First carrier landing |
| Jul | 1994 | OPEVAL completed |
| Jul | 1996 | USN approves Cockpit 21 installation |
| Late | 1996 | Flight tests begun with F124 engine |
| Oct | 1997 | Delivery of first Cockpit 21-equipped T-45 |
| Oct | 2009 | Production completed for USN |

# Worldwide Distribution/Inventories

| Operator | Designation | Quantity |
|---|---|---|
| United States Navy | T-45C | 219 |

# Forecast Rationale

The U.S. Navy procured its last T-45 with a 12-unit buy in FY07, and all of these aircraft were delivered on schedule by the end of October 2009.

The Navy was reported to be considering buying additional T-45s in the future. Under consideration is a new T-45D model that would be substantially cheaper – 20 to 40 percent less – than the T-45C, according to Boeing. The company claims it could cut 20-40 percent of the cost of materials from the unit cost through methods it is using to reduce the cost of its F/A-18 Super Hornet. Reports indicate that the Navy and Boeing are in talks regarding a new requirement for up to 180 aircraft, but there is no telling when an order could be made or whether funding will be available for more aircraft. Boeing's existing agreement with BAE Systems, maker of the Hawk trainer on which the T-45 is based, will expire in 2010, but Boeing does not expect BAE Systems to oppose extending the arrangement if additional sales to the USN are made.

Outside the U.S. market, Boeing has held talks with Israel in the past regarding a possible T-45 purchase, but no deal has materialized.

The Indian Navy is acquiring an aircraft carrier and may wish to acquire a trainer aircraft capable of carrier landings. However, only 12 RAC MiG-29K single-seaters and a pair of two-seat MiG-29KUBs have been ordered for use on the new ship. The number of carrier-trained pilots needed to operate them will therefore be small. These pilots currently have access to operational training on aircraft carriers through participation in U.S. Navy training programs, and the combination of U.S. training and type training with the MiG-29KUB is likely to suffice for the Indian Navy's carrier flight training requirements in at least the near term. We have assumed in our forecast that India will not order the T-45.

Boeing has also suggested the T-45C for a Greek requirement to replace its fleet of Rockwell T-2 Buckeyes, but the competition for that contract is likely to be fierce, and a likely winner in a competition is not clear at this time.

# Ten-Year Outlook

No production currently forecast.

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