## The Market for Military Fixed-Wing Trainer Aircraft

**Product Code #F617** 

A Special Focused Market Segment Analysis by:



# Analysis 3 The Market for Military Fixed-Wing Trainer Aircraft 2011-2020

## **Table of Contents**

Executive Summary	3
Introduction	3
Trends	4
Competitive Environment	
Market Statistics	12
Table 1 - The Market for Military Fixed-Wing Trainer Aircraft Unit Production by Headquarters/Company/Program 2011 - 2020	14
Table 2 - The Market for Military Fixed-Wing Trainer Aircraft Value Statistics by Headquarters/Company/Program 2011 - 2020	17
Figure 1 - The Market for Military Fixed-Wing Trainer Aircraft Unit Production 2011-2020 (Bar Graph)	20
Figure 2 - The Market for Military Fixed-Wing Trainer Aircraft Value of Production 2011-2020 (Bar Graph)	20
Table 3 - The Market for Military Fixed-Wing Trainer Aircraft Unit Production % Market Share by Headquarters/Company 2011 - 2020	21
Table 4 - The Market for Military Fixed-Wing Trainer Aircraft Value Statistics % Market Share by Headquarters/Company 2011 - 2020	22
Figure 3 - The Market for Military Fixed-Wing Trainer Aircraft Unit Production % Market Share 2011-2020 (Pie Chart)	23
Figure 4 - The Market for Military Fixed-Wing Trainer Aircraft Value Statistics % Market Share 2011-2020 (Pie Chart)	23
Table 5 - The Market for Military Jet Trainer Aircraft Unit Production by Headquarters/Company/Program 2011 - 2020	24
Table 6 - The Market for Military Jet Trainer Aircraft Value Statistics by Headquarters/Company/Program 2011 - 2020	26
Figure 5 - The Market for Military Jet Trainer Aircraft Unit Production 2011-2020 (Bar Graph)	28
Figure 6 - The Market for Military Jet Trainer Aircraft Value of Production 2011-2020 (Bar Graph)	28
Table 7 - The Market for Military Jet Trainer Aircraft Unit Production % Market Share by Headquarters/Company 2011 - 2020	29

## Analysis 3

Table 8 - The Market for Military Jet Trainer Aircraft Value Statistics % Market Share by Headquarters/Company 2011 - 2020	30
Table 9 - The Market for Military Turboprop Trainer Aircraft Unit Production by Headquarters/Company/Program 2011 - 2020	31
Table 10 - The Market for Military Turboprop Trainer Aircraft Value Statistics by Headquarters/Company/Program 2011 - 2020	32
Figure 7 - The Market for Military Turboprop Trainer Aircraft Unit Production 2011-2020 (Bar Graph)	34
Figure 8 - The Market for Military Turboprop Trainer Aircraft Value of Production 2011-2020 (Bar Graph)	34
Table 11 - The Market for Military Turboprop Trainer Aircraft Unit Production % Market Share by Headquarters/Company 2011 - 2020	35
Table 12 - The Market for Military Turboprop Trainer Aircraft Value Statistics % Market Share by Headquarters/Company 2011 - 2020	36
Conclusion	37

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## **PROGRAMS**

The following reports are included in this section: (Note: a single report may cover several programs.)

Advanced European Jet Pilot Training Program Alenia Aermacchi M-346
BAE Systems Hawk
Embraer EMB-314 Super Tucano
FAdeA AT-63
Fuji T-5/T-7
Hawker Beechcraft T-6A Texan
Hindustan Aeronautics HJT-36
Hongdu/PAC K-8
Korea Aerospace Industries KT-1
Korea Aerospace Industries T-50/A-50/FA-50
Pilatus PC-21
U.S. Air Force T-X
Yakovlev Yak-130

## Introduction

This analysis covers active programs within the fixedwing military training market, including aircraft powered by jet, turboprop, and piston engines.

Several aircraft that are often used as trainers are not included within our market forecast because they do not train the "first and second seaters" who perform the pilot-in-command or copilot/weapons officer roles in military aircraft. Specialist mission training aircraft, such as the Boeing 737 (U.S. Navy T-43), a navigation trainer, are excluded. All the aircraft covered in this analysis provide training for fighter and attack aircraft pilots.

Forecasting military trainer demand and production entails analyzing military inventories by type of trainer and age. Each nation's military expenditures and research and development plans are evaluated. Future military budgets are examined and force structure assumptions made, and military equipment priorities are established that determine what types of and how many frontline combat and special-purpose military aircraft will be required. This major military aircraft demand scenario then helps determine the 10-year demand for trainer aircraft.

When the total trainer demand curve is established, each aircraft program is studied to ascertain competitive advantage and disadvantage and any political, societal, or economic factors that ultimately determine the marketing and sales success or defeat of a particular trainer family. This is obviously a subjective methodology and one that changes with our overall assessment of worldwide defense spending.

This analysis takes a broad look at the military fixedwing trainer market as a whole. Detailed information and forecast rationales on each program are provided in the individual reports that cover the aircraft listed. The following trainers and trainer programs were reviewed in preparing this analysis:

## **JET TRAINERS**

Alenia Aermacchi M-346 BAE Systems Hawk EADS Mako FAdeA AT-63 HAL HJT-36 Hongdu/PAC K-8 Hongdu L-15 Korea Aerospace T-50/A-50 Yak-130

## **TURBOPROP TRAINERS**

Embraer EMB-314 Super Tucano Series Fuji Heavy Industries T-5 Hawker Beechcraft T-6A/B Korea Aerospace KT-1 Pilatus PC-21

## **PISTON TRAINERS**

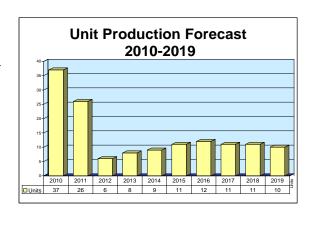
Alenia Aermacchi SF.260

Projected military sales of light general aviation aircraft used by military customers in the primary training role are not included in this analysis. These types of piston trainers – the Cessna 172, for example – are produced at the same factories at which civilian aircraft are produced and are all but identical to their civilian counterparts. The limited number of light piston trainer aircraft that make their way into military inventories each year are reflected in Forecast International's *Civil Aircraft Forecast*.

\* \* \*

## **Outlook**

- Nearly 180 Super Tucanos had been sold as of mid-2010
- Further sales opportunities abound



## **Orientation**

**Description.** Single-turboprop-powered military trainer and light attack aircraft. Produced in both two-seat and single-seat versions.

**Sponsor.** Brazilian Air Force.

**Status.** Production of the Super Tucano. The basic Tucano is no longer in production.

**Total Produced.** Through 2009, Embraer had produced two new-build Super Tucano prototypes, 32

Super Tucano production aircraft, and 77 ALX aircraft. Of the original Tucano model, Embraer produced approximately 348 aircraft, Short Brothers delivered 158, and AOI assembled 124.

**Application.** Military training and light attack.

**Price Range.** Super Tucano, \$9.0 million in 2009 U.S. dollars.



Super Tucano
Source: Embraer

## **Contractors**

## **Prime**

Embraer - Empresa Brasileira de	http://www.embraer.com, Av Brigadeiro Faria Lima, 2170, São José dos Campos, 12227-
Aeronáutica SA	901 São Paulo, Brazil, Tel: + 55 12 3927 1000, Prime

## Subcontractor

Hartzell Propeller Inc	http://www.hartzellprop.com, One Propeller PI, Piqua, OH 45356-2656 United States, Tel: + 1 (937) 778-4200, Fax: + 1 (937) 778-4321 (Five-Blade Propeller)
Martin-Baker Aircraft Co Ltd	http://www.martin-baker.com, Higher Denham, UB9 5AJ Buckinghamshire, United Kingdom, Tel: + 44 1895 832214, Fax: + 44 1895 832587, Email: information@martin-baker.co.uk (Mk 10LCX Ejection Seat)
Pratt & Whitney Canada	http://www.pwc.ca, 1000 Marie-Victorin Blvd, Longueuil, J4G 1A1 Quebec, Canada, Tel: + 1 (450) 677-9411, Fax: + 1 (450) 647-3620 (PT6A-68C Turboprop Engine)

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Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 22 Commerce Road, Newtown, CT 06470, USA; rich.pettibone@forecast1.com

## **Technical Data**

(EMB-314)

**Design Features.** Cantilever low-wing monoplane with retractable tricycle landing gear, cantilever horizontal stabilizers, and a slightly swept vertical fin.

	<u>Metric</u>	<u>U.S.</u>	
Dimensions			
Wingspan	11.14 m	36.53 ft	
Length	11.38 m	37.33 ft	
Height	3.97 m	13.01 ft	
Weight			
Max takeoff weight	5,400 kg	11,905 lb	
Performance			
Max level speed (clean)	590 km/h	320 kt	
Cruise speed	520 km/h	280 kt	
Service ceiling	10,665 m	35,000 ft	
Ferry range (internal fuel)	1,445 km	780 nm	
Ferry range (with external tanks)	2,855 km	1,540 nm	

## **Propulsion**

EMB-314	(1)	Pratt & Whitney Canada PT6A-68C turboprop engine rated 1,193 kW (1,600 shp).
EMB-312	(1)	Pratt & Whitney Canada PT6A-25C turboprop engine rated 559 kW (750 shp).
Shorts S312 (T1)	(1)	AlliedSignal Engines (Garrett) TPE331-12B-701A turboprop engine rated 820 kW
, ,	` '	(1,100 shp).

## Armament

One .50-caliber machine gun is mounted in each wing. Five hardpoints exist, one on the fuselage centerline and four underwing. Maximum external load is 1,550 kilograms (3,420 lb). Among the armament capable of being carried are gun pods, bombs, rocket pods, and (on the two outboard stations) air-to-air missiles.

## Variants/Upgrades

**EMB-314.** Uprated Tucano version; also called the Tucano H or the Super Tucano. Formerly called the EMB-312H. The Super Tucano features a 1.37-meter (4.49-ft) fuselage extension with the addition of sections fore and aft of the cockpit to restore its center of gravity and stability. Other features include a strengthened airframe and cockpit pressurization. The aircraft is powered by the Pratt & Whitney Canada PT6A-68C engine, rated 1,193 kW (1,600 shp).

A proof-of-concept model (a converted EMB-312) flew in September 1991, powered by a PT6A-67R engine rated 1,193 kW (1,600 shp). A second prototype flew for the first time in May 1993, powered by a PT6A-68A engine rated 969 kW (1,300 shp). A third prototype flew in October 1993.

**ALX.** Light attack version of the Super Tucano developed by Embraer for the Brazilian Air Force. The ALX is powered by a PT6A-68C engine rated 1,193 kW (1,600 shp), driving a Hartzell five-blade propeller. The aircraft has five hardpoints for external stores. Avionics include a navigation/attack system including a head-up display, multifunction displays, a central mission computer, an inertial reference system, and GPS equipment. The ALX has a Kevlar-based armored cockpit, which is pressurized and fitted with zero-zero ejection seats. The cockpit is also night vision goggle (NVG) compatible.

In 1996, Embraer selected the Israeli firm Elbit Systems to supply the mission avionics for the ALX. For this

contract, Elbit was chosen over GEC-Marconi and Sextant Avionique. The Israeli company supplies such equipment as the mission computer, head-up displays, and navigation and stores management systems.

In August 1995, the Brazilian Ministry of Aeronautics awarded Embraer a \$50 million contract for ALX development. The two Super Tucano prototypes built in 1993 were modified to serve as ALX prototypes. These made their initial flights in their new configuration in 1996 and 1997, respectively. The initial flight of a production-configured ALX, further modified from one of the prototypes, occurred in June 1999.

In August 2001, Embraer signed a contract with the Brazilian Air Force for 76 ALXs, plus options for an additional 23 aircraft. Embraer delivered the initial ALX to the service in December 2003.

In 2005, the Air Force exercised the 23 options, converting them into firm orders. This action increased the service's ALX firm order total to 99 aircraft, including 49 single-seaters and 50 two-seaters.

The Air Force's single-seat ALX version is designated the A-29A, while the two-seat model is called the A-29B. The service plans to use 30 of its A-29Bs to replace aging EMB-326 Xavante advanced trainers, though it will retain some Xavantes for use as fighter lead-in trainers.

## **Program Review**

**Background.** Embraer announced in January 1978 its intention to develop the PT6A-25C powered EMB-312 for the Brazilian Air Force and export customers. The aircraft, designated T-27 in Brazilian service, is a lowwing, tandem-seat design incorporating retractable tricycle type landing gear. It is used for primary, advanced, and aerobatic training at altitudes up to 9,150 meters (30,000 ft).

<u>Weapons Trainer</u>. As a weapons-delivery trainer, and for tactical use, the EMB-312 has four underwing hardpoints capable of carrying 1,000 kilograms (2,204 lb) of bombs, rockets, or machine guns.

## Licensed Assembly Programs

Egyptian Program. Under the terms of a \$181 million contract signed in December 1983, Embraer delivered 10 Tucanos in flyaway condition to the Egyptian Air Force beginning in late 1984. An additional 110 aircraft were then supplied to the Arab Organization for

Industrialization (AOI) in kit form for assembly at Heliopolis, Egypt. Out of the original order of 120 aircraft, Egypt received 40 Tucanos, with the other 80 assembled for Iraq.

The first Egyptian-assembled Tucano was delivered in 1985. Egypt placed an order in 1989 for an additional 14 Tucanos.

Embraer/Shorts and AST 412. The Brazilian manufacturer teamed with Short Brothers of Northern Ireland in May 1984 to promote the Tucano for the British Royal Air Force's AST 412 Jet Provost trainer replacement requirement. This design was subsequently selected in March 1985, and Shorts built 130 aircraft for the RAF (including 25 assembled from Embraer-supplied kits). The RAF also held options for another 15 units; the options were never exercised.

The Shorts-built S312 Tucano is powered by the uprated AlliedSignal (Garrett) TPE331-12B turboprop, and is



fitted with a fuselage-mounted ventral airbrake and a two-piece canopy with a birdproof windshield. The aircraft incorporates other changes as well, including a Hawk-type cockpit layout, small wingtip strakes, and a structural reinforcement for increased speed, maneuver loads, and a required 12,000-hour fatigue life.

The first Garrett-powered Tucano flew in Brazil in February 1986, and was subsequently shipped to Shorts in Belfast. The first Shorts-assembled aircraft was formally rolled out in January 1987, but delays in the program slipped initial deliveries into September 1988.

EMB-312F. In October 1991, the French Air Force formalized an order for up to 80 EMB-312F Tucanos. Two pre-series aircraft were delivered in 1993, and 48 aircraft were delivered in 1995-1997. France also held options for an additional 30 EMB-312F Tucanos; these options were never exercised.

The EMB-312F differs from the standard Tucano in that it features a 10,000-hour fatigue life airframe, a speedbrake, an angle-of-attack indicator, propeller and canopy de-icing, repositioned refueling and jacking points, and a French-supplied avionics package.

## Super Tucano

JPATS Candidate. In August 1993, Embraer and the U.S. company Northrop (now known as Northrop Grumman) announced that they had finalized a cooperation agreement for joint participation in an effort to compete for the U.S. Air Force/U.S. Navy Joint Primary Aircraft Training System (JPATS) program. (Embraer and Northrop had signed a preliminary agreement in May 1991.) The two companies unsuccessfully bid the uprated EMB-312H Super Tucano version, now called the EMB-314. The JPATS program involves the procurement of over 700 aircraft for the two U.S. services.

Development of the Super Tucano began in January 1991, and a proof-of-concept prototype flew for the first time in September 1991. This aircraft, which was a converted EMB-312, was powered by a PT6A-67R engine. In 1993, two new-build prototypes were completed. These aircraft were powered by the PT6A-68A powerplant. In August 1994, the Super Tucano received a provisional type certificate from the CTA, the Brazilian certification authority.

## **Related News**

**First Dominican Deliveries** – Embraer delivered two Super Tucano aircraft to the Dominican Republic in December 2009, the first of an order for eight aircraft. The Super Tucanos are to be operated by the Dominican Air Force on missions involving internal security, border patrol, and combating drug traffic.

"The use of the Super Tucano airplanes by the Dominican Air Force, beginning with these first two deliveries, will increase the readiness and solidity of the nation's defense system by performing patrol missions with the operational efficiency and precision that are already combat proven," said Orlando Jose Ferreira Neto, Embraer executive vice president for the defense market. (Embraer, 12/09)

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## **Timetable**

<u>Month</u>	<u>Year</u>	Major Development
Jan	1978	EMB-312 design work begun
Dec	1978	Embraer awarded development contract
Aug	1980	Prototype first flight
Sep	1983	Initial production deliveries
May	1984	Agreement with Shorts announced
Mar	1985	Tucano selected as AST 412 winner
	1985	First flight of Egyptian-assembled Tucano
Feb	1986	First flight of Garrett-powered Tucano
Sep	1988	First Shorts-built T1 delivered to RAF
Sep	1991	First flight of EMB-312H proof-of-concept aircraft
May	1993	Initial flight of first Super Tucano prototype
Oct	1993	Initial flight of second Super Tucano prototype

## **Worldwide Distribution/Inventories**

The geographic distribution of Tucanos and Super Tucanos as of July 2010 is as follows:

Angola	11	EMB-312
Argentina	22	EMB-312
Brazil	124	EMB-312
	86	ALX
Chile	12	EMB-314
Colombia	14	EMB-312
	25	EMB-314
Dominican Republic	2	EMB-314
Ecuador	8	EMB-314
Egypt	54	EMB-312
France	20	EMB-312
Honduras	9	EMB-312
Iran	15	EMB-312
Kenya	11	EMB-312
Kuwait	16	EMB-312
Paraguay	3	EMB-312
Peru	18	EMB-312
United Kingdom	67	EMB-312
United States	1	EMB-314
Venezuela	21	EMB-312

## **Forecast Rationale**

The Super Tucano has become a popular item in the past couple of years. As of June 2010, Embraer had accumulated orders for 178 Super Tucanos, of which 135 had been delivered. The order backlog at that time totaled 43 aircraft: 12 for Brazil, 16 for Ecuador, six for the Dominican Republic, and nine for a pair of undisclosed customers. Based on current production plans, these orders extend Super Tucano production well into 2011.

Deliveries of 12 Super Tucanos to the Chilean Air Force began in December 2009 and were completed in the first half of 2010. The service utilizes the Super Tucano as a basic trainer.

Embraer's Super Tucano order book includes 99 ALXs for the Brazilian Air Force. By mid-2010, Embraer had delivered 87 of the aircraft to the service.

Embraer delivered two Super Tucanos to the Dominican Republic in December 2009. The aircraft were the first of a Dominican order for eight of the type.

In March 2009, Embraer announced a deal to supply 24 Super Tucanos to the Ecuadorian Air Force for use in border patrol missions and pilot training. Though not announced until 2009, the contract had actually been finalized sometime in 2008. Deliveries began in February 2010 and, by the middle of the year, eight Super Tucanos had been delivered to the service.

In June 2010, however, the Ecuadorian Defense Ministry announced plans for a reduction of six aircraft in the Air Force's Super Tucano order, reducing the total acquisition to only 18 aircraft. The resultant savings are intended to be used to acquire 12 secondhand fighter aircraft, deemed to be a high priority for the service.



## Worldwide Interest

Sales competitors to the Super Tucano on the world market include other turboprop-powered aircraft such as the Hawker Beechcraft T-6, the Korea Aerospace Industries (KAI) KT-1, and the Pilatus PC-21. The jet-powered Alenia Aermacchi M-311 trainer also provides some competition to the Embraer aircraft.

Although Super Tucano sales have so far been largely concentrated in Latin America, considerable interest in the aircraft has become evident in other regions of the world as well. Particularly promising regional markets for the type include Asia and Africa.

Embraer has engaged in discussions with at least five countries in the Asia/Pacific region regarding acquisition of the Super Tucano. The Indonesian Air Force intends to order eight Super Tucanos for use in the light attack role. However, this plan has not yet received approval from the Indonesian Defense Ministry, and the KT-1 remains a contender for the buy.

In January 2010, the Indian Defense Ministry issued a Request for Proposals (RFP) regarding an Indian Air Force acquisition of 75 basic trainers. The Super Tucano is one of the contenders for this contract, as are the KT-1, the T-6, the Pilatus PC-7 or PC-21, the Grob G 120TP, the EADS PZL Warszawa-Okecie PZL-130, and possibly others.

The 75-aircraft buy is part of a larger Air Force requirement for 181 basic trainers. The remaining 106 aircraft might be built under license by Hindustan Aeronautics Ltd (HAL).

Latin America also provides considerable opportunity for further Super Tucano sales. Indeed, the Brazilian Air Force itself has an emerging requirement to replace its EMB-312 Tucanos, and the Super Tucano would appear to be the ideal candidate for such a buy.

The Paraguayan Air Force intends to acquire six Super Tucanos, as does the Guatemalan Air Force. The Peruvian Air Force wants at least four Super Tucanos. The Bolivian Air Force is planning to acquire an unspecified number of Super Tucanos to replace its fleet of 11 Pilatus PC-7s. The service utilizes the PC-7s in the counterinsurgency role.

Sales opportunities also exist in other parts of the world. The Super Tucano is a possible candidate for a Royal Australian Air Force requirement for up to 50 aircraft to replace 65 Pilatus PC-9/As from 2012.

The Super Tucano is also a candidate for the U.K.'s new Military Flying Training System (MFTS) program. Under the MFTS, a fleet of 40-50 basic trainers is to be acquired to replace the Royal Air Force fleet of 67 Shorts Tucanos.

The Super Tucano is expected to vie with the AT-6 version of Hawker Beechcraft's T-6 for a contract to supply the Afghanistan National Army Air Corps with six to 20 light attack aircraft. The U.S. Air Force is conducting this competition.

Meanwhile, the USAF itself intends to request funding for 15 light attack aircraft in its FY12 budget request. The aircraft would be used to train and assist developing air forces of partner nations. The Super Tucano and the AT-6 are expected to compete for this acquisition as well.

## **Ten-Year Outlook**

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ESTIMATED CALENDAR YEAR UNIT PRODUCTION												
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### TERMS

Net 30 days. For overdue accounts we reserve the right to assess interest of 12% annually, and add collection fees.

### **PURCHASE ORDER**

If company requires, please submit a purchase order to ensure timely delivery.

## **RETURNS OR REFUNDS**

Due to the nature of our products, no returns are accepted and no refunds are provided.

## **FORMS OF PAYMENT**

We accept VISA, MasterCard, American Express, or a company check drawn on a U.S. bank in U.S. dollars. Wire Transfer Details: Contact customerservice@forecast1.com or call 203.270.0633.

Please ensure bank charges are not deducted from the total amount due. Note: Include the quotation or invoice number with your payment.

### **DATA USAGE**

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## **ELECTRONIC DATA LICENSING**

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