

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 - 2009-2018

Table of Contents

Executive Summary	3
Introduction	3
Trends	4
Competitive Environment	7
Market Statistics	13
Table 1 - The Market for Military Fixed-Wing Trainer Aircraft Unit Production by Headquarters/Company/Program 2009 - 2018.....	15
Table 2 - The Market for Military Fixed-Wing Trainer Aircraft Value Statistics by Headquarters/Company/Program 2009 - 2018	18
Figure 1 - The Market for Military Fixed-Wing Trainer Aircraft Unit Production 2009-2018 (Bar Graph)	21
Figure 2 - The Market for Military Fixed-Wing Trainer Aircraft Value of Production 2009-2018 (Bar Graph)	21
Table 3 - The Market for Military Fixed-Wing Trainer Aircraft Unit Production % Market Share by Headquarters/Company 2009 - 2018.....	22
Table 4 - The Market for Military Fixed-Wing Trainer Aircraft Value Statistics % Market Share by Headquarters/Company 2009 - 2018	24
Figure 3 - The Market for Military Fixed-Wing Trainer Aircraft Unit Production % Market Share by Headquarters 2009-2018 (Pie Chart).....	26
Figure 4 - The Market for Military Fixed-Wing Trainer Aircraft Value Statistics % Market Share by Headquarters 2009-2018 (Pie Chart)	26
Table 5 - The Market for Military Jet Trainer Aircraft Unit Production by Headquarters/Company/Program 2009 - 2018.....	27
Table 6 - The Market for Military Jet Trainer Aircraft Value Statistics by Headquarters/Company/Program 2009 - 2018	29
Figure 5 - The Market for Military Jet Trainer Aircraft Unit Production 2009-2018 (Bar Graph).....	31
Figure 6 - The Market for Military Jet Trainer Aircraft Value of Production 2009-2018 (Bar Graph)	31
Table 7 - The Market for Military Jet Trainer Aircraft Unit Production % Market Share by Headquarters/Company 2009 - 2018.....	32
Table 8 - The Market for Military Jet Trainer Aircraft Value Statistics % Market Share by Headquarters/Company 2009 - 2018	33

Analysis 3

Table 9 - The Market for Military Turboprop Trainer Aircraft Unit Production by Headquarters/Company/Program 2009 - 2018.....	34
Table 10 - The Market for Military Turboprop Trainer Aircraft Value Statistics by Headquarters/Company/Program 2009 - 2018.....	36
Figure 7 - The Market for Military Turboprop Trainer Aircraft Unit Production 2009-2018 (Bar Graph).....	38
Figure 8 - The Market for Military Turboprop Trainer Aircraft Value of Production 2009-2018 (Bar Graph)	38
Table 11 - The Market for Military Turboprop Trainer Aircraft Unit Production % Market Share by Headquarters/Company 2009 - 2018.....	39
Table 12 - The Market for Military Turboprop Trainer Aircraft Value Statistics % Market Share by Headquarters/Company 2009 - 2018.....	40
Table 13 - The Market for Military Piston Trainer Aircraft Unit Production by Headquarters/Company/Program 2009 - 2018.....	41
Table 14 - The Market for Military Piston Trainer Aircraft Value Statistics by Headquarters/Company/Program 2009 - 2018.....	41
Figure 9 - The Market for Military Piston Trainer Aircraft Unit Production 2009-2018 (Bar Graph).....	42
Figure 10 - The Market for Military Piston Trainer Aircraft Value of Production 2009-2018 (Bar Graph)	42
Conclusion	43

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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
Aero L-159
Alenia Aermacchi M-346
BAE Systems Hawk
Boeing/BAE Systems T-45
EADS Mako
Embraer EMB-314 Super Tucano
Fuji 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
LMAASA AT-63
Pilatus PC-9
Pilatus PC-21
RAC MiG MiG-AT
Yakovlev Yak-130

Introduction

This analysis, and the accompanying tables and charts, includes active programs within the fixed-wing military training market, broken down into three categories of aircraft production: military jet trainers, military turboprop trainers, and military piston trainers.

It should be noted that there are several training aircraft that are not included in our calculations because they do not train “first and second seaters” – that is, those who perform the pilot-in-command or copilot/weapons officer roles. Specialist mission training aircraft, such as the Boeing 737 (U.S. Navy T-43), a navigation trainer, are therefore excluded. All the aircraft covered in this analysis provide training for fighter and attack aircraft pilots.

The first section of the analysis, **Trends**, looks at the overall size and direction of the market and discusses the outlook for the individual programs we analyze in forecasting the market as a whole. The second section, **Competitive Environment**, discusses the current structure of the market and the factors influencing its competitiveness and the success of manufacturers within it. The third and last section, **Market Statistics**, offers detailed information on our forecast for the market, including tables containing our forecasts of unit production and value of production of military fixed-wing trainers for each year of the forecast period, along with information on the market share of manufacturers producing aircraft in this segment.

Forecasting military trainer demand and production entails little of the sophistication embodied in developing projections for commercial transports, commuters, and commercial helicopters. The method is clear-cut. Existing military inventories are analyzed 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.

The following trainers and trainer programs were reviewed in preparing this analysis:

JET TRAINERS

Alenia Aermacchi M-346
Aero L-159
BAE Hawk
Boeing/BAE T-45
EADS Mako
HAL HJT-36
Hongdu/PAC K-8
Korea Aerospace T/A-50
LMAASA AT-63
MiG-AT
Yak-130

TURBOPROP TRAINERS

Alenia Aermacchi SF.260TP
Embraer EMB-314 Super Tucano Series
Fuji Heavy Industries T-5/T-7
Hawker Beechcraft T-6A/B
Korea Aerospace KT-1
Pilatus PC-9
Pilatus PC-21

PISTON TRAINERS

Alenia Aermacchi SF.260

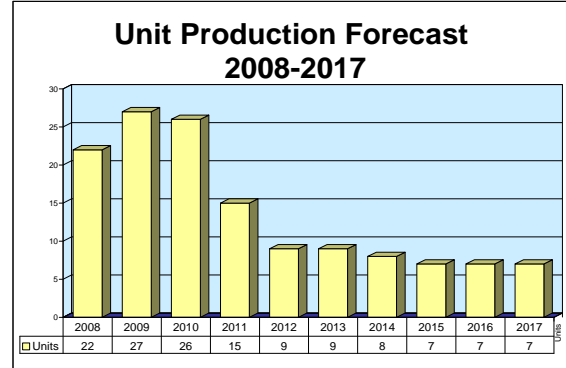
Projected military sales of many light general aviation aircraft are not included in this analysis, as it is our intention to evaluate the trainer market by assessing those aircraft that represent the bulk of production and market share.

* * *

Embraer EMB-314 Super Tucano

Outlook

- Interest in the Super Tucano on the world market is increasing
- The aircraft is in contention for a number of contracts
- Deliveries are under way to the Brazilian and Colombian air forces



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 2007, Embraer had produced two new-build Super Tucano prototypes,

approximately 15 Super Tucano production aircraft, and about 56 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, \$4.5-\$7.0 million in 2008 U.S. dollars.



Super Tucano

Source: Embraer

Embraer EMB-314 Super Tucano

Contractors

Prime

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

Subcontractor

Hartzell Propeller Inc	One Propeller Pl, 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, Near Uxbridge, UB9 5AJ Middlesex, United Kingdom, Tel: + 44 0 1895 832214, Fax: + 44 0 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	36.55 ft
Length	11.38 m	37.33 ft
Height	3.97 m	13.0 ft
Weight		
Max takeoff weight, clean	3,190 kg	7,033 lb
Performance		
Cruise speed	574 km/h	310 kt
Service ceiling	10,670 m	35,000 ft

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 axial-centrifugal-flow turboprop engine rated 559 kW (750 shp).
Shorts S312 (T1)	(1)	AlliedSignal Engines (Garrett) TPE331-12B-701A single-shaft centrifugal-flow turboprop engine rated 820 kW (1,100 shp).

Armament

One 12.7mm machine gun is mounted on each wing. Five hardpoints exist, one on the fuselage centerline and four underwing. Maximum external load is 1,500 kilograms (3,307 lb). Among the armament capable of being carried are machine gun pods, bombs, rocket pods, and (on the two outboard stations) air-to-air missiles.

Embraer EMB-314 Super Tucano

Variants/Upgrades

EMB-314. Upgraded 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 rated 1,193 kW (1,600 shp). A second prototype flew for the first time in May 1993, powered by the PT6A-68A rated 969 kW (1,300 shp). A third prototype flew in October 1993.

In December 2006, Embraer delivered the first five Super Tucanos to the Colombian Air Force out of an order for 25. Elbit Systems supplies various avionics for the Colombian Air Force Super Tucanos. In addition, FLIR Systems has engineered a flexible installation for the aircraft, which allows installation of either the company's BRITE Star or StarSAFIRE III thermal imaging systems.

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 late 1996, Embraer selected the Israeli firm Elbit Systems to supply the mission avionics for the ALX. For this contract, Elbit defeated 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 low-wing, 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).

Weapons Trainer. As a weapons-delivery trainer, and for tactical use, the EMB-312 has four underwing hardpoints capable of carrying 1,000 kilograms (2,204 pounds) 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. Out of the original order of 120 aircraft, Egypt received 40 Tucanos, with the other 80 assembled for Iraq. The Egyptian contract also included options on another 60 units (40 for Egypt and 20 for Iraq). The first Egyptian-assembled Tucano was delivered in 1985. Egypt placed an order in 1989 for an additional 14 Tucanos.

Embraer EMB-314 Super Tucano

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. These 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

50th A-29 Delivered – Embraer delivered the 50th A-29 to the Brazilian Air Force (FAB) in September 2007. “With the delivery of the 50th A-29, we are moving ahead with one more phase of an historic and successful partnership between the FAB and Embraer,” said Luiz Carlos Aguiar, Embraer Executive Vice President for the Defense and Government Market. (Embraer, 9/07)

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Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
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

Embraer EMB-314 Super Tucano

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
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 June 2008 is as follows:

Angola	5
Argentina	22
Brazil	179
Colombia	29
Egypt	54
France	47
Honduras	9
Iran	15
Kenya	11
Kuwait	16
Paraguay	3
Peru	18
United Kingdom	67
United States	1
Venezuela	21

Forecast Rationale

The Super Tucano has had an eventful year so far in 2008. In April 2008, the Super Tucano was selected over the Pilatus PC-21 as the Chilean Air Force's new basic trainer. At press time, negotiations were under way to finalize the sale. The contract is expected to be worth \$120 million, and cover 12 aircraft plus training support and logistics equipment. Deliveries are scheduled to begin by the end of 2008, and be completed in 2009.

Also at press time, Embraer was hoping to soon close a sale of eight Super Tucanos to the Dominican Republic, which would once again become a customer for the aircraft. Embraer had signed a contract in 2001 with the Dominican Republic government for 10 Super Tucanos, but that deal was later canceled.

Ecuador's President Rafael Correa announced a major modernization program for the country's military in

April 2008. The program is to include the acquisition of at least 24 Super Tucanos.

Embraer delivered a new Super Tucano in February 2008 to EP Aviation, a subsidiary of the U.S.-based private security firm Blackwater Worldwide. The aircraft is not fitted with weaponry, and is being used for training purposes in the U.S.

Meanwhile, deliveries are continuing of 25 Super Tucanos to the Colombian Air Force and 99 ALXs to the Brazilian Air Force. As of March 2008, more than half of the Colombian aircraft and more than 55 of the Brazilian ALXs had been delivered.

Worldwide Market

The main competitors to the Super Tucano on the worldwide market are other turboprop trainers such as the Hawker Beechcraft T-6, the Korea Aerospace

Embraer EMB-314 Super Tucano

Industries (KAI) KT-1, and the Pilatus PC-21. Alenia Aermacchi's M-311 jet trainer also provides some competition.

The Super Tucano was designed from the outset with light attack capability. Incorporation of this capability serves to enhance the marketability of the aircraft. In its sales efforts, Embraer emphasizes the Super Tucano's utility in the counterinsurgency (COIN) or dual COIN/training role.

The Super Tucano is a candidate to fill upcoming requirements for basic trainers in Australia, the Philippines, Thailand, and the U.K. The Australian requirement is for up to 50 aircraft, to replace 65 Pilatus PC-9/As from 2012.

The Super Tucano is a potential candidate for the U.K.'s new Military Flying Training System (MFTS) program. As a low-cost alternative to acquiring new-build aircraft, however, Shorts and Marshall Aerospace have teamed to propose an upgrade for the British Royal Air Force's 67 existing Tucanos. The upgrade would involve various aerodynamic improvements as well as installation of a CMC Electronics glass cockpit and mission computers. In addition, engine power would be increased by 10 percent.

Shorts and Marshall say that the upgrade could be provided for 10-15 percent of the cost of a new-build

aircraft, and would enable the RAF's Tucanos to continue in service for more than 20 years. Shorts built the RAF Tucanos under license from Embraer.

The UAE Air Force intends to acquire up to 40 basic trainers to replace its fleet of Pilatus PC-7s. The Super Tucano was shortlisted in February 2007 for the acquisition along with the M-311 and the PC-21. In late 2007, various press reports claimed that the Super Tucano had been eliminated from the contest but, in response, Embraer said that it had received no notification of such an action. The current status of the Super Tucano in the UAE contest is not clear.

Embraer is currently engaged in discussions concerning a possible sale of eight Super Tucanos for use by the Iraqi Air Force in the COIN role. Other contenders for the sale, which is being conducted by the U.S. Air Force, include the KT-1 as well as the armed AT-6 version of the T-6.

The Indonesian Air Force is considering the Super Tucano as a possible replacement for its fleet of 10 (mostly grounded) Rockwell OV-10 Broncos.

Current Tucano operators also constitute a potential customer base for the Super Tucano. Many will likely give serious consideration to the Super Tucano when they look to augment or replace their current Tucano fleets.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR UNIT PRODUCTION												
Designation or Program	High Confidence					Good Confidence			Speculative			Total
	Thru 2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Embraer - Empresa Brasileira de Aeronáutica SA												
ALX <> PT6 A -68												
	56	12	12	12	7	0	0	0	0	0	0	43
Super Tucano <> PT6 A -68												
Note: Does not include the proof-of-concept aircraft, which was a converted EMB-312.												
	17	10	15	14	8	9	9	8	7	7	7	94
Subtotal	73	22	27	26	15	9	9	8	7	7	7	137
Total	73	22	27	26	15	9	9	8	7	7	7	137

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Focused Market Segment Analyses			Binder & DVD	\$410	\$775	Binder & DVD	\$140	\$265
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Binder & RT	\$1,575	\$2,975	Binder & RT	\$360	\$680	Weapons		
Complete Military Library			Electronics			Binder	\$180	\$340
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