

SUPER TUCANO

A BRAZILIAN SUCCESS STORY

Building on its experience with the EMB-312 Tucano turboprop trainer, Embraer developed the more capable Super Tucano, one of the most popular advanced trainers and light attack aircraft in service today.

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report: **Santiago Rivas**

A pair of Chilean Super Tucanos at sunset. Chile received its first examples in 2009. Cees-Jan van der Ende



THE MARKET FOR turboprop light attack aircraft and advanced trainers currently has few serious bidders. Embraer and Beechcraft lead the way, thanks to the EMB-314 Super Tucano and the AT-6 Wolverine respectively. The Super Tucano has proved a successful light attack prospect with a growing list of foreign customers: 190 examples have been delivered to date (including 99 for the Brazilian Air Force), and there are orders for 30 more.

Winning the contest for the US Air Force's Light Air Support (LAS) program, which is providing 20 aircraft to the Afghan Air Force, was an important milestone for the Super Tucano, especially as it beat off competition from the more likely 'American' option, the AT-6. Embraer's design is an attractive proposition for smaller air forces that are unable to afford jet fighters, and the Brazilian turboprop offers a cheap solution that nonetheless incorporates the latest technology. This is evidenced by the examples of Angola, Burkina Faso, the Dominican Republic, Mali, Mauritania

and Senegal, all of which have purchased small quantities.

The Super Tucano emerged as a development of the successful EMB-312 Tucano with new capabilities including improved ground attack potential, an air-to-air role against helicopters, and an enhanced ability to intercept fixed-wing 'slow-movers'. Knowledge gained in the development of the Royal Air Force's Shorts Tucano — which was more powerful than the original model — showed what could result from allying the basic aircraft with a new engine. By that time, Colombia had gained considerable experience using the Tucano against drug-smuggling aircraft and guerrillas, and this was exploited by Embraer to define what air forces were looking for in order to fight the increasing threats posed by drug traffickers, smugglers and terrorists. The basic requirements called for an aircraft offering more power, increased weapons carriage, and more modern equipment compared to the basic Tucano.

Tucano of the Future

Launched in the late 1980s, the project was initially designated EMB-312F (Tucano

of the Future), and added some of the features of the Shorts Tucano, including the airbrake. However, the engine was to be more powerful, and different versions of the Pratt & Whitney Canada PT6A and the Garrett TPE331 were studied. When the EMB-312F title was later applied to French Tucanos, the project was re-named as the EMB-312H Super Tucano. A series production Tucano was modified with a 1,250shp PT6A-67 engine, a fuselage extended by 1.31m (4ft 3in) at the rear, and an airbrake. In this form it made its first flight on September 9, 1991. Two years later two new prototypes were built, this time with more changes, including a new cockpit design, a new canopy, and a 1,300shp PT6A-68A powerplant.

The Brazilian Air Force (Força Aérea Brasileira, FAB) became interested in the new aircraft for its SIVAM (System for the Vigilance of the Amazon) program, which required a platform able to intercept illegal flights and to conduct light attack over the Amazon area. At the same time, the EMB-312H could be used to replace the EMB-326 Xavante as an advanced trainer for new fighter pilots with the 2^o/5^o Grupo de Aviação (GA) 'Joker' squadron at Natal

air base. A contract was duly signed on August 18, 1995 with an initial order for 50 single-seat A-29As (with an extra fuel tank replacing the second seat) and 50 two-seat A-29Bs. With this move, development of the final version began. The FAB's request entailed more changes, which were introduced on the prototypes, including two additional underwing pylons, a cockpit compatible with night vision goggles (NVGs) and two liquid-crystal displays, forward-looking infra-red (FLIR), new avionics, two-axis autopilot, inertial navigation system and GPS, tactical UHF and VHF radios, radar warning receiver, missile approach warning system, head-up display, hands on throttle and stick (HOTAS) controls, helmet-mounted display, Martin-Baker Mk10LCX ejection seats, smart weapons capability, and the capacity to carry two Mectron MAA-1 Piranha air-to-air missiles (AAMs).

Tests led to further modifications in 1998, among them a new wing, increased weapons capacity, two internal 12.7mm (0.5in)-caliber machine guns with 200 rounds each, reinforced landing gear, and a new location for the air conditioning system, with an air intake above the fuselage instead of below. Protection was installed on the engine air intake to allow operations from un-prepared airfields. The



aircraft was re-engined with the 1,600shp PT6A-68/3 and the canopy modified once again.

On June 2, 1999 the final version was flown for the first time, now with the designation EMB-314 Super Tucano. The aircraft received the Brazilian military designation A-29 and series production began three years later, on receipt of a final FAB order for 99 aircraft. The first of these officially entered service in 2004. The 2^o/5^o GAv currently uses the A-29 for advanced training, while the 1^o/3^o GAv, 2^o/3^o GAv and 3^o/3^o GAv at Boa Vista, Porto Velho and Campo Grande respectively, employ the type for light attack, the interception of illegal aircraft, and reconnaissance.

On October 1, 2012 the Esquadrão de Demonstração Aérea (EDA, better known as the Esquadrilha da Fumaça) received the first two from a total of eight Super Tucanos to replace its Tucanos. However, one of these (FAB 5966) was lost in an accident on August 12, 2013.

FAB combat missions

The FAB has used the Super Tucano on operations against illegal runways,



destroying them with bombs, and to intercept abnormal flights that cross its borders. In most cases the aircraft intercepted are carrying drugs. In some instances A-29s have shot down the intruders, while others have been damaged and forced to land. The A-29s operate together with Embraer R-99A airborne early warning aircraft and with ground radar stations, which guide them to the suspect aircraft and maintain overall command of the operation. The Super Tucanos usually operate with live ammunition for their internal guns. Although the locally-built Piranha missile has been tested, it has not been used operationally. The FAB is expecting to introduce the MAA-1B version of the Piranha on its combat aircraft, but development is progressing very slowly.

For ground attack the A-29 employs M117, Mk81, 82 and 83 bombs, 70mm rockets carried in seven-round launchers, and SUU-20 training stores that carry four 70mm rockets and six BDU-33 practice bombs.

The FAB has tested a GPS guidance kit for the Mk81, 82 and 83 bombs that was developed by local company Britanite, as

well as the Israeli-made Lizard laser-guided bomb (LGB), but these have not been adopted for operational use.

In 2013 Embraer unveiled a proposal for the Recce Pod SAR (Synthetic Aperture Radar)/P-Band Scanning and Detection store. Developed by Orbisat, this pod can be installed on the aircraft's belly upon the request of the customer.

Although not in use in Brazil, the Super Tucano is also equipped to carry AIM-9 Sidewinder AAMs, AGM-65 Maverick and Delilah AL air-to-surface missiles, Paveway LGBs, GBU-38 and GBU-54 Joint Direct

Attack Munitions, and GBU-39 Small Diameter Bombs.

Export success

The Dominican Republic was the first foreign country to begin negotiations for a Super Tucano purchase, but in the end Colombia emerged as the launch customer. Twenty-five examples were received from December 14, 2006 for service with Escuadrones de Combate 211, 312 and 611 of the Fuerza Aérea Colombiana (FAC). The aircraft wear serials running from FAC 3101 to 3125.

Above: **The Força Aérea Brasileira operates a mix of single-seat A-29As and two-seat A-29Bs, as seen here. The former carries an extra fuel tank in the rear cockpit position.**
Cees-Jan van der Ende

Far left top to bottom: **The Super Tucanos of Ecuador have one of the most interesting color schemes. Together with the Denel Cheetahs they form the combat air arm of the Fuerza Aérea Ecuatoriana.**
Santiago Rivas

Chile operates a dozen two-seat A-29Bs.

Cees-Jan van der Ende



A Colombian Super Tucano armed with three Indumil IMC Xué 250lb iron bombs ready for a mission at Apiay Air Base. Colombia is the most combat-experienced A-29 operator.
Santiago Rivas



These were the first Super Tucanos to see combat, when they went into action against communist guerrillas on January 18, 2007. Colombia also made the first use of the type with LGBs, employing both the Lizard and Paveway types. The Colombian Super Tucanos have been used continuously in combat, mainly employing LGBs and 'dumb' bombs, and operating at night with the use of NVGs and FLIR. Colombia has found that the aircraft's modern equipment makes it very well-suited to operations both day and night, but it lacks the endurance and firepower of the OV-10 Bronco. On July 11, 2012 serial FAC 3122 was lost in an accident.

On May 12, 2013 six Colombian Super Tucanos were deployed from Barranquilla with the support of a KC-767 and a C-130H Hercules to the Royal Canadian Air Force's 4 Wing at Cold Lake in Alberta for the 'Maple Flag' exercise. This marked the type's debut deployment outside the country.

While the primary mission of the Colombian Super Tucano is unconventional warfare, growing tensions with Venezuela and the prospect of a possible peaceful solution to the internal war in Colombia have led to the Super Tucano squadrons increasing their training for conventional operations. The Super Tucano is employed as an escort for

combat search and rescue missions, and for close air support. The environment for this type of mission is very different, and might see them operating against an enemy equipped with radars, surface-to-air missiles and interceptors. Crews have been required to enhance their training to avoid being detected, intercepted and shot down.

After Colombia, the Dominican Republic received its first Super Tucano from a final order of eight on December 18, 2009, in order to replace the A-37B Dragonflies retired in 2002 by the Escuadrón de Combate. The Dominican Super Tucanos were given serials in the range FAD 2900 to 2907.





In November 2009 the Chilean Air Force took on the initial example out of 12 aircraft for Grupo 1, with serials FACH 451 to 462. These are used for light attack and advanced training, replacing the old A-37B and, partially, the Enaer/CASA C-101. The Chilean aircraft were the first to have a full 'glass' cockpit, with three displays instead of two.

January 2010 saw Escuadrón de Combate 2313 of Ala 23 of the Ecuadorian Air Force beginning to receive aircraft from an initial order of 24, later reduced to 18. These were used to replace the A-37Bs at Manta air base. In the past, Ala 23 also operated the Strikemaster and the T-33, which were not officially superseded, leaving the Super Tucano as the only attack aircraft at the base once the A-37s were finally retired in February 2011. The Ecuadorian Super Tucanos are armed with Lizard LGBs, 70mm rockets and 'dumb' bombs. The Shafirir 2 AAM was tested on the aircraft, but this missile was phased out shortly thereafter.

Ecuadorian Super Tucanos use the FLIR turret and NVGs for night operations, and Ala 23 is the Ecuadorian combat unit best-qualified to operate at night (the only other combat unit is Escuadrón de Combate 2112 equipped with Denel Cheetahs). FAE 1016 was lost in an accident on March 19, 2012 when the engine failed during take-off.

One interesting customer for the type was the US private security firm Blackwater (through its subsidiary EP Aviation LLC), now called Academi, which acquired a single example in 2008 for training. This aircraft, registered N314TG, was delivered without weapons. It was later sold to Tactical Air, armed and

received a FLIR turret for use in the Imminent Fury program (see below).

Orders continued with three examples for Burkina Faso, these being delivered during 2011 with registrations XT-MEA, 'MEB and 'MEC.

In 2012, Embraer announced the sale of six EMB-314s to Angola (serials R-701 to 706), and three to Mauritania, while in the same year the Indonesian Air Force received the first four from an order of eight aircraft (with serials TT-3101 onwards). The second Indonesian batch was delivered in 2014 and a deal for a second batch of eight is being negotiated. Three aircraft were donated to Mozambique by the Brazilian government in March 2014, and the African country has announced its intention to purchase another three.

A three-aircraft order came from Senegal on April 10, 2013, while on June 17, 2015 the company announced the sale of six examples to the Mali Air Force, followed two days later by the announcement of the sale of five to the Ghana Air Force.

Imminent Fury and LAS

After its experiences in Afghanistan and Iraq, the US Navy began to show interest in a new counter-insurgency (COIN) platform, and launched the Imminent Fury program. The Navy decided to test the Super Tucano, using the example operated by Tactical Air, which had made a good impression during trials with the Navy since 2008. The aircraft received the wing machine guns the following year and was tested with different types of weapons and systems.

From January 25-28, 2011, the Tactical Air Super Tucano was demonstrated to the

US Air Force at Kirtland Air Force Base, New Mexico, as part of the Light Air Support (LAS) system demonstration, with the intention of deploying a fleet of aircraft specifically to train partner nations in COIN and counter-terrorism operations. The US Navy program was later re-named Combat Dragon II but failed to lead to a definition phase, while the USAF meanwhile progressed with LAS. Hawker Beechcraft joined the competition with the AT-6, an armed version of the Texan II, which was then under development.

On December 30, 2011 the USAF announced selection of the Super Tucano as the winner of the LAS program, with 20 aircraft to be ordered under a \$355-million contract. The aircraft were to be built in the US by Sierra Nevada at Jacksonville, Florida and would be delivered to the Afghan Air Force. In January 2012 the program was halted after Hawker Beechcraft filed a lawsuit. During the activity surrounding this, the USAF discovered that its internal contract documents were not in order, and decided to terminate the existing LAS deal in March. A new request for proposals was issued on May 4, 2012. Finally, on February 27, 2013 the LAS contract, now worth \$427 million, was awarded again to Embraer.

The first aircraft assembled in the US was rolled out on September 25, 2014 with the US serial 13-2001. This version has additional armor plates on the sides of the cockpit and below the engine, as well as different communications equipment and other minor changes.

By November 2015 Sierra Nevada had delivered 13 of the 20 aircraft on order, all of which were assembled at a new plant in

Top left to right: Pilots equipped with night vision goggles prepare for a night mission at Manta Air Base, Ecuador. Santiago Rivas

The 81st Fighter Squadron at Moody AFB currently operates the Afghan Air Force A-29s in a training role. USAF

This Super Tucano simulator gives a good impression of the front cockpit, which includes three large multi-function head-down displays and a head-up display. Santiago Rivas

Left page: A Brazilian A-29B starts up for a night mission. Cees-Jan van der Ende

Cees-Jan van der Ende




Jacksonville. The company will continue deliveries at a rate of one per month. The USAF's 81st Fighter Squadron is now training Afghan pilots at Moody AFB, Georgia, after the unit was re-activated in January 2015.

The most recent order for the Super Tucano was placed on behalf of the Lebanese Air Force. Confirmed in November 2015, it covers six aircraft to be built in the US by Sierra Nevada at a cost of \$172.5 million. They will be equipped with AN/ALE-47 countermeasures dispensing systems and AN/AAR-60(V)2 missile launch detection systems.

With increasing interest among possible customers in the Middle East, Embraer sent a demonstrator, PT-ZNV, to the Dubai Airshow in November 2015, marking the first appearance of the Super Tucano in the United Arab Emirates.

Bolivia, Guatemala, Honduras, Nigeria, Paraguay and the UAE have all shown interest in the Super Tucano and been involved in recent negotiations, but none has placed orders as yet.

Despite overtures from Venezuela about buying the aircraft, the ongoing US embargo against the Chávez government has prevented any sale, since many of the Super Tucano's components are US-built.

As of November 2015 the worldwide Super Tucano fleet had racked up more than 230,000 flight hours, including 33,000 hours in combat, according to Embraer. 

EMB-314 (A-29) SUPER TUCANO AND AT-6 WOLVERINE SPECIFICATIONS COMPARED

	EMB-314 (A-29) Super Tucano	AT-6 Wolverine
Engine	One 1,600shp (1,193kW) Pratt & Whitney Canada PT6A-68-3 turboprop driving a five-blade Hartzell variable-pitch propeller	One 1,600shp (1,193kW) Pratt & Whitney Canada PT6A-68D turboprop driving a four-blade Hartzell variable-pitch propeller
Performance*		
Maximum level speed	557km/h (301kt)	585km/h (316kt)
Maximum cruise speed	530km/h (286kt)	500km/h (311mph)
Service ceiling	10,668m (35,000ft)	9,448m (30,997ft) clean
Range	1,568km (974 miles) at 9,144m (30,000ft) with maximum fuel and 30 minutes of reserves	3,195km (1,985 miles) ferry range with four external fuel tanks
Dimensions		
Length	11.42m (37ft 5in)	10.16m (33ft 4in)
Wingspan	11.14m (36ft 6in)	10.4m (34ft 2in)
Height	3.9m (12ft 9in)	3.25m (10ft 8in)
Weights		
Empty	2,420kg (5,335lb)	2,671kg (5,890lb)
Maximum external load	1,500kg (3,307lb)	1,864kg (4,110lb)
MTOW	3,600kg (7,937lb) clean	4,536kg (10,000lb)
Armament	One 12.7mm (0.5in) machine gun in each wing with 200 rounds per gun. Four underwing and one ventral pylon for a variety of weapons including GIAT NC621 20mm gun pods, Mk81, Mk82 and Mk83 bombs, MAA-1 Piranha AAMs, BLG-252 cluster bombs, SBAT-70/19 or LAU-68A/G rocket launchers, MLB bombs, electronic countermeasures pods, training targets, reconnaissance pods, etc.	Six underwing pylons for stores including GBU-12 and GBU-58 LGBs, APKWS and Talon laser-guided rockets. Future weapons expected to include 12.7mm (0.5in) gun pods, GATR laser-guided 70mm rockets, AGM-114P+ Hellfire anti-tank guided missiles, and G-CLAW tube-ejected unitary area munition.

* EMB-314 performance figures all at maximum take-off weight (MTOW) and 'clean'.

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Though Embraer claims that its A-29 Super Tucano is the most successful turboprop light attack and advanced training aircraft currently on the world market, it faces strong competition in the shape of the impressive Beechcraft AT-6 Wolverine.

report: **Jon Lake**

THE WOLVERINE IS a structurally-strengthened derivative of the T-6 Texan II trainer and was designed for a wide spectrum of missions including manned intelligence, surveillance and reconnaissance (ISR), training, and light precision attack, while also offering non-traditional capabilities for homeland defense and civil support missions. The aircraft can be used to quickly transition pilots between basic flight training missions and complex net-centric light attack and armed reconnaissance tasks, and can provide an excellent stepping-

stone for air forces aspiring to a fast jet combat aircraft capability.

The AT-6 was originally dubbed Coyote (at least internally), but it is now known as the Wolverine, or sometimes as the AT-6 Light Attack. The aircraft is a purpose-built derivative of the T-6 advanced trainer that has been fully optimized for light attack and armed reconnaissance. As such the aircraft is built on what Russ Bartlett, president of the Beechcraft Defense Company, calls 'the good bones of the T-6 trainer'. It is optimized for inexpensive operation, enjoying great commonality with the United States' existing pilot training infrastructure.



Above: **An AT-6 flies alongside an A-10C during testing at the Air National Guard and Air Force Reserve Test Center in Arizona.**
Jim Haseltine

Left: **N610AT during its 2010 visit to the UK for the Farnborough International Airshow.**
Beechcraft/
Jamie Hunter

Nine hundred T-6 Texan IIs have been built or are on order (752 of them for use by the US Department of Defense), and the type serves with, or has been ordered by, nine customer nations — Canada, Greece, Iraq, Israel, Mexico, Morocco, New Zealand, the United Kingdom and the US.

JPATS origins

The basic T-6A Texan II was developed to meet the US Department of Defense's Joint Primary Aircraft Training System (JPATS) requirement, which aimed to find a replacement for the US Air Force's Cessna T-37B 'Tweet' and the US Navy's T-34C Turbo Mentor. The aircraft was not an entirely 'clean-sheet' design, but rather



HUNGRY LIKE THE WOLVERINE

was developed from the Swiss Pilatus PC-9 trainer, itself a more powerful and refined derivative of the Pilatus PC-7. More than 250 PC-9s have been delivered to Angola, Australia, Bulgaria, Chad, Croatia, Cyprus, Germany, Ireland, Mexico, Myanmar, Oman, Saudi Arabia, Slovenia, Switzerland and Thailand.

While the USAF's T-6As had a federated analog cockpit, the US Navy T-6B added a digital 'glass' cockpit with six multi-function displays, hands on throttle and stick (HOTAS) controls and a head-up display, while the CT-156 Harvard II is a version of the T-6A used by the NATO Flying Training in Canada (NFTC) scheme.

Some of the T-6s delivered have been armed versions. Twenty of the Hellenic Air Force's T-6As were built to T-6A NTA standard, for example, capable of carrying external fuel tanks and a range of unguided weapons including gun pods, rocket pods and bombs, while retaining the federated analog cockpit of the USAF's T-6A. Morocco's T-6C has a 'glass' cockpit like that used by the US Navy's T-6B, and has a stores management system and underwing hardpoints, while the Mexican T-6C+ has further weapons capabilities.

The AT-6 Wolverine is powered by a 1,600shp Pratt & Whitney Canada PT6A-68D engine. This affords an unequalled power-to-weight ratio

among turboprop light attack aircraft, translating into what Beechcraft claims to be a higher airspeed and Mach envelope for the carriage and employment of external stores than is available on any other aircraft in its class. But where the Wolverine really comes into its own is in its proven US combat avionics systems and sensors, which make the aircraft fully compatible with all fielded US Joint Terminal Attack Controller (JTAC) digital voice/data capabilities and their NATO equivalents.

Furthermore, with its FAA-certified CMC Esterline Cockpit 4000 primary flight and flight management system avionics, and a Lockheed Martin combat mission



system as used in the A-10C Thunderbolt II, the cockpit 'represents a very 'F-16-like' environment, with a very similar pilot/vehicle interface. This, says Bartlett, results in a cockpit that would be familiar to any F-16 pilot.'

Sensors and weapons

The aircraft is equipped with an L-3 Wescam MX-15Di turret, similar to that used on the MC-12W Liberty. This contains color and infra-red cameras, a laser designator, laser illuminator, and laser rangefinder, giving the AT-6 an organic capability to find and designate targets, which the Wolverine can then engage using a wide range of precision-guided weapons thanks to the four Mil Std 1760-wired, smart weapon-compatible underwing hardpoints. The HMP-400 0.5in (12.7mm)-caliber gun pods, Hydra 70mm unguided rockets, Mk81/82 iron bombs, GBU-12/58 laser-guided bombs (LGBs), AGM-114K/M/P and R Hellfire anti-tank missiles, BAE Systems/General Dynamics Advanced Precision Kill Weapon System (APKWS), Raytheon/EAI Talon laser-guided rockets and Orbital/ATK GATR laser-guided 70mm rockets have already been cleared for use on the aircraft. It is also expected to be able to deliver the Textron Systems' G-CLAW tube-ejected unitary area munition.

The Wolverine is fitted with proven high-end communications and datalink equipment that give full interoperability in US and NATO command and control environments.

'The aircraft deployed to Nellis for two weeks from April 12, 2010, and flew six missions, totaling 17.5 flying hours. One lasted 4.5 hours. On another sortie the AT-6B landed on a remote, dry lake-bed and refueled on the ground from an MC-130P Combat Shadow tanker'

Despite these structural and avionics changes, the AT-6 Wolverine is said to retain 85 per cent commonality with the baseline T-6A/B trainer as used by the USAF and US Navy.

Today's Wolverine was originally developed to meet the USAF's Light Attack and Armed Reconnaissance (LAAR) or OA-X requirement of July 2009, building on earlier work dating back beyond 2006. The aircraft has since been developed in an iterative fashion. The LAAR requirement aimed to produce a dedicated light attack aircraft that would cost less than \$1,000 per hour to operate, rather than using fast jets at far below their full potential and costing more than \$10,000 per flying hour (the F-15E Strike Eagle's operating cost was calculated at \$44,000). The competition was originally expected to result in an order for up to 100 LAAR machines, with a total purchase price of \$2 billion. At the time it was anticipated that some of the 100 LAAR aircraft would equip an initial 24-aircraft USAF squadron and later a whole special operations wing.

In addition to its own LAAR platform, the USAF was expected to procure further aircraft for supply to some US allies who had neither the budget nor the expertise to operate types like the F-16, and who were conducting their own irregular warfare and counter-insurgency (COIN) campaigns.

The LAAR requirement did not specify turboprop power, but did place great emphasis on low operating costs, making a turboprop the most likely solution. It specified that the successful candidate must be derived from an existing, 'in-production' aircraft type and dictated that it should be simple enough to be operated by a 'partner nation' such as Iraq or Afghanistan.

As well as the AT-6 and Super Tucano, a new-build derivative of the twin-turboprop OV-10 Bronco (proposed by Boeing), an armed version of Aermacchi's jet-engined M-346 Master advanced trainer, and even Air Tractor's AT-802U — a militarized crop-duster — were put forward to meet the requirement.

Left: This pair of Wolverines (the second of which is the newest AT-6, N630LA) demonstrates some of the being tested on the type including GBU-12s, the Advanced Precision Kill Weapon System (APKWS) and 0.5in (12.7mm)-caliber gun pods. Beechcraft/Paul Bowen

Inset: A 500lb GBU-12 laser-guided bomb is dropped during testing. Beechcraft/Jim Haseltine

Bottom: Raytheon/EAI Talon laser-guided rockets have already been cleared for use on the aircraft. Beechcraft/Jim Haseltine

Spiral development

Beechcraft flew the first of its company-funded AT-6 prototypes (c/n AT-1, N610AT) on September 10, 2009. The aircraft was heavily instrumented, being used for envelope expansion and for performance and handling qualities assessments with various external stores configurations. The second, production-representative, AT-6B prototype (AT-2, N620AT), also company-funded, made its maiden flight on April 5, 2010. It was the first to be powered by a 1,600shp engine, the initial aircraft having had a 1,100shp powerplant. The AT-6B also had the new mission avionics suite, based on that of the A-10C.

Even before the second prototype joined the test program, on September 15, 2009, Beechcraft announced that it was teaming with Lockheed Martin in responding to the LAAR requirement. Lockheed Martin Systems Integration in Owego, New York, was appointed as the mission systems integrator for the aircraft, making use of the company's experience in integrating the A-10C's precision engagement modification. Not only was this a relevant, state-of-the-art and combat-proven precision-strike capability, but it also gave the Owego division experience

of an innovative approach between government and industry. Such teamwork promised to be essential for LAAR.

Although Beechcraft had built its two AT-6B prototypes with company funds, these were soon flying government-funded sorties as part of a \$15.4-million demonstration and evaluation program run by Detachment 11 of the National Guard Bureau and the Air National Guard/Air Force Reserve Command Test Center (AATC) in Tucson, Arizona.

This program was conducted in four phases known as spirals. Spiral One, using the first AT-6B prototype, was flown with simulated bombs and guns, and included participation in the Joint Expeditionary Forces Exercise 10-3 (JEFX 10-3) at Nellis Air Force Base, Nevada. This saw the aircraft undertaking realistic irregular warfare sorties against ground targets in mock-war conditions, with a strong focus on net-centric warfare and use of the datalink.

The aircraft deployed to Nellis for two weeks from April 12, 2010, and flew six missions, totaling 17.5 flying hours. One lasted 4.5 hours. On another sortie the AT-6B landed on a remote, dry lake-bed and refueled on the ground from

an MC-130P Combat Shadow tanker. The team assessed the suitability of the aircraft for the training of pilots from partner nations.

Spiral Two of the demonstration began in August 2010, and employed the second prototype, delivering live laser and GPS guidance-aided munitions at the Gila Bend test range in Arizona. These sorties included use of the Scorpion helmet-mounted cueing system. It was estimated that the aircraft had cost just \$1,000 per flight hour to operate.

After displaying the first aircraft at the 2010 Farnborough International Airshow, Beechcraft modified it to the full-standard AT-6 configuration by installing the same 1,600shp engine that was installed on the second AT-6 prototype, giving the company two aircraft for a new round of trials in 2011, during which they dropped 500lb GBU-12 and 250lb GBU-58 LGBs.

Spiral Three was completed in September 2012 at Eglin AFB and saw the employment of more than 265 bombs and rockets, as well as firing 3,000 rounds from the AT-6's 0.50-cal gun pods. The trials included test firings of the APKWS and Talon laser-guided rockets plus a further round of trials with the Gator and Hellfire missiles.

Spiral Four in September 2013 saw the AT-6 trialing the Single-Channel Ground and Airborne Radio System Situational Awareness (SINCGARS SA) Waveform capability. The SINCGARS SA Waveform is a software-controlled high frequency radio designed to provide digital communication and global positioning services (GPS) in both fixed and mobile configurations vital for military armed reconnaissance. The dual ARC-210 Warrior radios of the AT-6 were configured to securely and directly communicate simultaneously with three different Joint Terminal Attack Controllers





(JTACs). The success of the SA Waveform in the AT-6 is designed to further advance its future mission tactics in close air support (CAS), combat search and rescue (CSAR) and combat search and rescue task force (CSARTF).

LAAR exclusion

In November 2011 it was announced that the Beechcraft AT-6B had been excluded from the LAAR competition, and the USAF confirmed that the Embraer A-29 had been awarded the contract on December 30, 2011.

Selection of the Brazilian aircraft prompted a series of protests from Beechcraft, initially forcing work on the A-29 to stop. Embraer was re-awarded the contract on February 27, 2013, whereupon Beechcraft challenged the award again. This time, though, the USAF pressed ahead, and the United States Court of Federal Claims upheld the Air Force's decision to proceed.

In its protests, Beechcraft pointed out that the USAF was spending over \$125 million more (or more than 40 per cent) for what it labeled as a 'less capable, foreign-manufactured airplane with weapons and systems unfamiliar to, and outside the control of, the United States military'. It charged that the requirement had been 'written to favor the competition's aircraft', and questioned 'whether the Embraer aircraft with its foreign-made weapons can be certified to US military standards in time to provide the mission-capable aircraft per the contract.'

Hawker Beechcraft CEO Bill Boisture contended that the AT-6 met all threshold and five of seven objective requirements, and claimed that it had better take-off,



climb and cruise performance, and carried more fuel, while it could carry an electro-optical/infra-red (EO/IR) turret without sacrificing a weapons station. The manufacturer continued to highlight their aircraft's six weapons stations and unlimited 6g airframe, while pointing out that rough-field, grass and gravel runway capabilities had been demonstrated.

In response, Embraer pointed to its aircraft's wider-track, longer-wheelbase undercarriage (with its big, low-pressure tires) and greater ground clearance to claim superior rough/uneven runway operating characteristics. It claimed that the A-29's bigger, taller, wider canopy

Above: **The Wolverine is equipped with an L-3 Wescam MX-15Di turret under its belly.** Beechcraft/Jamie Hunter

Left: **The cockpit of the AT-6 was designed with A-10 pilots in mind. Indeed, it used contractors from the A-10C's precision engagement modification.** Beechcraft



gave its crew a significantly better all-round view. It contended that the aircraft's built-in, wing-mounted FN M3P 0.5in-caliber machine guns represented a significant advantage, while the forward-mounted AN/AAQ-22 Star SAFIRE II surveillance and targeting turret offered a better field of view and fewer blind spots, and the five-bladed propeller was significantly quieter.

In commenting on the contract award, the US Government Accountability Office (GAO) said that in order to meet its proposed offer targets, the AT-6 would have had to experience a 40 per cent increase in maximum gross take-off weight, noting that 'experience' showed that anything over 20 per cent would impose a serious risk of certification delays, with implications for service life. The GAO identified a number of other issues and revealed that the AT-6 was rated as exceptional, but 'high-risk', while the A-29 was rated as exceptional and 'low-risk'.

When the decision was made, in 2011, there were just two AT-6s flying — all prototypes — and 166 A-29s, which already had a long operational career, making perceptions of relative risk a critical factor.

The best-value element of the competition had three categories, in which capability was the most important factor, followed by past performance, with cost in third place.

The decision clearly still rankles with Russ Bartlett, president of the Beechcraft Defense Company, who told the author at the recent Dubai Airshow: 'We had a superior aircraft that was 100 per cent technically compliant and for 30 per cent less money'. He pointed out that it had been 'a tough decision to protest a decision by our biggest customer.'

Bartlett, an extremely experienced former F/A-18 Hornet pilot, acknowledged that the A-29 may have marginally better rough-runway characteristics, and described having the internal guns as 'cool', but claimed that Embraer's other claimed advantages were not relevant, and were 'not a combat discriminator'. He expressed the opinion that he would prefer to be delivering precision-guided weapons from height rather than trying to engage them with guns 'down in the weeds'.

In the end, losing the LAAR competition did not mean missing out on orders running into hundreds of aircraft. Instead, 15 aircraft were to be ordered for the Stateside training of allied pilots under LAAR, while just 20 Embraer A-29s were purchased for supply to the Afghan Air Force under the Light Air Support (LAS) program. The Afghan pilots trained using their own aircraft, which were temporarily operated by the newly re-activated 81st Fighter Squadron based at Moody Air Force Base, Georgia, LAAR having seemingly fallen by the wayside.


The 20 Afghan Air Force aircraft were built by US-based prime contractor Sierra Nevada in Jacksonville, Florida. Six of the LAS-winning machines were subsequently ordered for the Lebanese Air Force.

Crucially, the USAF has abandoned any plans to form a dedicated COIN air wing and to procure around 100 LAAR/OA-X/LAS aircraft to equip it. The A-29 seems destined to remain a little-known and very short-lived rarity in USAF service, limited to training a handful of overseas air forces. And without the boost in credibility and momentum that a large USAF order would have endowed on the selected aircraft, the A-29 and AT-6 seem destined to slug it out for what remains of the light attack and ISR market.

Beechcraft clearly believes that there is still a market to fight for, and, undeterred by defeat, the company has continued to develop and promote its own light attack offering. Indeed, a third AT-6 (AT-3) flew in August 2013 and was the first production aircraft, first registered as N630LA on October 23, 2013. AT-3 has now joined the program and it was this example that was displayed at Farnborough in 2014, and at Paris, the Royal International Air Tattoo and the Dubai Airshow in 2015.

Beechcraft remains confident in the Wolverine, which it says offers its operators a robust and interoperable air power solution at a fraction of the cost of traditional (fast jet) tactical aircraft, with lower operating costs and greater versatility than unmanned aerial systems. At the same time, the type is fully networked, and has advanced survivability features, rendering it less vulnerable than many rivals in its class.

Iraq, which already operates 15 unarmed T-6A trainers and six Special Mission King Airs, is understood to be Beechcraft's main target as launch customer for the Wolverine. Industry journal *Flight* reported in November 2015 that a letter of offer and acceptance for six of the light attack turboprops was being prepared for the Iraqi government. The US State Department approved a possible deal for up to 24 aircraft in May, and these would be delivered in increments of six.

Securing a launch customer will allow Beechcraft to begin the process of military type certification, completion of which will make the Wolverine more attractive to foreign buyers. To this end, the company is believed to be exploring the possibility of using the new Non-DoD Military Aircraft Airworthiness Accreditation program — a USAF initiative that will allow companies to self-fund the certification process. 

Below left to right: **The AT-6 has demonstrated its ability to operate from austere strips.**
Beechcraft/
Paul Bowen

Below: **Textron's offerings in the close air support sphere include its Scorpion and the AT-6.**
Jim Haseltine

