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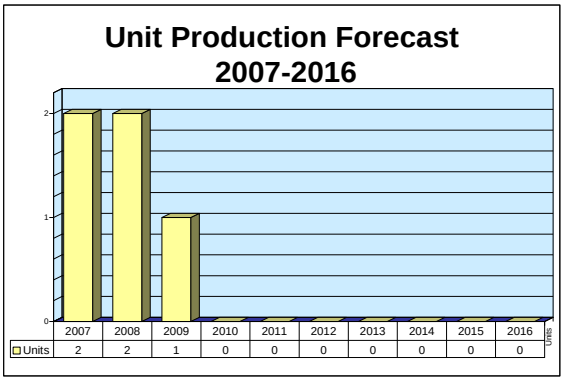
Microturbo TGA 15 - Archived 10/2008

Outlook

- TGA 15 machine is not being eyed for APU duty on board other aircraft
- Limited and infrequent production in the near term for the machine for ground-start carts
- TGA 15 use on the JAS 39 Gripen was switched to that of another OEM's product (effective with aircraft # 107)



Orientation

Description. The TGA 15 is a small, twin-shaft, axial-flow gas turbine machine that provides combined starting and onboard auxiliary power.

Sponsor. The TGA 15 was privately developed by the prime contractor.

Power Class. The output of the TGA 15 is a maximum equivalent 335 shp (250 kW), or 3.31 lb/sec (1.5 kg/s) of bleed air.

Status. The TGA 15 is not in production for the JAS 39. It is being built infrequently as replacement units for ground-start carts.

Total Produced. At the start of 2007, over 125 TGA 15 units are estimated to have been built for ground-start carts and for production aircraft.

Application. The TGA 15 gas turbine starter/auxiliary power unit is used on board fighter/attack aircraft. Recent, current, or proposed applications include the following:

Model Variant	Power or Thrust Rating [(a)]	Application	Units per Airframe
TGA 15	335 shp	Dassault Aviation Rafale A (only one model built)	1
TGA 15-122	335 shp	Ground-Start Carts/Ground Power Units	1
TGA 15-328	335 shp	Saab JAS 39 Gripen Starter/Auxiliary Power System	1

[(a)] Exact power output is dependent on specific application.

Price Range. Estimated in 2007 U.S. dollars at $225,000 for the TGA 15 for ground-start carts and $240,000-$250,000 for the APU on board the Gripen.

Competition. Excluding small gas turbine machines manufactured in the Russian Federation, Ukraine, and China, there are many small gas turbine machines

having approximately the same power output and/or bleed air production as the Microturbo TGA 15. At present, the machines that primarily complete with the TGA 15 are the Rolls-Royce T 312 and the Hamilton Sundstrand Titan T-62T. Some inventoried Honeywell Model 165 machines may still be available.

Contractors

Prime

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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

Design Features. The Microturbo TGA 15 is a twin-spool gas turbine machine, most likely axial flow. The TGA 15 unit comprises a turbojet engine driving a load compressor via a free (power) turbine. It provides a compressed air supply for various uses, including air conditioning systems, turbine starters, accessory drive turbines for powering hydraulic units, electric generators, and starters.

Dimensions. The approximate dimensions and weights of the Microturbo TGA 15 in an Aermacchi Chariot de Démurrage P75T include the following:

	Metric Units	English Units
Length, overall	922 mm	36.3 in
Width	335 mm	13.2 in
Height	545 mm	21.5 in
Weight, dry	67 kg	147.7 lb
Weight of air starter	12 kg	26.45 lb

Performance. The Microturbo TGA 15-122 has the following performance parameters (ISA, S/L):

	Metric Units	English Units
Performance		
Generator Speed	43,000-45,000 rpm	43,000-45,000 rpm
Air Flow	1.24 kg/sec	2.73 lb/sec
Output Pressure	3.23-5 bar abs	46.85-72.52 psia
Supply Air Temperature	170-240°C	338-464°F
Operating Envelope		
Altitude	0-3500 m	0-11,483 ft
Temperature	-40°C/+50°C	-40°F/+122°F

Variants/Upgrades

TGA 15-122/155. The TGA 15-122/155 designation applies to the TGA 15 machine used in ground-start carts for on-ground engine starting.

TGA15-090. The TGA15-090 was the original APU on the JAS Industry Group JAS 39 Gripen multirole aircraft manufactured by Saab Aircraft AB. It was changed to the TGA15-328 with the 41st JAS3 9A.

TGA 15-328. The TGA 15-328 designation applies to the TGA 15 machine used as an airborne APU on board the JAS Industry Group JAS 39 with aircraft #41 through #106. It was retrofitted into all early Lot 2

aircraft. It was replaced on the JAS 39 by a Hamilton Sundstrand APU.

Program Review

Background. Microturbo SA surprised the gas turbine industry by winning the JAS Industry Group JAS 39 Gripen aircraft auxiliary power unit/gas turbine starter competition with its TGA 15 unit. Although little information regarding the internal configuration of the TGA 15 has been released, the unit's general layout is believed to be similar to that of the firm's TRI 60 turbojet, an all-axial-flow machine developing a maximum of 832 lbst (3.7 kN).

The TGA 15 Air Producer, integrated into a mobile starting system, produces compressed air for starting aircraft engines. Associated with a pneumatic regulation system controlled by a digital electronic control unit, the TGA 15 automatically provides the airflow rate and pressure required for each type of starting system, according to the aircraft concerned. The versatility of the Model 122 means that it can be used to a start a wide range of aircraft, including the Boeing range (from the 707 to the 747), the Airbus range (from the A319 to the A340), the Ilyushin 76, the Antonov 74T 200, and the F4, F5, DC8, F/A-18, EFA, AMX, C130, Atlantic, and Orion P3.

Microturbo not only produces complete ground power units, but can also supply its customers with separate turbogenerators for integration into mobile starting systems (by separate contractors). In the latter case, the company defines requirements and provides technical assistance throughout the project until the product has been qualified.

Applications

JAS Industry Group JAS 39 Gripen. This single-engine, all-weather, multirole, high-performance, supersonic combat aircraft began replacing the Saab 37 Viggen and J35 Draken in the 1990s. Unlike the Viggen, it is a single electronically packaged aircraft dedicated to performing all three of the basic combat missions.

The aircraft is a product of the JAS Industry Group that consists of Saab AB (Linkoping, Sweden), Volvo Aero Corp (Trollhatten, Sweden), and Ericsson Microwave Systems AB (Mölndal, Sweden). The aircraft has a maximum takeoff weight of 30,864 pounds (14,000 kg); it is powered by a single Volvo Aero Corp (formerly Volvo Flygmotor) RM12 turbofan engine.

The initial contract to JAS was placed in 1982 for 30 aircraft, along with options on an additional 110 aircraft, for the Swedish Air Force. The Gripen's premier flight took place in December 1988. The first prototype crashed in February 1989, reportedly due to a software malfunction in the aircraft's fly-by-wire system. Because of the crash, the aircraft's Initial Operational capability (IOC) date was pushed back to 1997. The crash of a second JAS 39 in August 1993 pushed the program schedule back another six months while modifications were developed in the electronic flight control system.

In 1992, the Swedish Ministry of Defense placed a $3.3 billion order with Saab for the production of 110 Gripens, including 14 two-seat JAS 39B trainers. That contract was completed in 2001.

For the Gripen, the TGA 15 load compressor provides compressed air for engine starting through a matched air starter, and provides air conditioning and power for the aircraft's emergency power systems.

The TGA 15-328 designation applies to the TGA 15 machine used as an airborne APU on board the JAS 39 with aircraft #41 through #106; it was retrofitted into all early Lot 2 aircraft. It was replaced on the JAS 39 by a Hamilton Sundstrand APU.

Dassault Rafale A. The second airborne use of the TGA 15 is on board the Dassault Aviation Rafale A aircraft, an advanced-technology, high-performance, single-seat multirole aircraft. As the prototype for the production versions, the Rafale A logged over 700 flight hours since 1986. Initially referred to as the ACX, the ACT/ACM (Avion de Combat Tactique/Avion de Combat Marine) Rafale demonstrator was rolled out in December 1985; it made its initial flight in July 1986. No additional Rafale A models are projected to be built. The only Rafale variants that have entered production are the Rafale B, C, and M.

The production versions of the Rafale (Rafale B, C, and M) use the Microturbo Rubis 3 APU (see "Microturbo Rubis" report in this tab).

Microturbo TGA 15

Funding

French and Swedish government funding, if any, specifically related to the Microturbo TGA 15 has not been identified.

Timetable

Month	Year	Major Development
	1982	TGA 15 development begun
Dec	1985	Rafale A rolled out
Aug	1987	JAS 39 Gripen prototype rolled out
Dec	1988	First flight of prototype Gripen
Sep	1992	First flight of initial production JAS 39
	1993	Start of production of TGA 15 for JAS 39
	1997	IOC of JAS 39 Gripen
	2002	APU on board Lot 2 JAS 39s switched to a Hamilton Sundstrand APU
Thru	2016	Continued infrequent production of TGA 15

Worldwide Distribution/Inventories

At the start of 2007, all Microturbo TGA 15 machines were assumed to be in use in **France** and **Sweden**.

Forecast Rationale

As a starter/APU that equipped only one in-production aircraft, the Microturbo TGA 15 was tied to the JAS 39 Gripen. While it enjoyed some popularity with that aircraft, and an estimated 125 machines were produced for APU/GPU service, it was replaced from aircraft #107 with a Hamilton Sundstrand APU.

The Microturbo TGA15-122 can be used to a start a wide range of aircraft, including Boeing (from the 707 to the 747), Airbus (from the A319 to the A340), Ilyushin (76), Antonov (74T 200), and such other aircraft as the F4, F5, DC8, F/A-18, EFA, AMX, C130, Atlantic, and Orion P3.

We are projecting the manufacture of an additional five TGA 15 machines for use in ground-start carts; beyond the forecast period, other production may occur. We estimate that at least 10 TGA 15s were built as ground-start carts.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR UNIT PRODUCTION

Designation or Program	High Confidence				Good Confidence			Speculative			
	Thru 2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
Microturbo SA												
TGA 15 <> <> gpu												
	10	2	2	1	0	0	0	0	0	0	0	5
Total	10	2	2	1	0	0	0	0	0	0	0	5