General Electric Catalyst

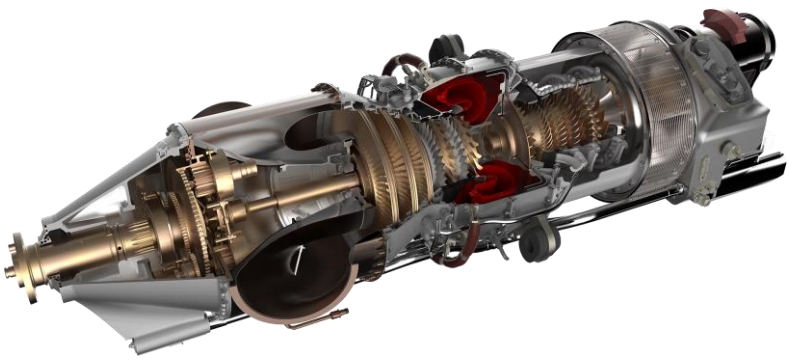
Turboprops
December 2018

Program Briefing

GE officially launched its new 1,000- to 1,600-shp Advanced Turboprop (ATP) family in November 2015 when it announced that Textron had selected the 1,240-shp variant for the new single-engine Cessna Denali. In May 2028, GE renamed the ATP, Catalyst.

The Catalyst will be assembled in GE's Czech facility in Prague. The family is competing against the monolithic Pratt Canada PT6A, as well as Honeywell's TPE331.

We forecast the production of 739 Catalysts (including development engines) over the next 10 years. Of these, the production installs and initial complete engines are projected to have a total retail value of $581.6 million.



Source: GE Aviation

Quick Specs:

Power Class:	1,000 – 1,600 shp
Pressure Ratio:	16:1
Airflow:	n/a
SFC:	n/a
Configuration:	5A + 1C HPC; Annular; 2 HPT; 3 LPT

Manufacturer

General Electric Co.
GE Aviation
Business & General Aviation Turboprops
Beranových 65
199 02 Praha 9 – Letnany
Czech Republic

Technical Description

Components

Layout
Twin-shaft turboprop.

Compressor
All-titanium, 3D aerodynamic five-stage axial plus single-stage centrifugal compressor. The first two stages of stator vanes are variable. Overall pressure ratio is 16:1.

Combustor
Single reverse-flow annular combustor. Liner is additive-manufactured.

HP Turbine
Two-stage unit driving the compressor. Cooled blades.

LP Turbine
Three-stage turbine driving the propeller via a gearbox.

Summary Forecast

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Total
Units Produced	9	6	23	51	61	76	102	122	142	147	739
Value* (2019 $ Millions)	2.4	—	18.4	40.8	48.8	60.8	81.6	97.6	113.6	117.6	581.6

**does not include development engines*

Other Features

Twelve additive manufactured components replace what would have been 855 conventionally manufactures parts. This includes sumps, bearing housings, frames, exhaust case, combustor liner, heat exchangers and stationary flow path components.

The engine features the first Full-Authority Digital Engine and Propeller Control (FADEPC) in the general aviation market.

Variants

GE93—Original in-house designation for the Catalyst.

Catalyst—Official name of the GE93.

Specifications

(Imperial Units)

Model	Max. Power Sea Level (shp)	Pressure Ratio	Comp./Tur. Config.	TIT (°F)	SFC (lb/shp-hr)	Max. Dia. (in)	Length (in)	Weight (lb)
Catalyst	1,240	16:1	5A/1C + 2A/3A	n/a	n/a	n/a	n/a	n/a

(Metric Units)

Model	Max. Power Sea Level (kW)	Pressure Ratio	Comp./Tur. Config.	TIT (°C)	SFC (g/kWhr)	Max. Dia (m)	Length (m)	Weight (kg)
Catalyst	924.7	16:1	5A/1C + 2A/3A	n/a	n/a	n/a	n/a	n/a

Applications

Engine	Aircraft	Engines per A/C
Catalyst	Cessna Denali	1

Marketing Data

Costs

We estimate the retail cost of the Catalyst to be in the range of $800,000.

The Competition

The Catalyst competes directly with the upper power range of the Pratt & Whitney Canada PT6A. Also, in the mix will be the Honeywell TPE331.

Milestones

Date	***Milestone***
2012	ATP concept development begins
Nov. 16, 2015	GE announces selection of ATP for Cessna Denali
May 23, 2016	Initial combustor tests completed
Dec. 22, 2017	First run of the ATP
Mar. 7, 2018	ATP given new name, Catalyst
early 2019	First flight of Denali planned
2020	Certification of Denali planned
2020	GE Turboprop Center of Excellence to open

Program Overview

Background

Origins

In 2012, GE aviation began studying concepts for a new clean-sheet 1,000- to 1,600-shp general aviation turboprop. The company officially launched the new Advanced Turboprop (ATP) family in November 2015 when it announced that Textron had selected the 1,240-shp variant (inhouse designation was GE93) for the new single-engine Cessna Denali.

Plans called for detailed design review for the ATP to be conducted in 2017 with first full engine test in late 2017.

GE Turboprop Center of Excellence

In January 2016, GE announced plans to build a new turboprop development, test and production facility located at its Prague (ex-Walter) location. Officially called the GE Turboprop Center of Excellence, when it opens in 2020 it will be the site of ATP production.

In October 2016, GE reported that it had finalized negotiations with the Czech government on an investment agreement to build the new facility.

First ATP Components Tested

In May 2016, GE completed initial combustor tests for ATP at the company's US facility in Cincinnati.

Additive Manufacturing

In October 2016, at the Orlando NBAA show, GE announced that it had completed testing a 35%-additive manufactured demonstrator engine. The engine, based on the CT7-2E1, and dubbed the a-CT7, was aimed at validating the additive manufacturing process that will be used ATP production. The demonstrator featured 16 additive-manufactured parts that would normally comprise more than 900 individual subtractive-manufactured (e.g., milled) parts. Twelve additive-manufactured parts will be used in the ATP, including: sumps, bearing housings, frames, exhaust case, combustor liner, heat exchangers and stationary flowpath components.

MRO

TBO

The initial planned time between overhaul (TBO) for the Catalyst is 4,000 hr.

Current Developments

Development

GE announced that a complete ATP had its first run in December 2017. Certification testing would begin in June 2018. The company said that a second engine was near completion at that time.

ATP Gets a New Name

In March 2018, GE Aviation announced that the ATP had been officially named Catalyst.

Teal Group Evaluation

The launch of the ATP confirmed GE's goal to seriously take on Pratt & Whitney Canada's near monopoly of the small- to mid-size turboprop market with its PT6A (500-1,650 shp). First, in 2008, GE acquired the Czech company Walter Aircraft Engines, which built the M601 turboprop in the 550- to 778-shp range. Then the company injected some of its advanced technology into the M601 and came up with the new H series of small turboprops (see report herein) in 2012. This gave GE a creditable PT6A competitor in the 750- to 850-shp power band, which has had some initial successes. Now, with the new Catalyst (1,000-1,600 shp), GE will have an answer to the entire PT6A line of props.

Success will not be easy for GE. Pratt Canada has a broad and well entrenched product line in the PT6A, with a wide range of applications and a proven aftermarket presence. Unlike the battle in the larger engine segments, a single application won cannot tip the balance of power. It will be a long-term contest of winning new applications, and perhaps stealing a few.

The Denali just represents the start of the battle, but it is significant nonetheless. We see further successes and have included an 'undetermined" line in our forecast below to represent this.

We forecast the production of 739 Catalysts (including development engines) over the next 10 years. Of these, the production installs and initial complete engines are projected to

have a total retail value of $581.6 million.

Production Forecast

Units	Thru 2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Total
Catalyst												
development engines	3	6	6	—	—	—	—	—	—	—	—	15
Denali	—	3	—	23	51	55	56	62	62	62	67	441
undetermined	—	—	—	—	—	6	20	40	60	80	80	286
Total	**3**	**9**	**6**	**23**	**51**	**61**	**76**	**102**	**122**	**142**	**147**	**742**

Value (2019 $Millions)	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Total
Catalyst											
Denali	2.4	—	18.4	40.8	44.0	44.8	49.6	49.6	49.6	53.6	352.8
undetermined	—	—	—	—	4.8	16.0	32.0	48.0	64.0	64.0	228.8
Total*	**2.4**	**—**	**18.4**	**40.8**	**48.8**	**60.8**	**81.6**	**97.6**	**113.6**	**117.6**	**581.6**

**does not include development engines*