

The CFM56-5C

THE CFM56-5C, the most powerful engine in the CFM56 family, is the sole propulsion system for the long-range Airbus A340-300 aircraft in production. The introduction of the A340-500 / -600 has seen the Trent engine certified on the A340 airframe, too. The CFM56 was developed from the collaboration of General Electric and Snecma in the late 1960's and early 1970's. The basis for the CFM56 was the F101 engine which powers the Rockwell B1-B. Continuing the CFM56 engine's excellent worldwide reputation, the CFM56-5C features innovative technologies, low fuel consumption, and the ability to meet all existing environmental requirements with significant margins.

In its class, the A340 fitted with CFM56-5C offers what Snecma claim to be the lowest noise signature in commercial service. The development of the CFM56-5C was supported at its entry into service in 1993, by the CFM56 family's more than 40 million engine flight hours of experience. The CFM56-5C has an excellent reliability rate which has become synonymous with the CFM56 family.

The CFM56-5C has the lowest specific fuel consumption of the engines within CFM56 family largely due to its large fan and high bypass ratio. It is also recognised as the quietest engine in its thrust class although competitors are few and far between. The engine has a high thrust-to-weight ratio, which provides excellent take-off performance for high altitudes and hot airfields. The engine has successfully demonstrated its ability to operate at

Development history	
Initial development contract	Fourth-quarter 1987
First engine to test	December 1989
First flight on Boeing 707 FTB	August 1990
CFM56-5C certification at 31,200lbs and 32,500lbs T/O thrust	December 1991
Airbus A340/CFM56-5C entry into service	February 1993
Airbus A340/CFM56-5C circles the world with only one stop	June 1993
CFM56-5C4 certification at 34,000lbs	October 1994
CFM56-5C4 entry into service (A340 at 257 tonnes)	March 1995
CFM56-5C4 entry into service (A340 at 271 tonnes)	April 1996

36,000lbs thrust during ground testing. Currently the -5C4 is the highest certified thrust capability at 34,000lbs thrust. The engine benefits from second-generation FADEC.

This CFM56 is the only model with the mixed flow bypass. It was developed by CFMI to provide significant noise attenuation, reduced fuel burn, and increased climb thrust.

Because of the aircraft installation, this CFM56 model has a very high hours to cycles ratio and the average time between a performance restoration shop visit is 15,000 hours.

The engine-caused shop visit rate has been as low as 0.046 and was equivalent to one visit per 21,739 engine flight

hours. Dispatch reliability rate was 99.61%, which is one of the highest rates for aircraft of this size.

The CFM56-5C had just entered its 'maturity' product phase. The market is stable and only a few aircraft are on backlog. This will guarantee the market to remain unchanged for several years, guaranteeing a good value retention to investors.

With the preceding factors taken into account, IASG assesses the current market value of the engine and QEC to be \$7,500,000. [n](#)

Article contributed by Paolo Lironi of IASG Powerplant Support Services

CFM56-5C4 characteristics	
Takeoff conditions (sea level)	
Max. takeoff (lbs)	34,000
Airflow (lbs/sec)	1,065
Bypass ratio	6.4
In-flight performance (35,000 ft-Mach=0.80-ISA)	
Max. climb thrust (lbs)	7,580
Overall pressure ratio at max. climb	38.3
Max. cruise thrust (lbs)	7,100
Engine characteristics	
Length (in)	103
Fan diameter (in)	72.3
Basic dry weight (lbs)	8,796

The CFM56-5C models		
Model (LPC, HPC, HPT, LPT)	Thrust (lbs)	Configuration
CFM56-5C2	31,200	1F + 4L, 9H, 1H, 5L
CFM56-5C3	32,500	1F + 4L, 9H, 1H, 5L
CFM56-5C4	34,000	1F + 4L, 9H, 1H, 5L
The -5C benefited of the core changes made on -5B engine, the -5C4/P version, too		

Reliability and other statistics	
Entry into service	1993
Departure reliability % successful per 1,000 departures	99.61
Shop visit rate per 1,000 engine flight hours	0.060
In-flight shutdowns rate per 1,000 engine flight hours	0.008
Average flight duration (hours)	6.1
Utilisation (hours per day)	12.8
Utilisation (cycles per day)	2.1
Number aircraft in-service	235
Engines in-service	1,082
Customers	38
Total engine flight hours (million)	29.2
Total engine flight cycles (million)	4.5