WHICH ENGINE FOR WHICH AIRCRAFT?

Match each type of CFM56 engine with the aircraft it powers.

A. CFM56-7B

B. CFM56-5C

C. CFM56-5B

D. CFM56-5A

E. CFM56-3

F. CFM56-2

1. Airbus A318, A318 Elite, A319, A319CJ, A320 and A321

2. Airbus A340-200, A340-300 and A340-300 Enhanced

3. KC-135R, C-135R, E-3, KE-3, E-6, and DC-8-71/72/73

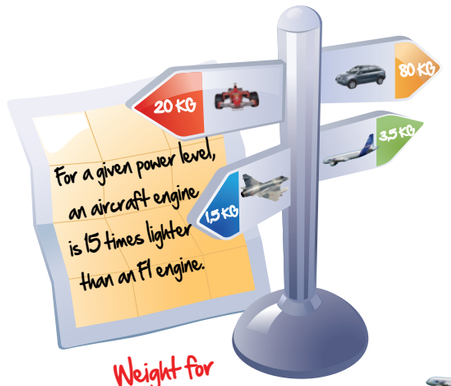
4. Boeing 737-600/-700/-800/-900/-900ER/BBJ/AEW&C/C-40/P-8A

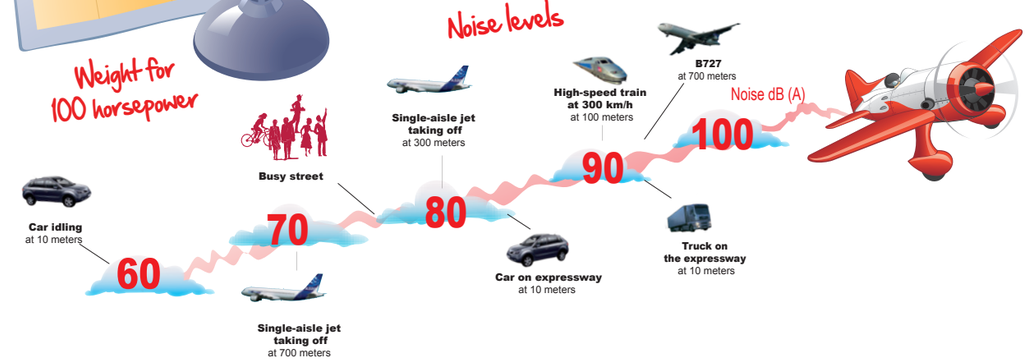
5. Airbus A319 and A320

6. Boeing 737-300, 737-400 and 737-500

Answers: A4, B2, C1, D5, E6 and F3

SEVERAL ORDERS OF MAGNITUDE





Z-CARD® Ltd. PTN
information to go here

QUIZ

7 questions to test your knowledge of CFM56 engines.

I. Who was CFM's first customer?

II. Where did the CFM56 name come from?

III. Which is the largest and most powerful CFM engine?

IV. How many flights does a CFM56 perform during its lifetime, on average?

V. What is the average lifespan of a CFM56 engine?

VI. How often does a CFM56-powered plane take off?

VII. What is the engine's fuel consumption in liters per 100 passenger-kilometers?

Answers: **I.** Delta, United and Flying Tigers (today's UPS). They placed the first order for the CFM56, to re-engine DC8 Super 70 jetliners. **II.** It was created in September 1971. It comes from combining the "CF" designation for "Commercial Fan", from GE, and the M56 from Snecma. The letter "M" refers to the Roman god of war, Mars, as Snecma was historically a manufacturer of engines for military aircraft. **III.** The CFM56-5C4. Length: 103 inches. Fan diameter: 72.3 inches. Thrust: 34,000 lbs (151 kN). **IV.** About 60,000, although the "senior" CFM56 has logged about 70,500 flights. **V.** In general, 60,000 to 80,000 hours in flight. / 2. It logs an average of 25,000 hours "on wing" before its first overhaul. **VI.** Somewhere in the world, every 2.5 seconds. **VII.** 3 to 5 liters per 100 passenger-kilometers.

DID YOU KNOW?

Everything you always wanted to know about the life cycle of a CFM56 engine.

Step 1
Initial studies

Marketing
- Preliminary design studies
- Market studies

Design
- Definition of engine with new technology concepts
- Design optimization and validation of each iteration
- Finalization of an "industrial validation file"

Step 2
Development

- Program launch
- Engine design
- Manufacture of first development parts
- Assembly of development engines
- Start of component & rig tests
- Certification

Step 3
Production and Distribution

Production
- Parts sent to assembly shop
- Engine assembly
- Start of full engine & flight tests

Service entry

Evolution possible with upgrade kits

Step 4
Sales and Support

Sales
- Marketing
- Sales and contract negotiations (vendors and customer support)

Customer support
- Customer Support Center (CSC), open 24/7
- Customer Web Center
- Remote Diagnostics: real-time monitoring of engine parameters

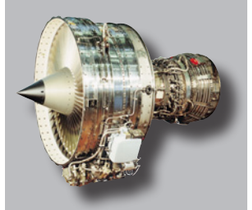
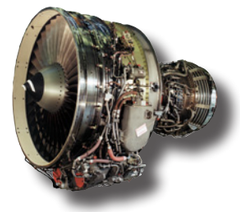
Step 5
Maintenance, Repair and Overhaul (MRO)

- Troubleshooting
- Repair or restoration
- Re-assembly
- Test
- Re-installation

Spare parts

- Forecast customer needs
- Component delivery
- Customer-oriented service

110-10

	CFM56-2			CFM56-3			CFM56-5A				CFM56-5B						CFM56-5C			CFM56-7					
																									
	-2C1	-2A2 -2A3	-2B1	-3B1	-3B2	-3C1	-5A1	-5A3	-5A4	-5A5	-5B1 -5B2	-5B3	-5B4	-5B5 -5B6	-5B7	-5B8 -5B9	-5C2	-5C3	-5C4	-7B18	-7B20	-7B22	-7B24	-7B26	-7B27
Takeoff performance (SLS)																									
Thrust (lbs)	22,000	24,000	22,000	18,500 to 20,000	22,000	18,500 to 23,500	25,000	26,500	22,000	23,500	30,000 /31,000	33,000(1)	27,000	22,000 /23,500	27,000	21,600 /23,300	31,200	32,500	34,000	19,500	20,600	22,700	24,200	26,300	27,300
Flat rating temperature (°F/°C)	86/30	95/35	90/32	86/30	95/35	90/32	86/30	86/30	113/45	99/37	86/30	86/30	111/44	113/45	111/44	113/45	86/30	95/35	90/32	86/30	86/30	86/30	86/30	86/30	86/30
Mass flow (lbs/sec)	788	817	784	638/655	683	638/710	852	876	816	842	943/956	968	900	818/844	900	810/840	1,025	1,045	1,065	677	696	728	752	779	792
Bypass ratio	6	5.9	6	5	4.9	5	6	6	6.2	6	5.5	5.4	5.7	6/5.9	5.7	6/5.9	6.6	6.5	6.4	5.5	5.4	5.3	5.3	5.1	5.1
In-flight performance (uninstalled) (35,000 ft-Mach=0.80-ISA)																									
Max. climb thrust (lbs)	5,400	5,760	5,450	4,860	5,260	5,540	5,616	5,616	5,616	5,616	6,420	6,420	5,705	5,705	6,420	5,705	7,365	7,365	7,585	5,960	5,960	5,960	5,960	5,960	5,960
Overall pressure ratio at max. climb thrust	31.3	31.8	30.5	27.5	28.8	30.6	31.3	31.3	31.3	31.3	34.4	34.4	32.6	32.6	34.4	32.6	38.3	38.3	39.2	32.7	32.7	32.7	32.7	32.7	32.7
Max. cruise thrust (lbs)	4,980	5,760	4,970	4,650	5,040	5,370	5,000	5,000	5,000	5,000	5,840	5,840	5,025	5,025	5,840	4,720	6,915	6,915	7,105	5,420	5,420	5,450	5,480	5,480	5,480
Engine characteristics																									
Length (in)	95.7	95.7	95.7	93	93	93	95.4	95.4	95.4	95.4	102.4	102.4	102.4	102.4	102.4	102	103	103	103	103,5	103,5	103,5	103,5	103,5	103,5
Fan diameter (in)	68.3	68.3	68.3	60	60	60	68.3	68.3	68.3	68.3	68.3	68.3	68.3	68.3	68.3	68.3	72.3	72.3	72.3	61.0	61.0	61.0	61.0	61.0	61.0
Fan/LP/HP compressor stage number	1+3+9	1+3+9	1+3+9	1+3+9	1+3+9	1+3+9	1+3+9	1+3+9	1+3+9	1+3+9	1+4+9	1+4+9	1+4+9	1+4+9	1+4+9	1+4+9	1+4+9	1+4+9	1+4+9	1+3+9	1+3+9	1+3+9	1+3+9	1+3+9	1+3+9
HP/LP turbine stage numbers	1+4	1+4	1+4	1+4	1+4	1+4	1+4	1+4	1+4	1+4	1+4	1+4	1+4	1+4	1+4	1+4	1+5	1+5	1+5	1+4	1+4	1+4	1+4	1+4	1+4
Basic dry weight (lbs)	4,635	4,820	4,671	4,276	4,301	4,301	4,995	4,995	4,995	4,995	5,250	5,250	5,250	5,250	5,250	5,250	8,796(2)	8,796(2)	8,796(2)	5,257	5,257	5,257	5,257	5,257	5,257
Certification redlines																									
EGT (°C)	905	930	905	930	930	930	890/915	915	890/915	890/915	950	950	950	950	950	950	950/965/975	965/975	975	950	950	950	950	950	950
NL (rpm)	5,280	5,280	5,280	5,490	5,490	5,490	5,100	5,100	5,100	5,100	5,200	5,200	5,200	5,200	5,200	5,200	4,800	4,800	4,960	5,380	5,380	5,380	5,380	5,380	5,380
NH (rpm)	15,183	15,183	15,183	15,183	15,183	15,183	15,183	15,183	15,183	15,183	15,183	15,183	15,183	15,183	15,183	15,183	15,183	15,183	15,183	15,183	15,183	15,183	15,183	15,183	15,183
Status (certification date)																									
	Nov. 1979	June 1985	May 1982	Jan. 1984	June 1984	Dec. 1986	Aug. 1987	Feb. 1990	Feb. 1996	Feb. 1996	Feb./May 1994/1993	June 1996	Feb. 1994	Mar. 1996	June 1999	Dec. 2001	Dec. 1991	Mar. 1993	Oct. 1994	Dec. 1996	Dec. 1996	Dec. 1996	Dec. 1996	Dec. 1996	Dec. 1996
Aircraft applications																									
	DC-8-71	E-3 - KE-3	KC-135 R	737-300	737-300	737-300	A320	A320	A319	A319	A321	A321	A320	A319	A319	A318	A340-200	A340-200	A340-200	737-600	737-600	737-600	737-700	737-700	737-700
	DC-8-72	E-6	C-135 FR	737-500	737-400	737-400							A321	A320	A319CJ	A318 Elite	A340-300	A340-300	A340-300		737-700	737-700	737-800	737-800	737-800
	DC-8-73					737-500								A319CJ									737-900	737-900	737-900/ER
																								BBJ	BBJ/ AEW&C
																									C-40/P-8A
Entry into service																									
	April 1979	July 1986	July 1984	Dec. 1984	June 1985	Sept. 1988	Apr. 1988	Dec. 1990	June 1996	July 1996	June/Feb 1994	June 1997	May 1995	Apr. 1996	June 2000	Aug. 2003	Feb. 1993	Mar.1994	Mar.1995	Nov. 2001	Apr. 1998	Dec. 1997	Mar. 1998	June 1998	Apr. 1998

(1) Equivalent thrust . (2) Propulsion System weight (lbs) - Engine characteristics are provided for reference purpose only and are subject to change