



Turbofans – Bypass Engines

- **Purpose**

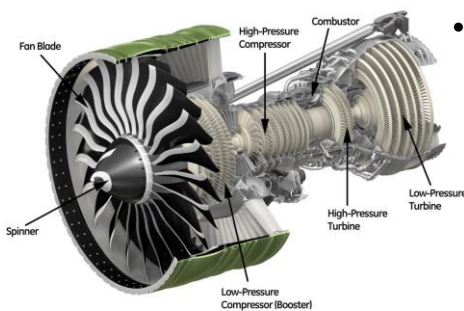
- higher propulsive efficiency
 - use more air with lower exit velocity to achieve same thrust ($u_e \rightarrow u, \eta_p \rightarrow 1$)
 - improved cruise range and/or lower fuel consumption (operating cost)

- **Configuration options**

- forward vs. aft fans
- unmixed vs. mixed nozzles



Forward Fans



lyle.smu.edu/propulsion/Pages/variations.htm

Bypass Ratio

$$\beta \equiv \frac{\dot{m}_s}{\dot{m}_a}$$

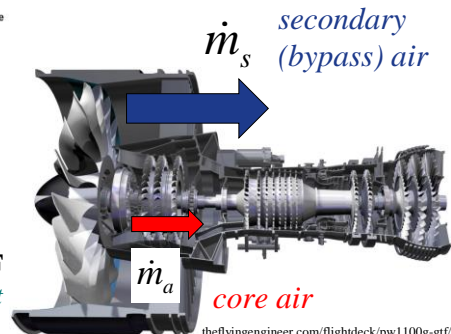
(III.17)



- PW1100 GTF
fan on LP spool, but geared down rpm

- GE90-115B

spool: for engines with LP and HP spools, fan typically on LP spool

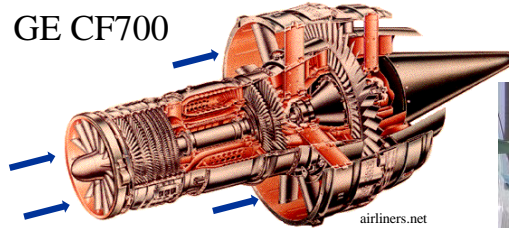


theflyingengineer.com/flightdeck/pw1100g-gtf/



Aft Fans

- GE CF700



airliners.net

separate diffusers for core and fan



www.fliegerszene.de/falcon.htm

- GE 36 (Demonstrator)



0809-1-046 Burkhard Domke © 2007

unducted fan

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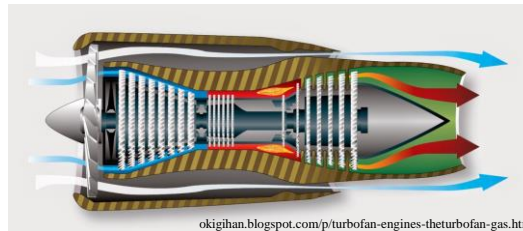
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Nozzle Configurations

- **Separate nozzles**

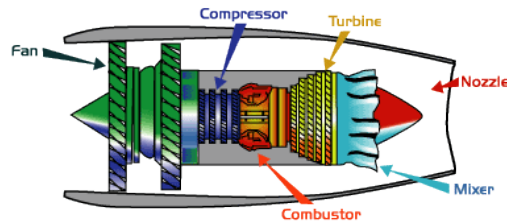
- for fan and core
- mechanically simple



okigihan.blogspot.com/p/turbofan-engines-theturbofan-gas.html

- **Single (mixed) nozzle**

- impacts η_p and noise



inventors.about.com/library/inventors/blhowajetengineparts.htm

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