SNS COLLEGE OF TECHNOLOGY
(An Autonomous Institution)

Department of Aerospace Engineering

23AST101-Fundamentals of Aerospace Engineering

UNIT-4:
POWER PLANTS

TURBOPROP ENGINE

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A **turboprop engine** is a type of gas turbine engine that drives a propeller to generate thrust. It combines the principles of jet propulsion with propeller efficiency, making it ideal for aircraft that require good performance at subsonic speeds, typically used in regional airliners, military transport, and utility aircraft.

How a Turboprop Engine Works:
Air Intake – Air is drawn into the engine through an inlet.
Compression – A compressor (axial or centrifugal) increases the air pressure.
Combustion – Fuel is injected and ignited in the combustion chamber, producing high-energy exhaust gases.
Turbine Expansion – The hot gases expand through a turbine, which extracts energy to drive both the compressor and the propeller (via a gearbox).
Propeller Thrust – The remaining energy is used to spin the propeller, generating most of the thrust (~90%), while a small portion comes from jet exhaust (~10%).

Key Components:
Propeller – Provides the majority of thrust.
Gearbox – Reduces high turbine RPM to optimal propeller speed.
Compressor – Pressurizes incoming air.
Combustor – Burns fuel-air mixture.
Turbine – Extracts energy to drive compressor and propeller.
Exhaust Nozzle – Expels residual jet thrust.

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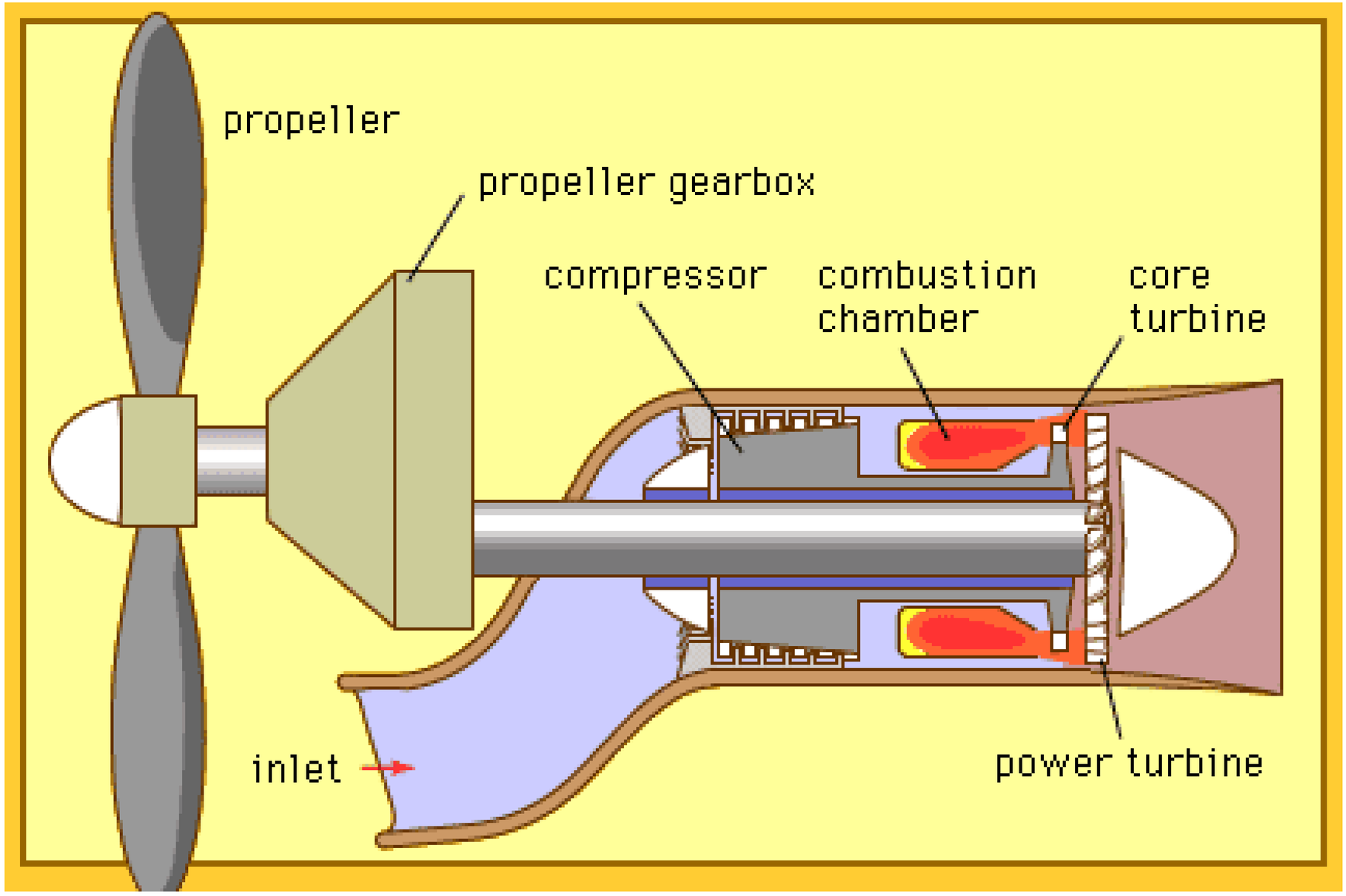
propeller
propeller gearbox
compressor
combustion chamber
core turbine
inlet
power turbine

Advantages of Turboprop Engines:
✓ **Fuel Efficiency** – Better than turbofans at lower speeds (250–400 knots).
✓ **Short Takeoff & Landing (STOL) Capability** – Ideal for small or rugged airstrips.
✓ **Lower Operating Costs** – Economical for regional and cargo operations.
✓ **Durability** – Performs well in harsh environments.

Disadvantages:
✕ **Speed Limitation** – Not suitable for high-speed flight (max ~450 mph).
✕ **Noise & Vibration** – Propellers generate more noise than pure jets.
✕ **Altitude Performance** – Less efficient at very high altitudes compared to turbofans.

Examples of Turboprop-Powered Aircraft:
Commercial: ATR 72, Bombardier Q400 (Dash 8)
Military: C-130 Hercules, P-3 Orion
Utility: Pilatus PC-12, King Air 350

Turboprop vs. Turbofan vs. Piston Engine:

Feature	Turboprop	Turbofan	Piston Engine
Speed Range	250–400 kts	450–600+ kts	100–300 kts
Fuel Efficiency	Best at low speeds	Best at high speeds	Moderate
Thrust Source	Propeller (~90%) + Jet	Fan (~80%) + Core Jet	Propeller Only
Complexity	Moderate	High	Low


THANK YOU!