Engine Input Data

Project: Turbofan Engine V1 – Preliminary Thermodynamic Analysis

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1. Operating Conditions

Parameter	Symbol	Value	Unit
Ambient Temperature	T_0	288.15	K
Ambient Pressure	P_0	101.325	kPa
Flight Velocity	V_0	0	m/s
Mach Number	M	0	—
Operating Condition	—	Static Sea Level	—

2. Engine Configuration

Parameter	Value
Engine Type	Two-Spool High-Bypass Turbofan
Bypass Ratio	5.0
Core Air Mass Flow	20 kg/s
Bypass Air Mass Flow	100 kg/s
Total Air Mass Flow	120 kg/s

3. Gas Properties

Parameter	Symbol	Value	Unit
Specific Heat	Cp	1005	J/(kg·K)
Ratio of Specific Heats	γ	1.40	—
Gas Constant	R	287	J/(kg·K)

4. Component Assumptions

Parameter	Value
Fan Pressure Ratio	1.60
High-Pressure Compressor Ratio	12
Combustor Exit Temperature	1400 K
Combustor Pressure Loss	5 %
Compressor Efficiency	0.86
Turbine Efficiency	0.90
Mechanical Efficiency	0.99
Nozzle Efficiency	0.95

5. Fuel Properties

Parameter	Value
Fuel Type	Jet-A (Assumed)
Lower Heating Value	43 MJ/kg
Combustion Efficiency	0.99
Fuel Mass Flow	0.329 kg/s

6. Thermodynamic Station Inputs

Station	Description	Temperature (K)	Pressure (kPa)
0	Ambient	288.15	101.325
2	Fan Exit	337.90	162.12
25	LPC Exit	330.00	160.00
3	HPC Exit	726.74	1920.00
4	Combustor Exit	1400.00	1824.00
45	HPT Exit	1003.25	650.83
5	LPT Exit	637.39	161.73

Note: These values correspond to the input and intermediate conditions used throughout the thermodynamic analysis presented in this project.

7. Engineering Assumptions

- One-dimensional steady-flow analysis
- Ideal gas behaviour
- Constant specific heats
- Complete combustion
- No cooling-air extraction
- Negligible leakage losses
- Static sea-level operating condition
- Perfectly expanded nozzles where applicable