CHAPTER 3
Turbine Engine Design and Construction

TURBINE ENGINE ENTRANCE DUCTS

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KEY POINTS

1. Commercial airliners and business jets have an inlet (entrance) duct with a _____ shape.
   A. Convergent
   B. Divergent

2. Supersonic aircraft have an inlet duct with a _____shape.
   A. Convergent
   B. Convergent-divergent

3. Ram recovery is the point where pressure inside the inlet equals _____ pressure outside the inlet.
   A. Ambient
   B. Ram

4. A low-speed aircraft such as a helicopter that is not designed for ram recovery will often have an inlet duct with a _____ shape.
   A. Convergent
   B. Divergent

5. Refer to Figure 3-10C in the textbook. The sand and ice separator is operated by a cockpit _____.
   A. Control handle
   B. Mechanical lever

6. The function of a vortex dissipater is to break up suction being created _____.
   A. At ground level
   B. At the inlet duct

RESEARCH QUESTIONS

1. What type or shape of flight inlet is found on a business jet?
   A. Convergent
   B. Divergent
   C. Variable geometry

2. What do the words "variable geometry inlet duct" refer to?
   A. A supersonic flight inlet
   B. A subsonic flight inlet
   C. A movable inlet screen

3. What is the velocity of gases flowing at the waist of a C-D inlet duct when the aircraft is flying at supersonic cruise speed?
   A. Subsonic
   B. Sonic
   C. Supersonic

4. Ram recovery refers to increasing what?
   A. Velocity in the flight inlet
   B. Thrust in the flight inlet
   C. Compression in the flight inlet

5. The typical subsonic aircraft will receive what compression ratio from its flight inlet at cruise airspeed?
   A. 0.5:1
   B. 1.5:1
   C. 5.0:1

6. Which of the following is more likely to have a screen installed in its inlet duct?
   A. Turbojet
   B. Turboprop
   C. Turbofan

7. What is the purpose of the inlet separator?
   A. To remove air velocity
   B. To remove air pressure
   C. To remove sand and ice

NOTES

ACCESSORY SECTION

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KEY POINTS

1. The main accessory section of a turbine engine is most often mounted externally on the engine at the _____ position.
   A. 6 o'clock
   B. 12 o'clock

2. The sump where oil collects before returning to the oil tank is located in the _____ gearbox.
   A. Accessory
   B. Auxiliary

RESEARCH QUESTIONS

1. What is the main unit of the accessory section?
   A. Fuel pump
   B. Fuel control
   C. Gearbox

COMPRESSOR SECTION

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KEY POINTS

1. The primary purpose of the compressor section is to increase air _____.
   A. Pressure
   B. Velocity

2. A secondary purpose of the compressor is to provide air for internal engine cooling known as engine _____ air.
   A. Bleed
   B. Cooling

3. The compressor also provides air to aircraft systems known as _____ bleed air.
   A. Cooling
   B. Customer

4. The centrifugal compressor raises air pressure by accelerating air molecules outward (radially) into a _____ outlet duct.
   A. Convergent-shaped
   B. Divergent-shaped

5. The axial flow compressor raises air pressure by accelerating air molecules rearward and then directing them into numerous _____ ducts formed by the stator vanes.
   A. Convergent-shaped
   B. Divergent-shaped

6. Stator vanes are placed at the rear of the rotor blades for the purpose of raising static pressure by the process of _____.
   A. Diffusion
   B. Divergence

7. Compressor blade roots are normally of the _____ design.
   A. Dovetail
   B. Fir tree

8. The main function of inlet guide vanes is to create a change in the _____ of airflow entering the first stage of compression.
   A. Angle
   B. Velocity

9. The compressor pressure ratio of a dual-spool turbofan engine is a ratio of the pressure after the last stage of compression to the pressure at the inlet of the _____.
   A. Fan
   B. HP compressor

10. The compression ratio of a fan stage is a ratio of the pressure at the fan discharge to the pressure at the fan _____ ___.
    A. Exhaust
    B. Inlet

11. The fan bypass ratio is not a pressure ratio but rather a ratio of two _____ airflow values.
    A. Mass
    B. Velocity

12. The centrifugal section of a combination compressor is always placed at the _____.
    A. Front
    B. Rear

13. Combination compressors are used almost exclusively in _____ engines.
    A. Large
    B. Small

14. The two vector forces that influence velocity and direction of compressor airflow are the inlet effect and the _____ effect.
    A. R.p.m.
    B. Velocity

RESEARCH QUESTIONS

1. The ideal compressor will produce the greatest compression with the least what?
   A. Velocity rise
   B. Pressure rise
   C. Temperature rise

2. What is the maximum number of stages that can be used successfully in a centrifugal flow compressor?
   A. One
   B. Two
   C. Three

3. What main advantage does a centrifugal compressor have over an axial compressor?
   A. Low weight
   B. High overall compression
   C. Narrow diameter

4. What makes up a stage of axial flow compression?
   A. A set of rotor blades
   B. A set of rotor blades followed by a set of stator vanes
   C. A set of stator vanes