

Unit 87: Construction and Operation of Aircraft Fluid Systems

Unit code: L/6017218

QCF level: 4

Credit value: 15

- **Aim**

This unit will develop learners' understanding of the construction and operation of aircraft hydraulic and pneumatic systems. Learners will interpret fluid circuit diagrams and inspect and test aircraft fluid systems.

- **Unit abstract**

This unit will investigate the constructional detail, operating principles and system function of a variety of aircraft hydraulic and pneumatic system components. Learners will interpret and analyse hydraulic and pneumatic circuit drawings and use a variety of illustrative methods and conventions so that fluid system operational status may be determined. The unit will also enable learners to inspect a range of aircraft hydraulic and pneumatic systems.

- **Learning outcomes**

On successful completion of this unit a learner will:

- 1 Understand the construction, operation and control of aircraft hydraulic systems and components
- 2 Understand the construction, operation and control of aircraft pneumatic systems and components
- 3 Be able to read and interpret fluid circuit diagrams to determine the operational status of fluid circuits
- 4 Be able to inspect and carry out functional tests on aircraft hydraulic and pneumatic systems.

Unit content

1 Understand the construction, operation and control of aircraft hydraulic systems and components

Hydraulic power: use; advantages/disadvantages of hydraulic actuation on aircraft; hydraulic system fluid principles

Aircraft hydraulic systems: power supplies; powered flying controls; landing gear; nose wheel steering; flaps; airbrakes; arrestor gear; braking and anti-skid; thrust reversers; emergency systems

Hydraulic system components: function and operation; oil types and properties; seals; pumps; linear actuators; rotary actuators (motors); pressure control valves; flow control valves; powered flying control units; accumulators; reservoirs; fluid conductors and plumbing; filters; pressure switches and gauges; fluid conditioning equipment; interface with other systems

2 Understand the construction, operation and control of aircraft pneumatic systems and components

Air as a fluid power medium: use; advantages/disadvantages of pneumatic power on aircraft; pneumatic fluid power principles; properties of air including the special characteristics needed by a fluid when subject to extremes of environmental change; related safety precautions for air and oxygen

Aircraft pneumatic systems: pneumatic sources eg engine bled, ram air, blowers, compressors, Auxiliary Power Unit (APU), bottles, oxygen generators, ground cart; air conditioning and pressurisation; wing and nacelle anti-icing; rain protection; reservoir/tank pressurisation; gyro instrument supply; engine starting; pneumatic landing gear/flaps/brakes; cabin/cargo heating and smoke detection; anti-g systems; oxygen systems; equipment cooling

Pneumatic system component: bottle; compressor; fan; turbine; blower; receiver; filter; dryer; humidifier; lubricator; pressure regulator; drainage points; oil separator; water separator; heat exchanger; cold air unit; cooling/refrigeration pack; duct; louvre; pipe; gauge; plenum chamber; check valve; mixing valve; sensor; switch, pressure controller; discharge valve; temperature controller; pneumatic actuator; air motor; relief valve; pressure control valve; directional control valve; non-return valve; flow control valve; solenoid valve; in/out flow valve; interface with other systems

3 Be able to read and interpret fluid circuit diagrams to determine the operational status of fluid circuits

Literature illustrating fluid power circuits: circuit diagrams and graphical representations eg pictorial, schematic, diagrammatic, block diagram; standard symbols; fluid system publications eg Air Transport Association (ATA) 100 system, air publications (APs), books, periodicals, manufacturers' literature, maintenance manuals, operational manuals, wall charts and diagrams

ISO and BS circuit system diagrams: ISO 1219/BS 2917 fluid power symbols; use of symbols for fluid storage; power sources and other components eg blowers, compressors, turbines, pumps and motors, drives, linear actuators, valve control mechanisms, directional control, servo and proportional control, pressure control, flow control, fluid plumbing and storage, fluid conditioning, fluid heating and cooling, refrigeration; associated electrical components

Interpret aircraft system diagrams: use of fluid power circuit diagrams eg ATA 100, ISO 1219, BS 2917; translation of ISO 1219/BS 2917 into other conventions and vice-versa; use of aircraft fluid power circuit diagrams eg determining system operation, identifying possible causes of system failure, suggestions for remedial action

4 Be able to inspect and carry out functional tests on aircraft hydraulic and pneumatic systems

Hydraulic systems: use of appropriate techniques to assemble, prime, bleed and analyse aircraft hydraulic systems

Pneumatic systems: use of appropriate techniques to dismantle, inspect and assemble aircraft pneumatic, pressurisation and conditioning systems

Fluid system functional tests: identification of required system functional tests and checks; proving integrity of fault diagnosis in practice and return system(s) to serviceable status

Learning outcomes and assessment criteria

Learning outcomes On successful completion of this unit a learner will:	Assessment criteria for pass The learner can:
LO1 Understand the construction, operation and control of aircraft hydraulic systems and components	1.1 explain the reasons for using hydraulic power as a major source of energy for aircraft systems operation 1.2 determine the properties of aircraft hydraulic fluids and their behaviour when subject to pressure and to extreme operating environments 1.3 explain the function, operation and control of aircraft hydraulic systems and their associated status indicators 1.4 explain the operation and constructional features of hydraulic system components
LO2 Understand the construction, operation and control of aircraft pneumatic systems and components	2.1 determine the properties of air as a fluid power medium for aircraft systems 2.2 explain the function and operation of aircraft pneumatic systems and their associated status indicators 2.3 investigate the function, nature and operation of selected aircraft pressurisation, air conditioning and refrigeration systems and their associated status indication systems 2.4 explain the operation and constructional features of pneumatic system components 2.5 explain the operation and constructional features of components used in aircraft pressurisation, cabin conditioning and refrigeration systems

<p>Learning outcomes</p> <p>On successful completion of this unit a learner will:</p>	<p>Assessment criteria for pass</p> <p>The learner can:</p>
<p>LO3 Be able to read and interpret fluid circuit diagrams to determine the operational status of fluid circuits</p>	<p>3.1 identify and use appropriate sources of literature illustrating aircraft fluid power circuits</p> <p>3.2 interpret ISO and BS circuit/system diagrams and translate these conventions into standard aircraft system schematic diagrams and vice-versa</p> <p>3.3 produce circuit diagrams in standard and other conventions for given aircraft fluid system services</p> <p>3.4 read and interpret aircraft system diagrams for selected hydraulic, pneumatic and environmental control systems</p> <p>3.5 identify possible aircraft fluid system and component defects by interpreting circuit diagrams for given situations</p>
<p>LO4 Be able to inspect and carry out functional tests on aircraft hydraulic and pneumatic systems</p>	<p>4.1 assemble, prime and bleed hydraulic systems and analyse system performance, using appropriate training rigs or aircraft systems</p> <p>4.2 dismantle, inspect and assemble selected aircraft pneumatic, pressurisation and conditioning systems/ components, using system mock-ups and/or aircraft</p> <p>4.3 carry out aircraft fluid system functional tests, determine and prove defects and return system(s) to an airworthy condition.</p>

Guidance

Links

This unit may be linked with *Unit 82: Aircraft Systems Principles and Applications*.

Essential requirements

The unit requires access to aircraft hydraulic, pneumatic and environmental control systems and components (these may be in the form of system mock-ups). Appropriate sources of literature in the form of aircraft manuals, diagrams and charts will also be required.

Employer engagement and vocational contexts

The delivery of this unit will benefit from centres establishing strong links with employers willing to contribute to the delivery of teaching, work-based placements and/or detailed case study materials.