SEMAE3337

Maintaining turbine engines on aircraft

## Overview

This standard identifies the competences you need to carry out maintenance activities on aircraft turbine engines, in accordance with the approved aircraft maintenance manual, approved change documentation (service bulletin) and airworthiness requirements. It covers both fixed wing and rotary winged aircraft, and covers the general maintenance requirements. It does not cover complete engine overhaul, for which other standards are available. The maintenance activities will include carrying out the removal, fitting and testing of a range of turbine engine components. You will remove the required components and fit approved replacements, as appropriate. You will then need to test and adjust the completed system to meet the aircraft maintenance manual, change documentation (service bulletin) and airworthiness requirements.

Your responsibilities will require you to comply with the specific practices and procedures identified in the aircraft manual, change/service bulletin documentation and airworthiness requirements for the maintenance activities undertaken, and to report any problems with these requirements that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. You must ensure that all tools, equipment and materials used are correctly accounted for on completion of the activities, and that all necessary job/task documentation is completed thoroughly, accurately and legibly. You will be expected to work with a minimum of supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work, and will provide an informed approach to applying the appropriate maintenance techniques and procedures to aircraft turbine engines. You will understand the component removal, fitting and testing methods and procedures, and their application, along with the turbine engine maintenance requirements. You will know how the equipment functions, the common problems that can occur, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and for ensuring that the aircraft turbine engine is maintained to the required standard.

You will understand the safety precautions required when working on the aircraft turbine engines, especially those for ensuring that the engine, and its fuel supply, is

safely and correctly isolated. You will be required to demonstrate safe working practices throughout, and will understand your responsibility for taking the necessary safeguards to protect yourself and others in the workplace.

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**Notes:**

1. This standard is designed to cover the practical experience requirements of the Airline Transport Association (ATA) Chapter 72 Aircraft Turbine Engines.
2. To display competence in this standard, it is necessary to both remove and fit aircraft turbine engine components. You must remove components; however, you may fit a replacement component where the original was previously removed by another person. You should also be aware of how to leave a system in a safe condition if maintenance tasks cannot be completed. This covers both the physical systems and the job documentation.

## Performance criteria

*You must be able to:*

1. work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
2. follow the relevant maintenance schedules to carry out the required work
3. carry out the maintenance activities within the limits of your personal authority
4. carry out the maintenance activities, and replace components in the specified sequence and in an agreed timescale
5. report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
6. complete relevant documentation in accordance with organisational requirements
7. dispose of waste materials in accordance with safe working practices and approved procedures
8. leave the aircraft and engine in a safe and appropriate condition, free from foreign object debris on completion of the activities

## Knowledge and understanding

*You need to know and understand:*

1. the specific safety practices and procedures that you need to observe when working on aircraft turbine engines (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
2. the need to check that cabin/cockpit switches, selectors and circuit breakers are in the correct position before applying any form of external power (such as electrical, hydraulic, air or vacuum)
3. the importance of maintenance on aircraft turbine engines, and impact upon Extended Range Twin-Engine Operations Procedures (ETOPS) systems, Electrical Wiring Interconnect Systems (EWIS), legislation and local procedures
4. the requirements and importance of understanding and applying human factors as defined by the regulatory requirements and the potential impact if these are not adhered to
5. the hazards associated with carrying out maintenance activities on aircraft turbine engines, and with the tools and equipment used (such as handling oils, greases, the safe release of fuel and other fluids, traps from moving parts, hot parts of engines, misuse of tools) and how to minimise them and reduce any risk
6. the protective equipment that you need to use for both personal protection (PPE) and protection of the aircraft
7. what constitutes a hazardous voltage and how to recognise victims of electric shock
8. how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
9. the importance of aircraft husbandry and of ensuring that, throughout the maintenance activity, the aircraft and work area are maintained free from foreign objects, and the implications of FOD to the safety of the aircraft
10. how to extract and use information from aircraft manuals, log books, flight logs, charts, system and physical layouts, specifications, symbols used in aircraft turbine engines, and other documents in the maintenance activities
11. how to carry out currency/issue checks on the specifications you are working

with

12. terminology used in aircraft turbine engines, and the use of system diagrams and associated symbols
13. the principles of operation of the turbine engine being worked on, and the function of the units that make up the system
14. the techniques used to remove turbine engine components without damage to the components or surrounding structure (such as release of pressures/force, draining of fuel/fluids, removal of components and the need to protect the system integrity by ensuring that exposed components and pipe ends are correctly covered/protected)
15. the various mechanical fasteners to be removed and replaced, and their methods of removal and replacement (such as threaded fasteners, special securing devices)
16. the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking-in of the connections
17. why electrical bonding is critical, and why it must be both mechanically and electrically secure
18. the need to label and store correctly components that require repair or overhaul, and to check that replacement components have the correct part/identification markings and accompanying release documentation
19. how to remove and refit aircraft turbine engine components safely and correctly (such as use of lifting and handling equipment; ensuring the correct tightness of connections; eliminating stress on pipework/connections; carrying out visual checks of all components)
20. how to make adjustments to components/assemblies to ensure that they function correctly (such as blade tip clearance)
21. why securing devices need to be tightened to the correct torque, locked and labelled, and the different methods that are used
22. the tools and equipment used in the maintenance activities, and their calibration/care and control procedures
23. why tool/equipment control is critical and what to do if a tool or piece of equipment is unaccounted for on completion of the activities
24. the routine checks and tests to be carried out on the aircraft turbine engine
25. how to record the results of the checks and tests, and the documentation that must be used
26. how to analyse the checks and tests, and make valid decisions about the acceptability of the aircraft turbine engine

27. the procedure for the safe disposal of waste materials, scrap components and fuel/fluids
28. the extent of your own authority and to whom you should report if you have problems that you cannot resolve

## Scope/range related to performance criteria

1.

Carry out all of the following during the maintenance of the aircraft turbine engine:

1.1 ensure that appropriate authorisation to work on the aircraft is obtained, and observe all relevant isolation and safety procedures
1.2 obtain and use the correct documentation (such as job instructions, technical instructions, aircraft manuals and maintenance documentation)
1.3 obtain the correct tools and equipment for the activity, and check that they are in a safe, tested and usable condition and within current calibration dates
1.4 adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work
1.5 ensure the safe isolation and draining of fluid lines before breaking into the system
1.6 ensure that the relevant safety devices and mechanical/physical locks are in place (where appropriate)
1.7 use approved removal, fitting and testing techniques and procedures at all times
1.8 return tools and equipment to the correct storage location on completion of the activities
1.9 ensure that work carried out is correctly documented and recorded
1.10 ensure that any outstanding tests are correctly documented

2.

Carry out maintenance on one of the following types of aircraft turbine engine:

2.1 turbo prop
2.2 un-ducted fan
2.3 turbo-shaft
2.4 ducted fan
2.5 turbo jet
2.6 turbo-fan

3.

Carry out maintenance on two of the following parts of the aircraft turbine engine:

3.1 air intake section
3.2 turbine section
3.3 reverse thrust
3.4 air inlet section
3.5 fan section
3.6 propulsor section (rear mounted)
3.7 compressor section
3.8 accessory drives
3.9 nozzles and jet pipes
3.10 combustion section

3.11 by-pass section
3.12 reduction gear and shaft section (turboprop or front-mounted driven propulsor)

4.

Remove and fit six different aircraft turbine engine components (at least two must be from group A):

Group A

1. drive shafts
2. gearboxes/gearbox housing
3. annulus fillers/sealing strips
4. reduction gears
5. drive tubs/shafts
6. attrition linings
7. propulsor blades
8. oil pump assembly
9. compressor support structural fairings
10. guide vanes
11. compressor spinners
12. shrouds
13. curvic couplings
14. bearing housing end cover
15. rotor/stator fan blades
16. nose cone support rings
17. bearings
18. burner cans
19. front and rear blade root chocking pads
20. cooling air manifold
21. turbine nozzles
22. bearing support assembly
23. valves (such as oil tank check)
24. hydraulic pump
25. integrated drive generator (IDG)
26. starter
27. nozzle exhaust
28. fuel control/meter unit (FCU/FMU)
29. air intake

Group B

30. attachment and locking mechanisms
31. fittings and brackets
32. fairings
33. rod assemblies/levers and linkages
34. cables
35. cable harness/wiring/switches/plugs
36. support links

37. nose cowl
38. indicators and warning devices
39. mounting bolts
40. seals
41. other specific components

1.

Carry out fifteen of the following maintenance activities:

1.1 removing cowling and fairings to expose components to be removed
1.2 carrying out inspections, fault diagnosis and system checks
1.3 preparing the system for maintenance (such as isolating, draining fluids)
1.4 disconnecting electrical connections
1.5 disconnecting/reconnecting bonding leads
1.6 refitting components in the correct position, orientation and alignment
1.7 disconnecting/removing hoses and pipes
1.8 removing securing devices and mechanical fasteners
1.9 setting and adjusting replaced components
1.10 supporting equipment to be removed
1.11 making mechanical connections
1.12 dismantling equipment to an appropriate level
1.13 making electrical connections
1.14 covering (protecting) exposed components, wires, pipework or vents
1.15 torque loading as required
1.16 replenishing fluid systems
1.17 checking components for serviceability
1.18 carrying out system functional checks
1.19 replacing damaged/defective components
1.20 replacing single use items such as seals, filters, gaskets
1.21 ensuring that replacement components have the correct part numbers
1.22 fitting blanks, labelling (and storing in the correct location) components that require repair or overhaul
1.23 applying bolt locking methods (such as split pins, wire locking, lock nuts)
1.24 carrying out area inspections prior to task close down

2.

Service/check aircraft turbine engines, to include carrying out four of the following:

2.1 visually checking the system for damage and leaks
2.2 checking fastenings/security of all engine access panels/cowls
2.3 checking and cleaning rotor and compressor blades (compressor washing)
2.4 oil replenishment
2.5 carrying out vibration checks
2.6 carrying out blade tip clearance checks
2.7 carrying out transient acoustic propagation (TAP) test of rotor/compressor blades

3.

Complete the relevant paperwork, to include one from the following and pass it to

the appropriate people:

3.1 job cards/work sheets
3.2 aircraft cabin log
3.3 computer records
3.4 aircraft log book
3.5 aircraft technical log

4.

Carry out maintenance on aircraft turbine engines in compliance with one of the following:

4.1 Civil Aviation Authority (CAA)/European Aviation Safety Agency (EASA)
4.2 Extended Range Twin-Engine Operations Procedures (ETOPS) (where appropriate)
4.3 Ministry of Defence (MoD)
4.4 Military Aviation Authority (MAA)
4.5 Aerospace Quality Management Standards (AS)
4.6 Federal Aviation Authority (FAA)
4.7 aircraft maintenance manual/approved change documentation (service bulletin)
4.8 manufacturers standards and procedures

## Behaviours

You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

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