

## SECTION 3.2 TYPE RATINGS

### Unit 3.2.1 TYPA: Pilot type rating – aeroplane

#### 1. General note: for this unit

- 1.1.1 Applicants for a multi-crew certified aircraft type rating are required to satisfy the knowledge standards specified for the ATPL of the same aircraft category, that are relevant to the operation of the aircraft. The following knowledge standards may not be relevant for all aircraft type ratings and can be ignored if not applicable to an aircraft type.

#### 2. Aeroplane limitations and documentation

- 2.1.1 Identify aircraft limitations and able to locate information contained in the AFM and POH.
- 2.1.2 Perform pre-flight inspection and determine serviceability of the aircraft for flight.
- 2.1.3 Apply MEL and CDL, where applicable.
- 2.1.4 Determine the effects of ADs, ASB/SB where pilot action may be required, as applicable to type.
- 2.1.5 Aware of licensing obligations for variants, where applicable.

#### 3. Weight and balance

- 3.1.1 Calculate CG for aircraft and determine if within prescribed limits.
- 3.1.2 Determine trim settings and MAC, where applicable.
- 3.1.3 Describe the effects of fuel use and management on CG, if any.
- 3.1.4 Describe the effects of changes to CG on aircraft performance.
- 3.1.5 Awareness of aircraft weight limitations, loading limits, cargo hold limitations, and any load/weight limitations for operational equipment contained in the flight manual supplement

#### 4. Meteorology and adverse weather operations

- 4.1.1 Interpret weather forecasts typically required to conduct a flight in the aeroplane.
- 4.1.2 State the requirements for low-visibility operations.
- 4.1.3 Describe the effect on aircraft operations for the following conditions:
- (a) ice, slush or snow (as applicable);
  - (b) turbulence penetration;
  - (c) heavy rain or falling snow;
  - (d) windshear techniques during take-off, approach and landing (as applicable);
  - (e) cold weather operations (as applicable);
  - (f) low-visibility operations (as applicable).

#### 5. Aerodynamics and performance

- 5.1.1 Describe basic aerodynamics and high speed aerodynamics for turbo-jet powered aircraft.
- 5.1.2 Describe the effect of changes in airspeed on longitudinal stability for swept-wing aeroplanes.
- 5.1.3 Describe the minimum climb gradient performance requirements for each segment for aeroplanes that are certified as a transport or commuter category aircraft.
- 5.1.4 Describe the effects on airflow over aerofoils and the aerodynamic effects of the following if installed on the aircraft:
- (a) spoiler;
  - (b) speed brakes;
  - (c) flaps and slats.

- 5.1.5 Determine the airspeeds to meet performance requirements for different configurations and phases of flight.
- 5.1.6 Describe stall characteristics and limits of normal operating envelope.
- 5.1.7 Discuss the meteorological performance limiting factors.
- 5.1.8 Discuss any unique operational characteristics, including runway requirements/limitations.

## **6. Fuel and engine oil systems**

- 6.1.1 Describe the following in relation to the aircraft's fuel system:
  - (a) location of fuel tank/s and capacity;
  - (b) normal and non-normal fuel system operation and distribution;
  - (c) location and type of pumps used;
  - (d) vents system and location of vents and drains;
  - (e) system controls and indicators;
  - (f) minimum grades, colour and additives required, if any;
  - (g) minimum fuel temperature;
  - (h) indications of reduced or loss of fuel flow.
- 6.1.2 Determine level of engine oil.
- 6.1.3 Describe oil system indicators and grade of oil required.
- 6.1.4 Describe fuel and oil system limitations.

## **7. Engines**

- 7.1.1 Describe type of engine/s installed, the main components, rated thrust or horsepower and indicators required for operation.
- 7.1.2 State engine start limits, as applicable.
- 7.1.3 Describe engine controls and their function.
- 7.1.4 Describe normal and non-normal engine operation.
- 7.1.5 Describe operation of the ignition system.
- 7.1.6 Describe the method of feathering and unfeathering the propeller/s, where applicable.

## **8. Electrical system**

- 8.1.1 Describe core components of the aircraft's electrical system.
- 8.1.2 Describe the system design and operation, including use of AC or DC power, as applicable.
- 8.1.3 Explain the methods of power generation.
- 8.1.4 Describe the electrical system protections and locations of key components.
- 8.1.5 Explain the indications of normal and degraded system operation.
- 8.1.6 Describe the location of connections for external sources of power, if applicable.
- 8.1.7 Describe the use of the APU when used to provide a source of electrical power.

## **9. Hydraulic system**

- 9.1.1 Describe core components of the aircraft hydraulic system/s and their method of operation, including alternative sources of operation.
- 9.1.2 Describe normal system operating pressure and system protections to prevent damage to components or system.
- 9.1.3 Explain method of determining sufficient system capacity, indicators and controls.
- 9.1.4 Describe systems operated by the hydraulic system/s.

**10. Undercarriage and brakes**

- 10.1.1 Describe the undercarriage system components and safety systems.
- 10.1.2 Explain normal and alternative method of undercarriage operation.
- 10.1.3 Describe operation of the nosewheel steering system, if installed.
- 10.1.4 Describe the brake system components and normal and non-normal operation.
- 10.1.5 Explain operation of the anti-skid system and limitations.
- 10.1.6 Determine brake energy limits and brake cooling requirements.

**11. Pneumatic system**

- 11.1.1 Describe the aircraft pneumatic system components and methods of operation.
- 11.1.2 Describe system limitations and safety devices.

**12. Environmental system**

- 12.1.1 Explain the operation of aircraft heating, demisting, and airconditioning systems, normal and emergency modes of operation and limitations.

**13. Flight controls**

- 13.1.1 Describe primary and secondary flight controls and their method of operation.
- 13.1.2 Describe degraded modes of operation for aircraft fitted envelope protection systems, the effects on longitudinal stability with changes in aircraft speed.
- 13.1.3 Knowledge of limitations and safety features that prevent structural damage to the aircraft.

**14. Ice and rain protection**

- 14.1.1 Describe the aircraft ice protection system/s, detection systems and explain their operation.
- 14.1.2 Describe anti-ice system limitations.

**15. Fire and overheat protection**

- 15.1.1 Describe the fire and overheat protection system/s installed on the aircraft, including indicators and extinguishing agents used.
- 15.1.2 Can determine the serviceability of the system/s.
- 15.1.3 Describe the power sources required for system operation.

**16. Flight instruments**

- 16.1.1 Describe the system/s that provide data to the primary flight instruments.
- 16.1.2 Describe the power sources for the primary flight instruments/displays.
- 16.1.3 Describe the operation of the warning systems.
- 16.1.4 Knowledge of alternative sources of flight instrument operation.
- 16.1.5 Describe the operation of EFIS system and redundant modes of operation.

**17. Navigation and radar systems**

- 17.1.1 Knowledge of the operation of the aircraft navigation, communication and surveillance system/s.
- 17.1.2 Describe the operation of the aircraft navigation receivers and how to determine their operational status and integrity.
- 17.1.3 Knowledge of the aircraft's weather detection system/s and safety precautions.
- 17.1.4 Explain operation of the aircraft FMS and integration with other aircraft systems.

- 17.1.5 Determine ANP for RNP operations.
- 17.1.6 Describe the operation of the aircraft windshear detection system.

**18. Autoflight system**

- 18.1.1 Explain the operation of the autopilot and autothrottle, if installed, in flight operation in all modes.
- 18.1.2 Describe failure annunciations, pilot actions and limitations.
- 18.1.3 Explain the integration of aircraft navigation systems with the autoflight system.

**19. Communications**

- 19.1.1 Can operate all the aircraft communication systems, voice and data when installed.
- 19.1.2 Describe operation of aircraft intercommunication systems.
- 19.1.3 Describe operation of the communications system in the event of changes in power source.
- 19.1.4 Explain operation of the CVR and FDR and requirements for operation.

**20. Airframe**

- 20.1.1 Describe airframe construction, fuselage sections, materials, cowling and firewalls, as applicable.
- 20.1.2 Describe aerodynamic surfaces of the airframe.
- 20.1.3 Describe operation of the doors, exits, windows and monitoring systems.

**21. Miscellaneous systems**

- 21.1.1 Describe other systems installed in the aircraft that are likely to be used by the flight crew to operate the aircraft.
- 21.1.2 Describe the location and operation of emergency equipment installed on the aircraft.

**Unit 3.2.2 TYPH: Pilot type rating – helicopter****1. Reserved****2. Helicopter limitations and documentation**

- 2.1.1 State aircraft limitations and demonstrate ability to locate information contained in the RFM and POH, if applicable.
- 2.1.2 Perform pre-flight inspection and determine serviceability of the aircraft for flight.
- 2.1.3 Apply MEL and Configuration Deviation List (CDL), where applicable.
- 2.1.4 Determine the effects of ADs, ASB/SB where pilot action may be required, as applicable to type.
- 2.1.5 Awareness of licensing obligations for variants, where applicable.

**3. Weight and balance**

- 3.1.1 Calculate CG for aircraft and determine if within prescribed limits.
- 3.1.2 The effects of configuration changes on CG, if any.
- 3.1.3 The effects of fuel use and the management of the CG, if any.
- 3.1.4 The effects of changes to CG on aircraft performance.
- 3.1.5 Aircraft weight limitations, loading limits, cargo hold limitations, and any load/weight limitations for operational equipment contained in the flight manual supplement.

**4. Meteorology and adverse weather operations**

- 4.1.1 Interpret weather forecasts typically required to conduct a flight in the helicopter.
- 4.1.2 State the requirements for low-visibility operations.
- 4.1.3 Describe the effect on helicopter operations of the following:
  - (a) ice, slush or snow (contaminated runway);
  - (b) turbulence penetration;
  - (c) heavy rain or falling snow;
  - (d) windshear and localised environments (as applicable);
  - (e) cold weather operations (as applicable);
  - (f) low-visibility operations (as applicable).

**5. Aerodynamics and performance**

- 5.1.1 Describe basic aerodynamics for single main rotor, tandem rotor or coaxial system, as appropriate.
- 5.1.2 Describe the effect of changes in airspeed on drag and, therefore, performance.
- 5.1.3 Describe the minimum climb gradient performance requirements for each segment for helicopters that are certified as an air transport helicopter.
- 5.1.4 Describe the following aerodynamic effects as they apply to the particular helicopter:
  - (a) ground resonance;
  - (b) dynamic rollover;
  - (c) tail rotor drift and tail rotor roll;
  - (d) flapback and inflow roll;
  - (e) vortex ring;
  - (f) retreating blade stall;
  - (g) autorotation;
  - (h) loss of tail rotor effectiveness.

- 5.1.5 Determine the airspeeds to meet performance requirements for different configurations and phases of flight.
- 5.1.6 Describe stall characteristics and limits of normal operating envelope.
- 5.1.7 Discuss the meteorological performance limiting factors.
- 5.1.8 Discuss any unique operational characteristics, including terrain and environment.

## **6. Fuel and engine oil systems**

- 6.1.1 Describe the following in relation to the aircraft's fuel system:
  - (a) location of fuel tank/s and capacity;
  - (b) normal and non-normal fuel system operation and distribution;
  - (c) location and type of pumps used;
  - (d) vents system and location of vents and drains;
  - (e) system controls and indicators;
  - (f) minimum grades, colour and additives required, if any;
  - (g) minimum fuel temperature;
  - (h) indications of reduced or loss of fuel flow.
- 6.1.2 Minimum level of engine oil.
- 6.1.3 The aeroplane's oil system indicators and grade of oil required.
- 6.1.4 Fuel and oil system limitations for the aeroplane.

## **7. Engines**

- 7.1.1 Describe type of engine/s installed, the main components, rated horsepower and indicators required for operation.
- 7.1.2 State engine start limits, as applicable.
- 7.1.3 Describe engine controls and their function.
- 7.1.4 Describe normal and non-normal engine operation.
- 7.1.5 Describe operation of the ignition system.
- 7.1.6 Describe the method of rotor engagement, as applicable.

## **8. Electrical system**

- 8.1.1 Describe core components of the aircraft's electrical system.
- 8.1.2 Describe the system design and operation, including use of AC or DC power, as applicable.
- 8.1.3 Explain the methods of power generation.
- 8.1.4 Describe the electrical system protections and locations of key components.
- 8.1.5 Explain the indications of normal and degraded system operation.
- 8.1.6 Describe the location of connections for external sources of power, if applicable.
- 8.1.7 Describe the use of the APU when used to provide a source of electrical power.

## **9. Hydraulic system**

- 9.1.1 Describe core components of the aircraft hydraulic system/s and their method of operation, including alternative sources of operation.
- 9.1.2 Describe normal system operating pressure and system protections to prevent damage to components or system.
- 9.1.3 Explain method of determining sufficient system capacity, indicators and controls.
- 9.1.4 Describe systems operated by the hydraulic system/s.

**10. Undercarriage and brakes**

- 10.1.1 Describe the undercarriage system components and safety systems.
- 10.1.2 Explain normal and alternative method of undercarriage operation.
- 10.1.3 Describe operation of the nosewheel steering system, if installed.
- 10.1.4 Describe the brake system components and normal and non-normal operation.
- 10.1.5 Determine brake energy limits and brake cooling requirements.

**11. Pneumatic system**

- 11.1.1 Describe the aircraft pneumatic system components and methods of operation.
- 11.1.2 Describe system limitations and safety devices.

**12. Environmental/pressurisation system**

- 12.1.1 Explain the operation of aircraft heating, demisting, and airconditioning systems, if applicable, normal and emergency modes of operation and limitations.

**13. Flight controls**

- 13.1.1 Describe primary and secondary flight controls and their method of operation.
- 13.1.2 Knowledge of limitations and safety features that prevent structural damage to the aircraft.

**14. Ice and rain protection**

- 14.1.1 Describe the aircraft ice protection system/s, detection systems and explain their operation.
- 14.1.2 Describe anti-ice system limitations, if applicable.

**15. Fire and overheat protection**

- 15.1.1 Describe the fire and overheat protection system/s installed on the aircraft, including indicators and extinguishing agents used, if applicable.
- 15.1.2 Determine the serviceability of the fire and or overheat system/s, if applicable.
- 15.1.3 Describe the power sources required for system operation.

**16. Flight instruments**

- 16.1.1 Describe the system/s that provide data to the primary flight instruments.
- 16.1.2 Describe the power sources for the primary flight instruments/displays.
- 16.1.3 Describe the operation of the warning systems.
- 16.1.4 Knowledge of alternative sources of flight instrument operation.
- 16.1.5 Describe the operation of EFIS system and redundant modes of operation.

**17. Navigation and radar systems**

- 17.1.1 Knowledge of the operation of the aircraft navigation, communication and surveillance system/s, as applicable.
- 17.1.2 Describe the operation of the aircraft navigation receivers and how to determine their operational status and integrity.
- 17.1.3 Knowledge of the aircraft's weather detection system/s and safety precautions, if applicable.
- 17.1.4 Explain operation of the aircraft FMS and integration with other aircraft systems, if applicable.
- 17.1.5 Determine RNP capability.
- 17.1.6 Conduct RNP operations, as applicable.

17.1.7 Describe the operation of the aircraft windshear detection system, if applicable.

**18. Autoflight system**

18.1.1 Describe the function and design of stability augmentation, autopilot and flight director systems in both the normal and degraded modes, if applicable.

18.1.2 Describe failure annunciations, pilot actions and limitations.

18.1.3 Explain the integration of aircraft navigation systems with the autoflight system.

**19. Communications**

19.1.1 Describe operation of all the aircraft communication systems, voice and data when installed.

19.1.2 Describe operation of aircraft intercommunication systems.

19.1.3 Describe operation of the communications system in the event of changes in power source.

19.1.4 Explain operation of the CVR and the FDR and requirements for operation, as applicable.

**20. Airframe**

20.1.1 Describe airframe construction, fuselage sections, materials, cowling and firewalls, as applicable.

20.1.2 Describe the operation and function of aerodynamic surfaces of the airframe.

20.1.3 Describe operation of the doors, exits, windows and monitoring systems.

**21. Miscellaneous systems**

21.1.1 Describe design of role equipment and their use, the applicable procedures during normal and non-normal operations and limitations imposed on such equipment.

21.1.2 Describe other systems installed in the aircraft that are likely to be used by the flight crew to operate the aircraft.

21.1.3 Describe the location and operation of emergency equipment installed on the aircraft.



**Unit 3.2.3 FETR: Flight engineer type rating – all aircraft****1. Reserved****2. General operational knowledge****2.1 Aircraft limitations and documentation**

- 2.1.1 Recalls essential aircraft limitations.
- 2.1.2 Can locate information in the AFM.
- 2.1.3 General background knowledge on unique aircraft characteristics, similar models and variants, including knowledge required to confirm the serviceability of the aircraft before commencement of flight.
- 2.1.4 Knowledge of licensing obligations for variants, where applicable.
- 2.1.5 Use of MEL and configuration deviation list (CDL), where applicable.

**2.2 Weight and balance**

- 2.2.1 Describe the effects of fuel burn on the CG.

**2.3 Adverse weather operations**

- 2.3.1 Describe operational impact of icing conditions.

**2.4 Aerodynamics and performance**

- 2.4.1 General knowledge of airflow over aerofoils and the aerodynamic effects of the following if installed on the aircraft:
  - (a) spoiler;
  - (b) speed brakes;
  - (c) flaps and slats.
- 2.4.2 Able to calculate or extract relevant aircraft performance data for different phases of flight and the effects of non-normal operations on aircraft range and endurance.
- 2.4.3 Describe the meteorological performance limiting factors.
- 2.4.4 Discuss any unique operational characteristics.

**2.5 Meteorology**

- 2.5.1 Can interpret the weather forecasts typically required for the normal operation of the aircraft.

**3. Aircraft systems****3.1 Fuel and oil systems**

- 3.1.1 Can describe the following in relation to the aircraft's fuel system:
  - (a) location of fuel tank/s and capacity;
  - (b) normal and non-normal fuel system operation and distribution;
  - (c) location and type of pumps used;
  - (d) vents system and location of vents and drains;
  - (e) system controls and indicators;
  - (f) minimum grades, colour and additives required, if any.
- 3.1.2 Determine minimum level of engine oil.
- 3.1.3 Describe oil system indicators and grade of oil required.
- 3.1.4 Knowledge of fuel and oil system limitations.

**3.2 Engines**

- 3.2.1 Describe type of engine/s installed, the main components, rated thrust or horsepower and indicators required for operation.
- 3.2.2 Describe engine controls, their function.
- 3.2.3 Describe normal and non-normal engine operation.
- 3.2.4 If installed, the type of propellers/s, indicators and method of control and the method of feathering and unfeathering the propeller.
- 3.2.5 For turbine engine aircraft, explain the operation of the engine ignition system.

**3.3 Electrical system**

- 3.3.1 Describe core components of aircraft's electrical system, including;
  - (a) method/s of power generation;
  - (b) system design and operation;
  - (c) system protections and locations of key components;
  - (d) indicators and normal and degrade system operation;
  - (e) APU operation and location of connections for other external sources of power, if applicable.

**3.4 Hydraulic system**

- 3.4.1 Describe core components of the aircraft hydraulic system and their method of operation.
- 3.4.2 Method of determining sufficient system capacity, indicators and controls.
- 3.4.3 Systems operated by the hydraulic system/s.

**3.5 Undercarriage and brakes**

- 3.5.1 Describe the undercarriage system components and safety systems.
- 3.5.2 Normal and alternative method of operation.
- 3.5.3 Nosewheel steering system, if installed.
- 3.5.4 Describe the brake system components and normal and non-normal operation.

**3.6 Pneumatic system**

- 3.6.1 Describe the aircraft pneumatic system components and methods of operation.
- 3.6.2 Describe system limitations and safety devices.

**3.7 Environmental/pressurisation system**

- 3.7.1 Describe aircraft pressurisation system components and methods of normal and non-normal operation.
- 3.7.2 Explain the aircraft pressurisation limitations and safety features.
- 3.7.3 Describe the differences between gradual and rapid depressurisation experienced by the occupants of the aircraft.
- 3.7.4 Describes the reason for pressurisation limitation for take-off and landing.
- 3.7.5 Explain why a pressurised aircraft is fitted with a cabin altimeter.
- 3.7.6 Describe how to determine that the pressurisation system is functioning correctly.

**3.8 Flight controls**

- 3.8.1 Describe primary and secondary flight controls and their method of operation.
- 3.8.2 Describe the operation of speed-sensing devices that limit or operate flight controls where installed.
- 3.8.3 Describe degraded modes of operation for aircraft fitted with fly-by-wire flight control systems, the degraded protection provided and the effects on longitudinal stability with changes in aircraft speed.

- 3.8.4 Knowledge of limitations and safety features that prevent structural damage to the aircraft.

### **3.9 Ice and rain protection**

- 3.9.1 Describe the aircraft ice protection system/s, detection systems and explain their operation.
- 3.9.2 Describe anti-ice system limitations.

### **3.10 Fire and overheat protection**

- 3.10.1 Describe the fire and overheat protection system/s installed on the aircraft, including indicators and extinguishing agents used.
- 3.10.2 Can determine the serviceability of the system/s.
- 3.10.3 Describe the power sources necessary for system operation.

### **3.11 Flight instruments**

- 3.11.1 Describe the system/s that provide data to the primary flight instruments.
- 3.11.2 Describe the power sources for the primary flight instruments/displays.
- 3.11.3 Describe the operation of the stall avoidance and/or warning systems.
- 3.11.4 Knowledge of alternative sources of operation.

### **3.12 Navigation**

- 3.12.1 Knowledge of the operation of the aircraft navigation system/s, including transponder/s and flight director/s and limitations.
- 3.12.2 Describe the operation of the aircraft navigation receivers and how to determine their working status.
- 3.12.3 Knowledge of the aircraft's weather detection system/s and safety precautions.
- 3.12.4 Operation of the aircraft FMS and can determine signals used to determine aircraft position.
- 3.12.5 Describe the operation of the aircraft TCAS system.
- 3.12.6 Understanding of the aircraft windshear detection system, if installed.

### **3.13 Autoflight**

- 3.13.1 Knowledge of autopilot and autothrottle, if installed, in flight operation in all modes.
- 3.13.2 Describe failure annunciations and pilot actions.
- 3.13.3 Understanding of interface with aircraft navigation systems.
- 3.13.4 Describe autoflight limitations.

### **3.14 Communications**

- 3.14.1 Can operate all the aircraft communication systems, voice and data when installed.
- 3.14.2 Describe operation of aircraft intercommunication systems.
- 3.14.3 Describe operation of the communications system in the event of depressurisation or use of emergency oxygen system.
- 3.14.4 Explain operation of the CVR and FDR.

### **3.15 Miscellaneous systems**

- 3.15.1 Describe other systems installed in the aircraft that contribute to the safety of the aircraft operation or are likely to be used by the flight crew to operate the aircraft.
- 3.15.2 Describe the location and operation of emergency equipment installed on the aircraft.
- 3.15.3 Knowledge of the location and operation of all exits installed on the aircraft.