Civil Aviation Safety Authority
of Papua New Guinea

Advisory Circular

AC61-2

Aircraft Type Ratings

Issue 2

31 October 2022

GENERAL

Civil Aviation Safety Authority Advisory Circulars (AC) contain information about standards, practices and procedures that the Director has found to be an Acceptable Means of Compliance (AMC) with the associated rule.

An AMC is not intended to be the only means of compliance with a rule, and consideration will be given to other methods of compliance that may be presented to the Director. When new standards, practices or procedures are found to be acceptable, they will be added to the appropriate Advisory Circular.

This Advisory Circular also includes Explanatory Material (EM) where it has been shown that further explanation is required. Explanatory Material must not be regarded as an acceptable means of compliance.

PURPOSE

This Advisory Circular provides methods, acceptable to the Director, for showing compliance with the aircraft type rating requirements of Rule Part 61 and explanatory material to assist in showing compliance.

RELATED CAR

This AC relates specifically to Civil Aviation Rule Part 61 Subpart B.

CHANGE NOTICE

This AC replaces Issue 1 dated 1 April 2015.

APPROVAL

This AC has been approved for publication by the Director of Civil Aviation

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INTRODUCTION

This advisory circular provides support for Part 61, subpart B, Aircraft Type Ratings.

SUBPART B – Aircraft Type Ratings

Rule 61.53 Eligibility Requirements

(a) Rule 61.53(2) requires an applicant for an aircraft type rating to have conversion instruction flight experience acceptable to the Director. Attainment of the experience detailed in Appendix I of this subpart advisory circular is acceptable.

(b) Rule 61.53(3) requires an applicant for a turbine powered aircraft type rating to have a Basic Gas Turbine rating. Attainment of the syllabus detailed in Appendix II of this subpart advisory circular would meet this requirement. An examination credit in the subject of basic turbine knowledge which has been obtained in a foreign country will not normally be recognised in Papua New Guinea unless the applicant has obtained a type rating on a turbine powered aircraft in that country.

(c) Rule 61.53(4) requires an applicant for an aircraft type rating to demonstrate a satisfactory technical knowledge of the aircraft, and 61.53 (6)(ii) and (7) require an applicant for a type rating for an aircraft exceeding 5700 kg MCTOW or for a helicopter to have passed an approved examination. Attainment of the syllabuses detailed in Appendix III of this subpart advisory circular would meet these requirements.

(d) Rule 61.53(5) requires an applicant for an aircraft type rating to demonstrate competency in that type to a flight instructor. Attainment of the syllabuses detailed in Appendix IV of this Advisory Circular to Subpart B would meet this requirement.

(e) The syllabuses in the Appendices were taken from the New Zealand Civil Aviation Safety Order (CASO) 12 and were updated through the consultative rule-writing process.

Rule 61.55 Issue

(a) An aircraft type rating which has been issued by a foreign contracting State to the Convention may be recognised by the Director provided the applicant produces evidence that the type rating was obtained in a manner which meets the requirements of this Subpart.

(b) Rule 61.55(d) allows an aircraft type rating to include any other aircraft approved as being so similar as to require no further conversion instruction. An aircraft type that has no significant differences, of performance or of handling characteristics, and without any reasonable doubt by anyone concerned as to whether they are the same type, is approved as similar for this purpose.

(c) The form below is acceptable to the Director for recording type ratings entered in a pilot's logbook.

TYPE RATING CERTIFICATE

This is to certify that ……..

has successfully demonstrated to the flight examiner or to the flight instructor responsible for the conversion instruction, whose signature appears below, technical knowledge of the aircraft and ability to perform competently all normal, abnormal and emergency manoeuvres appropriate to the aircraft type in accordance with the requirements of Civil Aviation Rule Part 61.

Flight Examiner or Flight Instructor

Aircraft type	Name, licence class and number	Signature	Date

Appendix I Aircraft type rating experience

For a multi-engined aeroplane not exceeding 5700 kg MCTOW:

- Initial issue — 5 hours, subsequent types — 1 hour.

For a multi-engined centerline-thrust aeroplane not exceeding 5700 kg MCTOW:

- 2 hours.

For a single engined aeroplane operating on land only:

- 30 minutes, except that holders of Category A flight instructor ratings are exempt from this experience requirement.

For a single engined ski-plane:

- Using snow as the sole take-off and landing medium — 3 hours.

For a single engined seaplane:

- Using water as the sole take-off and landing medium, initial issue — 5 hours, subsequent types — 2 hours.

For a multi-engined helicopter not exceeding 5700 kg MCTOW:

- Initial issue — 5 hours, subsequent types — 3 hours.

For a helicopter above 5700 kg MCTOW:

- Initial issue — 10 hours, subsequent types — 5 hours.

For a single engined helicopter not exceeding 5700 kg MCTOW:

- Initial issue will be coincident with the initial issue of a helicopter pilot licence, subsequent types — 1 hour.

For any other aircraft:

- As specified by the Director.

Notes

A pilot who has qualified as pilot-in-command on aeroplanes or helicopters in any civil or military capacity may have such conversion time assessed towards meeting the above requirements.

The minimum conversion flight time will be dual instruction unless otherwise specified and will be confined to exercises relative to conversion to the particular aircraft type.

The minimum conversion flight time may include the flight test.

In the case of a single seat type, the instructor issuing the rating is to be satisfied that the pilot has successfully completed ground training to an appropriate level. In addition, before making the appropriate logbook entry, the instructor is to personally observe from the ground the pilot's flying of the aircraft and be satisfied that an acceptable level of competence was displayed.

Appendix II Basic turbine knowledge syllabus

Theory syllabus

Basic principles: Newton's third law of motion and its practical application to the principle of jet propulsion, a practical understanding of how a gas undergoes changes of pressure, volume and temperature in accordance with Boyle's and Charles' Laws, the pressure-temperature cycle, the Brayton cycle, a comparison between the working cycle of a gas turbine engine and a piston engine.

Engine Types: Different gas turbine engine types, variations in mechanical arrangements, and their operating parameters, characteristics and use.

Compressors: The basic principles of operation of centrifugal and axial flow compressors, rotor blades and stator blades, diffusers, bleed valves, compressor stall.

Combustion Chambers: The operation of the combustion chamber, the proportion of air for combustion and cooling, three main types of combustion chamber in use — can or multiple chamber, turbo-annular or can-annular, annular.

Turbines: The function of a turbine, multi-stage turbines, design features of nozzle guide vanes and turbine blade passages, the meaning of the terms *impulse* and *reaction* in relation to turbine design.

Exhaust Systems: The exhaust gas flow through convergent and divergent passages, comparative noise levels of different types and their means of noise suppression, thrust reversal, its types, components, variations and means of application.

Fuel Systems: The basic requirements of a fuel control system, *simplex* and *duplex* type fuel nozzles, pressurizing and dump valve, gas turbine fuels, effect of a change in specific gravity, water and water-methanol injection.

Lubrication: Lubricating oils and systems, types and requirements for gas turbine lubrication, differences in requirements for turbo-prop, turbojet and turbofan.

Ignition: High energy ignition, the starting sequence, re-lighting in the air, precautions when starting and re-lighting, the requirement for continuous ignition.

Air Cooling and Sealing: Components cooled, low and high pressure air, types of air and oil seals.

Engine Instrumentation: Analysis of engine operation from the following instruments: engine pressure ratio (EPR), turbine inlet temperature (TIT), jet pipe temperature (JPT), exhaust gas temperature or turbine gas temperature (EGT or TGT) (whichever instrument is used to indicate turbine temperature limitations), fuel-flow gauges, RPM indicators, horsepower or thrust indicators, oil temperature and pressure gauges.

Thrust Augmentation: Methods, components, and principles involved in thrust augmentation.

Engine Performance: Effect of forward speed, ram effect, effect of altitude, effect of temperature and humidity, specific fuel consumption, effect of air intake icing.

Ice and Fire Protection: Principles, features and operating parameters of ice and fire protection systems applicable to the various gas turbine engines.

Starting Malfunctions: Background theory.

Simulator syllabus

A practical simulation phase that demonstrates student recognition of starting malfunctions and corrective actions conducted in a simulator approved for this purpose.

Appendix III Aircraft type rating examinations

1. Aeroplanes exceeding 20 000 kg MCTOW

(a) For aeroplanes exceeding 20 000 kg MCTOW, Part 61.53(6) requires an applicant for a type rating to have completed an approved course of technical training and to have passed an approved written examination to the syllabus in para 4.

(b) These requirements would be met by completion of an appropriate course of technical training at an organisation certificated under Civil Aviation Rule Part 141, with certification that a satisfactory standard of technical knowledge has been achieved in the required type rating technical examinations.

2. Aeroplanes exceeding 5700 kg but not exceeding 20 000 kg MCTOW

(a) For aeroplanes exceeding 5700 kg MCTOW but not exceeding 20 000 kg MCTOW, Part 61.53(6) requires an applicant for a type rating to have completed an approved course of technical training and to have passed an approved written examination to the syllabus in para 4.

(b) These requirements would be met by completion of an appropriate course of technical training at an organisation certificated under Civil Aviation Rule Part 141, with certification that a satisfactory standard of technical knowledge has been achieved in the required type rating technical examinations.

(c) A detailed syllabus is given in the *Technical Examination Syllabus — Aeroplanes* for an examination paper consisting of: Part I, Aircraft technical knowledge and Part II, Performance, weight and balance. Only those items in the syllabus applicable to the particular aeroplane type need be included in the examination paper.

(d) The examinations are intended to enable an assessment to be made of the candidate's knowledge of the general constructional and operational features of the aeroplane type for which the rating is required. Failure to demonstrate a satisfactory standard of knowledge of the following items of the syllabus will necessitate complete re- examination:

Fuel system;

Engine limitations;

Airspeed limitations;

Weight and balance; and

Aeroplane take-off and landing performance requirements.

3. Aeroplanes not exceeding 5700 kg MCTOW

(a) For aeroplanes not exceeding 5700 kg MCTOW, Part 61.53(4) requires an applicant for a type rating to have demonstrated a satisfactory technical knowledge of the aircraft type. The examination should be conducted by the flight instructor who is to carry out the flight test.

(b) The examination may be oral or written, and is to be based on the applicable items in the *Technical Examination Syllabus — Aeroplanes*.

(c) The examination, which is to be undertaken in association with the type rating flight test, is

intended to enable an assessment to be made of the candidate's knowledge of the general constructional and operational features of the aeroplane type for which the rating is required. Failure to demonstrate a satisfactory standard of knowledge of the following items of the syllabus will necessitate complete re-examination:

Fuel system;

Engine limitations;

Airspeed limitations;

Weight and balance; and

Aeroplane take-off and landing performance requirements.

(d) Notwithstanding the above provisions, a course of approved training should be completed where the aircraft is to be used for air transport operations.

(e) These requirements would be met by completion of an appropriate course of technical training at an organisation certificated under Civil Aviation Rule Part 141, with certification that a satisfactory standard of technical knowledge has been achieved in the required type rating technical examinations.

4. Examination syllabus — Aeroplanes

Fuel system: Grade and specification of fuel, system layout and management, dumping facilities, tank capacities and location, safety devices, location and purpose of various components, emergency operation, precautions to be observed in operation, fault finding.

Oil system: Grade and specification of engine oil, system layout and management, tank capacities and location, safety devices, operating pressures, functional checks, emergency operation, location and purpose of various components, precautions to be observed in operation, fault finding.

Hydraulic system: Grade and specification of fluid, system layout and management, reservoir capacity and location, safety devices, operation pressures, functional checks, emergency operation, location and purpose of various components, precautions to be observed in operation, fault finding and remedial action to be taken in flight.

Electrical system: Layout and management, location and purpose of various components and circuits, functional checks, operating voltages, capacity and number of generators and batteries, safety devices, precautions to be observed in operation, emergency operation, fault finding and remedial action to be taken in flight.

Vacuum system: Layout and management, location and purpose of various components, safety devices, functional checks, emergency operations, fault finding and remedial action to be taken in flight.

Pneumatic system: Layout and management, purpose and location of various components, operating pressures, emergency operation, functional checks, safety devices, precautions to be observed in operation, fault finding.

Anti-icing and de-icing systems: Layout and management, purpose and location of various components, precautions to be observed in operation, functional checks, fault finding.

Pitot-static system: Layout and management, purpose and location of various components, precautions to be observed in operation, functional checks safety devices, emergency operation, fault finding and remedial action to be taken in flight.

Fire extinguisher system: Layout and management, location and purpose of various components, fire warning devices, functional checks, action in event of fire, precautions to be taken in operation.

Heating and ventilating system: Layout and management, location and purpose of various components, functional checks, precautions to be observed in operation, safety devices, fault finding.

Pressurisation system: Layout and management, location and purpose of various components, functional checks, emergency operation, precautions to be observed in operation, safety devices, fault finding and remedial action to be taken in flight.

Oxygen system: Layout and management, location and purpose of various components, operating pressures, functional checks, emergency operation, safety devices, supply duration

under various conditions, precautions to be observed in operation, fault finding and remedial action to be taken in flight.

Engines: Operating limitations, location and purpose of various components, operating procedure for starting, ground running, take-off, climb, cruising, landing and shutting down, functional checks, controls, safety devices, accessories, power control and interpretation of power charts, fuel and oil consumption, prevention of icing, fault finding.

Propellers: Principle of operation, location and purpose of various components, operating procedure, feathering and unfeathering procedure, safety devices, fault finding.

Airframe: Layout of various components, layout of bilge system.

Auto-pilot: Operating limitation, location and purpose of main components, operating procedure, safety devices, precautions to be observed in operation, fault finding and remedial action to be taken in flight.

Flying controls: Layout and management, safety devices, precautions to be observed in operation, fault finding.

Weight and balance: Certificate of airworthiness requirements for loading and centre of gravity limits, use of load adjusters and loading charts, effect of fuel consumption on centre of gravity, effect of movement of crew, passenger or cargo on centre of gravity, effect of landing gear retraction on centre of gravity, precautions to be observed in loading and securing of load.

Aeroplane operations: Take-off and landing performance characteristics, aeroplane operating limitations, procedures to be followed in take-off, climb, landing and cruising in both symmetric and asymmetric flight, stalling speeds, safety speeds, interpretation of aeroplane flight manual data, use of radio and navigation equipment, action in the event of forced landing on land or water, use of survival equipment.

5. Multi-engine helicopters and helicopters exceeding 5700 kg MCTOW

(a). For multi-engined helicopters and helicopters exceeding 5700 kg MCTOW, Part 61.53(6) requires an applicant for a type rating to have completed an approved course of technical training and to have passed an approved written examination to the syllabus in para 7.

(b). These requirements would be met by completion of an appropriate course of technical training at an organisation certificated under Civil Aviation Rule Part 141, with certification that a satisfactory standard of technical knowledge has been achieved in the required type rating technical examinations.

6. Single engine helicopters not exceeding 5700 kg MCTOW

(a). For single engined helicopters not exceeding 5700 kg MCTOW, Part 61.53(7) requires an applicant for a type rating to have passed an approved written examination except that for helicopters not exceeding 1500 kg MCTOW an oral examination is acceptable. The examination should be conducted by the flight instructor who is to carry out the flight test.

(b). The examination is to be based on the applicable items in the *Technical Examination Syllabus — Helicopters.*

(c) The examination, which is to be taken in association with the type rating flight test, is intended to enable an assessment to be made of the candidate's knowledge of the general constructional and operational features of the helicopter type for which the rating is desired. Failure to demonstrate a satisfactory standard of knowledge of the following items of the syllabus will necessitate complete re-examination:

Fuel and oil systems;

Electrical system;

Engine and rotor limitations;

Airspeed limitations, including V_{NE} at altitude;

Weight and balance; and

Helicopter take-off and landing performance requirements.

7. Examination syllabus — Helicopters

Fuel system: Grade and specification of fuel, system layout and management, tank capacities and location, safety devices, location and purpose of various components, emergency operation, precautions to be observed in operation, fault finding.

Oil system: Grade and specification of engine and transmission oils, system layout and management, tank capacities and location, safety devices, operating pressures, functional checks, emergency operation, location and purpose of various components, precautions to be observed in operation, fault finding.

Electrical system: Layout and management, functional checks, operating voltages, capacity and number of batteries and generators, safety devices, precautions in operation, emergency operation, fault finding and remedial action to be taken in flight.

Engines: Operating limitation, location and purpose of various components, operating procedure for starting, ground running, take-off, climb, cruising, landing and shutting down, functional checks, controls, safety devices accessories, power control and interpretation of power charts, fuel and oil consumption, prevention of icing, fault finding.

Rotor systems: Principle of operation, location and purpose of various components, operating procedure, safety devices, fault finding.

Airframe: Layout of various components.

Auto-pilot: Operating limitations, location and purpose of main components, operating procedure, safety devices, precautions to be observed in operation, fault finding and remedial action to be taken

in flight.

Flying controls: Layout and management, safety devices, precautions to be observed in operation, fault finding.

Weight and balance: Certificate of airworthiness requirements for loading and centre of gravity limits, use of load adjusters and loading charts; effect of fuel consumption on centre of gravity, effect of undercarriage retraction on centre of gravity, precautions to be observed in loading and securing of load.

Helicopter operation: Take-off and landing performance characteristics, helicopter operating limitations, procedures to be followed in take-off, climb, cruising and landing, height/velocity diagram, interpretation of helicopter flight manual data, use of radio and navigation equipment, action in the event of forced landing on land or water, use of survival equipment.

Appendix IV Aircraft type rating flight tests

1. Aeroplanes exceeding 20 000 kg MCTOW

These requirements would be met by completion of an appropriate course of flight training at an organisation certificated under Civil Aviation Rule Part 141, with certification that a satisfactory standard of competency has been demonstrated in all applicable normal, abnormal and emergency manoeuvres.

2. Aeroplanes exceeding 5700 kg but not exceeding 20 000 kg MCTOW

Pre-flight requirements

- **Aircraft documents and pilot equipment**:
  - aircraft flight manual, release to service, engine charts, PNGAIP, route guide.
- **Oral examination**:
  - aircraft and engine limitations, emergency equipment and procedures.
- **Flight management**;
  - aircraft loading, trim sheets and flight planning, fuel requirements and fuel management.
- **Aircraft inspection**;
  - external and internal, the location of critical items and the purpose of inspection.
- **Pre-start checks**;
  - radio and electronic equipment, engine start procedures and after start cockpit checks, selection of navigation and communication frequencies, instrument checks.
- **Pre-take-off checks**;
  - engines, instruments, systems, Air Traffic Control clearance and radiotelephone procedures, crew briefing, taxiing and steering.

Flight test general manoeuvres

- Normal take-off and landing.
- Crosswind take-off and landing.
- Rejected take-off.
- Take-off with engine failure immediately after decision speed (V_1).
- Circling approach at minimum authorised circling altitude followed by missed approach from not more than 100 feet.
- All normal climb and descent manoeuvres.
- Stall to buffet onset in clean, take-off and landing configurations, at least one stall to be demonstrated with the aircraft in a turning configuration.
- Steep turns through 360 degrees in both directions, recommended bank angle 45 degrees.

- Approach to V_{MCA} with asymmetric power.
- Where applicable, recovery from unusual attitudes peculiar to aircraft type.

Instrument flight

- Asymmetric climb and descent procedures.
- Interception and tracking of predetermined bearings to facility.
- Airways procedures, including entering, maintaining and departing from holding patterns.
- Descent to minimum altitude through intermediate and approach procedures using ILS, VOR or a non-precision radio navigation facility.
- Missed approach from minimum altitude with asymmetric thrust.

Emergency procedures

- Engine fire and normal unfeathering or relight.
- Emergency descent — pressurised aircraft.
- Any other emergency procedures contained in the aircraft flight manual.

Normal and abnormal procedures

Each applicant is to demonstrate the proper use of the following systems, including the correct abnormal or emergency drills, or both, to be carried out in the event of failure or malfunction of the systems, appropriate to the aircraft type:

- Auto-pilot;
- Anti-ice and de-icing systems;
- Electrical system — including failures where this may result in loss of flight instruments;
- Hydraulics and pneumatics;
- Air conditioning and pressurisation systems;
- Oxygen system;
- Weather radar.

The aeroplane used for the flight test is to be loaded as far as is practicable to a weight, which will give a positive indication of its flight and handling characteristics. Those items not applicable to the particular aeroplane type are not required.

3. Aeroplanes not exceeding 5700 kg MCTOW

Pre-flight check of aircraft, internal and external, satisfactory knowledge of release to service, certificate of airworthiness and flight manual including load sheet and performance aspects.

Cockpit drills or check lists.

All manoeuvres used in normal flight, including taxiing, take-off and landing including crosswind, turning (climbing, level, medium, steep and descending), use of flap, side-slipping, minimum length field operations, overshoot procedure.

Emergency manoeuvres including; recovery from stalls entered from both level and banked attitudes, and where applicable with wheels and flaps up and with wheels or flaps down or both, spinning and recovery where applicable, action in the event of fire, forced landing without power, engine failure during or after take-off.

Flight with one or more engines inoperative during or after take-off, approach, landing and overshoot where applicable.

Management of fuel, hydraulic, pneumatic, and electrical systems as fitted.

Water handling for seaplanes

Taxiing upwind, downwind and crosswind with and without the use of drogues, step work, mooring and slipping, ramp and beach techniques, use of standard buoy, anchoring and weighing anchor, varying water conditions, tidal effects.

Ski-plane snow operation

A satisfactory demonstration of the ability to operate a ski-equipped aircraft which is to include not less than four consecutive take-offs and four consecutive full-stop landings in conditions where snow is the sole take-off and landing medium.

All flight manoeuvres are to be made at a weight that will give a positive indication of the aeroplane's flight and handling characteristics. Any manoeuvre specified may be modified or eliminated if such a manoeuvre is inadvisable or inapplicable. Pilots are expected to be aware of the normal and emergency limitations of their aircraft and are expected to demonstrate correct emergency procedures.

4. Type rating flight test requirements — helicopters

- Pre-flight inspection, including knowledge of documents;
- Engine start up, warm up, clutch engagement, run up and functional checks;
- Taxiing — surface or air or both;
- Take-offs, approaches and landings — normal and crosswind, including vertical take-off to hover and vertical landing from hover;
- Minimum power take-off and roll-on (running) landing;
- Hovering — upwind, downwind and crosswind;
- Hover patterns and hover turns on the spot to left and right;
- Emergencies including autorotative approach with power recovery to the hover and engine failure in the hover;
- Maximum performance take-off and steep approach;
- Confined areas operations and sloping ground landings;

  Recovery from low RPM condition at altitude;

- Quick stops;
- Settling with power (vortex ring state) and incipient stage recovery at altitude;
- Figure S turns along a straight reference line at 500 feet;
- Incipient ground resonance;
- Single-engine operation for multi-engined helicopters.