CIVIL AVIATION AUTHORITY
OF NEW ZEALAND
Te Mana Rererangi Tūmatanui o Aotearoa

Advisory Circular

Subject: **Flight Engineer Licences and Ratings** Date: **12 December 1995** **AC63-1**

Iain F. Kerr

1. GENERAL. Civil Aviation Authority advisory circulars (AC) contain information about standards, practices and procedures that the Authority has found to be acceptable for compliance with the associated rule.

Consideration will be given to other methods of compliance which may be presented to the Authority.

When new standards, practices or procedures are found to be acceptable they will be added to the appropriate advisory circular.

Each reference to a number in this AC, such as 63.15, is a reference to a specific rule within Part 63

2. PURPOSE. This Advisory Circular (AC) provides methods acceptable to the Authority for showing compliance with the Flight Engineer Licences and Ratings Part of the Civil Aviation Rules (CAR).

3. FOCUS. This material is intended for applicants for cadet flight engineer licences and flight engineer licences and ratings; holders of those licences and ratings; including their instructors and examiners; and airline operators.

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Subpart A — General

63.1 Applicability

63.1.1 Subpart A prescribes the general rules governing the issue of cadet flight engineer licences, flight engineer licences, and ratings; the conditions under which they are necessary; and the privileges and limitations of those licences and ratings.

63.1.2 Part 63 does not include any rule on definitions and abbreviations. These are in Part 1, Definitions and abbreviations, along with the definitions from other Parts of the rules. Any ordinary word not explained in Part 1 has the meaning given to it in the Concise Oxford Dictionary, and any technical term not defined has the meaning ascribed by Jane's Aerospace Dictionary.

63.3 Requirement for Licence and Ratings

63.3.1 Rule 63.3(a)(2) refers to validation of a foreign flight engineer licence

63.3.1.1 A current flight engineer licence issued by a foreign contracting State to the Convention may be validated for use in New Zealand. Validation will normally be restricted to 3 months and the validation of a foreign licence is not normally renewed. It is recommended that flight engineers requiring more than a single short period of validation apply for a New Zealand licence.

63.3.1.2 The level of privileges granted may be lower than those applying to the licence in the country of issue because of differences between the licence requirements in the country of issue and New Zealand. The Validation Certificate will show the extent of the privileges granted and any limitations which may be imposed.

63.3.1.3 For the validation of a foreign licence, a New Zealand medical examination is not normally required.

63.3.1.4 An applicant for the validation of a foreign flight engineer licence is required to pass an examination in New Zealand air law.

63.3.1.5 Any person who has been denied the issue of a New Zealand licence is not eligible for the issue of a Certificate of Validation.

63.7 Exchange of Terminating Licence for Lifetime Licence

63.7.1 Rule 63.7(a) deems cadet flight engineer licences and flight engineer licences issued before this Part comes into force to be lifetime licences. Because existing licences have an expiry date, which is overridden by this Rule in New Zealand, flight engineers intending to use their licences overseas are advised to exchange them for new lifetime licences.

63.7.1.1 Once flight engineers hold the lifetime licence they must comply with the conditions of lifetime licences. One of these conditions is the requirement for a Biennial Flight Review (BFR). Unless a flight engineer has passed a licence issue flight test within the previous 2 years then they require a BFR before they can use their lifetime licence. (See 63.25).

63.7.2 Rule 63.7(b) says ratings held on a licence issued before the date this Part comes into force carry over to a licence issued under this Part; and are deemed to have been issued under this Part. These ratings may include aircraft types which are no longer on the NZ Register.

63.7.2.1 These ratings may be shown on the new lifetime licence.

63.9 Application for Licences and Ratings

63.9.1 Rule 63.9 requires an applicant for the grant of a cadet flight engineer licence, flight engineer licence, or for the endorsement of a rating on that licence, to complete form CAA 24061/01. A copy of this form is included in this AC.

63.11 Issue of Licences and Ratings

63.11.1 Rule 63.11(2) requires an applicant to have sufficient ability in reading, writing, speaking and understanding the English language to enable the applicant to adequately carry out their responsibilities as the holder of that licence or rating. Normally the ability to comply with all the other prerequisites for the issue of a licence, or rating, will satisfy this requirement.

63.15 Examinations

63.15.1 Rule 63.15 requires applicants to produce written proof of their identity for both written examinations and for flight tests. In the case of flight tests the flight engineer examiner will also check the candidate’s logbook record of

any required training and flight experience before conducting the flight test.

63.15.2 Rule 63.15(a)(2) requires applicants to gain at least 70% of the possible marks in order to pass. Where a supplier of examination credits issues pass credits in the form of letter grades, those grades will have to be shown to be awarded on a final recorded percentage of at least 70%. Normally this would equate to a grade of at least B plus.

63.15.3 A pass in any written examination is valid for life.

63.15.4 Part 63 does not require applicants for flight tests to have passed all the written examinations before taking the flight test.

63.19 Flight Engineers Logbooks – General

63.19.1 Rule 63.19 requires each holder of a cadet flight engineer licence or flight engineer licence to maintain a record of their flight time in a logbook acceptable to the Director. Use of the Pilot Logbook MOT 1373, or an equivalent, would meet this requirement if the column headings are changed.

63.21 Flight Engineers Logbooks – Crediting Flight Time

63.21.1 Rule 63.21 details the crediting of flight time which the Civil Aviation Authority requires and accepts for the purposes of Part 63. Flight simulator time which a cadet flight engineer or flight engineer wishes to claim towards a licence or rating should be logged in a similar manner. Other times, such as duty times, which are required for operational or other purposes, may also be logged provided these additional times can not be confused with the times required for Part 63.

63.23 Medical Requirements

63.23.1 There are a number of medical conditions that will cause either a temporary or permanent change in a person's health or fitness that renders them unfit to fly. These conditions are described in detail in Part 67, but for specific advice on whether a medical problem will result in a period of unfitness or not, a licence holder should consult an Aviation Medical Assessor before using the licence.

63.23.2 Rule 63.23(c) requires each person who exercises the privileges of a cadet flight engineer licence or flight engineer licence or rating, on demand by the Director, any employee of the Authority duly authorised by the Director, or any sworn member of the Police, to produce a current Class 1 medical certificate and, on further demand, to surrender such medical certificate. Failure to satisfy these demands would be *prima facie* evidence that no current medical certificate was held by that person at the time the privileges of the cadet flight engineer or flight engineer licence were exercised.

63.25 Biennial Flight Review

63.25.1 Rule 63.25 details the BFR requirements that apply to lifetime licences. It is in addition to the recent experience requirements of 63.157 for specified experience within the previous 90 days, and any other currency requirements of that or any other Rule.

63.25.2 The BFR is based on the FAA model as described in FAA AC61-98A. It is not a flight test, but is intended to ensure that all flight engineers are assessed periodically by a flight engineer instructor and receive whatever instruction is required to ensure their continued proficiency. Rule 63.25 allows the use of a flight simulator for a flight engineer BFR.

63.25.3 A BFR will continue until the flight engineer instructor is satisfied that they can sign the flight review off in the flight engineer's logbook as having been satisfactorily completed.

63.25.4 The syllabus for the BFR is based on the flight test syllabus for the flight engineer licence. However the flight engineer instructor should also take account of the flight engineer's practical flying requirements, and should agree with the flight engineer where the flight review emphasis should be.

63.25.5 This rule only requires a flight engineer to complete one BFR every two years in order to keep their licence current. However where a flight engineer is operating aircraft of very different types it is recommended that they undergo additional flight reviews in those different aircraft.

63.25.6 A Regulation 76 check is a flight review that meets the BFR requirements. A Regulation 76 check completed within the preceding 2 years will meet this currency requirement for a lifetime licence. It is to be recorded in the flight engineer's logbook, and during the transitional period this record may be made retrospectively.

63.25.7 The BFR may be combined with any other training or testing, provided the requirements of that flight review are fully met.

63.29 Offences involving Alcohol or Drugs

63.29.1 Rule 63.29 allows a conviction for any offence relating to alcohol or drugs, including a refusal to submit to any lawful test for alcohol or drugs, to be relevant for determining whether a person is or remains fit and proper to hold a licence. These measures are not mandatory, but provide the means to act against persons whose actions are not compatible with the privileges of holding a cadet flight engineer or flight engineer licence or ratings. Any action taken would have to be in accordance with the provisions of the Act.

Subpart B — Cadet Flight Engineer Licences

63.51 Applicability

63.51.1 Subpart B prescribes the rules governing the issue of cadet flight engineer licences and the privileges and limitations of those licences.

63.51.2 A flight engineer who does not meet the type rating, BFR, or currency requirements of the flight engineer licence, but who meets the medical requirements, automatically has the privileges of the cadet flight engineer licence.

63.51.3 Rule 63.53(2) requires a candidate for a cadet flight engineer licence to hold a current Class 1 medical certificate issued under Part 67. Class 1 medical certificates may be issued to flight engineers with an endorsement for flight engineer duties only, for eyesight or other reasons. These are still valid Class 1 medical certificates and, subject to Rule 63.23, meet the requirements of Part 63 for holding a Class 1 medical certificate.

Subpart C — *Reserved*

This Subpart has been reserved to allow for the option of a restricted flight engineer licence, for relief purposes only; and similar to that currently being developed in Australia.

Subpart D — Flight Engineer Licences

63.151 Applicability

Subpart D prescribes the rules governing the issue of flight engineer licences and the privileges and limitations of those licences.

63.153 Eligibility Requirements

63.153.1 Rule 63.153(5) requires an applicant for a flight engineer licence to have passed written examinations or their equivalents, that are acceptable to the Director, in air law, theory of flight and flight operations, aircraft engineering, and human factors. Examinations on the written syllabuses given in Appendix I would be an acceptable means of complying with the requirements of the Rule. Examples of equivalents that the Director might consider for approval would include certain overseas qualifications, Royal NZ Air Force qualifications, pilot licences, university qualifications, and NZQA credits.

63.153.2 Rule 63.153 (6) requires an applicant for a flight engineer licence to demonstrate competency to the holder of a flight engineer examiner rating. Appendix II gives a flight test syllabus that would comply with the requirements of the Rule.

63.153.3 A current flight engineer licence issued by a foreign contracting State to the Convention will normally be accepted as meeting the requirements in Rule 63.153(3) for flight time; in Rule 63.153(5) for all written examination passes, except for air law; and in Rule 63.153(6) for a flight test, provided the applicant—

(a) produces evidence of having completed at least 250 hours as flight engineer on commercial operations subsequent to the issue of the flight crew licence that has been presented for recognition. Such experience is to have been gained in countries under the jurisdiction of the foreign authority that issued the licence; and

(b) passes a New Zealand BFR.

63.153.4 The syllabuses in the Appendices have been taken from Civil Aviation Safety Order (CASO) 12 and are subject to updating

through the consultative rule-writing process. When all the Civil Aviation Rules are in place, it is intended to specifically examine these syllabuses in detail, and to redraft them in co-operation with the Aviation, Tourism & Travel Training Organisation (ATTTO) and New Zealand Qualifications Authority (NZQA).

Subpart E — Flight Radiotelephone Operator Ratings

63.201 Applicability

Subpart E prescribes rules governing the issue of flight radiotelephone operator ratings and the privileges and limitations of those ratings.

63.203 Eligibility Requirements

63.203.1 Rule 63.203(2) requires an applicant for a flight radiotelephone operator rating to have passed a written examination or its equivalent, that is acceptable to the Director, in aeronautical radiotelephone practices and procedures. An examination covering the syllabus in Appendix III would meet this requirement.

Subpart F — Aircraft Type Ratings

63.251 Applicability

Subpart F prescribes the rules governing the issue of aircraft type ratings to flight engineers.

63.253 Eligibility Requirements

Rule 63.253(a)(4) requires an applicant for an aircraft type rating to demonstrate competency in that type to the holder of a flight engineer instructor rating. Attainment of the standards of the flight engineer licence flight test syllabus would meet this requirement.

63.255 Aircraft Type Ratings

63.255.1 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.

63.255.2 Rule 63.255(a) specifies how a type rating is to be entered in the flight engineer's logbook. Type ratings may be entered in accordance with this Rule either individually or in a table.

63.257 Privileges

63.257.1 Rule 63.257 only allows an aircraft type rating to include any variant of that aircraft that has no significant differences in performance, systems or procedures. The tests of whether aircraft are similar, for this purpose, are that they require no further conversion instruction and that there could be no reasonable doubt by anyone concerned whether they were the same type.

Subpart G — Flight Engineer Instructor Ratings

63.301 Applicability

63.301.1 Subpart G prescribes the rules governing the issue of flight engineer instructor ratings and the privileges and limitations of those ratings

63.301.2 This Subpart is intended to take the present arrangement, whereby the Civil Aviation Authority approves individuals to exercise these privileges, into the new Rules system.

63.303 Eligibility Requirements

63.303.1 Rule 63.303(4) requires a flight engineer instructor to demonstrate to the holder of a flight engineer examiner rating the ability to give flight engineer instruction, in all normal, abnormal, and emergency flight situations, by passing an oral examination and a flight test that are acceptable to the Director. These assessments will be based on practical demonstration of the privileges of a flight engineer instructor as listed in Rule 63.305. Rule 63.303(4) allows a flight simulator to be used for this flight test.

Subpart H — Flight Engineer Examiner Ratings

63.351 Applicability

63.351.1 Subpart H prescribes the rules governing the issue of flight engineer examiner ratings and the privileges and limitations of those ratings

63.351.2 This Subpart is intended to take the present arrangement, whereby the Civil Aviation Authority approves individuals to exercise these privileges, into the new Rules system.

63.353 Eligibility Requirements

63.353.1 Rule 63.353(5) requires a flight engineer examiner to demonstrate to a Civil Aviation Authority flight testing officer the ability to perform the duties of a flight engineer examiner. This assessment could be based on practical demonstration of the privileges of a flight engineer examiner as listed in Rule 63.355.

Appendix I

Flight Engineer Written Examination Syllabuses

1. Flight Engineer Air Law

1.1 This syllabus will be drafted in detail when the Civil Aviation Rules, drafted under the Civil Aviation Act 1990, have completely superseded the Civil Aviation Regulations, CASO, and CAIC made under the Civil Aviation Act 1964. Meanwhile it will assess a practical working knowledge of whatever legislation is in force at the time the examination paper is taken, and which is relevant to the duties, responsibilities and privileges of the flight engineer.

1.2 A credit in Air Law for the Airline Transport Pilot Licence would be accepted as meeting the requirements for a Flight Engineer Licence.

1.3 The following topics from the CASO 12 flight engineer syllabus are still relevant indicators of what should be known: Promulgation of legislation; General conditions of flying; Documents to be carried; Load Sheets; Records to be maintained in flight; Dropping of articles; Passengers not to be carried on certain flights; Smoking in aircraft; Carriage of Flight Engineer; Intoxicating liquor and drugs; Responsibilities of pilot-in-command and flight engineer; Pre-flight responsibilities of pilot-in-command and flight engineer; Radio ground check; Engine ground check; Operation of aircraft controls; Occupation of certain seats in aircraft; Icing conditions; Flight check system; Wearing of safety belts; Emergency and life saving equipment; Checking by and carriage of authorised persons; Basic Instruments and Equipment; Instruments and Equipment for IFR flight; Instruments and Equipment for Night flights; Instruments and Equipment for Air Transport Operators; Instruments, equipment and safety devices – general; Emergency and survival equipment; Provision and use of Oxygen; Expiry of Airworthiness Certificates; Conditions of Airworthiness Certificates; Suspension of Airworthiness Certificates; Inspection of aircraft and issue of Releases to Service; Certification of New Zealand aircraft operating outside New Zealand; Maintenance of aircraft; Airworthiness, certification after maintenance; Overhaul, modification, replacement, repair and inspection of aircraft to be made under approved conditions; Privileges and limitations of cadet flight engineer licences, flight engineer licences and ratings, and medical certificates; Flight Crew Log Books; Flight and Duty Time Limitations applicable to flight engineers; Aircraft Fuelling Ground Fire Precautions; Provision and Use of Oxygen in Aircraft; Civil Airworthiness Requirements Vol 1 and CAR Parts 43 and 145; Airworthiness Certificate issue, validation and renewal; Issue and Validity of Maintenance Release; Reporting, Investigation and Rectification of Defects; Search and Rescue.

2. Flight Engineer Theory of Flight and Flight Operations

2.1 The Atmosphere: Density, pressure and temperature changes in the atmosphere and their inter-relationship. The effects of density, pressure and temperature changes on aircraft performance. The International Standard Atmosphere.

2.2 Measurement of Speed: Dynamic pressure; Static pressure; IAS, CAS, AS, TAS, Mach number.

2.3 The Laws of Motion: An understanding of the following terms: Mass and inertia, momentum, force, equilibrium, weight and gravity; Motion on a curved path; Centripetal force and acceleration; Centrifugal force.

2.4 Airflow and Aerofoils: The airflow about a wing; Types of aerofoils; Dihedral, angle of incidence and angle of attack; The effect of flaps and slots on angle of attack; Lift generation; The pressure distribution about an aerofoil; Bernoulli's Theorem; Streamlining; Boundary Layer; Laminar and Turbulent flow; Lift/Drag ratio; Profile drag and induced drag; The centre of pressure; Stable and unstable movement of the centre of pressure; Stalling; The effect of slots and flaps on stalling; The effect of flap on angle and rate of climb; The effect of flap during approach to land; Span, chord and aspect ratio; The forces acting on an aeroplane during straight and level flight; Loading and acceleration during flight manoeuvres.

2.5 Thrust and Momentum: Thrust drag relationship; Types of thrust; Jet and propeller and the relative efficiency of each type; Basic propeller theory as follows: The motion of a propeller blade showing resolution of total reaction into thrust and torque. Helix angle; blade angle; advance per revolution; variable pitch; geometric pitch; experimental pitch; constant speed. Centrifugal turning moment.

2.6 High Speed Flight: The significance of the speed of sound; Compressibility and shock waves; Shock stall; Mach number and critical Mach number; Control problems associated with high speed flight; Buffet boundary; The aerodynamic characteristics of high speed aeroplanes; Design methods of raising the critical Mach number; Laminar flow aerofoils.

2.7 Flying Controls: Longitudinal stability, lateral stability and direction stability; The controls of an aeroplane; Balanced controls; Trims, servo and balance tabs; Mass and aerodynamic balance; Flaps and slots; Airbrakes and spoilers.

2.8 Performance: True altitude, pressure altitude and density altitude; The calculation of density altitude given pressure altitude; The calculation of pressure altitude given QNH; The effect of humidity on atmospheric density; Specific fuel consumption and the ability to determine fuel flow; The factors affecting take-off and climb performance; The factors affecting range – Altitude, temperature and weight; The meaning and application of the terms – V1; V2 and accelerate/stop; Use of the navigational computer to solve the following problems: EAS to TAS, EAS and/or TAS to Mach number. IAS to CAS to EAS. Conversion of units – pounds to kilos. Pounds to gallons at varying specific gravities. Gallons to litres and vice versa.

2.9 Weight and Balance: Aircraft loading; Definition and determination of MAC and centre of gravity; Centre of gravity computation prior to and during flight; Use of index numbers; Effect on handling and stability if the centre of gravity is outside limits; Weight limitations; Effect of adding or removing cargo or passengers; Effect of fuel consumption and dumping; Shifting weight from one location to another.

2.10 Elementary Principles of Air Navigation: The earth as a sphere, axis and direction of rotation, geographic and magnetic poles, great circle, small circle and rhumb line; The graticule of meridians of longitude and parallels of latitude, Greenwich meridian, equator and the expression of position in terms of latitude and longitude; Direction by the 360° system, true north, magnetic north and magnetic variation; The effect of wind on an aircraft's flight path relative to the ground; heading, drift, track, airspeed, groundspeed, wind component; Time-distance-speed problems and fuel consumption problems.

3. Flight Engineer Aircraft Engineering

3.1 Aircraft Structure: The basic principles of structural design; Tie, strut, and beam; Perfect, deficient and redundant frames; Triangular, Warren Girder, N-bracing and K-bracing types of structure: Types of structural failure; Types of stress – Tension, compression, bending, torsion and shear; Ultimate load, fatigue, distortion and flutter; The *fail safe* concept: The main types of aircraft construction; Monocoque, geodetic and stressed skin fuselage construction; D-spar, Box spar, cantilever and stressed skin wing construction: Control Systems; Ailerons, elevators, rudders, trims, flaps, servo and balance tabs, slats, airbrakes and spoilers: Power controls; The basic principles of power boosted and power operated controls.

3.2 Engines: General; The basic theory and principles of gas turbine engines; Types and associated characteristics of turbine engines used in large transport aircraft: Engine Components; Types of subsonic inlet ducts; Principles of operation and construction of centrifugal compressors; The principle of diffusion; Airflow through a centrifugal compressor; Temperature, pressure and velocity changes through a centrifugal compressor; Principles of operation and construction of axial flow compressors; Rotor, rotor blades and stator blades; Airflow through an axial flow compressor; Temperature, pressure and velocity changes through an axial flow compressor; Compressor stall; Design features of centrifugal and single and twin spool axial flow compressors: The combustion process; Can, can-annular and annular types of combustion chamber; Ignition requirements; The propagation of the flame front; Combustion chamber cooling; Fuel nozzle design: Turbines; Types of turbines, their functions and construction; Nozzle guide vanes; Reaction, impulse and reaction-impulse types of turbine design; Forces exerted on turbine blades; Fir-Tree attachment; Blade shrouds; Blade creep and distortion; Multi-stage turbines: Exhaust systems; Convergent and convergent-divergent types of exhaust systems; Noise suppression: Ancillary systems and accessories; Component design and general principles of starter systems; Fuel control systems; Lubrication systems; Ignition systems; Thrust reversal; Thrust augmentation, Water injection and afterburners.

3.3 Engine Instruments: Design features and operating principles of the following engine

instruments: Turbine discharge pressure gauge; Engine pressure ratio gauge; Torquemeter; Engine speed indicator; Exhaust gas temperature gauge; Oil pressure and oil temperature gauge; Synchro transmission systems as used in aircraft instruments.

3.4 Flight Instruments: The principles of pitot/static systems. The basic principles of operation of the following flight instruments: Airspeed indicator; Altimeter; Vertical speed indicator; Mach meter; Direction indicator; Artificial horizon; Turn indicator; The effect of a malfunction of the pitot-static system on such instruments; The properties of gyroscopes as applied to flight instruments; Principles of magnetic, gyro, and gyro magnetic compass; Malfunction indications of the flight director system; Types and source of instrument power supplies.

3.5 Integrated Flight Systems: Flight management systems, displays, and avionics; Director Horizon; Course Deviation Indicator; Remote Vertical Gyro; A general knowledge of the inputs to the Director Horizon and Course Deviation Indicator; The principles of Remote Vertical Gyroscopes. Power Supplies, levelling devices, torque motor erection and limitations in gyro movement. Advantages of Remote Vertical Gyros.

3.6 Electrical Systems: The basic principles of AC and DC generating systems; AC and DC distribution systems; Elementary AC theory – Sine Wave. Frequency; DC current; Generator control – Voltage regulation. Overvolt-undervolt protection and reverse current protection; Switches, actuators, relays and solenoids; Fuses and circuit breakers; The principle of electric motors; Electrical measuring devices – Ammeter, voltmeter, ohm-meter and Watt-meter; Method of connecting meters in a circuit; Measurement of kilowatts and kilovolt – amperes reactive (kvar) and the meaning of the terms; Function of transformers, converters, inverters and rectifiers; Solid state conversion; Ohms Law and its practical application; Series and parallel grouping of components; Aircraft bonding and screening; Methods of discharging static electricity; Principles of operation of auto-pilots, radio communication equipment, radio and radar navigation aids. .

3.7 Hydraulic Systems: The principle of the transmission of force by means of hydraulic fluid; The basic aircraft hydraulic system and its components as follows: Pump, reservoir, check valve, selector valve, relief valve, hand pump, accumulator, pressure regulator and restrictor; Normal and emergency systems for operating the landing gear, flaps, brakes and nosewheel steering.

3.8 Pressurisation and Air Conditioning Systems: Pneumatic systems in a modern jet transport; Turbocompressor; Use of bleed air; Temperature control; The air cycle unit; Refrigeration; Cabin pressure control; Cabin differential pressure; Outflow valve; Spill valve.

3.9 De-icing and Anti-icing: Thermal systems for wing and empennage leading edges; Electrothermal systems for intake cowls, scoops, wind screens and pitot heads; Thermal systems for the engine using bleed air or engine oil; Ice detection systems; Window anti-icing; Anti fogging and bird proofing.

3.10 Fuels and Fuel Systems: Characteristics of jet fuels – Avtur (JP1) and Avtag (P4); The importance of specific gravity; Capacitance type fuel gauge; Fuel flowmeter; Tank venting and pressurisation; Fuel icing causes and prevention. Fuel heaters; Fuelling valves, float valves and vent valves; Pressure fuelling and defuelling.

3.11 Fire Detection and Prevention Systems: A knowledge of the systems in use; Methods of detection and prevention; Types and characteristics of extinguishing agent used in aircraft; Cabin fire and smoke control; Electrical fires; Oil fires; Use of portable oxygen equipment for investigation and control of fires.

3.12 Oxygen Systems: Replenishing, hand-ling, safety devices and safety precautions incorporated and required in oxygen systems.

This credit in Flight Engineer Aircraft Engineering is accepted as meeting the ATPL requirement for a credit in Advanced Aerodynamics, Performance, and Systems Knowledge. However, the ATPL credit does not meet the requirements for the flight engineer licence.

4. Flight Engineer Human Factors

The syllabus is the same as for Airline Transport Pilot Licence Human Factors. This credit in Human Factors is therefore accepted as meeting the requirements for all Pilot Licences and for the Flight Engineer Licence.

Appendix II

Flight Engineer Licence Flight Test

1. The applicant is required to demonstrate the ability to perform satisfactorily:

(a) pre-flight inspection, starting, pre-take-off and post-landing procedures;

(b) normal in-flight duties and procedures relating to the aircraft, engines, propellers if applicable, and systems; and

(c) either in flight or in a flight simulator, emergency duties and procedures and to recognise and take appropriate action for malfunctions.

2. In particular the following items are relevant:

(a) Normal Procedures and Operations:

(i) inspection, compilation and understanding of all documents required by Civil Aviation Rules and company requirements;

(ii) pre-flight inspection. Exterior and interior checks;

(iii) pre-starting system checks;

(iv) engine starting, power checks, pre-take-off, post-landing and shut down procedures;

(v) engine operation and power analysis. Limitations;

(vi) pressurisation, air conditioning and cabin temperature control;

(vii) anti-icing and de-icing procedures and checks;

(viii) operation of all systems;

(ix) fuel management. Refuelling and defuelling procedures.

(b) Recognition and Correction of In-Flight Malfunctions:

(i) analysis of abnormal engine operation;

(ii) analysis of abnormal operation of any system;

(iii) corrective action.

(c) Emergency Drills and Operations:

(i) engine fire control;

(ii) fuselage fire control;

(iii) smoke control;

(iv) engine overspeed and over temperature;

(v) fuel dumping;

(vi) electrical failure;

(vii) landing gear, spoilers, speed brakes, and flap extension and retraction where appropriate;

(viii) engine shut-down and re-start;

(ix) use of oxygen;

(x) emergency de-pressurisation.

Appendix III

Flight Radiotelephone Operator Rating Written Examination Syllabus

1.1 Controls: Correct manipulation and adjustment of the controls of an aeronautical radiotelephone transceiver.

1.2 Communication: Transmission and reception of spoken messages competently and in accordance with prescribed procedures.

1.3 Practices: Knowledge of approved aeronautical radiotelephone practices and procedures with reference to ICAO Annex 10, Volume II – Communications Procedures, Chapter 5 – Aeronautical Mobile Service.

1.4 Regulations: Knowledge of regulations which are pertinent to the duties, responsibilities and privileges of the flight radiotelephone operator rating.

1.5 General radiotelephony procedures: Language to be used, word spelling, transmission of numerals, procedure words and

phrases, time system, establishment of communications, frequencies to be used, failure of communications, identification of service, radiotelephony call signs of aircraft, procedures for exchange of messages, corrections and repetitions, tests, readability scale.

1.6 Distress and urgency communications: Definitions, distress and urgency signals; distress communications; action by the aircraft in distress, imposition of silence, actions by all other stations, termination of distress communications, urgency communications; action by aircraft reporting an urgency condition.

1.7 Phraseology and procedures: Standard radiotelephony phraseologies and procedures for all VFR operations, take-off, approach, and landing, at both Air Traffic Controlled Aerodromes and Flight Service Aerodromes, and en route.