

to multi-pilot operation shall be endorsed with the type rating in the licence. This endorsement shall be removed when the applicant completes a proficiency check that included the necessary elements for single-pilot operation as specified in [Appendix 9](#) to this Annex.

- (ii) In all other cases, the form of operation shall not be entered in the licence. The pilot is entitled to exercise the privileges of the type rating:
 - (A) in single-pilot operation, provided that the skill test or proficiency check either:
 - (1) was completed in single-pilot operation; or
 - (2) was completed in multi-pilot operation and contained additional elements for single-pilot operation, as specified in [Appendix 9](#) to this Annex.
 - (B) in multi-pilot operation under all of the following conditions:
 - (1) the pilot complies with point [FCL.720.H\(a\)\(2\)](#);
 - (2) the privileges are exercised in accordance with Annex III (Part-ORO) to [Regulation \(EU\) No 965/2012](#) only;
 - (3) the skill test or proficiency check was completed in multi-pilot operation.

[point (d) applicable from 30 October 2022 — Regulation (EU) 2021/2227]

- (e) Notwithstanding the paragraphs above, pilots holding a flight test rating issued in accordance with [FCL.820](#) who were involved in development, certification or production flight tests for an aircraft type, and have completed either 50 hours of total flight time or 10 hours of flight time as PIC on test flights in that type, shall be entitled to apply for the issue of the relevant type rating, provided that they comply with the experience requirements and the prerequisites for the issue of that type rating, as established in this Subpart for the relevant aircraft category.
- (f) Applicants for a class rating for TMGs who also hold an SPL in accordance with Annex III (Part-SFCL) to [Commission Implementing Regulation \(EU\) 2018/1976](#), including the privileges to fly on TMGs, shall receive full credits towards the requirements in paragraphs (a), (b) and (c).

AMC1 FCL.725(a) Requirements for the issue of class and type ratings

ED Decision 2020/005/R

SYLLABUS OF THEORETICAL KNOWLEDGE FOR CLASS OR TYPE RATINGS

I. SE AND ME AEROPLANES

- (a) Detailed listing for aeroplane structure and equipment, normal operation of systems and malfunctions:
 - (1) dimensions: minimum required runway width for 180 ° turn.
 - (2) engine including auxiliary power unit:
 - (i) type of engine or engines;
 - (ii) in general, function of the following systems or components:

- (A) engine;
 - (B) auxiliary power unit;
 - (C) oil system;
 - (D) fuel system;
 - (E) ignition system;
 - (F) starting system;
 - (G) fire warning and extinguishing system;
 - (H) generators and generator drives;
 - (I) power indication;
 - (J) reverse thrust;
 - (K) water injection.
 - (iii) on piston or turbine-propeller engines additionally:
 - (A) propeller system;
 - (B) feathering system.
 - (iv) engine controls (including starter), engine instruments and indications in the cockpit, their function, interrelation and interpretation;
 - (v) engine operation, including APU, during engine start, start and engine malfunctions, procedures for normal operation in the correct sequence.
- (3) fuel system:
- (i) location of the fuel tanks, fuel pumps, fuel lines to the engines, tank capacities, valves and measuring;
 - (ii) location of the following systems:
 - (A) filtering;
 - (B) heating;
 - (C) fuelling and defueling;
 - (D) dumping;
 - (E) venting.
 - (iii) in the cockpit:
 - (A) the monitors and indicators of the fuel system;
 - (B) quantity and flow indication, interpretation.
 - (iv) procedures:
 - (A) fuel procedures distribution into the various tanks;
 - (B) fuel supply, temperature control and fuel dumping.
- (4) pressurisation and air conditioning:
- (i) components of the system and protection devices;
 - (ii) cockpit monitors and indicators;

- (iii) interpretation about the operational condition;
 - (iv) normal operation of the system during start, cruise, approach and landing, air conditioning airflow and temperature control.
- (5) ice and rain protection, windshield wipers and rain repellent:
 - (i) ice protected components of the aeroplane including engines, heat sources, controls and indications;
 - (ii) operation of the anti-icing or de-icing system during take-off, climb, cruise and descent, conditions requiring the use of the protection systems;
 - (iii) controls and indications of the windshield wipers and rain repellent systems operation.
- (6) hydraulic system:
 - (i) components of the hydraulic system(s), quantities and system pressure, hydraulically actuated components associated to the respective hydraulic system;
 - (ii) controls, monitors and indicators in the cockpit, function and interrelation and interpretation of indications.
- (7) landing gear:
 - (i) main components of the:
 - (A) main landing gear;
 - (B) nose gear;
 - (C) gear steering;
 - (D) wheel brake system, including anti-skid.
 - (ii) gear retraction and extension (including changes in trim and drag caused by gear operation);
 - (iii) required tyre pressure, or location of the relevant placard;
 - (iv) controls and indicators including warning indicators in the cockpit in relation to the retraction or extension condition of the landing gear and brakes;
 - (v) components of the emergency extension system.
- (8) flight controls and high lift devices:
 - (i)
 - (A) aileron system;
 - (B) elevator system;
 - (C) rudder system;
 - (D) trim system;
 - (E) spoiler system;
 - (F) lift devices;
 - (G) stall warning system;
 - (H) take-off configuration warning system.

- (ii) flight control system from the cockpit controls to the flight control or surfaces;
 - (iii) controls, monitors and indicators including warning indicators of the systems mentioned under (8)(i), interrelation and dependencies.
- (9) electrical power supply:
 - (i) number, power, voltage, frequency and location of the main power system (AC or DC), auxiliary power system location and external power system;
 - (ii) location of the controls, monitors and indicators in the cockpit;
 - (iii) flight instruments, communication and navigation systems, main and back-up power sources;
 - (iv) location of vital circuit breakers;
 - (v) generator operation and monitoring procedures of the electrical power supply.
- (10) flight instruments, communication, radar and navigation equipment, autoflight and flight data recorders:
 - (i) visible antennae;
 - (ii) controls and instruments of the following equipment in the cockpit during normal operation:
 - (A) flight instruments;
 - (B) flight management systems;
 - (C) radar equipment, including radio altimeter;
 - (D) communication and navigation systems;
 - (E) autopilot;
 - (F) flight data recorder, cockpit voice recorder and data-link communication recording function;
 - (G) TAWS;
 - (H) collision avoidance system;
 - (I) warning systems; and
 - (J) weather radar system, best practices for optimum use, interpretation of displayed information.
- (11) cockpit, cabin and cargo compartment:
 - (i) operation of the exterior, cockpit, cabin and cargo compartment lighting and the emergency lighting;
 - (ii) operation of the cabin and cargo doors, stairs, windows and emergency exits;
 - (iii) main components of the oxygen system and their location, oxygen masks and operation of the oxygen systems for the crew and passengers, required amount of oxygen by means of a table or diagram.
- (12) emergency equipment operation and correct application of the following emergency equipment in the aeroplane:
 - (i) portable fire extinguisher;

- (ii) first-aid kits;
 - (iii) portable oxygen equipment;
 - (iv) emergency ropes;
 - (v) life-jacket;
 - (vi) life rafts;
 - (vii) emergency transmitters;
 - (viii) crash axes;
 - (ix) megaphones;
 - (x) emergency signals.
- (13) pneumatic system:
 - (i) components of the pneumatic system, pressure source and actuated components;
 - (ii) controls, monitors and indicators in the cockpit and function of the system;
 - (iii) vacuum system.
- (b) Limitations:
 - (1) general limitations:
 - (i) certification of the aeroplane, category of operation, noise certification and maximum and minimum performance data for all flight profiles, conditions and aircraft systems:
 - (A) maximum tail and crosswind-components at take-off and landing;
 - (B) maximum speeds for flap extension v_{fo} ;
 - (C) at various flap settings v_{fe} ;
 - (D) for landing gear operation v_{lo} , M_{lo} ;
 - (E) for extended landing gear v_{le} , M_{le} ;
 - (F) for maximum rudder deflection v_a , M_a ;
 - (G) for tyres;
 - (H) one propeller feathered.
 - (ii)
 - (A) minimum control speed air v_{mca} ;
 - (B) minimum control speed ground v_{mcg} ;
 - (C) stall speed under various conditions v_{so} , v_{s1} ;
 - (D) maximum speed v_{ne} , M_{ne} ;
 - (E) maximum speed for normal operation v_{mo} , M_{mo} ;
 - (F) altitude and temperature limitations;
 - (G) stick shaker activation.

- (iii)
 - (A) maximum airport pressure altitude, runway slope;
 - (B) maximum taxi mass;
 - (C) maximum take-off mass;
 - (D) maximum lift off mass;
 - (E) maximum landing mass;
 - (F) zero fuel mass;
 - (G) maximum dumping speed v_{dco} , M_{dco} , v_{dce} , M_{dce} ;
 - (H) maximum load factor during operation;
 - (I) certificated range of centre of gravity.
- (2) engine limitations:
 - (i) operating data of the engines:
 - (A) time limits and maximum temperatures;
 - (B) minimum RPMs and temperatures;
 - (C) torque;
 - (D) maximum power for take-off and go-around on pressure altitude or flight altitude and temperature;
 - (E) piston engines: certified range of mixture;
 - (F) minimum and maximum oil temperature and pressure;
 - (G) maximum starter time and required cooling;
 - (H) time between two start attempts for engines and auxiliary power unit;
 - (I) for propeller: maximum RPM of propeller triggering of automatic feathering device.
 - (ii) certified oil grades.
- (3) systems limitations:
 - (i) operating data of the following systems:
 - (A) pressurisation, air conditioning maximum pressures;
 - (B) electrical power supply, maximum load of main power system (AC or DC);
 - (C) maximum time of power supply by battery in case of emergency;
 - (D) mach trim system and yaw damper speed limits;
 - (E) autopilot limitations of various modes;
 - (F) ice protection;
 - (G) speed and temperature limits of window heat;
 - (H) temperature limits of engine and wing anti-ice.
 - (ii) fuel system: certified fuel specifications, minimum and maximum pressures and temperature of the fuel.
- (4) minimum equipment list.

- (c) Performance, flight planning and monitoring:
- (1) performance calculation about speeds, gradients, masses in all conditions for take-off, en-route, approach and landing according to the documentation available (for example for take-off V_1 , V_{mbe} , V_r , V_{lof} , V_2 , take-off distance, maximum take-off mass and the required stop distance) on the following factors:
 - (i) accelerate or stop distance;
 - (ii) take-off run and distance available (TORA, TODA);
 - (iii) ground temperature, pressure altitude, slope, wind;
 - (iv) maximum load and maximum mass (for example ZFM);
 - (v) minimum climb gradient after engine failure;
 - (vi) influence of snow, slush, moisture and standing water on the runway;
 - (vii) possible single or dual engine failure during cruise flight;
 - (viii) use of anti-icing systems;
 - (ix) failure of water injection system or antiskid system;
 - (x) speeds at reduced thrust, V_1 , V_{1red} , V_{mbe} , V_{mu} , V_r , V_{lof} , V_2 ;
 - (xi) safe approach speed V_{ref} on V_{mca} and turbulent conditions;
 - (xii) effects of excessive approach speed and abnormal glideslope on the landing distance;
 - (xiii) minimum climb gradient during approach and landing;
 - (xiv) limiting values for a go-around with minimum fuel;
 - (xv) maximum allowable landing mass and the landing distance for the destination and alternate aerodrome on the following factors:
 - (A) available landing distance;
 - (B) ground temperature, pressure altitude, runway slope and wind;
 - (C) fuel consumption to destination or alternate aerodrome;
 - (D) influence of moisture on the runway, snow, slush and standing water;
 - (E) failure of the water injection system or the anti skid system;
 - (F) influence of thrust reverser and spoilers.
 - (2) flight planning for normal and abnormal conditions:
 - (i) optimum or maximum flight level;
 - (ii) minimum required flight altitude;
 - (iii) drift down procedure after an engine failure during cruise flight;
 - (iv) power setting of the engines during climb, cruise and holding under various circumstances, as well as the most economic cruising flight level;
 - (v) calculation of a short range or long range flight plan;
 - (vi) optimum and maximum flight level and power setting of the engines after engine failure.

- (3) flight monitoring.
- (d) Load and balance and servicing:
 - (1) load and balance:
 - (i) load and trim sheet on the maximum masses for take-off and landing;
 - (ii) centre of gravity limits;
 - (iii) influence of fuel consumption on the centre of gravity;
 - (iv) lashing points, load clamping, maximum ground load.
 - (2) servicing on ground, servicing connections for:
 - (i) fuel;
 - (ii) oil;
 - (iii) water;
 - (iv) hydraulic;
 - (v) oxygen;
 - (vi) nitrogen;
 - (vii) conditioned air;
 - (viii) electric power;
 - (ix) start air;
 - (x) toilet and safety regulations.
- (e) Emergency procedures:
 - (1) recognition of the situation as well as immediate memory actions in correct sequence and for those conditions recognised as emergencies by the manufacturer and competent authority for certification:
 - (i) engine failure during take-off before and after v_1 , as well as in flight;
 - (ii) malfunctions of the propeller system;
 - (iii) engine overheat, engine fire on ground and in-flight;
 - (iv) wheel well fire;
 - (v) electrical smoke or fire;
 - (vi) rapid decompression and emergency descent;
 - (vii) air-conditioning overheat, anti-ice system overheat;
 - (viii) fuel pump failure;
 - (ix) fuel freezing overheat;
 - (x) electric power failure;
 - (xi) equipment cooling failure;
 - (xii) flight instrument failure;
 - (xiii) partial or total hydraulic failure;

- (xiv) failures at the lift devices and flight controls including boosters
 - (xv) cargo compartment smoke or fire.
- (2) actions according to the approved abnormal and emergency checklist:
 - (i) engine restart in-flight;
 - (ii) landing gear emergency extension;
 - (iii) application of the emergency brake system;
 - (iv) emergency extension of lift devices;
 - (v) fuel dumping;
 - (vi) emergency descent.
- (f) Special requirements for extension of a type rating for instrument approaches down to decision heights of less than 200 ft (60 m):
 - (1) airborne and ground equipment:
 - (i) technical requirements;
 - (ii) operational requirements;
 - (iii) operational reliability;
 - (iv) fail operational;
 - (v) fail passive;
 - (vi) equipment reliability;
 - (vii) operating procedures;
 - (viii) preparatory measures;
 - (ix) operational downgrading;
 - (x) communications.
 - (2) procedures and limitations:
 - (i) operational procedures;
 - (ii) crew coordination.
- (g) Special requirements for 'glass cockpit' aeroplanes with EFIS Additional learning objectives:
 - (1) general rules of aeroplanes computer hardware and software design;
 - (2) logic of all crew information and alerting systems and their limitations;
 - (3) interaction of the different aeroplane computer systems, their limitations, the possibilities of computer fault recognition and the actions to be performed on computer failures;
 - (4) normal procedures including all crew coordination duties;
 - (5) aeroplane operation with different computer degradations (basic flying).
- (h) Flight management systems.