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Circulaire

CIR/FCL 18

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Objet : La qualification CRI (SPA).

Réf. :
Arrêté royal du 4 mars 2008 réglementant les licences civiles de pilote d'avions. Art. 88, §1, 4°, et § 2, 4°.

JAR-FCL 1.380 (a) & (b)
App. 1 & 2 to JAR–FCL 1.380
AMC FCL 1.380
App. 1 & 2 to JAR–FCL 1.330 & 1.345
IEM FCL 1.330

Betreft: De bevoegdverklaring CRI (SPA).

Ref. :
Koninklijk besluit van 4 maart 2008 tot regeling van de burgerlijke vergunningen van bestuurder van vliegtuigen. Art. 88, §1, 4°, en § 2, 4°.

JAR-FCL 1.380 (a) & (b)
App. 1 & 2 to JAR–FCL 1.380
AMC FCL 1.380
App. 1 & 2 to JAR–FCL 1.330 & 1.345
IEM FCL 1.330

Le Directeur général a.i.,
De Directeur-generaal a.i.,

Frank DURINCKX

L'édition 3 comprend
De 3de uitgave bevat

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FCL 18

Cette circulaire décrit la formation, le programme et les procédures qui sont d'application pour l'épreuve d'aptitude en vue de l'obtention de la qualification d'instructeur de qualification de classe CRI(A).

Elle comprend :

- **Appendix 1 to JAR–FCL 1.380**

Course for the single-pilot multi-engine class rating instructor rating (aeroplane) CRI(SPA).

- **Appendix 2 to JAR–FCL 1.380**

Course for the single-pilot single-engine class rating instructor rating (aeroplane) CRI(SPA).

- **AMC FCL 1.380**

Course for the single-pilotmulti-engine class rating instructor rating (aeroplane) CRI(SPA).

- **Appendix 1 to JAR–FCL 1.330 & 1.345**

Arrangements for the flight instructor rating (FI(A)) skill test.

- **Appendix 2 to JAR–FCL 1.330 & 1.345**

Contents of the flight instructor rating (FI(A)) skill test.

- **IEM FCL 1.330**

Flight instructor rating (FI(A)) skill test.

FCL 18

Deze circulaire beschrijft de opleiding, het programma en de procedures die van toepassing zijn voor de vaardigheidstest met het oog op het bekomen van de bevoegdverklaring instructeur voor een klassebevoegdverklaring CRI(A).

Zij omvat:

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Appendix 1 to JAR-FCL 1.380
Course for the single-pilot multi-engine class rating instructor rating (Aeroplane) (CRI(SPA))
(See JAR-FCL 1.380)
(See AMC FCL 1.380)

1 The aim of this course is to train aeroplane licence holders with at least 500 hours as pilot of aeroplanes to the level of proficiency necessary for the issue of a CRI(A) rating for single-pilot multi-engine aeroplanes. The course shall be designed to give adequate training to the applicant in theoretical knowledge instruction, flight instruction and synthetic flight instruction in order to instruct for any single-pilot multi-engine aeroplane class or type rating for which the applicant is qualified (see JAR-FCL 1.380).

TEACHING AND LEARNING

2 The syllabus is set out in AMC FCL 1.380. An approved CRI(A) Teaching and Learning course shall comprise not less than 25 hours. Pilots holding or having held one of the following ratings are credited for the CRI(A) Teaching and Learning part of the CRI course:

FI(A), IRI(A), TRI(A), SFI(A)
FI(H), TRI(H), IRI(H), SFI(H)

FLYING TRAINING

3 An applicant for the issue of a CRI(SPA) rating for multi-engine aeroplanes shall complete not less than 5 hours of flying training given by an instructor, approved for this purpose. The flight training shall be aimed at ensuring that the applicant is able to teach the air exercises safely and efficiently to students undergoing a course of training for the issue of a single-pilot multi-engine class/type rating. The flying training syllabus is set out in AMC FCL 1.380.

SKILL TEST

4 On completion of the course, the applicant shall take the skill test in accordance with Appendix 1 and Sections 1, 2, 3, 5 and 7 of Appendix 2 to JAR-FCL 1.330 & 1.345.

Appendix 2 to JAR-FCL 1.380
Course for the single-pilot single engine class rating instructor rating (aeroplane) (CRI(SPA))
(See JAR-FCL 1.380)

1 The aim of this course is to train aeroplane licence holders with more than 300 hours as pilot of aeroplane to the level of proficiency necessary for the issue of a CRI(A) rating for single engine aeroplanes. The course shall be designed to give adequate training to the applicant in theoretical knowledge instruction, flight instruction and synthetic flight instruction in order to instruct for any single pilot single engine aeroplane class or type rating for which the applicant is qualified (see JAR FCL 1.380)

TEACHING AND LEARNING

2 An approved CRI(A) Teaching and Learning course shall comprise not less than 25 hours. Pilots holding or having held one of the following ratings credited for the CRI(A) Teaching and Learning part of the CRI course:

FI(A), IRI(A), TRI(A), SFI(A)
FI(H), TRI(H), IRI(H), SFI(H)

FLYING TRAINING

3. An applicant for the issue of a CRI(SPA) rating for single engine aeroplanes shall complete not less than 3 hours of flying training given by an instructor, approved for this purpose. The flight training shall be aimed at ensuring that the applicant is able to teach the air exercises safely and efficiently to students undergoing a course of training for the issue of a single pilot single engine class or type rating.

SKILL TEST

4. On completion of the course, the applicant shall take the skill test in accordance with Appendix 1 and Sections 1, 2, 3, 4 and 7 of Appendix 2 to JAR FCL 1.330 & 1.345.

AMC FCL 1.380
Course for the single-pilot multi-engine class rating instructor rating (aeroplane) (CRI(SPA))
See JAR–FCL 1.380
See Appendix 1 to JAR-FCL 1.380

COURSE OBJECTIVE:

1 The aim of this course is to give adequate training to the applicant in theoretical knowledge and flight instruction in order to instruct for a single-pilot multi-engine class rating.

GROUND TRAINING

2 This syllabus is concerned only with the training on multi-engine aeroplanes. Therefore, other knowledge areas, common to both single- and multi-engine aeroplanes, should be revised as necessary to cover the handling and operating of the aeroplane with all engines operative, using the applicable sections of the Ground Subjects Syllabus for the flight instructor course (AMC FCL 1.340 – CIR/FCL 16). Additionally, the ground training should include 25 hours of classroom work to develop the applicant's ability to teach a student the knowledge and understanding required for the air exercise section of the multi-engine training course. This part will include the long briefings for the air exercises.

PART 1

TEACHING AND LEARNING

Item No.

1 THE LEARNING PROCESS

Motivation
Perception and understanding
Memory and its application
Habits and transfer
Obstacles to learning
Incentives to learning
Learning methods
Rates of learning

2 THE TEACHING PROCESS

Elements of effective teaching
Planning of instructional activity
Teaching methods
Teaching from the 'known' to the 'unknown'
Use of 'lesson plans'

3 TRAINING PHILOSOPHIES

Value of a structured (approved) course of training
Importance of a planned syllabus
Integration of theoretical knowledge and flight instruction

4 TECHNIQUES OF APPLIED INSTRUCTION

a. Theoretical knowledge – Classroom instruction techniques
Use of training aids
Group lectures
Individual briefings
Student participation/discussion

b. FLIGHT – Airborne instruction techniques
The flight/cockpit environment
Techniques of applied instruction
Post flight and inflight judgement and decision making

5 STUDENT EVALUATION AND TESTING

a. Assessment of student performance

The function of progress tests
Recall of knowledge
Translation of knowledge into understanding
Development of understanding into actions
The need to evaluate rate of progress

b. Analysis of student errors

Establish the reason for errors
Tackle major faults first, minor faults second
Avoidance of over criticism
The need for clear concise communication

6 TRAINING PROGRAMME DEVELOPMENT

Lesson planning
Preparation
Explanation and demonstration
Student participation and practice
Evaluation

7 HUMAN PERFORMANCE AND LIMITATIONS RELEVANT TO FLIGHT INSTRUCTION

Physiological factors
Psychological factors
Human information processing
Behavioural attitudes
Development of judgement and decision making

8 HAZARDS INVOLVED IN SIMULATING SYSTEMS FAILURES AND MALFUNCTIONS IN THE AEROPLANE DURING FLIGHT

Selection of a safe altitude
Importance of ‘touch drills’
Situational awareness
Adherence to correct procedures

9 TRAINING ADMINISTRATION

Flight theoretical knowledge instruction records
Pilot’s personal flying log book
The flight/ground curriculum
Study material
Official forms
Aircraft Flight/Owner’s Manuals/Pilot’s Operating Handbooks
Flight authorisation papers
Aircraft documents
The private pilot’s licence regulations

PART 2

THEORETICAL KNOWLEDGE INSTRUCTION SYLLABUS

SUGGESTED BREAKDOWN OF COURSE CLASSROOM HOURS

Tuition hours	Practice in class	Topic	Internal progress test
1.00		Aviation legislation	1.00
2.00		Performance, all engines operating, including mass and balance	
2.00		Asymmetric flight Principles of flight	
2.00	2.00	Control in asymmetric flight Minimum control and safety speeds Feathering and unfeathering	
2.00		Performance in asymmetric flight	1.00
2.00		Specific type of aeroplane – operation of systems. Airframe and engine limitations	1.00
4.00	5.00	Briefings for air exercises progress	
15.00	7.00		3.00
Course total	25.00 (including progress test)		

SYLLABUS OF THEORETICAL KNOWLEDGE SUBJECTS

AIR LEGISLATION

Aeroplane performance group definitions (JAA).
Methods of factoring gross performance.

ASYMMETRIC POWER FLIGHT

PRINCIPLES OF FLIGHT

THE PROBLEMS

asymmetry
control
performance

THE FORCES AND COUPLES

offset thrust line
asymmetric blade effect
offset drag line
failed engine propeller drag
total drag increase
asymmetry of lift
uneven propeller slipstream effect
effect of yaw in level and turning flight
thrust and rudder side force couples
effect on moment arms

CONTROL IN ASYMMETRIC POWER FLIGHT

- use, misuse and limits of:
  - rudder
  - aileron
  - elevators
- effect of bank/sideslip/balance
- decrease of aileron/rudder effectiveness
- fin stall possibility
- effect of ias/thrust relationship
- effect of residual unbalanced forces
- foot loads and trimming

MINIMUM CONTROL AND SAFETY SPEEDS

- minimum control speed (V_{mc})
- definition
- origin
- factors affecting (V_{mc})
  - thrust
  - mass and centre of gravity position
  - altitude
  - landing gear
  - flaps
  - cowl flaps/cooling gills
  - turbulence/gusts
  - pilot reaction/competence
  - banking towards the operating engine
  - drag
  - feathering
  - critical engine
- take-off safety speed
- definition/origin of V_2
- other relevant V codes

AEROPLANE PERFORMANCE – ONE ENGINE INOPERATIVE

- effect on excess power available
- single-engine ceiling
- cruising, range and endurance
- acceleration/deceleration
- zero thrust, definition and purpose

PROPELLERS

- variable pitch – general principles
- feathering/unfeathering mechanism and limitations (e g minimum rpm)

SPECIFIC AEROPLANE TYPE

AEROPLANE AND ENGINE SYSTEMS

- operation normal
- operation abnormal
- emergency procedures

LIMITATIONS – AIRFRAME

- load factors
- landing gear/flap limiting speeds (V_{lo} and V_{fe})
- rough air speed (V_{ra})
- maximum speeds (V_{no} and V_{ne})

LIMITATIONS – ENGINE

rpm and manifold pressure
oil temperature and pressure
emergency procedures

MASS AND BALANCE

(To be covered in conjunction with the flight/owner's manual/pilot's operating handbook)
mass and balance documentation for aeroplane type
revision of basic principles
calculations for specific aeroplane type

MASS AND PERFORMANCE

(To be covered in conjunction with the flight/owner's manual/pilot's operating handbook)
calculations for specific aeroplane type (all engines operating)
take-off run
take-off distance
accelerate/stop distance
landing distance
landing run
take-off/climb out flight path
calculations for specific aeroplane type (one engine operating)
climb out flight path
landing distance
landing run

PART 3

FLIGHT INSTRUCTION SYLLABUS – NORMAL FLIGHT

This part is similar to the Air Exercise Sections of the single-engine Flight Instructor course, including 'Introduction to Instrument Flying' except that the objectives, airmanship considerations and common errors are related to the operation of a multi-engine aeroplane.

The purpose of this part is to acquaint the applicant with the teaching aspects of the operational procedures and handling of a multi-engine aeroplane with all engines functioning.

The following items should be covered:

1 Aeroplane familiarisation

2 Pre-flight preparation and aeroplane inspection

3 Engine starting procedures

4 Taxiing

5 Pre-take-off procedures

6 The take-off and initial climb
into wind
crosswind
short field

7 Climbing

8 Straight and level flight

9 Descending (including emergency descent procedures)

10 Turning

11 Slow flight

12 Stalling and recoveries

13 Instrument flight – basic

14 Emergency drills (not including engine failure)

15 Circuit, approach and landing
into wind
crosswind
short field

16 Mislanding and going round again

17 Actions after flight

AIR EXERCISES

The following air exercises are developments of the Basic (single-engine) syllabus which are to be related to the handling of multi-engine types in order to ensure that the student learns the significance and use of controls and techniques which may be strange to the student in all normal, abnormal and emergency situations, except that engine failure and flight on asymmetric power are dealt with separately in the Air Exercises in Part 2.

LONG BRIEFING 1

AEROPLANE FAMILIARISATION

introduction to the aeroplane
explanation of the:
- cockpit layout
- systems and controls

aeroplane power plant
check lists and drills
differences when occupying the instructor's seat

EMERGENCY DRILLS

action in event of fire:
- in the air
- on the ground

Escape drills:
- location of exits
- emergency equipment, e.g. fire extinguishers, etc.

PRE-FLIGHT PREPARATION AND AEROPLANE INSPECTION

aeroplane documentation
external checks
internal checks
harness, seat/rudder pedal adjustment

ENGINE STARTING PROCEDURES

use of checklists
checks prior to starting
checks after starting

AIR EXERCISE 1

AEROPLANE FAMILIARISATION

external features
cockpit layout
aeroplane systems
check lists, drills
action in the event of fire in the air and on the ground
- – engine
- – cabin
- – electrical

systems failure (as applicable to type)
escape drills
- – location and use of emergency equipment and exits

PREPARATION FOR AND ACTION AFTER FLIGHT

flight authorisation and aeroplane acceptance
technical log/certificate of maintenance release
mass and balance and performance considerations
external checks
internal checks, adjustment of harness and/or rudder pedals
starting and warming up engines
checks after starting
radio nav/com checks
altimeter checks and setting procedures
power checks
running down and switching off engines
completion of authorisation sheet and aeroplane serviceability documents

LONG BRIEFING 2

TAXIING

pre-Taxiing area precautions
    greater mass – greater inertia
effect of differential power
precautions on narrow taxiways
common errors

PRE TAKE-OFF PROCEDURES

use of checklist
engine power checks
pre take-off checks
instructor's briefing to cover the procedure to be followed should an emergency occur during take-off, e.g. engine failure
common errors

THE TAKE-OFF AND INITIAL CLIMB

ATC considerations
factors affecting the length of the take-off run/distance
correct lift-off speed
importance of safety speed
crosswind take-off, considerations and procedures
short field take-off, considerations and procedures
engine handling after take-off, throttle/pitch/engine synchronisation
common errors

CLIMBING

airmanship considerations
    pre-climbing checks
engine considerations
    use of throttle/pitch controls
maximum rate of climb speed
maximum angle of climb speed
synchronising the engines
common errors

AIR EXERCISE 2

TAXIING

checks before taxiing
starting and stopping
control of speed
control of direction and turning
turning in confined spaces
leaving the parking area
freedom of rudder movement (importance of pilot ability to use full rudder travel)
instrument checks

EMERGENCIES

brake/steering failure

PRE TAKE-OFF PROCEDURES

use of checklist
engine power and system checks
pre take-off checks
instructor's briefing in the event of:
- emergencies during take-off

THE TAKE-OFF AND INITIAL CLIMB

ATC considerations
directional control and use of power
lift-off speed
crosswind effects and procedure
short field take-off and procedure
procedures after take-off
- landing gear retraction
- flap retraction (as applicable)
- selection of manifold pressure and rpm
- engine synchronisation
- other procedures (as applicable)

at an appropriate stage of the course

CLIMBING

Pre-Climbing checks
Power Selection for Normal and Maximum Rate Climb
Engine and RPM Limitations
Effect of Altitude on Manifold Pressure, Full Throttle
Levelling Off – Power Selection
Climbing with Flaps Down
Recovery to Normal Climb
En Route Climb (Cruise Climb)
Maximum Angle of Climb
Altimeter Setting Procedures
Prolonged Climb and use of Cowl Flaps/Cooling Gills
Instrument Appreciation

LONG BRIEFING 3

STRAIGHT AND LEVEL FLIGHT

Airmanship considerations
Selection of power – throttle/pitch controls

Engine synchronisation
Fuel consumption aspects
Use of trimming controls
    elevator, rudder (aileron as applicable)
Operation of flaps
    effect on pitch attitude
    effect on airspeed
Operation of landing gear
    effect on pitch attitude
    effect on airspeed
Use of mixture controls
Use of alternate air/carburettor heat controls
Operation of cowl flaps/cooling gills
Use of cabin ventilation and heating systems
Operation and use of the other systems (as applicable to type)
Common errors

DESCENDING

Airmanship considerations
    pre-descent checks
Normal descent
    selection of throttle/pitch controls
    engine cooling considerations
Emergency descent procedure
Common errors

TURNING

Airmanship considerations
Medium turns
Climbing/descending turns
Steep turns (45 degrees of bank or more)
Common errors

AIR EXERCISE 3

STRAIGHT AND LEVEL FLIGHT

At Normal Cruising Power
– selection of cruise power
– manifold pressure/RPM
– engine synchronisation
– use of trimming controls
– performance considerations – range/endurance
Instrument Appreciation
Operation of Flaps (in stages)
– airspeed below V_{fe}
– effect on pitch attitude
– effect on airspeed
Operation of Landing Gear
– airspeed below V_{lo}/V_{le}
– effect on pitch attitude
– effect on airspeed
Use of Mixture Controls
Use of Alternate Air/Carburettor Control
Operation of Cowl Flaps/Cooling Gills
Operation of Cabin Ventilation/Heating Systems
Operation and use of Other Systems (as applicable to type)

DESCENDING

Pre-Descent Checks
Power Selection – Manifold Pressure/RPM
Powered Descent (Cruise Descent)
Engine Cooling Considerations
– use of cowl flaps/cooling gills
Levelling Off
Descending with Flaps Down
Descending with Landing Gear Down
Altimeter Setting Procedure
Instrument Appreciation
Emergency Descent
– as applicable to type
– limitations in turbulence V_{no}

TURNING

Medium Turns
Climbing and Descending Turns
Steep Turns –45 degrees of Bank
Instrument Appreciation

LONG BRIEFING 4

SLOW FLIGHT

Airmanship considerations
flight at V_{s1} and V_{so} +5 knots
aircraft handling characteristics
Simulated 'go around' from slow flight
at V_{sse} with flaps down
note pitch trim change
Common errors

STALLING

Airmanship considerations
Power selection
Symptoms approaching the stall
Full stall characteristics
Recovery from the full stall
Recovery at the incipient stall
Stalling and recovery in the landing configuration
Recovery at the incipient stage in the landing configuration

INSTRUMENT FLIGHT (BASIC)

Straight and level
Climbing
Turning
Descending

EMERGENCY DRILLS (not including engine failure)

As applicable to type

CIRCUIT APPROACH AND LANDING

Airmanship and ATC consideration

Downwind leg
- airspeed below V_{fe}
- use of flaps (as applicable)
- pre-landing checks
- position to turn onto base leg

Base leg
- selection of power (throttle/pitch), flaps and trimming controls
- maintenance of correct airspeed

Final approach
- power adjustments (early reaction to undershooting)
- use of additional flaps (as required)
- confirmation of landing gear down
- selection 'touch down' point
- airspeed reduction to V_{at}
- maintenance of approach path

Landing
- greater sink rate
- longer landing distance and run
- crosswind approach and landing
- crosswind considerations
- short field approach and landing
- short field procedure – considerations

AIR EXERCISE 4

SLOW FLIGHT

Safety Checks
Setting up and Maintaining (Flaps Up)
- V_{s1} + 5 knots
- note aeroplane handling characteristics

Setting up and Maintaining (Flaps Down)
- V_{so} + 5 knots
- note aeroplane handling characteristics

Simulated 'Go Around' from a Slow Flight with Flaps
- Down and airspeed not below V_{sse}, e.g. airspeed at V_{sse} or V_{mca} + 10 knots
- increase to full power and enter a climb
- note pitch change

Resume Normal Flight

STALLING

- airmanship considerations
- selection of RPM
- stall symptoms
- full stall characteristics
- recovery from the full stall
  - care in application of power
- recovery at the incipient stage
- stalling and recovery in landing configuration
- stall recovery at the incipient stage in the landing configuration

INSTRUMENT FLIGHT (BASIC)

– straight and level
– climbing
– turning
– descending

EMERGENCY DRILLS (not including engine failure)

As applicable to type

CIRCUIT, APPROACH AND LANDING

Airmanship and ATC considerations
Downwind leg
– control of speed (below V_{fe})
– flaps as applicable
– pre-landing checks
– control of speed and height
– base leg turn

Base leg
– power selection
– use of flap and trimming controls
– maintenance of correct airspeed

Final approach
– use of additional flap (as required)
– confirmation of landing gear down
– selection of touchdown point
– airspeed reduction to V_{at}
– maintaining correct approach path
  – use of power

Landing
– control of sink rate during flare
– crosswind considerations
– longer landing roll
– short/soft field approach and landing
  – considerations and precautions

ASYMMETRIC POWER FLIGHT

During this part, special emphasis is to be placed on the:

a. Circumstances in which actual feathering and unfeathering practice will be done, i.e. safe altitude; compliance with regulations concerning minimum altitude/height for feathering practice, weather conditions, distance from nearest available aerodrome.

b. Procedure to use for instructor/student co-operation, e.g. the correct use of touch drills and the prevention of misunderstandings, especially during feathering and unfeathering practice and when zero thrust is being used for asymmetric circuits. This procedure is to include positive agreement as to which engine is being shut down/re-started or set at zero thrust and identifying each control and naming the engine it is going to affect.

c. Consideration to be given to avoid over-working the operating engine, and the degraded performance when operating the aeroplane during asymmetric flight.

d. Need to use the specific check list for the aeroplane type.

LONG BRIEFINGS

FLIGHT ON ASYMMETRIC POWER

Introduction to asymmetric flight
Feathering the propeller
- method of operation

Effects on aeroplane handling at cruising speed
Introduction to effects upon aeroplane performance
Note foot load to maintain a constant heading (No rudder trim)
Unfeathering the propeller
- regain normal flight

Finding the zero thrust setting

- comparison of foot load when feathered and with zero thrust set

Effects and Recognition of Engine Failure in Level Flight

The forces and the effects of yaw
Types of failure
- sudden or gradual
- complete or partial

Yaw, direction and further effects of yaw
Flight instrument indications
Identification of Failed Engine
The couples and residual out of balance forces
- resultant flight attitude

Use of rudder to counteract yaw
Use of aileron
- dangers of mis-use

Use of elevator to maintain level flight
Use of power to maintain a safe airspeed and altitude
Supplementary recovery to straight and level flight
- simultaneous increase of speed and reduction in power

Identification of failed engine
- idle leg = idle engine

Use of engine instruments for identification
- fuel pressure/flow
- RPM gauge response effect of CSU action at lower and higher airspeed
- engine temperature gauges

Confirmation of identification
- close the throttle of identified failed engine

Effects and recognition of engine failure in turns
Identification and control
Side forces and effects of yaw

DURING TURNING FLIGHT:

Effect of ‘inside’ engine failure
- effect sudden and pronounced

Effect of ‘outside’ engine failure
- effect less sudden and pronounced

The possibility of confusion in identification (particularly at low power)
- correct use of rudder
- possible need to return to lateral level flight to confirm correct identification

Visual and flight instrument indications
Effect of varying speed and power
Speed/thrust relationship
At normal cruising speed and cruising power
- engine failure clearly recognised

At low safe speed and climb power

– engine failure most positively recognised

High speed descent and low power

– possible failure to notice asymmetry (engine failure)

MINIMUM CONTROL SPEEDS

ASI colour coding – red radial line

NOTE: This exercise is concerned with the ultimate boundaries of controllability in various conditions that a student can reach in a steady asymmetric power state, approached by a gradual speed reduction. Sudden and complete failure should not be given at the Flight Manual V_{mca}. The purpose of the exercise is to continue the gradual introduction of a student to control an aeroplane in asymmetric power flight during extreme or critical situations. It is not a demonstration of V_{mca}.

Techniques for assessing critical speeds with wings level and recovery – dangers involved when minimum control speed and the stalling speed are very close

– use of V_{sse}

Establish a minimum control speed for each asymmetrically disposed engine

– to establish critical engine (if applicable)

Effects on minimum control speeds of:

– bank
– zero thrust setting
– take-off configuration
  landing gear down/take-off flap set
  landing gear up/take-off flap set

It is important to appreciate that the use of 5ø of bank towards the operating engine produces a lower V_{mca} and also a better performance than that obtained with the wings held level. It is now normal for manufacturers to use 5ø of bank in this manner when determining the V_{mca} for the specific type. Thus the V_{mca} quoted in the aeroplane manual will have been obtained using the technique.

FEATHERING AND UNFEATHERING

Minimum heights for practising feathering/unfeathering drills

Engine handling – Precautions (overheating, icing conditions, priming, warm up, method of simulating engine failure – reference to Aircraft Engine Manual and Service Instructions and Bulletins).

ENGINE FAILURE PROCEDURE

Once the maintenance of control has been achieved, the order in which the procedures are carried out will be determined by the phase of operation and the aircraft type.

Flight Phase

In cruising flight

Critical phase such as immediately after take-off or during the approach to landing or during a ‘go around’.

AIRCRAFT TYPE

Variations will inevitably occur in the order of certain drills and checks due to differences between aeroplane types and perhaps between models of the same type, and the Flight/Owner’s Manuals, Pilot’s Operating Handbooks are to be consulted to establish the exact order of these procedures.

For example, one Flight/Owner’s Manual/Pilot’s Operating Handbook may call for the raising of flaps and landing gear prior to feathering, whilst another may recommend feathering as a first step. The reason for this latter procedure could be due to the fact that some engines cannot be feathered if the RPM drops below a certain figure.

Again, in some aeroplanes, the raising of the landing gear may create more drag during retraction due to the transient position of the landing gear doors and as a result of this retraction would best be left until feathering has been accomplished and propeller drag reduced.

Therefore, the order in which the drills and checks are shown in this syllabus under IMMEDIATE and SUBSEQUENT actions are to be used as a general guide only and the exact order of precedence is determined by reference to the Flight/Owner's Manual, Pilot's Operating Handbook for the specific aeroplane type being used on the course.

IN FLIGHT ENGINE FAILURE

In cruise or other flight phase not including take-off or landing.

Immediate Actions:

Recognition of Asymmetric Condition
Identification and Confirmation of Failed Engine
- idle leg – idle engine
- closing of throttle for confirmation

Cause and Fire Check
- typical reasons for failure
- methods of rectification

Feathering Decision and Procedure
- reduction of other drag
- need for speed but not haste
- use of rudder trim

Subsequent Actions:

Live Engine
- temperature, pressures and power
- remaining services
- electrical load – assess and reduce as necessary
- effect on power source for air driven instruments
- landing gear
- flaps and other services

Re-plan Flight
- ATC and weather
- terrain clearance, single-engine cruise speed
- decision to divert or continue

Fuel Management
- best use of remaining fuel

Dangers of re-starting damaged engine
Action if unable to maintain altitude
- effect of altitude on power available

Effects on Performance
Effects on power available and power required
Effects on various airframe configuration and propeller settings
Use of Flight/Owner's Manual
- cruising
- climbing – ASI colour coding (blue line)
- descending
- turning

'Live' Engine Limitations and Handling

Take-Off and Approach – Control and Performance

SIGNIFICANT FACTORS

Significance of Take-off safety speed

- effect of landing gear, flap, feathering, take-off, trim setting, systems for operating landing gear and flaps
- Effect on mass, altitude and temperature (performance)

Significance of Best Single-engine Climb Speed (V_{yse})

- acceleration to best engine climb speed and establishing a positive climb
- relationship of S/E climb speed to normal climb speed
- action if unable to climb

Significance of Asymmetric Committal Height and Speed

- action if baulked below asymmetric committal height

Engine Failure During Take-Off:

Below V_{mca} or unstick speed

accelerate/stop distance considerations
prior use of Flight Manual data if available

Above V_{mca} or unstick speed and below safety speed
Immediate re-landing or use of remaining power to achieve forced landing

Considerations:

- degree of engine failure
- speed at the time
- mass, altitude, temperature (performance)
- configuration
- length of runway remaining
- position of any obstacles ahead

Engine Failure After Take-Off

Simulated at a safe height and at or above take-off safety speed

Considerations:

- need to maintain control
- use of bank towards operating engine
- use of available power achieving best single-engine climb speed
- mass, altitude, temperature (performance)
- effect of prevailing conditions and circumstances

IMMEDIATE ACTIONS:

Maintenance of control including airspeed and use of power.
Recognition of asymmetric condition
Identification and confirmation of failed engine
Feathering and removal of drag (procedure for type)
Establishing best single-engine climb speed

SUBSEQUENT ACTIONS:

Whilst carrying out an asymmetric power climb to the downwind position at single-engine best rate of climb speed:

Cause and fire check
Live engine, handling considerations
Remaining services
ATC liaison
Fuel management

NOTE: These procedures are applicable to aeroplane type and flight situation.

ASYMMETRIC COMMITTAL HEIGHT

Asymmetric Committal Height is the minimum height needed to establish a positive climb whilst maintaining adequate speed for control and removal of drag during an approach to a landing

Because of the significantly reduced performance of many JAR 23 aeroplanes when operating on one engine, consideration is to be given to a minimum height from which it would be safely possible to attempt a 'go around' procedure, during an approach when the flight path will have to be changed from a descent to a climb with the aeroplane in a high drag configuration.

Due to the height loss which will occur during the time that the operating engine is brought up to full power, landing gear and flap retracted, and the aeroplane established in a climb at V_{yse} a minimum height (often referred to as 'Asymmetric Committal Height') is to be selected, below which the pilot should not attempt to take the aeroplane round again for another circuit. This height will be compatible with the aeroplane type, all up weight, altitude of the aerodrome being used, air temperature, wind, the height of obstructions along the climb out path, and pilot competence.

Circuit Approach and Landing on Asymmetric Power

- Definition and use of Asymmetric Committal Height
- Use of Standard Pattern and Normal Procedures
- Action if unable to maintain Circuit Height
- Speed and Power Settings Required
- Decision to land or go around at asymmetric committal height
  - factors to be considered

Undershooting
- importance of maintaining correct airspeed, (not below V_{yse})

SPEED AND HEADING CONTROL

Height/speed/power relationship
- need for minimum possible drag

Establishing positive climb at best single-engine rate of climb speed
- effect of availability of systems, power for flap and landing gear
- operation and rapid clean up

NOTE 1: The airspeed at which the decision is made to commit the aeroplane to a landing or to go around should normally be the best single-engine rate of climb speed and in any case not less than the safety speed.

NOTE 2: On no account should instrument approach 'Decision Height' and its associated procedures be confused with the selection of minimum Height for initiating a go around in asymmetric power flight.

ENGINE FAILURE DURING AN ALL ENGINES APPROACH OR MISSED APPROACH

Use of asymmetric committal height and speed considerations

speed and heading control
- decision to attempt a landing, 'go around' or force land as circumstances dictate

NOTE: At least one demonstration and practice of engine failure in this situation should be performed during the course.

INSTRUMENT FLYING ON ASYMMETRIC POWER

Considerations relating to aircraft performance during:
- straight and level flight
- climbing and descending
- standard rate turns:
- level, climbing and descending turns including turns onto pre-selected headings

Vacuum operated instruments

– availability

Electrical power source

– availability

FLIGHT INSTRUCTION AIR EXERCISES

ASYMMETRIC POWER FLIGHT

This section covers the operation of a single-pilot multi-engine aeroplane when one engine has failed and it is applicable to all such light piston aeroplanes. Check lists should be used as applicable.

AIR EXERCISES

FLIGHT ON ASYMMETRIC POWER

Introduction to asymmetric flight

- close the throttle of one engine
- feather its propeller
- effects on aeroplane handling at cruising speed
- effects on aeroplane performance e.g. cruising speed and rate of climb
- note foot load to maintain a constant heading
- unfeather the propeller
- return to normal flight finding the zero thrust throttle setting
- comparison of foot load when feathered and with zero thrust set

Effects and Recognition of Engine Failure in Level Flight with the aeroplane straight and level at cruise speed

- slowly close the throttle of one engine
- note yaw, roll and spiral descent

Return to normal flight

- close throttle of other engine
- note same effects in opposite direction

Methods of Control and identification of Failed Engine close one throttle and maintain heading and level flight by use of

- rudder to control yaw
- aileron to hold wings level
- elevators to maintain level flight
- power (as required) to maintain airspeed and altitude

Alternative/supplementary Method of Control

- simultaneously:
  - lower aeroplane nose to increase airspeed
  - reduce power
  - loss of altitude – inevitable

Identification of failed engine

- idle foot = idle engine

Use of instruments for identification

- fuel pressure/fuel flow
- RPM gauge/CSU action may mask identification
- engine temperature gauges

Confirmation of identification

- close the throttle of the identified failed engine

Effects and recognition of Engine Failure in Turns/Effects of 'inside' engine failure

- more pronounced yaw
- more pronounced roll
- more pronounced pitch down

Effects of 'outside' engine failure

- less pronounced yaw
- less pronounced roll
- less pronounced pitch down

Possibility of confusion in identification

- use of correct rudder application
- return to lateral level flight if necessary

Flight instrument indications

Effect of Varying Speed and Power

Failure of one engine at cruise speed and power

- engine failure clearly recognised

Failure of one engine at low speed and high power (not below V_{sse})

- engine failure most positively recognised

Failure of one engine at higher speeds and low power

- possible failure to recognise engine failure

Minimum Control speeds

Establish the V_{yse}

- select maximum permitted manifold pressure and RPM
- close the throttle on one engine

– raise the aeroplane nose and reduce the airspeed

- note the airspeed when maximum rudder deflection is being applied and when directional control can no longer be maintained
- lower the aeroplane nose and reduce power until full directional control is regained
- the lowest airspeed achieved prior to the loss of directional control will be the V_{mc} for the flight condition
- repeat the procedure closing the throttle of the other engine
- the higher of these two airspeeds will identify the most critical engine to fail

Warning

In the above situations the recovery is to be initiated immediately before directional control is lost with full rudder applied, or when a safe margin above the stall remains, e.g. when the stall warning device operates, for the particular aeroplane configuration and flight conditions. On no account should the aeroplane be allowed to decelerate to a lower airspeed.

Establish the effect of using 5ø of bank at V_{mc}

- close the throttle of one engine
- increase to full power on the operating engine
- using 5ø of bank towards the operating engine reduce speed to the V_{mc}
- note lower V_{mc} when 5ø of bank is used

'In flight' Engine Failure Procedure

In cruise and other flight circumstances not including take-off and landing.

IMMEDIATE ACTIONS:

Maintenance of control and use of power
- identification of failed engine
- confirmation of failed engine
- failure cause and fire check
- feathering decision and implementation
- reduction of any other drag, e.g. flaps, cowl flaps etc.
- retrim and maintain altitude

SUBSEQUENT ACTIONS:

Live Engine:
- oil temperature and pressure. Fuel flow and power
- remaining services
- electrical load – assess and reduce as necessary
- effect on power source for air driven instruments
- landing gear
- flaps and other services

Re-plan Flight
- ATC and weather
- terrain clearance
- single-engine cruise speed
- decision to divert or continue

Fuel Management
- best use of fuel

Dangers of Re-starting Damaged Engine
Action if unable to maintain altitude
- adopt V_{yse}
- effect of altitude on power available

Effects on performance
Effects on Power Available and Power Required
Effects on various airframe configurations and propeller settings

Use of Flight/Owner's Manual
- cruising
- climbing – ASI colour coding (blue line)
- descending
- turning

'Live' Engine Limitations and Handling

Take-Off and Approach – Control and handling

NOTE: To be done at a safe height away from the circuit

Take-off case with Landing Gear Down and Take-Off Flap Set (if applicable)

Significance of Take-Off at or above Safety Speed
- at safety speed. The ability to maintain control and to accelerate to SE climb speed with aeroplane clean and zero thrust set. Thereafter to achieve a positive climb.

Significance of flight below Safety Speed
- below safety speed and above V_{mca}. A greater difficulty to maintain control, a possible loss of height whilst maintaining speed, cleaning up, accelerating to SE climb speed and establishing a positive climb.

Significance of Best Single-engine Climb Speed

- the ability to achieve the best rate of climb on one engine with minimum delay.

Significance of Asymmetric Committal Height

- the ability to maintain or accelerate to the best single-engine rate of climb speed and to maintain heading whilst cleaning up with perhaps a slight height loss before climbing away
- below this height, the aeroplane is committed to continue the approach to a landing.

Engine Failure During Take-Off

- during the take-off run and below safety speed briefing only

Engine Failure after take-Off

NOTE: To be initiated at a safe height and at not less than take-off safety speed with due regard to the problems of a prolonged single-engine climb in the prevailing conditions.

Immediate Actions:

control of direction and use of bank
control of airspeed and use of power
recognition of asymmetric condition
identification and confirmation of failed engine feathering and reduction of drag (procedure for type)
re-trim

Subsequent Actions

Whilst carrying out an asymmetric power climb to the downwind position at single-engine best rate of climb speed:

- cause and fire check
- live engine, handling considerations
- drills and procedures applicable to aeroplane type and flight situation
- ATC liaison
- fuel management

Asymmetric Circuit, Approach and Landing

Downwind and Base Legs

- use of standard pattern
- normal procedures
- landing gear and flap lowering considerations
- position for base leg
- live engine handling
- airspeed and power settings
- maintenance of height

Final Approach

- Asymmetric Committal Height drill
- control of airspeed and descent rate
- flap considerations

Going Round Again on Asymmetric Power (Missed Approach)

- not below Asymmetric Committal Height
- speed and heading control
- reduction of drag, landing gear retraction
- maintaining V_{yse}
- establish positive rate of climb

Engine failure during ALL engines approach or missed approach

NOTE: To be started at not less than asymmetric committal height and speed and not more than part flap set.

- speed and heading control
- reduction of drag flap
- decision, attempt landing or go around

- control of descent rate if approach is continued
- if go around is initiated, maintain V_{yse}, flaps and landing gear retracted and establish positive rate of climb

NOTE: At least one demonstration and practice of engine failure in this situation should be performed during the course.

Instrument flying on asymmetric power

Flight instrument checks and services available
- straight and level flight
- climbing and descending
- standard rate turns
- level, climbing and descending turns including turns onto pre-selected headings

Appendix 1 to JAR–FCL 1.330 & 1.345

Arrangements for the flight instructor rating (FI(A)) skill test, proficiency check and oral theoretical knowledge examination

(See JAR–FCL 1.330, 1.345, 1.355, 1.380, 1.385 and 1.395)

1 The skill test for a FI(A) rating is set out in Appendix 2 to JAR–FCL 1.330 & 1.345. The test comprises oral theoretical examinations on the ground, pre-flight and post flight briefings and in-flight FI(A) demonstrations during skill tests in an aeroplane.

2 An applicant for the skill test shall have received instruction on the same type or class of aeroplane used for the test. The aeroplane used for the test shall meet the requirements set out in Appendix 1a to JAR–FCL 1.055, paragraph 25. (see circular FCL 2 – FTO)

3 Before taking the skill test an applicant shall have completed the required training. The FTO shall produce the applicant's training records when required by the examiner.

4 Section 1, the oral theoretical knowledge examination part of the skill test, is sub-divided into two parts:

(a) the applicant is required to give a lecture under test conditions to other 'student(s)', one of whom will be the examiner. The test lecture is to be selected from items a–h of Section 1. The amount of time for preparation of the test lecture shall be agreed beforehand with the examiner. Appropriate literature may be used by the applicant. The test lecture should not exceed 45 minutes.

(b) the applicant is tested orally by an examiner for knowledge of items a–i of Section 1 and the 'teaching and learning' content given in the FI(A) courses.

5 Section 2, 3 and 7 are for a FI(A) rating for single engine (SE) single pilot aeroplanes (SPAs). These sections comprise exercises to demonstrate the ability to be a FI(A) (ie. instructor demonstration exercises) chosen by the examiner from the flight syllabus of the FI(A) training courses (see AMC FCL 1.340, 1.380 and 1.395). The applicant will be required to demonstrate FI(A) abilities, including briefing, flight instruction and de-briefing.

6 Section 4 is intentionally blank and may be used for the inclusion of other FI(A) demonstration exercises, as decided by the examiner and acknowledged by the applicant before the skill test.

7 Section 5 comprises additional instructor demonstration exercises for a FI(A) rating for multi-engine (ME) SPAs. This section, if required, shall use a ME SPA, simulator or FNPT II. If a simulator or FNPT is used, this shall simulate a ME aeroplane. This section shall be completed in addition to Section 2, 3 and 4 (if applicable) and 7.

8 Section 6 is intentionally blank. This part will include additional FI(A) rating demonstration exercises, as decided by the examiner and agreed with the applicant before the skill test, for a FI(A) rating for instrument ratings (IR). These exercises will be related to the training requirements for the initial issue of an IR.

9 During the skill test the applicant shall occupy the seat normally occupied by the FI(A). The examiner or another FI(A) shall function as the 'student'. The applicant shall be required to explain the relevant exercises and to demonstrate their conduct to the 'student', where appropriate. Thereafter, the 'student' shall execute the same manoeuvre including typical mistakes of inexperienced students. The applicant is expected to correct mistakes orally and/or, if necessary, by intervening.

10 Section 1 and 2 through 7 (as relevant) shall be completed within a period of six months but all Sections should, wherever possible, be completed on the same day. Failure in any exercise within Sections 2, 3 and 4 (if applicable) and 5/6 (if relevant) requires a re-test covering all exercises. Section 1, if failed, may be retaken separately.

11 The examiner may terminate the test at any stage if it is considered that the applicant's demonstration of flying or instructional skills require a re-test.

12 The examiner shall be the pilot-in-command, except in circumstances agreed by the examiner when another FI(A) is designated as pilot-in-command for the flight. Responsibility for the flight shall be allocated in accordance with national regulations.

13 The skill test contents and sections set out in Appendix 2 to JAR–FCL 1.330 & 1.345 shall be used for the skill test. The applicant for the test will use the application form as set out in IEM FCL 1.330.

Appendix 2 to JAR–FCL 1.330 & 1.345 (amended for CRI(A))
Contents of the CRI(A) skill test, oral theoretical knowledge examination and proficiency check

SECTION 1 THEORETICAL KNOWLEDGE ORAL	
a	Air law
b	Aircraft General Knowledge
c	Flight Performance and Planning
d	Human Performance and Limitations
e	Meteorology
f	Navigation
g	Operational Procedures
h	Principles of Flight
i	Training Administration

SECTIONS 2 AND 3 SELECTED MAIN EXERCISE:

SECTION 2 PRE-FLIGHT BRIEFING	
a	Visual Presentation
b	Technical Accuracy
c	Clarity of Explanation
d	Clarity of Speech
e	Instructional Technique
f	Use of Models and Aids
g	Student Participation

SECTION 3 FLIGHT	
a	Arrangement of Demo
b	Synchronisation of Speech with Demo
c	Correction of Faults
d	Aeroplane Handling
e	Instructional Technique
f	General Airmanship/Safety
g	Positioning, use of Airspace
SECTION 4 OTHER EXERCISES	
a	
b	
c	
d	
e	
f	
g	
SECTION 5 MULTI-ENGINE EXERCISES	
a	[1]Actions following an Engine failure shortly after take-off
b	[1]A single-engine approach and go around
c	[1]A single-engine approach and landing
d	
e	
f	
g	

[1] These exercises shall be demonstrated at the skill test for the single-pilot multi-engine class rating instructor rating.

SECTION 6 INSTRUMENT EXERCISES	
a	
b	
c	
d	
e	
f	
g	
SECTION 7 POSTFLIGHT DE-BRIEFING	
a	Visual Presentation
b	Technical Accuracy
c	Clarity of Explanation
d	Clarity of Speech
e	Instructional Technique
f	Use of Models and Aids
g	Student Participation

IEM FCL 1.330 (amended for CRI(A))
CRI(A) skill test and proficiency check form

APPLICATION AND REPORT FORM FOR THE CRI(A) SKILL TEST

1	Applicants personal particulars:		
Applicant's last name:		First names:	
Date of Birth:		Tel (Home):	Tel (Work):
Address:		Country:	

2	Licence Details		
Licence type:		Number:	
Class ratings included in the licence:		Exp. Date:	
Type ratings included in the licence:	1.		
	2.		
	3.		
	4.		
	5.		
Other ratings included in the licence:	1.		
	2.		
	3.		
	4.		
	5.		

3	Pre-course flying experience (See JAR–FCL 1.335)			
TOTAL FLYING HOURS	PIC hours	SINGLE-ENGINE (PISTON) preceding 6 months	INSTRUMENT FLIGHT INSTRUCTION	CROSS-COUNTRY hours

CPL THEORETICAL EXAMINATION PASSED .....(date) (For PPL holders only)
(Copy of pass shall be submitted with this form)

4	**Pre-entry flight test (See JAR–FCL 1.335(f))**
I recommend .....for the Flight Instructor Course.	
Name of FTO:	Date of flight test:
Name of FI conducting the test (Block capitals):	
Licence number:	
Signature:	

5	**Declaration by the applicant**					
I have received a course of training in accordance with the syllabus approved by the Authority for the: (Tick as applicable)						
Flight Instructor Rating FI(A)		Instrument Rating Instructor Rating (IRI(A))		Class Rating Instructor Rating for multi-engine SPA – (CRI(A) ME SPA)		
Applicant's name: (Block Letters)			Signature:			

6	**Declaration by the chief flight instructor**					
I certify that ..... has satisfactorily completed an approved course of training for the						
Flight Instructor Rating FI(A)		Instrument Rating Instructor Rating (IRI(A))		Class Rating Instructor Rating for multi-engine SPA – (CRI(A) ME SPA)		
in accordance with the relevant syllabus approved by the Authority.						
Flying hours during the course:						
Aeroplane/s, simulator/s or flight and navigation procedure trainers used :						
Name of CFI:						
Signature:						
Name of FTO:						

7	**Flight instructor examiner's certificate**			
I have tested the applicant according to the examination report				
A – FLIGHT INSTRUCTOR EXAMINER'S ASSESSMENT in case of partial pass:				
Theoretical oral examination:			Skill test:	
Passed		***Failed***	***Passed***	***Failed***
	I recommend further flight/ground training with a FI instructor before re-test			
	I do not consider further flight/theoretical instruction necessary before re-test *Tick as applicable*			
B – FLIGHT INSTRUCTOR EXAMINER'S ASSESSMENT:				
	Flight Instructor rating			
	Instrument Instructor rating			
	Class Rating Instructor Rating for multi-engine SPA *Tick as applicable*			
FIE's name (block letters):				
Signature:				
Licence number:			Date:	