

APPENDIX R62.05
RECREATIONAL PILOT LICENCE
WEIGHT-SHIFT CONTROLLED MICROLIGHT AEROPLANES
THEORETICAL TRAINING

1. Aim of training course

The aim of the course is to train a candidate to the level of proficiency required for the issue of a class and type rating for weight-shift controlled microlight aeroplanes, and to provide the training necessary to act as pilot-in-command of any weight-shift controlled microlight aeroplane, engaged in non-revenue flights under visual flight rules.

2. Theoretical knowledge course

2.1 The theoretical knowledge course must cover the subjects as detailed in the syllabus:

- (1) Principles of Flight
- (2) Air Law
- (3) Aviation Meteorology
- (4) Aircraft Engines, Airframes and Instruments
- (5) General Navigation
- (6) Human Performance Limitations and Passenger care

2.2 Restricted Radio Telephony Operator's Certificate as prescribed in AIC 30.9

3. Theoretical knowledge course syllabus

3.1 Principles of Flight

3.1.1 Principles of Flight - General

- (1) PHYSICS AND MECHANICS
 - (a) Speed, velocity, force
 - (b) Pressure – Bernoulli's Principle
 - (c) Motion of body along a curved path

Note: The student must have a good understanding of the speed squared law as applicable to Lift with specific reference to gusts and lulls, and their effect on your flight path.

- (2) AEROFOILS, LIFT AND DRAG
 - (a) Air resistance and air density
 - (b) Aerofoil shapes
 - (c) Lift and drag – Angle of attack and airspeed
 - (e) Drag – Induced, parasite – Form, skin, interference

- (f) Lift/drag ratio and aspect ratio
- (g) Wake turbulence

(4) EQUILIBRIUM

- (a) The four forces: Lift, weight, thrust and drag
- (b) Centre of gravity (C of G) position
- (c) The balance of the four forces: Straight and level
 Climbing
 Descending

(5) STABILITY

- (a) Positive, neutral, negative
- (b) Lateral and directional stability
- (c) Longitudinal stability
- (d) Wash-out

(6) FORMATION FLYING

- (a) Law Governing
- (b) Procedures and hazards

(7) TURNING FLIGHT

- (a) The forces in the turn
- (b) Compensation for loss of lift

(1) THE STALL

- a. Airflow separation
- b. Stalling angle – Relationship to airspeed
- c. Wing loading
- d. Wing loading increase with bank angle increase
- e. High-speed stall

(9) AIRCRAFT PERFORMANCE

- (a) Power curves
 Effect of temperature, altitude, density, moisture etc.
 Range and endurance
- (b) Climbing performance
 Rate of climb
 Angle of climb
- (c) Take-off and landing performance
 Take-off run available
 Take-off distance available
 Landing distance available

- (d) Take-off and initial climb - performance
 - Effect of –
 - wind, wind gradient and wind shear
 - weight
 - pressure, altitude, temperature and density
 - ground surface and gradient

- (e) Approach and landing – performance
 - Effect of –
 - wind, wind gradient and wind shear
 - weight
 - turbulence and gusts
 - ground effect

3.1.2 Principles of flight – Weight shift control specific

(1) FLYING CONTROLS

- (a) Controlling the three axes: Vertical, Lateral, Longitudinal
Yaw, Pitch, Roll
- (b) Operation and function of the base-bar
- (c) Operation and function of thrust
- (d) Principles and purpose of mass distribution
- (e) Principles and effect of changes to the following:
 - hang point,
 - batton bungee tension,
 - batten shapes
 - wing-tip washout
 - reflex.
- (d) Operation and function of billow shift and roach
- (e) Loss of bar movement in advanced spiral dive

(2) AEROFOIL, LIFT AND DRAG

- a. Distribution of lift, Centre of pressure with specific reference to swept back, washed out, flex wings with reflex

(3) WEIGHT AND BALANCE

- (c) Limitations on aircraft weight
- (d) Limitations in relation to wing specifications, i.e. size
- (e) Weight calculations

(4) THE STALL

- (a) Progressive stall characteristics of swept back washed out wing
- (b) Whip Stall - tumble

(5) PERFORMANCE

- (a) Performance of wing in rain
- (b) Pendulum effect @ Rotation
- (c) Pilot induced oscillations (P.I.O.), Causes, symptoms and recovery.

(6) STABILITY

- (a) Relationship of gross weight to
 - control in pitch
 - control in turbulence
- (b) Luff lines
- (c) Reflex
- (d) Swept back wings

(7) LOAD FACTOR AND MANOEUVRES

- (a) Maneuvering speed limitations (gusty conditions)
- (b) Effect on stalling speed
- (c) Effect on glide slope
- (d) Effect on base-bar trim position
- (e) Effect on approach slope and round out technique

4.2 Air Law

- (1) Applicable acts, regulations and other documents
- (2) Structure and function of ANR's, CAR's, CAT's, AIP's, Notams, AIC's and AIP supplements.
- (3) Classification of aircraft
- (4) Aircraft documentation
- (5) Aircraft equipment
- (6) Aircraft radio equipment
- (7) Aircraft weight schedule
- (8) Documents to be carried on board
- (9) Documents and records to be maintained and produced on request
- (10) Offences in relating to documents and records
- (11) Airworthiness aspects
- (12) Flight crew licensing
- (13) Microlight aeroplane pilot - Privileges and limitations
- (14) Microlight aeroplane ratings
- (15) Personal flying logbook
- (16) Airspace classification
- (17) General flight rules
- (18) Visual flight rules
- (19) Special flight rules
- (20) Flight operations
- (21) General provisions
- (22) Air traffic services
- (23) Flight plans
- (24) Air-proximity reporting procedures
- (25) Incident/accident reporting
- (26) International operations
- (27) Operation of Non-type certified aircraft
- (28) Marine living resources act and Proclaimed nature reserves

4.3 Aviation Meteorology

(1) THE ATMOSPHERE

- (a) Composition and structure
- (b) Vertical divisions

(2) PRESSURE, DENSITY AND TEMPERATURE

- (a) Barometric pressure, isobars
- (b) Changes of pressure, density and temperature with altitude
- (c) Solar and terrestrial energy radiation, temperature
- (d) Lapse rate
- (e) Stability and instability
- (f) Effects of radiation, advection subsidence and convergence

(3) HUMIDITY AND PRECIPITATION

- (a) Water vapour in the atmosphere
- (b) Dew point and relative humidity

(4) PRESSURE AND WIND

- (a) High and low pressure areas
- (b) Gradient wind
- (c) Vertical and horizontal motion
- (d) Effect of wind gradient and windshear on take-off and landing
- (e) Relationship between isobars and wind, Buys Ballot's law
- (f) Turbulence and gustiness
- (g) Local winds, land and sea breezes, berg winds, valley winds

(5) CLOUD FORMATION

- (a) Cloud types
- (b) Convection clouds
- (c) Orographic clouds
- (d) Stratiform and cumulus clouds

(6) VISIBILITY

- (a) Fog, mist and haze
- (b) Radiation, advection, frontal
- (c) Formation and dispersal
- (d) Reduction of visibility due to mist, snow, smoke, dust and sand
- (e) Hazards of flight due to low visibility, horizontal and vertical

(7) AIRMASSES

- (a) Weather associated with pressure systems

(8) FRONTS

- (a) Formation of cold and warm fronts
- (b) Associated clouds and weather, cold front

(9) ICE ACCRETION

- (a) Conditions conducive to ice formation
- (b) Effects of hoar frost, rime ice, clear ice
- (c) Effects of icing on microlight performance
- (d) Precautions and avoidance of icing conditions
- (e) Powerplant icing

(10) THUNDERSTORMS

- (a) Formation – airmasses, frontal, orographic
- (b) Conditions required
- (c) Development process
- (d) Recognition of favourable conditions for formation
- (e) Hazards
- (f) Effects of lightning and severe turbulence
- (g) Avoidance of flight in the vicinity of thunderstorms

(11) FLIGHT OVER MOUNTAINOUS AREAS

- (a) Hazards
- (b) Influence of terrain on atmospheric processes
- (c) Mountain waves, windshear, turbulence, vertical movement, rotor effects

(12) CLIMATOLOGY

- (a) General world circulation
- (b) South African summer patterns
- (c) South African winter patterns
- (d) The South Westerly Buster
- (e) The Cape Doctor
- (f) The Black South Easter

(13) ALTIMETRY

- (a) Operational aspects of pressure settings
- (b) Pressure altitude, density altitude
- (c) Height, altitude, flight level

(14) THE METEOROLOGICAL ORGANISATION

- (a) Forecasting service

(15) WEATHER ANALYSIS AND FORECASTING

- (a) Weather charts, symbols, signs
- (b) Significant weather charts
- (c) Prognostic charts for general aviation

(16) WEATHER INFORMATION FOR FLIGHT PLANNING

- (a) Reports and forecasts for departure, *en route*, destination and alternate(s)
- (b) Interpretation of coded information METAR, TAF
- (c) Availability of ground reports for surface wind, windshear, visibility

(1) METEOROLOGICAL BROADCASTS FOR AVIATION

- (a) ATIS, SIGMET

(18) MICRO-METEOROLOGY

- (a) Rotors
- (b) Venturies
- (c) Katabatic and Anabatic winds
- (d) Thermal activity
- (e) Dust devils
- (f) The immediate environment.
 - Wind indicators
 - Cloud forms
 - Topography
 - Dams

4.4 Aircraft Engines, Airframes and Instruments

(1) UNDERCARRIAGE

- (a) Structure
- (b) Materials
- (c) Wear and tear considerations

(2) WING

- (a) Structure
- (b) Materials
- (c) Wear and tear considerations
 - Repairs
 - Sail assessment
 - Wind
 - UV
 - Turbulence
 - Hard Landings

(3) POWERPLANT AND SYSTEMS

- (a) Engines – general
 - principles of 2 and 4 stroke engines
- (b) Maintenance
 - spark plug replacement
 - air-filter cleaning
 - cooling system
 - V-belt adjustment
 - gearbox oil change
 - renewing carb rubbers
 - adjusting idle
 - exhaust springs
 - manufacturer maintenance schedule
 - lubrication

(4) IGNITION SYSTEMS

Carburetion and Fuel system

- 1. Principles of float type carburetor
- 2. Fuel-bypass (choke)
- 3. Recognition of faulty mixture
- 4. Methods to maintaining correct mixture ratio
 - ii. carburetor jetting and needle and seat inspection
 - iii. balancing carburetors
- 1. Carburetor icing
- 2. Emergency use of Fuel-bypass (choke)

Fuel

- 3. Types
- 4. Suitability
- 5. Hazards of avgas
- 6. Contamination
- 7. Fuel strainers and drains
- 8. Fire hazards
 - iv. containers
 - v. transportation
 - vi. de-canting

Electrical system

- 1. general
 - 2. batteries
 - 3. circuit breakers and fuses
 - 4. recognizing malfunctions
- Propellor
- 5. nomenclature
 - 6. construction, shape and types
 - 7. forces on blades
 - 8. designs
 - 9. effect of blade pitch changes
 - 10. maintenance and care
 - 11. tracking

vii. Instruments

- (c) Airspeed indicator
- (d) Altimeter
- (e) VSI
- (f) Magnetic compass
 - 1. Precautions when carrying magnetic objects
 - 2. Errors
- (g) Engine instruments
 - Temperature and pressure gauges
- (h) Digital instruments
- (i) RPM

4.5 General Navigation

- (1) FORM OF THE EARTH
 - (c) Axis, poles
 - (d) Meridians of longitude
 - (e) Parallels of latitude

- (2) DIRECTION
 - (g) True north
 - (h) Earth's magnetic field, variation – annual change
 - (i) Magnetic north
 - (j) Magnetic influences within the microlight
 - (k) Compass deviation
 - (l) Turning, acceleration errors
 - (m) Avoiding magnetic interference with the compass

- (3) DISTANCE
 - (a) Nautical mile, statute mile, kilometre

- (4) AERONAUTICAL MAPS AND CHARTS (TOPOGRAPHICAL)
 - (c) Projections and their properties
 - (d) Scale
 - (e) ICAO 1:250 000 and 1: 500 000 charts
 - (f) main properties
 - (g) Scale
 - (h) depiction of height
 - (i) Topography
 - (j) Relief
 - (k) Cultural features
 - (l) Aeronautical symbols
 - (m) Aeronautical information

- (5) CHARTS IN PRACTICAL NAVIGATION
 - (a) Plotting positions
 - (b) Latitude and longitude
 - (c) Bearing and distance
 - (d) Use of navigation protractor
 - (e) Measurement of tracks and distances
 - (f) Conversion of units

- (6) PRINCIPLES OF NAVIGATION
 - (a) IAS, RAS (CAS) and TAS
 - (b) Track, true and magnetic
 - (c) Wind velocity, heading and ground speed
 - (d) Triangle of velocities
 - (e) Calculation of heading and ground speed
 - (f) Drift, wind correction angle
 - (g) EET and ETA
 - (h) Dead reckoning, position, fix

- (7) FLIGHT PLANNING
 - (a) Selection of charts
 - (b) Route and aerodrome weather forecasts and reports

- (c) Assessing the weather situation
- (d) Plotting the route
- (e) Considerations of controlled airspace, airspace restrictions, danger areas, etc.
- (f) Use of AIP and NOTAMS
- (g) ATC liaison procedures in controlled airspace
- (h) Fuel considerations
- (i) *En-route* safety altitude(s)
- (j) Alternate aerodromes
- (k) Communications and radio/navaid frequencies
- (l) Compilation of flight log
- (m) Compilation of ATC flight plan
- (n) Selection of check points, time and distance marks

(8) PRACTICAL NAVIGATION

- (a) Compass headings, use of deviation card
- (b) Organisation of in-flight workload
- (c) Departure procedure
- (d) Maintenance of heading and altitude
- (e) Use of visual observations
- (f) Establishing position, checkpoints
- (g) Revisions to heading and ETA
- (h) Arrival procedures, ATC liaison
- (i) Use of minute marker graph.

(9) GLOBAL POSITIONING SYSTEM (GPS)

- (a) Limitations
- (b) Application
- (c) Principles
- (d) Presentation and interpretation
- (e) Coverage
- (f) Errors and accuracy
- (g) Factors affecting reliability and accuracy
- (h) Legalities

3.6.1 Human performance limitations

(i) Human Performance Limitations and Passenger care

- (1) Introduction
- (2) Oxygen
 - (a) Hypoxia
 - (b) Hyperventilation
- (4) Barotraumas
- (5) Common ailments
- (6) Decompression
- (7) Air sickness
- (8) Hearing
- (9) Sight
- (10) Toxic hazards
- (11) Blood pressure

- (12) Epilepsy
- (13) Alcohol and drugs
- (14) Knowledge and the senses
- (15) Disorientation
- (16) Avoiding the air proximity
- (17) Stress
 - (a) Management of stress
 - (b) Emotional factors
 - (c) Social psychology
 - 1. The Ego Factor
 - 2. Intermediate syndrome

(ii) Passenger Care

- (1) Embarking / Disembarking
- (2) Seatbelt and comfort
- (3) Briefing
- (4) Indemnity
- (5) Open cockpit flying
- (6) clothing, long hair and security
- (7) cameras and loose articles
- (8) Human performance limitation as applicable to your passenger
- (9) Eye-contact and communication
- (10) Air law as applicable to passengers
- (11) Passenger seat and flying control access