APPENDIX R62.02
NATIONAL PILOT LICENCE
CONVENTIONAL MICROLIGHT AEROPLANES
THEORETICAL KNOWLEDGE COURSE

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 category rating for conventional microlight aeroplanes, and to provide the training necessary to act as pilot-in-command of any conventional microlight aeroplane for which he or she holds a valid class or type rating, 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 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
- (d) Distribution of lift, Centre of pressure
- (e) Drag – Induced, parasite – Form, skin, interference
- (f) Lift/drag ratio and aspect ratio
- (g) Wake turbulence

(3) 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
  - i. Climbing
  - ii. Descending

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

(5) LOOSE FORMATION/ GROUP FLYING
- (a) Law Governing
- (b) Procedures and hazards

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

(7) 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

(8) 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 - Conventional control specific

(1) FLYING CONTROLS
- (a) The three axes: Vertical, Lateral, Longitudinal
  Yaw, Pitch, Roll
- (b) Operation and function of elevators, ailerons and rudder

(c) Principles and purpose of mass and aerodynamic balance
(d) Operation and purpose of trimming controls
(e) Operation and function of flaps
(f) Operation and function of spoilers, spoilerons and tip rudders

(2) WEIGHT AND BALANCE
(a) Limitations on aircraft weight
(b) Limitations in relation to aircraft balance
(c) Weight and centre of gravity calculations

(3) THE SPIN
(a) Causes of a spin
(b) Autorotation
(c) Effect of the C of G on spinning characteristics

(4) PERFORMANCE
(a) Use of flaps
- take off and initial climb performance
- Approach and landing performance – effect of use of flaps

(b) Cross control
- Forward slipping
- Side slipping

(5) STABILITY
(a) Relationship of C of G to control in pitch

(6) LOAD FACTOR AND MANOEUVRES
Hey have
(a) Definition of load factor – V_n envelope
(b) Effect on stalling speed
(c) In-flight precautions

3.2 Air Law

(1) Applicable acts, regulations and other documents
(2) Structure and function of CAR's, CATS 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

3.3 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, TAFA
(c) availability of ground reports for surface wind, windshear, visibility

(17) METEOROLOGICAL BROADCASTS FOR AVIATION
ATIS, SIGMET

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

3.4 Aircraft Engines, Airframes and Instruments

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

(2) POWERPLANT AND SYSTEMS
(a) Engines – general
- Principles of 2 and 4 stroke engines
- 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

(b) Ignition systems
(c) Carburetion and Fuel system
- Principles of float type carburetor
- Fuel-bypass (choke)
- Recognition of faulty mixture
- Methods to maintaining correct mixture ratio

- carburetor jetting and needle and seat inspection
- balancing carburetors

- Carburetor icing
- Emergency use of Fuel-bypass (choke)

(d) Fuel
- Types
- Suitability
- Hazards of avgas
- Contamination
- Fuel strainers and drains
- Fire hazards
  - containers
  - transportation
  - de-canting

(e) Electrical system
- general
- batteries
- circuit breakers and fuses
- recognizing malfunctions

(3) PROPELLER
(a) nomenclature
(b) forces on blades
(c) designs
(d) effect of blade pitch changes
(e) maintenance and care

(4) INSTRUMENTS
(a) Airspeed indicator
(b) Altimeter
(c) VSI
(d) Magnetic compass
- Precautions when carrying magnetic objects
- Errors

(e) Engine instruments
(f) Temperature and pressure gauges
(g) Digital instruments
(h) RPM

3.5 General Navigation

(1) FORM OF THE EARTH
(a) Axis, poles
(b) Meridians of longitude
(c) Parallels of latitude

(2) DIRECTION
(a) True north
(b) Earth's magnetic field, variation – annual change
(c) Magnetic north
(d) Magnetic influences within the microlight
(e) Compass deviation

(f) Turning, acceleration errors
(g) Avoiding magnetic interference with the compass

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

(4) AERONAUTICAL MAPS AND CHARTS (TOPOGRAPHICAL)
(a) Projections and their properties
(b) Scale
(c) ICAO 1:250 000 and 1: 500 000 charts
(d) main properties
(e) Scale
(f) depiction of height
(g) Topography
(h) Relief
(i) Cultural features
(j) Aeronautical symbols
(k) 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 Human Performance Limitations and Passenger care

3.6.1 Human performance limitations

(1) Introduction
(2) Oxygen
(a) Hypoxia
(b) Hyperventilation
(3) Barotraumas
(4) Common ailments
(5) Decompression
(6) Air sickness
(7) Hearing
(8) Sight
(9) Toxic hazards
(10) Blood pressure
(11) Epilepsy
(12) Alcohol and drugs
(13) Knowledge and the senses
(14) Disorientation
(15) Avoiding the air proximity
(16) Stress
(18) Management of stress
(19) Emotional factors
(20) Social psychology
(a) The Ego Factor
(b) Intermediate syndrome

3.6.2 Passenger Care

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