Mountain Flying Training Standards Guide

Private Pilot, Commercial Pilot, and Flight Instructor

Aeroplane

Revision 1 - October 2010

Contents

Change Notice

Instructor requirements published in Advisory Circulars
Incorporates extensive feedback from industry
Editorial

Introduction

While this guide is presented in a similar format to the Flight Test Standards Guides, mountain flying is not a flight test syllabus subject and therefore the content is intended for flight instructors to assist in the development of terrain and weather awareness and basic mountain flying programmes.

Definition of mountain flying

For the purpose of this training guide mountain flying is defined as:
Any technique involving the manoeuvring of an aircraft between, over, or around terrain or resultant weather that is, or could be perceived as being, an obstacle to the aircraft flight path.

Use of this training guide

While the advisory circulars prescribe the minimum requirements for licensing purposes, this guide provides expanded material for use as required by training organisations, examiners and instructors.
When using this guide the flight instructor should evaluate the candidate's knowledge and skill in sufficient depth to determine that the standards of performance are met.

The flight instructor is not required to follow the exact order in which the exercises appear. However, the objectives of exercises as appropriate to each level are to be demonstrated and evaluated at some time during the training. Flight instructors will develop a plan of action that includes the order and combination of exercises to be experienced, including the meteorological conditions under which these experiences will take place.

Flight instructors will place special emphasis on areas of aeroplane operation that are most critical to flight safety and comfort. Among these areas are correct aeroplane control, horizon definition and judgement, sound judgement in decision making, anxiety effect on decision making, situational awareness, threat and error management, anticipation, stall/spin awareness, spatial orientation, collision avoidance, weather appreciation especially assessment of wind and cloud and their significance, turbulence avoidance, turbulence mitigation, and emergency responses. Although these areas may not necessarily be shown under each exercise, they are essential to flight safety and will receive emphasis throughout the training.

Flight Planning and performance calculations remain fundamental priorities as with any flying and should consider aspects of:-

1. Route assessment such as deviations, contours, terrain alignment, features, isolation.

2. Weather assessment such as wind direction and speed, cloud base, precipitation, stability, turbulence, visibility.

3. Performance, particularly pressure and density altitude effects on climb, flight above 5000', and take off.

Course content is provided in the form of:

1) Ground course syllabus; and

2) Flying course with performance criteria, topic, exercise, aim, technique, principles to experience and competencies.

For **Private Pilots** the training should apply a conceptual approach to develop **'terrain awareness'** and **'weather appreciation'** which facilitates safe flying in an environment where their experience and training may otherwise be inadequate. For **Commercial Pilots** the initial approach is to develop **'basic mountain flying'** skill and techniques.

Sufficient expanded material is included to prepare for a **'role training'** approach towards a level of decision making experience, skill, and technique, necessary to carry out hire or reward operations in a safe, professional manner when operating in mountainous terrain. Role training requirements for Part 135/125 are set out in AC 119-3.

For **Instructors** the approach is **'training provision'** therefore direction is provided to maximise the instructors experience and ability to provide a learning environment that challenges and extends the pilot without operating outside the instructors own limitations.

Course guidelines

Mountain Flying has four essential components:

- Terrain
- Weather
- Aircraft
- Pilot

A training programme should reflect the combination and interaction of all four including the variables of:

- Size/shape…of terrain
- Intensity/type…of weather
- Performance/loading/configuration…of aircraft
- Training/experience/decision making/ situational awareness…of pilot

It is desirable that variable weather and seasonal conditions are experienced. The existence of many terrain and weather variables in New Zealand means that while principles and techniques are portable, the accumulation of local knowledge is a factor of experience with unlimited scope for learning.
Where mountain flying operations expand into a region of more challenging terrain the training programme should reflect such by adapting to accommodate.

Where new aircraft type ratings are involved, in which unfamiliar performance issues such as rate of climb or greater turn radius exist, transition training should reflect such to ensure that the anticipation required is appreciated.

The content and principles of this guide should be applied to each pilot's particular needs and flying areas. Some material may not be locally relevant, for example if not operating at higher altitudes the relevance of hypoxia may be of lesser importance, however such aspects should be covered in any ground course content.

Aspects of Flight Planning both pre-flight and in-flight, Human Factors, Aircraft Technical Knowledge, Performance, Meteorology and Navigation are all integral to mountain flying awareness and should be incorporated as integrated components as they apply.

This is not an all encompassing document but rather a guideline of basic minimum standard concepts and experiences accepted as a necessary prerequisite for safe interaction with a mountainous environment and the associated weather.

Where water, snow, or remote strip operations are involved specific training to reflect such activity should be applied.

Instructor responsibility

To minimise the risk of misunderstandings, the instructor will:

(a) Ask the pilot to verbalise all checklists and nominated speeds.

(b) Brief the pilot to verbalise relevant decision making, particularly pertaining to threat and error management.

(c) Brief the pilot on the flight format.

(d) Brief the pilot as to who is pilot-in-command.

(e) Brief the pilot as to who will command 'go around' during forced landing and precautionary landing exercises.

(f) Brief the pilot that good decision making is absolutely vital to survival when flying in a mountainous environment. The progressive learning process will be conducted in such a way as to ensure that every action and manoeuvre, while potentially challenging the commitment to the pilot's decisions, will be flown well within the limitations of the instructor.

Training guide standards

Unacceptable performance is described in the NOT YET COMPETENT column.
The minimum acceptable standard of performance is described in the column stating COMPETENT performance.
The IDEAL level of competence is described in the far right column.

Satisfactory performance

The ability of a candidate to perform competently is based on;

(a) Executing all exercises within the aircraft's performance capabilities and limitations as laid down in the aircraft flight manual, including use of the aircraft's systems,

(b) Executing emergency procedures and manoeuvres, appropriate to the aircraft and in accordance with recommended procedures,

(c) Piloting the aircraft with smoothness and accuracy, in accordance with the limitations detailed in this guide,

(d) Executing all exercises involving balanced flight with no more than 1/4 ball sustained deflection in slip or skid,

(e) Exercising good judgement/decision making and maintaining situational awareness,

(f) Applying aeronautical knowledge (principles of flight) to in-flight situations,

(g) Completing all items in accordance with the tolerances prescribed in this guide,

(h) Showing complete control of the aircraft, with the successful outcome of each exercise never seriously in doubt,

(i) Applying threat management principles by recognising, verbalising and assessing potential threats with appropriate reasonable actions to reduce and manage the potential impact of such threats, and

(j) Applying effective strategies to avoid and trap errors so as to effectively mitigate the effects of any errors which occur.

Unsatisfactory performance

If, in the judgement of the flight instructor, the pilot does not meet the minimum standard of any exercise performed, then further training is required.
The candidate's decision making process and interaction with the weather should be evaluated. It is important to experience, within the limitations of the instructor, as many variables of weather and season that can safely and realistically be achieved.

Consistently exceeding tolerances or failure to take prompt corrective action when tolerances are exceeded is unsatisfactory performance.

Any action or lack of action by the candidate, which requires corrective intervention by the flight instructor to maintain safe flight, will be considered unsatisfactory performance.

It is vitally important that the candidate uses proper scanning techniques to clear the area before performing manoeuvres.

Ignorance of potential threats and errors, lack of significant action to reduce, manage or mitigate the potential impact of threats and errors will be considered unsatisfactory performance.

Distractions during flight

Numerous studies indicate that many accidents have occurred when the pilot's attention has been distracted. It is important, therefore, that the principles of *Threat and Error Management* are understood and mitigation strategies such as good control techniques, the ability to establish priorities and sound *airborne decision- making* should be instilled during training.
Flight instructors and trainees should be aware at all times that distractions are an inherent part of flight and an ever-present threat to safety.

Some examples of distractions that occur in training and testing are:

(a) Simulating engine failure,

(b) Identifying a field suitable for emergency landings,

(c) Identifying features or objects on the ground,

(d) Questioning by the flight instructor,

(e) General conversation,

(f) Simulating adverse weather conditions,

(g) Experiencing visual illusions,

(h) Assimilating new learning, especially in an unfamiliar environment.

Use of checklists

It may be that the use of a written checklist would be either unsafe or impractical. In such situations the checklists should be memorised.

Aircraft and equipment requirements

The aircraft must be equipped for, and its operating limitations must not prohibit, the pilot operations required.
Required equipment will include;

(a) Fully functioning dual flight controls, and

(b) Intercommunication equipment acceptable to the instructor/examiner, and

(c) At least three-point lap-and-sash harness, and

(d) A basic survival kit.

Adequate and private facilities for briefing prior to and after the flight are required.

Ground Course Syllabus

To include as applicable:

1 Horizon

- Define horizon
- Identification of real or imaginary horizon
- Super-imposing a useable horizon on any variable background i.e. visualising where the real horizon sits as if terrain or obstacles were transparent
- Illusions associated with inaccurate horizon definition
- Hazard potential associated with illusions and poor horizon definition

2 Wind awareness

- Forecast conditions including synoptic
- 'Fluid' flow concept of air between, over and around terrain
- Significance of wind direction relative to terrain
- Wind patterns less than 15kts
- Wind patterns greater than 15kts
- Local patterns and effects
- Upper winds compared to lower winds i.e. comparison of wind in a valley with wind at altitude
- Indicators of wind velocity at altitude, for example
    - snow
    - drift
    - lift/sink patterns
    - VSI indications
    - wave
    - cloud movement
- Indicators of lower level wind velocity, for example
    - tussocks
    - water ripples/lanes on stationary water and wind shadow on water
    - poplars
    - willows
    - crop
    - smoke/dust
    - drift, and drift indicators
    - G/S versus A/S
    - cloud shadows as indicator of upper wind and its influence on lower level wind
- Lift, sink, rotor, wave and turbulence
- Cloud types as indicators of potential flying conditions
- Applicability of Va and Vno
- Katabatic/anabatic winds in a valley
- Choice of flying low versus flying high

3 Situational awareness

- Threats
- Space
- Inertia

- Drift
- Altitude, including pressure and density altitude
- Turning radius and effects of speed, configurations, wind, turbulence, weight, visibility
- Weather patterns
- Sun/shadow
- Scale - GA aircraft are but a dot on the landscape
- Merging terrain
- Clear air effect
- Legal requirements
- Recognition of height above terrain
- Appreciation of the need for anticipation versus reaction
- Moral responsibilities – consideration of people and stock
- Appropriate clothing and footwear
- Passenger safety and comfort
- Potential landing options
- Distances for position reports
- Traffic
- Illusions, especially terrain gradient
- Fuel remaining
- Daylight remaining
- Potential for stalling in the turn
- Effect of poor visibility configuration on fuel management
- Potential dehydration effects
- White water content in rivers as indicator of valley gradient

4 Contour and constant altitude flying

- Horizon identification/appropriate nose attitude
- Awareness of space and position
- Appreciation of inertia
- Appreciation of available escape options
- Right of way
- Lookout - high wing versus low wing, left versus right, blind corners, colour schemes
- Recognising lift/sink
- Groundspeed versus airspeed relationship
- Flying constant altitude to recognise any changing gradient of valley floor

5 Valley turns

- Use of full width, anticipating need for 360° turn
- Minimise angle of bank to minimise Vs increase
- Lower airspeed to reduce turn radius
- Use of the poor visibility configuration
- Reduced flap to maintain performance i.e. 10° flap as opposed to 20°
- Need for power to combat drag
- Check turns before valley narrows
- Large valley - position anywhere right of centre

- Confined valley - any need to move over to make turn means one is not correctly positioned (Human Factors 5 - 7.5 seconds reaction time)
- Effect of sudden shadow/sun effects
- Clean screen
- Steep gliding turns and effects of changing horizon, narrowing valley
- Roll out position - never in middle of valley
- Always positioned to anticipate not react
- If on wrong side…easy decision to change sides, if in middle potential for indecision and lack of space
- If airspeed decays with full power, lower nose to convert height to airspeed
- Emphasise "caution flying up a valley you haven't previously flown down" philosophy

6 Saddle crossings

- Concept of saddle, pass, spur, ridge
- Compromise of many variables
- Anticipating/assessment of lift and sink
- VSI indications
- Appreciation of wind direction relative to terrain
- Approach 45° or less with escape route downhill, downstream
- Desirable approach left to right
- Escape option obstacle free to use minimum bank angle
- Knife edge saddle versus prolonged commitment area saddle
- Level attitude - maintain airspeed with regard to Va
- Not in climb attitude - airspeed and lookout are compromised
- Not in descent - airspeed and control limited by Va
- Anticipate turbulence
- Use of parallax to assess sink and safe height to cross i.e. more terrain visible behind as approaching saddle therefore higher than saddle; less terrain visible therefore lower and turn away early, including assessment of 500’ clearance technique
- Decision making, including:
    - planning of initial flight path to a mountain range or ridge
    - options
    - approaches to the saddle/pass/ridge/spur
    - commitment point
    - escape routes
    - position and options after crossing
    - position reports for traffic information
    - proximity to cloud including potential for lift

7 Route finding

- Water only flows downhill
- Identify flow and follow to larger river, lake, sea, roads, town etc.
- Awareness of valley alignment relative to compass
- Awareness of sun position
- Map folding; hold in one hand, thumb on moving position, whilst holding control-column/stick to facilitate peripheral vision
- Effective pre-flight planning

8 Difficult conditions

- Cloud, snow, showers, white out, bright out - effects on visibility, disorientation, illusion, work load
- Merging terrain – foreground with distant

- Dirty windscreen versus clean
- Precipitation on screen affecting judgement
- Gradient of snow covered areas, depth perception
- Sun/shadow effects
- Both pilot and aircraft performance are diminishing while performance required is increasing
- Effects of difficult conditions on aircraft management including:
    - distractions
    - fuel
    - icing
    - visual reference
    - attitude control
    - altitude/hypoxia
    - aviate, navigate, communicate
    - below VHF radio coverage levels
    - SARTIME management
    - orientation
    - decision making, including pilot attitudes
    - temperature extremes, temperature factors
    - turbulence
    - air movements including significant up or down flow
    - wires and obstacles e.g. wind farms

9 Cautions and emergencies

- Performance comparisons including:
    - utility category versus MAUW
    - effects on turn radius
    - rates of climb
    - handling of sink
    - altitude/power considerations
- New aircraft rating differences including:
    - often faster/heavier
    - greater turn radius required
    - more anticipation needed
    - higher workload (e.g. extra controls and instruments)
- CFIT accidents - most occur by:
    - loss of visual reference (horizon)
    - stall in turn
    - attempting to out-climb terrain
    - poor decision making, resulting in reaction instead of anticipation
    - lack of decision making resulting in inaction
- Forced landing and precautionary landing considerations including:
    - limited options
    - priority ~ make a plan; confined spaces may affect the ideal
    - tendency to crowd landing area
    - consider climatic/seasonal wind effects for calculated gamble on wind i.e. Anabatic versus Katabatic
    - consider valley gradient
    - awareness of mind sets and illusions
    - consider early Mayday or Pan call
    - habitation in remote area; look for airstrip/fertiliser bins
    - consider elevation

- use of lift conditions to glide down valley closer to potentially more suitable option and habitation
- river beds - consider landing downstream; surface may be smoother
- beaches;
    - stony patches usually indicate firm sand
    - steep indicates soft
    - wet sand - dangerous
    - flat, damp sand usually means firm sand
    - debris, especially following period of poor weather
    - no lagoon area above high tide line
    - x/w potential
    - sand type; quartz, iron, coal etc

10 Survival considerations

- Survival principles after unplanned landing
- Basic first aid principles and skills
- Survival kits, contents and use, basic principles of survival relative to the area of operations including;

LOCATION

Have items that will facilitate being found; that enhance your visibility compared to the surroundings for example;

- bright ground sheet/tent fly/clothing
- condys crystals, food colouring
- flares
- mirrors/reflection items
- torch
- ability to ignite fuel/oil as smoke producer
- candle
- fire axe to break pattern of vegetation for searchers
- lightweight camp shovel (snow ops)
- whistle

WATER

Have the ability to heat and provide warm drink. Use survival kit container as a receptacle.

FOOD

Basic dry freeze type food and means of providing warm food, more from principle of preventing hypothermia than satiating hunger.

SHELTER

Carry items that will facilitate use of resources available including parts of the aircraft, ground sheet/tent fly, survival blankets, duct tape, light rope/string etc. to shelter from the elements.

Include items to assist in remaining warm or creating warmth.

WILL TO SURVIVE

Be aware that, if each survivor retains the will to survive, their chances are greater regardless of the availability of the other principles. This alone will make the most difference. Have available mountain survival guidance material.

Reference reading — GAP booklets:

- Mountain Flying
- In, Out and Around Milford
- In, Out and Around Mount Cook
- In, Out and Around Queenstown
- Flight Instructor's Guide

Additional reference:

CAA Mountain flying DVD

Flying Course Syllabus

Preamble and philosophy

- The flying programme should follow an appropriate ground briefing.
- Performance criteria covered in previous lessons should, where appropriate, be reinforced in following sessions.
- The opportunity for experiencing varied meteorological and flight conditions should be maximised.
- Every opportunity should be taken within the limitations of the training instructors experience and skill to test the trainee's decision making. This should take the form of flying the chosen option, e.g. saddle crossing, and then assessing and flying the alternative(s) to encourage experiencing the effectiveness or lack of effectiveness in their decisions. Until the variables are experienced the pilot lacks the resources to make the best decision in the circumstances that prevail. It should be noted that while in the course of this training the trainee may be taken outside their comfort zone. **Under no circumstances should the instructor exceed their own limitations.**
- Emphasis should be placed on recognising threats pertaining to the terrain and associated weather, including the appropriate mitigation strategies. Likewise developing strategies to trap errors and minimise potential for entry into an 'undesired aircraft state' should be emphasised.
- The flying programme will in most cases place trainees in circumstances they have not previously experienced. It will also be a workload that tests their concentration and ability to operate at an optimum level. Instructors should therefore be aware of the workload they are placing on the pilots and timetable initial training with this in mind.
- The most dangerous position a pilot can experience in mountain flying is when they are forced to react and therefore rely on their skill and instinct to retrieve a hazardous circumstance.
- The correct approach is for the pilot, through training and experience, to appreciate significant factors in order to anticipate, and as a result always have a pre-planned, calculated set of options or escape route.
- Initial training will involve the pilot responding *reactively* when experiencing the results of their own decision or the simulated experiences provided by the instructor (either good or bad). A measure of the trainee's progress will be the degree to which they begin *anticipating* and have pre-planned options available should their decision not be the best.
- Flight training course and content are to be applicable to the pilot or operator's local mountainous area of operations, or intended area of operations.
- Operators may consider contracting out parts or all of the flying programme where they either, lack the appropriately qualified or experienced staff, or feel their pilots to be better serviced by experiencing part or all of the training in a more challenging region.

PERFORMANCE CRITERIA

Topic: Horizon

Exercise:

Maintaining a constant height and/or contour flying in areas of varying terrain (e.g. slope, surface covered by vegetation/snow) where a defined horizon is lacking.

Aim:

To consistently identify a useable horizon and superimpose it on any background.

Technique:

(a) Fly a constant altitude (terrain contour line) maintaining a constant wing tip distance from the terrain.

(b) Develop co-ordination of elevator, aileron, rudder, and power using outside reference confirming with instruments.

(c) Fly a constant height above a descending valley floor to appreciate gradient and shifting horizon perspective.

(d) Fly a constant altitude above a rising valley (or terrain) to appreciate gradient and horizon effects.

Principles to experience:

- consistent nose attitude
- awareness of space and position
- appreciation of inertia
- maintenance of escape options
- legal position/right of way
- lookout technique with blind corners
- minor lift/sink versus lift/sink where altitude is difficult to maintain
- maintenance of attitude versus altitude
- ground speed versus airspeed relationship
- anticipation versus reaction
- illusions created by varying slope and or gradient of terrain
- effect of ballooning out in turns and restricting options in confined space
- use of throttle in lift/sink
- wind conditions less than15 knots compared to greater than 15 knots
- comparison of upper winds with valley winds
- assessing wind using lift, sink, drift, tussock, water, trees, etc.
- applicability of Va (maximum manoeuvring speed)
- katabatic and anabatic conditions
- cloud patterns and resultant cues to turbulence, lift, sink, rotor, wave
- terrain texture differences i.e. bush, forest, tussock, rock, sand, snow, etc.
- precipitation on wind screen affecting judgement
- awareness that by the time an instrument shows a change of attitude or altitude, such change has been long evident by outside visual cue.

Note: Reasonable accuracy of superimposing an appropriate imaginary horizon on variable terrain may require approximately 5 hours disciplined flight experience.

HORIZON - PPL

Not yet competent	COMPETENT	Ideal
(1) Windscreen not cleaned as part of pre-flight	(1) Cleans windscreen as a pre-flight item	(1) Ensures windscreen is clean before each flight
(2) Loose items not secured before flight	(2) Anticipates by securing loose items before flight	(2) Always secures all loose items
(3) Minimum (if any) application of rudder	(3) Sufficient use of rudder to allow smooth co-ordinated flight	(3) Correct use of rudder in all phases of flight
(4) Nose attitude oscillates excessively relative to real or imaginary horizon	(4) Maintains adequate nose attitude relative to the real or imaginary horizon	(4) Maintains accurate nose attitude relative to the real or imaginary horizon
(5) Inputs of elevator, aileron, rudder and throttle uncoordinated and not smooth with limited or no respect for Va	(5) Smooth coordinated control inputs of elevator, aileron, rudder and throttle while respecting Va	(5) Maximises comfort by coordinating elevator, aileron, rudder and throttle while respecting Va
(6) Lacks awareness of space, position, inertia and escape options	(6) Shows awareness of space, position, inertia and escape options	(6) Always aware of space, position, inertia and escape options
(7) Unable to identify wind velocity	(7) Generally aware of wind velocity	(7) Always aware of wind velocity
(8) Unable to find best compromise between right of way, lookout and smoothest air	(8) Manages to balance principles of right of way, lookout and smoothest ride for safe flight path	(8) Achieves best compromise of right of way, lookout, comfort and safety principles
(9) Unable to recognise gradient or gradient changes	(9) Recognises gradient changes and mitigates any threat	(9) Always aware of gradient and anticipates with mitigating action
(10) Fails to anticipate and consequently reacts to majority of stimuli	(10) Generally anticipates situations and minimises reactive actions	(10) Always anticipates situations and has pre-planned options available

HORIZON - CPL

Not yet competent	COMPETENT	Ideal
(1) Windscreen not cleaned in pre-flight	(1) Cleans windscreen as a pre-flight item	(1) Ensures windscreen is clean before flight
(2) Loose items not secured before flight	(2) Anticipates by securing loose items	(2) Always secures all loose items
(3) Compromises attitude by lack of rudder inputs	(3) Correct use of rudder to allow smooth coordinated flight	(3) Correct use of rudder in smooth and turbulent conditions in all phases of flight
(4) Is unable to maintain consistent nose attitude relative to the real or imaginary horizon in calm conditions	(4) Maintains adequate nose attitude relative to the real or imaginary horizon in both calm and light turbulent conditions	(4) Maintains accurate nose attitude relative to the real or imaginary horizon in both calm and turbulent conditions
(5) Inputs of elevator, aileron, rudder and throttle are uncoordinated and/or not smooth with limited or no regard for Va	(5) Smooth coordinated control inputs of elevator, aileron, rudder and throttle while respecting Va in both calm and turbulent conditions	(5) Maximises comfort by coordinating elevator, aileron, rudder and throttle while respecting Va in both calm and turbulent conditions
(6) Lacks awareness of space, position, inertia and escape options	(6) Shows awareness of space, position, inertia and escape options under all conditions	(6) Always aware of space, position, inertia and escape options under all conditions
(7) Unable to identify wind velocity	(7) Generally able to identify wind velocity using available cues	(7) Always aware of wind velocity and able to confirm using all available cues
(8) Unable to find best compromise between right of way, lookout and smoothest air	(8) Generally balances principles of right of way, lookout and smoothest ride whilst achieving a safe flight path	(8) Always balances principles of right of way, lookout and smoothest ride to manage and maintain a safe flight path
(9) Unable to recognise gradient or gradient changes	(9) Recognises gradient changes and mitigates any threat	(9) Always aware of gradient and anticipates with mitigating action
(10) Fails to anticipate; consequently reacts to majority of stimuli	(10) Generally anticipates situations and minimises reactive actions	(10) Always anticipates situations and has pre-planned options available

HORIZON - INSTRUCTOR

Not yet competent	COMPETENT	Ideal
(1) Does not require a clean windscreen	(1) Requires a clean windscreen	(1) Consistently confirms a clean windscreen
(2) Does not require loose items secured	(2) Requires loose items secured	(2) Always confirms loose items are secured
(3) Fails to coordinate rudder use and/or does not teach it	(3) Demonstrates coordinated use of rudder to achieve smooth flight and encourages the same in students	(3) Teaches smooth coordinated flight under all conditions
(4) Fails to demonstrate a consistent nose attitude relative to the real or imaginary horizon in calm or turbulent conditions	(4) Demonstrates and teaches a consistent attitude relative to the real or imaginary horizon whilst maintaining altitude	(4) Demands and demonstrates an accurate nose attitude relative to real/imaginary horizon whilst maintaining altitude accurately
(5) Unable to demonstrate and/or recognise coordinated inputs of elevator, aileron, rudder and throttle with regard to Va	(5) Consistently demonstrates and recognises smooth coordinated control inputs with regard to airspeed and Va	(5) Always demonstrates and recognises smooth coordinated control inputs with regard to airspeed and Va
(6) Lacks awareness of space, position, inertia and escape options	(6) Demonstrates awareness of space, position, inertia and escape options, guiding the student to best compromise	(6) Exudes awareness of space, position, inertia and escape options to accurately assess the best option
(7) Cannot explain or assess wind indicators	(7) Demonstrates and teaches the use of available cues to identify and confirm wind velocity	(7) Consistently encourages the student to use all available cues to accurately assess wind velocity
(8) Cannot explain how to find the best compromise between right of way, lookout and smoothest air	(8) Generally demonstrates and explains best compromise of right of way, lookout and smoothest ride for a safe flight path	(8) Always demonstrates and explains best compromise of right of way, lookout and smoothest ride for a safe flight path
(9) Limited recognition and/or instruction of gradient and threat mitigation	(9) Teaches recognition of gradient including mitigation actions	(9) Always teaches recognition of terrain gradient and appropriate mitigation strategies/action
(10) Fails to teach anticipation, the student only reacts to the majority of stimuli	(10) Demonstrates/teaches how to anticipate, thereby minimising reactive actions	(10) Teaches anticipation and the value of pre-planned options

PERFORMANCE CRITERIA

Topic: Valley turns

Exercise:

Using valleys that provide as many variables as possible, practise level, climbing and descending turns.

Aims:

(a) To appreciate the safe level turn radius using different configurations in a valley with ill-defined horizon.

(b) To make check turns to ensure space is available before the valley narrows and escape is compromised.

(c) To learn appropriate positioning in both large and confined valleys.

(d) To appreciate the valley effects of changing horizon perspective and reducing radius in descending turns.

(e) To appreciate lack of performance in climbing turns with changing horizon perspective in a confined space and the need to identify the best flight path to maximise space and lift to improve performance.

Technique:

(a) Practise level 360º turns using the full width of the valley in a cruise configuration.

(b) Practise level 360º turns using poor visibility configuration.

(c) In a narrowing valley make check turns to evaluate turn radius and exit options with escape space available.

(d) Compare position for flying in a large valley with that of a confined valley i.e. anywhere right of centre.

(e) Make steep descending turns into a valley ensuring correct anticipated position for roll out.

(f) Make efficient climbing turns to climb out of a valley system or to position for saddle crossing.

(g) From beside a vertical face (if available) experience the aircraft turning radius through 180º in both cruise and poor visibility configurations.

Principles to experience:

- establishing and maintaining level turns with ill defined horizon in as many combinations of the following variables as possible:
    - steep valley sides – up to vertical
    - varying slopes in valley sides
    - varying terrain effects as background for ill defined horizon e.g. bush, forest, tussock, rock, snow etc.
    - varying valley floor gradient
    - deep valleys, shallow valleys
    - wind with rugged terrain compared to smoothly contoured terrain
    - calm conditions, windy conditions
    - clear, cloudy, precipitation conditions
    - bright sun glare behind ridges and (suddenly exposed – avoid!)
    - deep shadow effects
    - white-out horizons
- the need to move over in a valley to make the turn indicates that the aircraft was not correctly positioned.
- planned entry, use sufficient power, minimise angle of bank to minimise stall speed, use all the space available
- high wing - lean forward to anticipate horizon
- anticipation of roll out position to not compromise options available
- steep gliding turns:
    - changing horizon perspective
    - narrowing valley
    - roll out position - never in the middle
- awareness of higher performance aircraft effects:
    - less time
    - inertia
    - greater turn radius
    - workload
- flying lower in a valley compared to higher and above the valley e.g. wind, recognising the ‘shear level’
- awareness of greater power requirement at MAUW especially in poor visibility configuration
- if airspeed decays with full power lower nose to convert height to airspeed

VALLEY TURNS - PPL

Not yet competent	COMPETENT	Ideal
(1) Requires repositioning of aircraft before the turn can be commenced	(1) Is positioned correctly to commence the turn with maximum space available	(1) Anticipates necessary positioning for turning to appropriately use all available space
(2) Unable to anticipate circumstances of unsafe turning radius	(2) Anticipates circumstances of safe turning radius	(2) Anticipates circumstances of safe turning radius keeping options open
(3) Reactively rolls to an inappropriate angle of bank for the circumstances	(3) Rolls to appropriate angle of bank for valley size to use space available	(3) Smooth coordinated roll into appropriate angle of bank for the valley size to use all space available with no pressure
(4) Uses power reactively and compromises radius, Vs and/or Va	(4) Uses appropriate power for the compromise of radius, Vs and Va	(4) Anticipates power requirement appropriate to the best compromise for radius, Vs and Va
(5) Fails to maintain altitude	(5) Maintains altitude ± 100 feet	(5) Maintains altitude accurately
(6) Rolls out of turn with either under or over turn therefore compromising position	(6) Rolls out of turn with no under/over turn	(6) Anticipates correct roll out position which leaves options immediately available
(7) Unable to make efficient climbing turns to position for safe saddle crossing	(7) Makes efficient climbing turns to position for safe saddle crossings	(7) Uses conditions, space and appropriate speed to efficiently climb for safe saddle crossings
(8) Unable to maintain constant airspeed in descending turns and/or roll out in the correct position	(8) Maintains constant airspeed in descending turns and rolls out in the correct position	(8) Appropriately configures the aircraft for the conditions/circumstances, maintains a constant airspeed and rolls out correctly positioned within the valley

VALLEY TURNS - CPL

Not yet competent	COMPETENT	Ideal
(1) Requires reposition of aircraft before turn can be commenced	(1) Is positioned correctly to commence turn with maximum space available appropriate to flying conditions	(1) Anticipates necessary positioning to appropriately use space while maximising comfort in all conditions
(2) Unable to anticipate circumstances of unsafe turning radius	(2) Anticipates circumstances of safe turning radius	(2) Anticipates circumstances of safe turning radius keeping options open
(3) Reactively rolls to an inappropriate angle of bank for the circumstances	(3) Rolls to appropriate angle of bank for valley size to use space available in both calm and turbulent conditions	(3) Smooth coordinated roll into appropriate angle of bank for the valley size to use space available, under no pressure while maximising comfort in all conditions
(4) Uses power reactively and compromises radius, Vs, and/or Va	(4) Uses appropriate power for the compromise of radius, Vs and Va applicable to the flying conditions	(4) Anticipates the power requirement to maintain an appropriate compromise between radius, Vs, and Va while maximising comfort in all conditions
(5) Rolls out of turn with either under or over turn therefore compromising position	(5) Rolls out of turn with no under/over turn in both calm and turbulent conditions	(5) Anticipates correct roll out position ensuring options are immediately available while maximising comfort in all conditions
(6) Fails to maintain altitude	(6) Maintains altitude ± 50 feet	(6) Maintains altitude accurately
(7) Unable to maintain consistent nose attitude in climbing and/or descending turns in a valley	(7) Able to maintain consistent nose attitude in both climbing and descending turns in a valley	(7) Always able to maintain consistent nose attitude in both climbing and descending turns in a valley
(8) Unable to make efficient climbing turns to position for safe saddle crossing	(8) Makes efficient climbing turns to position for safe saddle crossings	(8) Uses conditions, space and appropriate speed to efficiently climb for safe saddle crossings
(9) Unable to maintain constant airspeed in descending turns and/or roll out in the correct position	(9) Maintains constant airspeed in descending turns and rolls out in the correct position	(9) Appropriately configures the aircraft for the conditions/circumstances, maintains a constant airspeed and rolls out correctly positioned within the valley

VALLEY TURNS - INSTRUCTOR

Not yet competent	COMPETENT	Ideal
(1) Does not show how to anticipate appropriate positioning of the aircraft for immediate turning capability in a valley	(1) Teaches anticipation to appropriately use available space while maximising comfort in calm and turbulent conditions	(1) Teaches anticipation to position for a turn appropriate to the space available while maximising comfort in all conditions
(2) Does not teach how to anticipate circumstances affecting a safe turning radius in varied conditions	(2) Teaches anticipation of circumstances affecting safe turning radius in varied conditions	(2) Demonstrates sound judgement of, and teaches, the assessment of aircraft turning radius in varied conditions
(3) Cannot teach how to anticipate consistent angle of bank required for any valley size	(3) Teaches a smooth coordinated roll to the appropriate angle of bank using the space available in calm/turbulent conditions	(3) Teaches coordination and appropriate angle of bank use whilst maximising comfort in all conditions
(4) Cannot demonstrate anticipation of the appropriate power requirement for safe turning radius and escape options	(4) Teaches power use for a safe compromise between turn radius, Vs, Va and escape options in calm and turbulent conditions	(4) Teaches power use to ensure a safe compromise between turn radius, Vs, Va and escape options under all conditions
(5) Fails to teach recognition of the cues provided by the nose attitude	(5) Teaches the use of cues provided by the aircraft's nose attitude	(5) Teaches nose attitude control as a priority without compromising altitude
(6) Does not teach correct roll out positioning to enable escape options in prevailing conditions	(6) Teaches correct roll out positioning so that escape options are available on roll out in calm/turbulent conditions	(6) Teaches anticipation so that escape options are immediately available on roll out while maximising comfort under all conditions
(7) Cannot teach how to maintain a constant nose attitude in climbing and/or descending turns in various scenarios	(7) Teaches how to maintain a constant nose attitude in climbing and descending turns in various valley scenarios	(7) Teaches how to maintain a constant nose attitude in climbing and descending turns in a valley under all conditions
(8) Unable to teach efficient climbing turns to position for safe saddle crossing	(8) Teaches efficient climbing turns to position for safe saddle crossings	(8) Teaches how to use conditions, space and appropriate speed to efficiently climb for safe saddle crossings
(9) Unable to teach constant airspeed in descending turns and/or how to roll out in the correct position	(9) Teaches constant airspeed in descending turns and the correct position to roll out	(9) Teaches the appropriate aircraft configuration for the conditions and/or circumstances and the correct position to roll out within a valley
(10) Does not teach type and performance affects on valley turns	(10) Teaches effects of type and performance on valley turns	(10) Teaches how to apply various type and performance criteria to all valley scenarios

PERFORMANCE CRITERIA

Topic: Saddle crossing

Exercise:

To consider variables associated with any particular saddle/pass/ridge/spur and assess the best compromise of options for safe crossing.

Aim:

To recognise and assess best options for approach, crossing and positioning after crossing.

Technique:

(a) Assess lift/sink sides of saddle.

(b) Approach at 45º or less to provide escape downhill, downstream with minimum angle of bank required.

(c) Desirably fly left to right for best visibility.

(d) If obstacle obstructed or in serious sink then right to left.

(e) Choose 'knife edge' saddle versus an area of prolonged commitment.

(f) Approach level, Va under control;

- Not in a climb - no airspeed back up and poor visibility
- Not in a descent - limited Va control; anticipate turbulence

(g) Use PARALLAX to assess sink and height in relation to pass;

- Should see more terrain behind as approaching - therefore higher
- Less terrain - therefore lower

Principles to experience:

- benefits of early planning of approach
- left to right versus right to left
- best option often a compromise of several variables
- best approach combined with best escape, both before and after crossing
- choice of saddle offering minimum commitment time crossing i.e. 'knife edge' preferred with face of the saddle as flat as possible compared to concave face which requires greater angle of bank during turn away
- identify a commitment point up to which an escape away is available
- use of parallax to recognise clearance to cross, including height recognition/calculation technique
- retaining height after crossing in case return is necessary
- both calm conditions and conditions of lift and sink where good decision making is required and reliance on aircraft performance is not available
- anticipating terrain with potential for viable saddle option when saddle not initially visible
- where decision making is lacking, providing instructors experience, judgement and skill are not compromised, ensure pilot under training is put into reactive scenarios to improve anticipation and decisions e.g. Take pilot to their commitment point and then test their escape option by simulating - "In significant sink, turn away now!"
- making appropriate position calls for other traffic

SADDLE CROSSING - PPL

Not yet competent	COMPETENT	Ideal
(1) Unable to predict lift and sink areas	(1) Able to identify areas of lift and sink	(1) Anticipates areas of lift and sink and positions aircraft appropriately
(2) Unable to decide on a saddle that will permit a safe crossing	(2) Chooses a safe saddle crossing option with minimum commitment period	(2) Able to correctly assess variables and choose an appropriate saddle crossing with minimum commitment period
(3) Unable to choose a safe approach and escape option	(3) Selects a safe approach and escape option	(3) Chooses best approach and escape options
(4) Unable to use parallax to assess height relative to a saddle	(4) Uses parallax to assess safe height relative to a saddle	(4) Assesses parallax and height relative to a saddle with time to execute escape options
(5) Maintains an airspeed within 10 knots of Vs or above Va	(5) Maintains airspeed well above Vs but below Va while using smooth coordinated control inputs	(5) Maintains safe airspeed and attitude control throughout the manoeuvre with smooth coordinated inputs
(6) Unable to correctly position the aircraft after crossing the saddle	(6) Correctly positions the aircraft after crossing the saddle	(6) Correctly positions the aircraft after crossing the saddle to permit options of escape or return

SADDLE CROSSING - CPL

Not yet competent	COMPETENT	Ideal
(1) Unable to anticipate areas of lift and/or sink	(1) Able to anticipate areas of lift and sink	(1) Correctly anticipates areas of lift and sink and positions aircraft appropriately
(2) Unable to decide on a saddle that will permit a safe crossing	(2) Chooses a safe saddle crossing option with minimum commitment period	(2) Able to correctly assess variables for choice of saddle with minimum commitment period
(3) Unable to assess safe approach and escape options	(3) Consistently selects a safe approach and escape option (for both sides of saddle)	(3) Finds best compromise for approach and escape options including for the other side
(4) Unable to use parallax to assess height relative to a saddle	(4) Able to use parallax to assess safe height relative to a saddle	(4) Assesses parallax and safe height relative to a saddle with time to execute escape options
(5) Maintains an airspeed within 10 knots of Vs or above Va	(5) Maintains airspeed well above Vs but below Va while using smooth coordinated control inputs	(5) Maintains safe airspeed and attitude control throughout the manoeuvre with smooth coordinated inputs
(6) Unable to correctly position the aircraft after crossing the saddle	(6) Correctly positions the aircraft after crossing the saddle	(6) Always correctly positions the aircraft after crossing the saddle permitting options of escape or return

SADDLE CROSSING - INSTRUCTOR

Not yet competent	COMPETENT	Ideal
(1) Unable to teach techniques for the recognition of lift and/or sink areas	(1) Teaches methods to anticipate areas of lift and sink	(1) Teaches methods to accurately anticipate areas of lift and sink
(2) Unable to teach decision making with regard to saddle selection	(2) Teaches decision making with regard to a compromise of options in choosing a saddle with minimum commitment period	(2) Teaches decision making with regard to the best compromise of options in choosing a saddle with minimum commitment period in various conditions
(3) Unable to teach decision making with regard to a compromise of approach and escape variables for both sides of saddle	(3) Teaches decision making with regard to a compromise of approach and escape variables for both sides of the saddle in a variety of conditions	(3) Teaches decision making with regard to approach and escape variables for both sides of the saddle to achieve the best possible compromise under a variety of conditions
(4) Unable to teach the use of parallax to assess height relative to a saddle	(4) Teaches parallax techniques to assess safe height relative to the saddle with time to execute escape options	(4) Teaches the use of parallax techniques to accurately assess a safe height relative to a saddle within an efficient time frame
(5) Unable to teach airspeed control and/or smooth coordinated control inputs	(5) Teaches airspeed and attitude control throughout the manoeuvre with smooth coordinated inputs	(5) Teaches airspeed and attitude control throughout the manoeuvre in all conditions
(6) Unable to teach the correct positioning of the aircraft after crossing the saddle	(6) Teaches how to correctly position the aircraft after crossing the saddle with regard to weather and terrain	(6) Teaches consideration of all variables to position the aircraft after crossing the saddle for best options of escape or return
(7) Unable to teach decision making before, during and/or after saddle crossing	(7) Teaches good decision making and situational awareness	(7) Teaches good decision making and situational awareness throughout so that the outcome is never in doubt

PERFORMANCE CRITERIA

Topic: Route finding

Exercise:

Use real or simulated circumstances of disorientation to develop strategies for reorienting in place and time awareness.

Aims:

(a) To recognise and experience disorientation.

(b) To identify cues and steps for re-orienting.

(c) To keep evaluating with an open mind and not continue to convince oneself of a false scenario.

Technique:

At some point during the training exercises, where orientation in place and time awareness may be a challenge for the pilot under training, simulate the scenario to develop strategies for reorientation.

Principles to experience:

- water only flows downhill – identify the flow direction
- small streams lead to larger flows, lakes or ocean which ultimately means roads, power lines, towns etc.
- much white water indicates steep gradient to valley floor
- valley alignment (compass rose)
- sun position going in, versus going out, assuming time covered is not significant
- map folding and holding to maximise peripheral vision and therefore LOOKOUT while referring to map
- high level – use peaks
- low level – use valleys

ROUTE FINDING – PPL, CPL

Not yet competent	COMPETENT	Ideal
(1) Unable to recognise downhill direction of river flow	(1) Able to recognise downhill direction of river flow	(1) Consistently able to recognise downhill direction of river and appreciate gradient by white water content
(2) Lacks situational awareness to a degree of consistent disorientation	(2) Maintains situational awareness to a degree that any disorientation does not affect overall safety of flight	(2) Consistently maintains situational awareness to a degree that provides the instructor with confidence that disorientation will not occur
(3) Unable to use a map while maintaining peripheral vision outside cockpit	(3) Able to use a map whilst using peripheral vision for lookout	(3) Confidently uses a map while maintaining lookout using peripheral vision
(4) When disoriented, either fails to re-orient self, or takes so long to do so that safe flight is compromised	(4) If disoriented is able to use available cues to safely reorient with minimal delay	(4) Any disorientation is momentary and has little or no effect on flight path and flight safety

ROUTE FINDING – INSTRUCTOR

Not yet competent	COMPETENT	Ideal
(1) Unable to teach recognition of river flow direction	(1) Teaches how to recognise the direction of river flow	(1) Teaches how to recognise direction of river flow and gradient
(2) Unable to teach techniques for situational awareness such that the student is often disorientated	(2) Demonstrates and teaches situational awareness techniques to a degree that any disorientation does not affect the overall safety of flight	(2) Teaches situational awareness techniques that provide the student with the tools to ensure disorientation does not occur
(3) Unable to teach how to use a map while maintaining peripheral vision outside the cockpit	(3) Teaches the ability to use a map while maintaining a lookout using peripheral vision	(3) Teaches the ability to accurately use a map while maintaining a lookout using peripheral vision
(4) Unable to teach how to re-orient self quickly	(4) Uses real or simulated disorientation to teach the student how to reorient using available cues with minimal delay	(4) Teaches orientation techniques that ensure any disorientation is momentary and has little or no effect on the flight path and flight safety is not compromised

Topic: Emergencies

Exercise:

To experience simulated forced landings and precautionary landings in mountainous areas.

Aim:

To practise emergencies where options may be limited, where terrain and or weather are intrusive to the ideal.

Technique:

In real or simulated circumstances provide as much variety from the 'ideal' simulated forced landing or precautionary landing as local resources permit, where the selected landing site means descent below the ridge line is required.

Principles to experience:

- lack of real horizon
- variables:
    - height available
    - distance from options/gliding distance
    - option types e.g. strips, paddocks, clearings, beaches, sand bars, roads, etc.
    - conditions of wind, turbulence and precipitation
    - conditions of load and performance
    - conditions of visibility including light/sun/shadow effects
- priorities – make plan – confined spaces may affect
- climatic/seasonal wind effects e.g. for a calculated gamble use anabatic/katabatic
- use of lift conditions/avoidance of sink for glide range considerations
- valley gradient
- illusions and mind sets
- need for early mayday – what frequency, consider 121.5
- habitation in remote areas – look for airstrip/fertiliser bins
- consider wires
- consider elevation
- contents of survival kits and uses relative to principles of survival

EMERGENCIES - PPL, CPL

Not yet competent	COMPETENT	Ideal
(1) Unable to select and assess an appropriate site in a mountainous area for a forced landing	(1) Able to assess and select an appropriate site in a mountainous area for a forced landing	(1) Assesses and selects the best available forced landing option in a mountainous area
(2) Unable to plan and execute a forced landing for the site chosen	(2) Able to plan and execute a forced landing for the site chosen	(2) Plans and executes a successful forced landing for the site chosen incorporating all relevant components
(3) Unable to select and assess an appropriate site in a mountainous area for a precautionary landing	(3) Able to select and assess an appropriate site in a mountainous area for a precautionary landing	(3) Selects and assesses the best available precautionary landing option in a mountainous area
(4) Unable to plan and execute a precautionary landing for the chosen site	(4) Able to plan and execute a precautionary landing for the chosen site	(4) Plans and executes a successful precautionary landing for the site chosen incorporating all relevant components
(5) Unaware of the contents of the survival kit and/or its relevance to the 'principles of survival'	(5) Demonstrates knowledge of the contents of the survival kit and its relevance to the 'principles of survival'	(5) Demonstrates a thorough knowledge of the contents of the survival kit and its relevance to the 'principles of survival'
(6) TEM, decision making and situational awareness exhibited increase the risk of an emergency and/or mismanagement of the emergency itself	(6) Demonstrates TEM, decision making and situational awareness that reduces the risk of an emergency or of mismanaging the emergency itself	(6) Demonstrates TEM, sound decision making and situational awareness minimising the risk of any emergency or of mismanagement of any emergency

EMERGENCIES - INSTRUCTOR

Not yet competent	COMPETENT	Ideal
(1) Unable to teach assessment of an appropriate site in a mountainous area for a forced landing	(1) Teaches how to assess an appropriate site in a mountainous area for a forced landing	(1) Teaches how to assess and select the best available option for a forced landing in mountainous terrain
(2) Unable to demonstrate a forced landing for the site chosen	(2) Demonstrates a forced landing for the site chosen	(2) Demonstrates a successful forced landing incorporating all relevant components
(3) Unable to teach assessment of an appropriate site in a mountainous area for a precautionary landing	(3) Teaches how to assess an appropriate site in a mountainous area for a precautionary landing	(3) Teaches how to assess and select the best available option for a precautionary landing in mountainous terrain
(4) Unable to demonstrate a precautionary landing for the site chosen	(4) Demonstrates a precautionary landing for the site chosen	(4) Demonstrates a successful precautionary landing incorporating all relevant components
(5) Unable to teach how to apply the contents of a survival kit to 'principles of survival'	(5) Teaches how the contents of a survival kit are applied to the 'principles of survival'	(5) Demonstrates a knowledge of the survival kit contents and use that significantly increases the probability of survival
(6) TEM, decision making and situational awareness exhibited increase the risk of an emergency, which may include mismanaging the emergency itself	(6) Demonstrates TEM, decision making and situational awareness that reduces the risk of an emergency or of mismanaging the emergency itself	(6) Demonstrates TEM, sound decision making and situational awareness that minimises the risk of any emergency or the mismanagement of any emergency
(7) Inadvertently allows the student to infringe the instructor's own limitations	(7) Manages flight training to remain within own limitations	(7) Always remains situationally aware; own limitations unchallenged