Thermalling Notes

The following notes outline the basis for our course and just touches on each subject we cover. The daily lectures provide more details of each section, though the contents is adjusted depending on the experience of the students and the rate of learning.

The flying areas launch and landing sites have been carefully selected for safety and ease of use; the views are stunning and the flying spectacular. The training will be carried out at three or four different flying sites as we don't believe in dragging the client from place to place as often it takes a full day to become familiarised with a new site.

We try and look at all variations found in the mountain, the weather, winds, thermals and inversions before venturing into the unknown. A brief account of each subject is listed below;

Firstly it is absolutely essential that we know the effects the weather forecast will have on our proposed flying area for that day. Obtaining a local forecast should be of prime importance not only regarding safety, but also for our enjoyment.

Weather Forecast

Weather forecasts can be found at the local tourist office or meteo office, in local newspapers, by telephone or from the Internet. Make it your business to find this important information which includes;

• Wind speeds and directions in the local valleys and at 2000m (mid Mountain) and 4000m (High Mountain) asl..

• Temperatures at different altitudes, and the amount of sun expected throughout the day..

• Cloud cover and general conditions; i.e. rain, storms, and how the trend will change throughout the day..

• The forecast should also give the provisions for the following days making it possible to build a picture of the general weather trend..

Prevailing Winds - Thermals and Valley Winds

In this part of Europe we live in a 'High Pressure' region where throughout the year we experience mainly light winds: moderate and strong forecasted winds often means no-flying. As a rule 20 kms of wind or more at 2000m makes thermal flying challenging. For this reason we tend to choose our flying areas carefully ensuring the best value from the day. *As a rule of thumb; deep and narrow valleys would be more affected by moderate to strong prevailing winds conditions. Wide and open valleys are less effected often making these better places to fly within.*

Thermals

The sun strength and general instability determines the amount and quality of lift we encounter. In the early part of the day, before 11.00, depending upon the amount of moisture from the night before, thermals will be small and broken, especially down low. As the ground

heats uniformly, in turn heating the air directly above, larger thermals form. The strongest thermal cycles will be found between the hours of 13.00 and 15.00. These are referred to as ‘peak times’. As the sun angle reduces, after 15.00, the power eases, then often in the late afternoon the flying becomes smooth and the lift widespread. On hot unstable days the ‘peak times’ can be quite lively, and in the spring and early summer may keep pilots grounded for a short while.

Thermal strength’s vary depending upon the time of year and the time of day. On unstable days in spring and early summer, at peak times, thermals have climb rates to around 4-6m/s (800-1200fpm). These thermals can be large and reach good altitudes. In the morning and especially in the evening, the thermals would be a little gentler averaging only 2-4m/s (400-800fpm).

Valley Winds

‘Valley Winds’ are winds created by thermic conditions and should not be mistaken for prevailing or forecasted winds, associated with frontal systems.

In the northern hemisphere, south facing mountainous areas will generally have weak'ish south easterly valley winds in the morning veering to stronger south westerly valley winds in the afternoon, as the sun arcs around to the west. In large open valleys the sun angle often determines the direction of the valley breeze.

In the evening most closed valleys will gradually release their latent heat, giving a vast pool of gently rising warm air, commonly referred to as ‘valley release’, ‘restitution’ or ‘glass-off’. This fantastic phenomenon often remains until the sun leaves the valley, giving beautiful and buoyant evening flying.

Deep valleys that are closed at one end create a Venturi effect and will attract strong valley winds, especially on hot unstable days. These winds will actually rise in depth as the day progresses, similar to water flooding into a river on a rising tide, though never really filling the valley. Normally the valley wind would only reach a depth of 600m above the valley floor, after then dispersing into thermic activity. The pilot needs to be aware of the ever increasing wind strength down below that can make landing hazardous. We would generally expect these valley winds to reach peak strength mid afternoon and often remain strong until 17.00, depending upon the amount of sun in the valley.

Inversions

In very stable, high pressure conditions, inversions sit in or over valleys causing a foggy haze often seen from above as a smoky layer generally spreading across the whole valley. This hazy layer will often reduce the sun’s heating abilities on dark dry ground: the thermal source.

In winter, strong inversions can condense into a sea of cloud, filling lower valleys. This is caused by the moist warm valley air being held in the inversion by the tremendous weight of the descending, cold, high pressure air. These cloudy inversions will remain in place until the next weather change.

The air mass above the inversion will be crisp and clear and allows the sun to do its work on the exposed dark faces, creating good thermal flying. Often these higher thermals will rise to great altitudes.

Flying Safety Code

In mountainous thermal flying the air either rises, sinks or is static. There is little or no dynamic component to the air passing over ridges. A ridge will deflect thermals, though the thermals are often bubbles of air with sink cycles surrounding them, especially on the underside.

The general rules are?

• Know your daily weather forecast and the effects it will have on the area..

• Never assume there will be lifting air, wherever you fly..

• Always have a safe escape route away from the mountain or tree line..

• Always fly within reach of a safe landing site..

Lift

There are three types of lift shown here in approximate order of usefulness in the Alps..

• Thermal..

• Convergence..

• Dynamic..

Most of our flying in the Alps is in thermals! We need a good understanding of the principles involved, and of thermal behaviour, to make the most of Alpine flying.

Basic Thermal Theory

• The sun is the lift generator. The sun heats the ground, which in turn irradiates the air close to it. This forms the source of the thermal. Warm air is less dense and lighter than cold air and under certain conditions this warm thermic will rise..

Thermal sources depend on?

• Surface type, terrain shape and sun angle..

• Sources: Bare ground, dry fields, ploughed fields, towns..

• Evening sources: High ground (still in the sun)..

• Avoid: Wet areas, low land, dark green areas, shadow, trees, and forests..

Thermal Triggers

• Wind irregularities, hills and mountains with up-slope breezes..

• Temperature or surface variations (e.g. tree and snow lines, fires, edges of towns, rivers or lakes)..

• Disturbances, e.g. trains, cars, large animals etc...

Thermal Shapes

• Bubbles and Columns surrounded by sink, single core and multiple cores..

• The aim of thermalling is to stay within the core using the region of greatest lift within the thermal as effectively as possible!

Finding Thermals

• Thermals are elusive, as we cannot see them. In order to locate thermals we must use indicators and signs..

• Gliders and birds thermalling, flying debris, seeds etc..

• Growing cumulus cloud..

• Warm air and smells..

• Tree/vegetation movement/gust/thermal cycle at launch..

Indicators of overall activity and general thermal location

• Sun on thermal sources, cumulus clouds..

• Gusty winds at launch area Gliders and birds thermalling..

• Valley breeze direction, possible triggers location..

• Known house thermals tree/vegetation movement..

Clouds as indicators for finding thermals

All clouds are produced by rising air. Cumulus clouds (Cu) are those associated with thermals, and a discrete cumulus has a life cycle (usually of the order of 10-30 minutes) dependant on the size of the thermal and the amount of moisture it contains. However, static cumulus clouds can form and remain in place over high peaks for many hours. These clouds are constantly fed by thermals from the valleys below.

In general, the stages of development and decay are as follows

• Growing clouds first appear as wisps then form into an upwind pointed triangular shape. A well formed cloud can be a puffy cauliflower shape with a dark flat almost concave shape to the base..

• A dying cloud has a reverse appearance: it generally decays from the base upwards forming a upside down triangle as it disperses, losing definition at the edges..

Ground clues versus cloud clues

• 1/3 cloud to base height, use ground clues only..

• Between 1/3 and 2/3 Combination use ground and cloud clues..

• 2/3 cloud base height use cloud clues only..

Blue Holes

• Large gaps in a cumulus filled sky, indicating sink, caused by moist ground, lakes or valley shape..

Blue Thermals

• Thermals where no clouds are formed, either due to a high-level inversion or extreme dryness..

Using Thermals

There are two directions by which a thermal may be entered, with corresponding differences in wing reaction.

• Head on: Wing dives in the sink, and then rocks back in lift. To enter the thermal, keep flying straight..

• Side on: Either one wing-tip clips the lift resulting in the wing-tip rising. To enter the thermal, turn towards that wing-tip..

Other Clues

• Wind noise before the wing dives then rises..

• Sensations of sink then lift..

• Smells and warm air/temperature changes..

• Your variometer tone..

Generalisations

• Do not change direction once established..

• Adjust your circle to maximise the use of lift..

• Observe other pilots (including birds)..

• Most pilots thermal with too little bank angle..

• Allow for variometer lag..

• Be aware of thermal drift (ground position)..

• To stay in the thermal you must turn as close to the core as possible..

• Staying within the thermal must be your prime consideration..

• Thermals expand with altitude as they experience lower pressure, so you may fly with less bank angle..

Thermal Problems

When flying in thermals the following may occur!

• Tip deflation clipping sink, counter the turn then pump out any deflation..

• Full frontal Hitting sink head on apply both brakes to open the glider..

• Spin by flying too slowly. Ease up the braked, then prepare to dampen out any dive as the glider starts flying again..

Beware of sink, especially when flying close to trees. Always allow an escape route which does not rely on finding lift, especially when flying above gullies and plateaus (beware of downwash).

When following thermals near cliffs, always allow a sensible margin between yourself and the cliff for obvious reasons. We suggest no closer than 75 - 100m especially if there is a cross wind or strong thermic activity!

Beware of other pilots! Always thermal in the same direction as other pilots, give way to lower gliders (they might not be able to see you) and never assume that the other pilot will take avoiding action - they might not know their air-law! Always keep a good look-out.

When flying lee-side thermals, beware of potential shear layers and rotor, especially if the sun goes in and the thermals die temporarily. Flying through inversions may also be turbulent.

Beware of cloud-suck, when the lift is wide-spread and strengthens close to cloud base. Fly to the valley side of the cloud, using big-ears and speed bar to pull away. If this fails, a fast 360 or spiral dive might be necessary. Never fly in cloud, though if this in unavoidable use a compass to fly away from the hill-side.

Pay attention to strengthening valley breezes, caused by air being drawn up to replace the rising mountain thermals. Penetration problems, valley side rotor and turbulence at landing may all be encountered.

Convergence

Convergence: caused by two air masses coming together. Limited mixing occurs and where the masses cannot expand side-ways, one or both of the air masses will rise. This either results in lift directly or acts to stimulate increased thermic activity.

• Cold fronts: Pre-frontal conditions are usually excellent for thermals, due to increased instability and a form of weak convergence..

• Sea-breeze fronts: not a factor in the Chamonix area, but significant in other mountainous regions (e.g. Pyrenees)..

• Magic-lift: when an anabatic wind meets either a valley breeze or another katabatic wind. The result is mid-valley lift..

• Thermal convergence: when a thermal meets light prevailing winds or another thermal stream, combining to form much more powerful lift..

• Low pressure systems: light convergence may promote increased thermic activity..

Differences in wind directions: over land and water due to varying degrees of friction may lead to both divergence and convergence.

When winds from two directions meet, convergence may occur!

• Signs of convergence: Weak lift, often in the absence of obvious alternative sources of lift. Veil, curtain or wispy clouds. Small patches of cumulus "Step-clouds"..

• Higher than normal cloud bases..

Dynamic conditions

Dynamic lift is created by a wind rising up a slope, creating a vertical component. The source of the wind may be either prevailing resulting from the movement of air from high to low pressure areas, from valley breezes or from sea breezes. In each case, a lift band may be generated. Dynamic soaring involves remaining within this lift band.

The effectiveness of dynamic lift depends on the following factors.

• Wind strength and angle onto the slope..

• Slope angle, width, height and shape (Concave - convex)..

Stability

Pure dynamic conditions are rarely experienced in the Alps. On-slope winds tend to stimulate thermal activity, which reinforce the lift. This situation is referred to as thermo-dynamic. In addition, convergence in bowls and on ridge tops between the wind and thermals rising up opposite sides may occur.

Problems associated with dynamic conditions.

• Lee side Rotor..

• Penetration..

• Wind gradients..

• Venturi on slope tops and in gaps..

• Turbulence in gullies and behind obstacles..

Technique

Information will be introduced to the pilot daily. There is actually no end to this tuition and the more the pilot responds to the information given, the more we give.

The mornings will generally start at around 08.30 - 09.00 at the chalet when all the weather forecasts have been collected. You will be notified of any changes the evening before.

DAY ONE

On the first morning we look closely at the pilot's equipment, inspecting each part separately. Make sure you have everything, glider, harness, reserve, instruments, cables and manuals. Please bring your log books and insurance details.

We look closely at the fit of the harness, the pilot's entry and exit of the harness at launch and when landing, the fit and the auxiliary equipment, accelerator and foot bars, if applicable, reserve parachute and housing, karabiners/riser attachments.

If necessary we will look at and discuss harness setup and the distant required between the risers.

We look closely at how the reserve parachute is attached and housed; we may have a practice at actually deploying the reserve, though we don't throw it so it requires a repack: the process is to make the pilot reserve-aware.

We inspect variometers and their mounts and make the necessary adjustments and calibrations. Make sure that you have a modern variometer with a climb averager, climb and sink tone and good altimeter. Don't forget to bring the instruction manual.

If you own a 2m radio, please bring it along with the instruction book and battery charger.

Please remember that you may require a headset unit for your flying helmet as many radio units are difficult to operate without one when in flight.

We also check your boots and helmets: Please note that only helmets conforming to the current European regulations will be accepted.

This is the morning where we can sort out any little or nagging problems there might be with the rig.

Each day, we have a pre-flight lecture. Today we talk about;

• Mountain safety..

• Air-law..

• Alpine launching techniques..

• Flying in the alpine conditions.

• Landing approaches and light wind landing techniques..

The lecture at the Lodge is followed by a full flight briefing at the landing area and finally the launch site.

• Often launching into thin mountain air requires a slightly different procedure. We may spend a little time on the training hill making adjustments to your technique helping you to become confident in this new environment.

The rest of the first day is spent flying where two or three flights would be expected allowing the pilot to settle themselves into this new environment. This also gives us time to access the pilot.

Where we can, we brief and debrief each flight, though often these are personal affairs with the individual pilot.

Our policy is on safety and efficient flying and on the first day we would like you to just fly within your own limitations so we can observe your current skills.

DAY TWO

The morning lecture is all about turning our glider efficiently using both brakes and weight shift and pitch control. Importantly, we are looking for a comfortable and relaxed flying position ensuring we have an excellent all around view, at all times.

• Today we shape up our general flying looking closely at efficient 360’s and constant turning techniques..

• Using our variometer we look closely at our sink rates and constant glide/speed adjustment as we strive to find the optimum performance from our glider during every turn. We discuss the uses of the climb-rate averager, climb tone and sink alarms.

• We cover speeds-to-fly; best glides and distance recognition to help us to achieve good glides with safety over the mountain terrain.

The last part of today's lecture covers thermal source and triggers points, where to look and find them. Importantly we discuss the sun angle and strength, heat generated, stability and instability and the differentials as the day changes.

In the air we practice today's theory. Long flights are achieved from the high sites allows time to practice new manoeuvres whilst hunting for thermals.

DAY THREE

Today's lecture starts as an open forum where we try and cover all the missed questions regarding technical flying.

Today we look at thermals in more detail as often pilots are expecting large thermals with easy sign-posting and are often surprised to find how difficult thermal location is when in mountain valleys.

• We study thermal shapes and the type of lift we would expect from a broken thermal that has just broken away from its source..

• We discuss the ways we enter a thermal, when to make that first turn and what sort of turns and climb rates we should expect to encounter..

• We discuss the information available from the air surrounding a thermal: the sound and feel, and how to use this effectively..

In the air we practice today's theory. These important technical aspects generally require a number of flights to perfect and often this part of the course continues into day four.

DAY FOUR

Today's lecture covers thermal tracking along the mountainside and how to read the terrain.

• Out on the mountain we practice thermal location and general thermalling techniques. Also this day, weather permitting, we look closely at serious descent methods and descent rates..

• These are not fully blown SIV exercises but more of an understanding in how to get down safely when escaping from strong thermal lift..

DAY FIVE/SIX

The lectures are directed towards mountain weather and reading the sky and flying conditions.

• In the air we spend time practising this weeks exercises, covering any missed points from the previous days..

USEFUL RADIO AND TELEPHONE NUMBERS

Alpine Flying Centre - Tel +33 (0)450545963
Dennis's Mobile - Tel +33 (0) 610634558

Gillian's mobile - tel +33 (0) 619638716
Licensed radio Frequency - 161,325
Secondary radio Frequency - 143,100
French FFVL Frequency - 143,9875 (this frequency is for emergencies only) - The weather radio stations are also transmitted on this frequency)

For emergency rescue service call the 'Pompiers' dial 18 on any telephone or 112 on mobiles. The call is free. Tell them the problem and where the problem is, as near as you can and they will be out quite quickly.

Chamonix Hospital - tel 0450538400
Sallanches Hospital - tel 0450473030