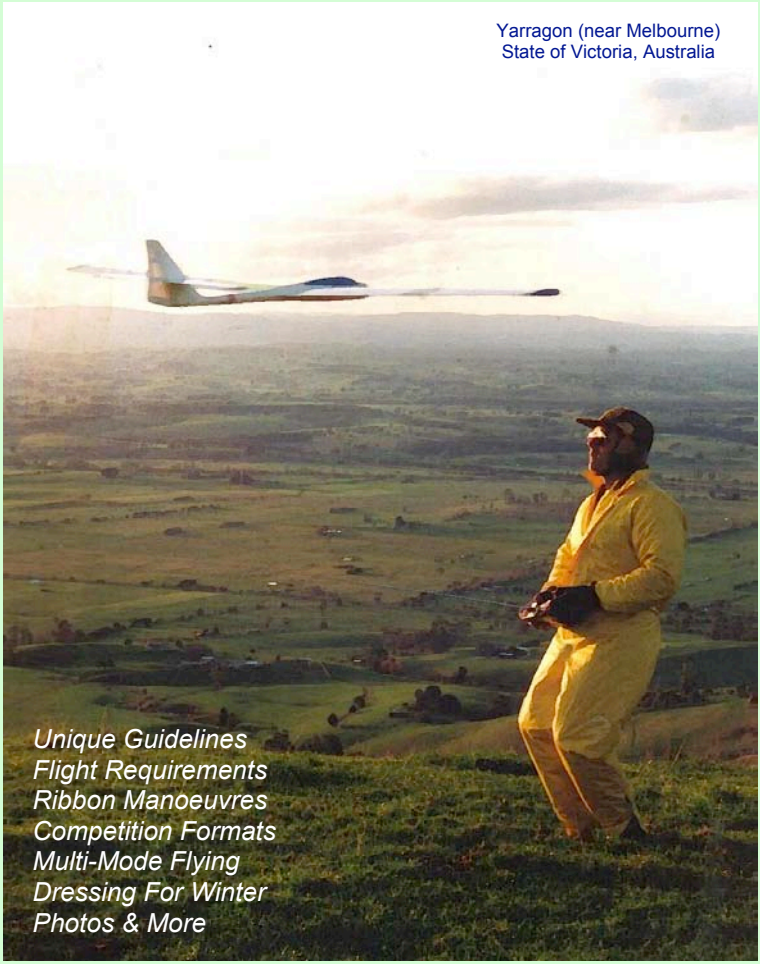
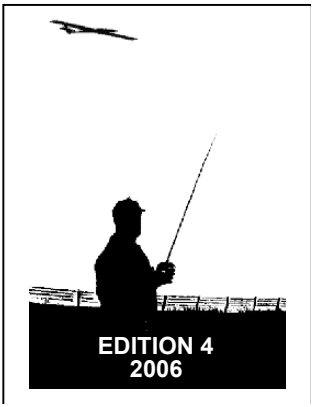
Aerobatics Plus

by Ian Cole

A Guide To Competitive Slope Soaring

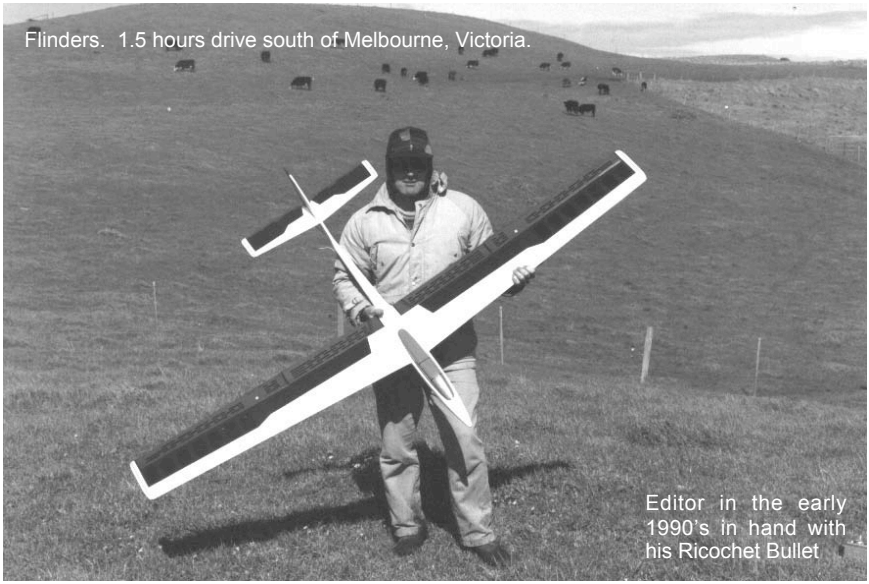




Written and published in Bass, Victoria, Australia.

As well as aerobatics, this handbook contains general information, including photos to entertain and assist all keen gliding enthusiasts.

*** INDEX ***



~ INTRODUCTION ~

Hello and welcome to the world of slope soaring. This handbook was written primarily with the aim of establishing common rules and guidelines to assist with both the performance and judging of manoeuvres for the purpose of competitive slope soaring aerobatics. Much of the literature on aerobatics could be adapted for other forms of aerobatics flying, including scale, pattern, electrics, helicopters, etc. Many people think they can judge well. I'm confident that when you've learnt this book thoroughly, you can take out the word think. Common knowledge, particularly with multiple judges, translates to consistent and accurate judging.

The chapter, **MECHANICS OF JUDGING AEROBATICS** is a lot to take on board at first. It takes quite some time for it all to sink in. For this chapter to work properly, it must be linked with the chapter, **CODE OF DEFINITIONS** and the **downgrading system within the ribbon diagrams.** The text for judging is specific in meaning and meticulously scripted in a repetitive way that is clear, concise and easy to comprehend and remember. The rules described can be adapted to suit almost any type of aircraft.

If you are new to the sport, simplified rules have been written (see **JUDGING GUIDELINES and JUDGING GUIDELINES IN BRIEF**) which make it very easy to organise aerobatics events. In particular, the event called ***MIND TWISTER*** was developed with the specific aim of enabling organisers to be able to run simple, easy to judge contests. It teaches almost everything you need to know about aerobatics in a compact format. In running a subjective type of event such as aerobatics, it is important to have precise rules and guidelines. The judges in particular need to establish a consistent and common standard for judging. Fair results are necessary for a successful outcome - even for 'low key' events. In fact, a successful event in most cases is one that has been organised with very specific rules and guidelines.

~ AEROBATICS IN GENERAL ~

Aerobatics encompasses so much in the way of self-discipline and accuracy skills, plus if you are interested in aerobatics, you are always challenged to learn something new every time you go flying. Most of us start out doing 'hotshot' aerobatics or to put it another way, un-disciplined aerobatics just for the fun of it. We then usually progress steadily from there. From time to time I have asked 'hotshot' fliers to perform specific manoeuvres, then watched them become quite perplexed and indeed frustrated in coming to terms with the amount of detail and prior knowledge required to fly their gliders with such a high degree of accuracy.

Aerobatics in its purest form - and we are talking about 'pin-point' accuracy, requires a great deal of practise and patience. To perform competitive slope aerobatics at the highest level you will need to, at the least, study the following chapters in this handbook. **Choosing The Right Site, Ideal Weather Conditions, The Right Glider, Skyroads, The Perfect Spot, Length of Slope, Wind Direction, Direction of Glider, Judges Allocated Viewing Window, Speed Control,** just to mention a few.

So you see, aerobatics isn't as simple as it seems - well at least not the aerobatics I'm talking about. When you feel that you are becoming spiritually connected with your competition aircraft and you can sense it's every movement, then you have begun a journey to a place where few pilots venture. I've been asked, "When you damage your aircraft, is it hard to fix?" My surreal reply is, "I don't fix it. I nurture it back to health!" That's the sort of respect I have for my aircraft. Enjoy your journey.

~ MECHANICS OF JUDGING AEROBATICS ~

The mechanics of judging aerobatics is a difficult area to explain, particularly as it can be very subjective. However, if you study this chapter carefully and follow the examples set out, I'm confident that the subjective matter will be kept to an absolute minimum, allowing you to judge and score in a fair, consistent and unbiased manner.

You will notice that each manoeuvre contains downgradings in the form of short sentences. Each sentence represents a segment (or part thereof) of a manoeuvre. Each segment can have a penalty of up to three points deducted from it, depending on the severity of the error made by the pilot, or should that be, the pilot's aircraft. Having three points per segment with which to downgrade, allows a judge to clearly differentiate the severity of an error between all other aircraft competing.

Take for example the **two consecutive stall turns**, which has eighteen segments for possible downgrading. If you were to deduct the maximum amount of three downgrade points per segment, you would then have a possible total of 54 deductions from which to choose, whilst judging the manoeuvre. This does not include an adjustment for presentation. (See **CODE of DEFINITIONS**)

LINEAR SCORING

Let's begin by giving an example of an alternative method of scoring, which should make it a little easier to understand the more acceptable **Percentage** method, which will be explained later. I'll continue to use the **two consecutive stall turns** as an example, remembering that this manoeuvre has a total of 54 downgrade points from which to choose. Let's say for example that during the aircraft's flight, you deducted points from six of the 18 segments. Say you deducted one point off the 1st segment, three points off the 5th, two points off the 8th and one point each off the 12th, 14th and 15th segments, giving you a final score of 45 out of 54. At this point the score may be adjusted for presentation, either up or down at the judges discretion.

This method is straight forward, although the high numbers do appear to be a bit daunting at first. Each manoeuvre would be scored in the same manner. That is, by calculating the maximum amount of downgrade points and setting that particular total as the benchmark for that particular manoeuvre. For example, **two consecutive loops** have 10 segments, making a possible total deduction of 30 downgrade points plus the presentation marks.

It has been suggested that one bench mark figure only could be set for all other manoeuvres, that figure being equal to the manoeuvre with the highest possible downgrade deductions. (The **two consecutive stall turns** have the most downgrade points.) However, this could not work successfully unless a complicated formula was applied to all other manoeuvres so that they all added up to the same total – which I can assure you, they don't.

A positive feature of this system is that the need for the **K Factor** or **Degree of Difficulty** bonus points, would no longer exist, as it is apparent that the more difficult the manoeuvre, the more downgrade points there would be available to capitalise on.

PERCENTAGE SCORING

Now that you've got the idea of scoring, let's switch to the more acceptable system, which only allows for a mark out of 10 for each manoeuvre.

The principle is the same as the linear system except that the downgrade points are no longer linear (or as you see them). Instead, each downgrade point deducted automatically becomes a percentage out of 10.

Once again let's look at the **two consecutive stall turns**. As in the previous example, deduct one point off the 1st segment, three points off the 5th, two points off the 8th and one point each off the 12th, 14th and 15th segments, giving you a total of 9 downgrade points deductions.

Now for the tricky part, **CONVERSION.** It is at this point your brain must evaluate each downgrade point and promptly come up with a score out of 10. Firstly, let's look at the example below, then we will review it later after it has sunk in a bit.

Two Consecutive Stall Turns Segment	**Linear Value** (As you see it)	**Percentage Value** (Converted)
S1	-1 point	-1/2 point
S5	-3	-2
S8	-2	-1
S12	-1	-1/2
S14	-1	-1
S15	-1	-1
Total Deductions =	-9 points	-6 points
Total Score =	**45 out of 54**	**4 out of 10**

If you are unable to clearly recognise a downgrade throughout the performance of a manoeuvre, yet feel that the manoeuvre definitely warranted upgrading or downgrading, then you might apply an adjustment for presentation. (See **CODE of DEFINITIONS**)

Now I know what you're thinking! How did I arrive at the **Linear and Percentage values**? Answer. I just wrote down some possibilities, as the example above does not give specific downgrades.

Okay, now let's look at an example on the next page of the **two consecutive loops** as you would judge them in the air. This time with specific downgrades included.

BEFORE CONTINUING, COVER UP THE FINAL SCORE – AND NO CHEATING!

LEGEND: *Minor Fault=1 Mediocre Fault =2 Major Fault =3*

The legend enables you to determine (or see, so to speak) the severity of each fault noticed during an aircraft's flight.

S1 to S6 are all segments within the manoeuvre, which we will be downgrading for the purpose of this particular example described on the next page.

EXAMPLE

S1. The aircraft enters the loop along the horizontal flightpath with one wing slightly tilted. (*Minor Fault*)
S2. The first loop is not round and appears to be out of shape in a major way. (*Major Fault*)
S3. The second loop is okay but does not superimpose the first loop to a considerable degree. *(Mediocre Fault)*
S4. The aircraft exits the second loop via the horizontal flightpath with its wings level but veers downward and therefore off the horizontal flightpath to a considerable degree. *(Minor Fault)*
S5. On completion of the manoeuvre, it was noticed that the direction of the aircraft had changed noticeably, more than the 15 degrees allowed. (Minor Fault)
S6. The overall flightpath of the aircraft was not seen to be performed central to the **judges allocated viewing window**. *(Minor 'Presentation' Fault)*

Well, how do you think you went? Let's see if your marks corresponded with mine.

S1	-1 point	-1/2 point
S2	-3	-3
S3	-2	-1
S4	-1	-1/2
S5	-1	-1/2
S6	-1	-1/2
Total Deductions =	-9 points	-6 points
Final Score =	**21 out of 30**	**4 out of 10**

The translation from **Linear** to **Percentage** is done at the end of a manoeuvre and after you have assessed all of the downgrades and made adjustments for presentation. Deciding on the severity of the **Linear** downgrade points is not as hard as it appears. A few hours of practise and you will have this area well within your grasp and eventually these decisions will become automatic.

The most difficult part is obviously the translation from **Linear** to **Percentage** (or conversion) but again, in time these decisions will become automatic.

Learn off by heart the first two and the last three segments of each manoeuvre, as these five sentences are the same for almost every manoeuvre. When these areas become second nature, start to look for similarities in other areas of other manoeuvres. Eventually you will learn to downgrade appropriately without even thinking about it.

~ JUDGING STANDARDS ~

The standard or level of judging will depend upon the quality of the pilots competing. If for example the entrants are of a very high standard, then judging will need to be very strict, requiring virtually no fault to go unnoticed. On the other hand, if the standard of entrants is on the mediocre or poor side, then the judges may need to adjudicate to a standard that will encourage the entrants - and not put them off for life (if you get my meaning). Of course, multiple judges would have to be very clear as to which standard they were adjudicating to on the day.

~ JUDGING GUIDELINES ~

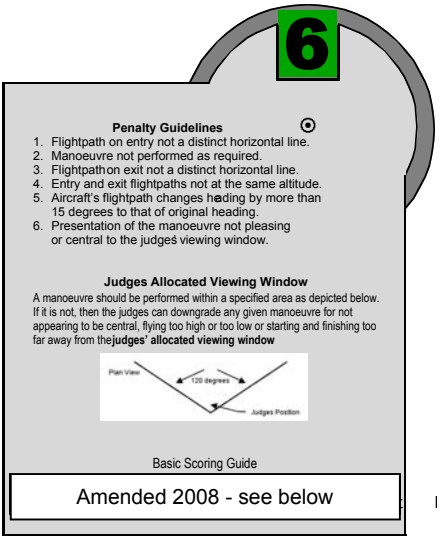
Whilst it would be ideal for everyone involved with competitive aerobatics to know off by heart the chapter **MECHANICS OF JUDGING**, in reality, this is unlikely to occur. Therefore, two more practical sets of guidelines below have been developed to assist with judging. They can be used either together or alternatively. Their ideal usage is shown on the diagram below, which depicts a judge's scoreboard. The diagram also shows the **Judges Allocated Viewing Window**, which is described in one of the following chapters. The photo below shows a judges scoreboard complete with a revolving wheel numbered from 1 to 10 and made from 3mm thick plastic.

JUDGING GUIDELINES IN BRIEF

The **PENALTY GUIDELINES** and **BASIC SCORING GUIDE** should be adhered to appropriate scoreboards to assist with judging. The **JUDGES ALLOCATED VIEWING WINDOW** diagram (described further on) should also be adhered.)

PENALTY GUIDELINES

1. Flightpath on entry not a distinct horizontal line.
2. Manoeuvre not performed as required.
3. Flightpath on exit not a distinct horizontal line.
4. Entry and exit flightpaths not at the same altitude.
5. Aircraft's flightpath changes heading by more than 15 degrees to that of original heading.
6. Presentation of the manoeuvre not pleasing or central to the judges allocated viewing window.



BASIC SCORING GUIDE

0 - 1 - 2	3 - 4	5	6 - 7	8 - 9	10
Not Recognisable	Very Poor	Pass	Good	Very Good	Excellent

~ CHOOSING THE RIGHT SITE ~

One of the most important things when starting out in slope soaring is flying at a suitable site. When people first trek to the slope, they sometimes choose sites which are simply within a practical driving distance or which have been recommended to them. The end result can be anything from, “Wow, that was great”, to, “I’ve finally got that kindling wood I was after for the barbeque.”

The most difficult part of slope soaring for many is the landing. For this factor alone, choosing an appropriate site can save you many hours of despair. Wrecking your first aircraft is like a death in the family. It can take quite some time to re-gain your confidence. If the unthinkable does eventuate, the best thing to do is get out the super glue and masking tape the minute you get home.

Inland sites are usually more hazardous than coastal sites because the lift is not as consistent and the sink factor (or a dramatic drop in lift) is more apparent. However, as you become more adventurous, you will discover more appropriate sites and your flying will improve considerably.

Accidents occur for a multitude of reasons. e.g. the sudden appearance of fences, trees, dams, boulders, cattle, houses and other person-made and/or natural obstacles that one may care to imagine. Blaming oneself for bad flying and the inability to grasp the hobby is not uncommon. Believe me, learning to fly at a suitable slope soaring site is a dose of good medicine, especially when you find that you can perform landing after landing without pranging.

Turbulence or rotors as they are called (similar to that which killed celebrity Graham (Shirley) Strachan from the pop group, SKYHOOKS), are also a real problem if you don’t know the area well enough. In particular, slopes which are very steep and at the same time host strong and gusty winds, tend to develop massive rotors to the rear of the slope. There are different theories on how rotors are formed. My theory is that when a slope is vertical or thereabouts, there is an incoming wind which blows in two directions. One blows in predominately horizontally across the top of the slope (or cliff) and one blows directly into the slope face, then changes direction to the vertical. When the two directions of winds meet at the top of the slope, a swirling action occurs, thus a rotor is formed. The more vertical the cliff, the bigger the rotor.

One day whilst slope soaring, I was nearby when rotor activity caught a para-glider pilot by surprise. Unaware of the danger, the inexperienced pilot wandered into the danger zone when suddenly his chute collapsed (from a height of about 20 metres) due to the amount of turbulence. It sent him crashing to the ground with a huge thud, leaving quite a divot in the earth. The rotor he got caught in was approximately 15 metres back from the 30 metre high vertical cliff-face. He was stabilised and rushed to hospital via air ambulance. Fortunately the man sustained only bruising and shock.

~ IDEAL WEATHER CONDITIONS ~

If the wind strength is less than 15 knots, don’t expect to get high marks. With no propeller up front, consistent wind strength onto the slope will be one of your closest companions. The other will be thermals.

~ THE RIGHT GLIDER ~

It is preferable to have a glider with an efficient wing section which has plenty of power (or penetration) to perform aerobatics, whilst sustaining reasonable air-speed.

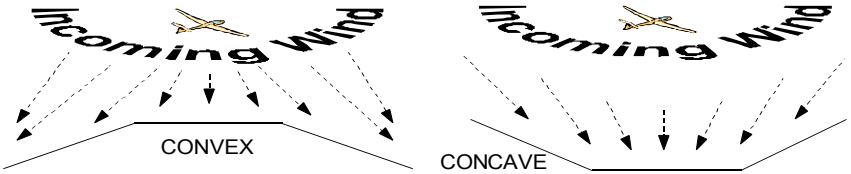
~ SKYROADS ~ (or Highways in the Sky)

Ever tried driving your car off the road in a built up area? If you have done so successfully, then you will have had to avoid obstacles like curbs, poles, fences, trees and buildings - just to mention a few. Obviously, the way to get from **a** to **b** is to drive your car along the road. This way there is a good chance that you'll get to your destination in relative comfort and safety.

The same principle applies when performing aerobatic manoeuvres. One should stick to the road or highway in the sky known as a **SKYROAD** to get the best performance out of one's glider. Different sites will give vastly different results and therefore, some time must be spent assessing the terrain and picturing the (invisible) **skyroad** in your mind before commencing an aerobatics program.

~ THE PERFECT SPOT ~

Good slopes have invisible or imaginary **perfect spots** as I prefer to call them. This is the position where you must aim to have your glider when half way through any required manoeuvre. If this spot is not found or known before you commence, you won't necessarily please the judges, especially if the manoeuvre is not performed **central to the judges' allocated viewing window**. The diagrams below give some indication as to where you might find that **perfect spot**.



~ WIND DIRECTION ~

The wind should be incoming to the slope for maximum performance. If it's not, then this could severely affect the corridor and length of the **skyroad**. The wind direction is a crucial factor in deciding upon the direction of the **flightpath** (or **skyroad**) you have chosen to fly your aircraft along. (See also diagrams above.)

~ FLYING YOUR TRANNY ~

A bad habit beginners tend to get into is transferring their emotional thoughts to their transmitter sticks. This isometric body language can be quite noticeable to others. Pilots have been observed waving their body around to such a degree, that their transmitter appeared to be doing almost as much flying as their aircraft. It's hard to break this habit (which we've all done) if it is not pointed out in the early stages. One reason for flying your tranny is if your aircraft is not trimmed correctly. For instance, an aircraft may have a tendency to constantly roll to one side. To counter act this, some pilots will tilt their transmitter (sometimes the whole body) to the opposite side in the hope of compensating for the roll. If that doesn't work, then biting their tongue will surely self-correct the trim – and pigs can fly! If you are made aware of this problem in the early stages, you can take control of the situation before it takes control of you.

Flicking or releasing the thumbs from the transmitter sticks (for those who use thumbs instead of fingers) is also a bad habit to get into - particularly when performing aerobatics. The manoeuvre where this is most noticeable occurs at the end of the **Three Turn Spin,** when the aileron control is released suddenly (if using Mode 1). It is at this point that you have lost control of your aircraft. So keep your thumbs firmly on the sticks and you'll perform manoeuvres more accurately and with greater safety.

~ LENGTH OF SLOPE ~

A long stretch of slope face, say about 200 metres, will give a longer and smoother **skyroad** with which to fly a glider. A narrow slope (particularly convex shaped ones), will give your glider a bumpy ride as the incoming wind rapidly disperses itself around the sides of the slope. This will also take much of the lift with it. As a consequence, the narrower slope will only have a short stretch of **skyroad.** It is very important to seek out a suitable corridor or starting point, which will enable you to commence building up sufficient speed before performing the manoeuvre proper. The correct speed is crucial for maximum performance. The concave slope will always give better lift, as the wind compresses towards the centre.

~ DIRECTION OF GLIDER ~

On numerous occasions, pilots have been seen to commence manoeuvres in the wrong direction, with obvious consequences. If propeller-driven gliders were allowed to be used in an aerobatics event, then it would be easier to give advice on positioning your aircraft for every manoeuvre. Therefore, only suggestions can be given, as it will depend on several factors as to how any given manoeuvre should be performed.

To keep within the **judges' allocated viewing window**, it is sometimes easier to perform certain manoeuvres starting from one side of the slope, then flying outwards on a flightpath which is at forty-five degrees to the slope, finishing at the other side of the slope. This option is taken provided the wind direction is coming predominantly onto the slope. This will also give you maximum length of **skyroad** within which to perform a manoeuvre effectively, yet at the same time, remain within the **judges' allocated viewing window**.

~ THE IDEAL SLOPE ~

Manoeuvres can also be performed at ninety degrees to the slope or across the slope, depending on the following variables: a. The type of manoeuvre. b. One's ability. c. The type of glider. d. The speed at which your glider is travelling. Learn the chapter, **CODE OF DEFINITIONS**, particularly the paragraph headed **MANOEUVRE**.
A long stretch of slope face, say about 200 metres and not less than 50°, will give a longer and smoother **skyroad** with which to fly a glider. A narrow slope (particularly convex shaped ones), will give your glider a bumpy ride as the incoming wind rapidly disperses itself around the outskirts of the slope. This will also take much of the lift with it. As a consequence, the narrower slope will only have a short stretch of **skyroad.** It is very important to seek out a suitable corridor or starting point, which will enable you to commence building up sufficient speed before performing the manoeuvre proper. The correct speed is crucial for maximum performance. The concave slope will always give better lift, as the wind compresses towards the centre.

~ CODE OF DEFINITIONS ~

MANOEUVRE: A manoeuvre well done is performed with grace and accuracy. It is **commenced** and **completed** with clarity and a sense of crispness that is pleasing and central to the **judges' allocated viewing window**.

COMMENCE: A competitor should say, ***"commence,"*** at the start of each manoeuvre. i.e. at the beginning of entry to the 'distinct horizontal line'.

COMPLETE: A competitor should say, ***"complete,"*** at the end of each manoeuvre. i.e. at the end when the 'distinct horizontal line' of exit has been completed.

ROLLS: A roll (or part thereof) must be executed in the same direction both on entry and exit of manoeuvre.

SEGMENT: A segment is one part of a manoeuvre, which has been divided into sections or pieces, so that downgrades or faults in a manoeuvre can be more easily identified.

DOWNGRADE: A downgrade is a means by which to penalise a manoeuvre, by deducting a point or points per segment and/or overall to come up with a score out of 10. Segments are to be downgraded by a minimum of 1 point if a minor fault is evident and by a maximum of 3 points if the fault is major.

PRESENTATION: A presentation mark of between 1 and 2 points may be deducted on completion of each manoeuvre, if downgrades are not deducted, yet the judge is well aware that the manoeuvre was not worthy of full points.

The reasons could be as follows:

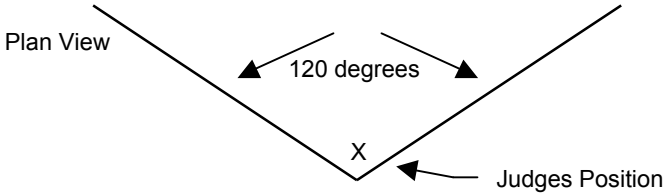
1. On reflection, the manoeuvre was not performed crisply, smoothly and evenly overall.
2. The aircraft's flightpath was inconsistent to the requirements, but not necessarily noticed to any degree until completion.
3. The manoeuvre was not performed in the required area allocated by the judges.
4. The manoeuvre was not performed central to the judges allocated viewing window.
5. The manoeuvre was not performed gracefully. i.e. the manoeuvre was performed the quickest and easiest way possible to avoid mistakes.
6. The aircraft may have varied its direction to that of its original heading but not necessarily noticed to any degree until completion.

FLIGHTPATH: The flightpath is the direction that the aircraft is heading along or required to head in, in order to successfully complete any given manoeuvre. If the flightpath varies in any way whilst performing a given manoeuvre, a loss of points may be applied by the judges.

ATTITUDE: The attitude (not altitude) is the angle or direction in which the aircraft is facing, whilst flying along the required flightpath. For example, due to the "wind factor", which predominantly blows in one direction, the attitude of the aircraft may be allowed to change without being downgraded. NOTE: If an attitude compensation is not made during the manoeuvre, the aircraft will most probably change its required flightpath and the manoeuvre may end up not looking circular. i.e. looking egg-shaped or elliptical (vertical or horizontal looking). This will result in a loss of points.

~ JUDGES ALLOCATED VIEWING WINDOW ~

A manoeuvre should be performed within a specified area as depicted below. If it is not, then the judges can downgrade any given manoeuvre for not appearing to be central, flying too high or too low or starting and finishing too far away from the **judges allocated viewing window**.



~ SPEED CONTROL ~

Unlike a powered aircraft, the speed of one's aircraft is controlled primarily by the incoming wind. Therefore, the ground speed of your aircraft could change dramatically if certain compensations are not made, depending of course on the type of manoeuvre being performed at the time.

Take for example the loop. When pulling up into a loop (after entering the horizontal flightpath), you will have to either speed up or slow down your aircraft in order to attain the required flightpath – no matter which direction you choose to commence the loop. If you do not take this action, your loop could end up looking like an ellipse. Judges should take special note of this phenomenon.

If the manoeuvre is performed correctly, that is, the loop is round or circular in appearance, the necessary change in speed at particular points of the loop could appear to be incorrect. This deception should be carefully noted. As previously mentioned in the chapter, **ATTITUDE**, accuracy of a manoeuvre is far more important than inconsistency in speed.

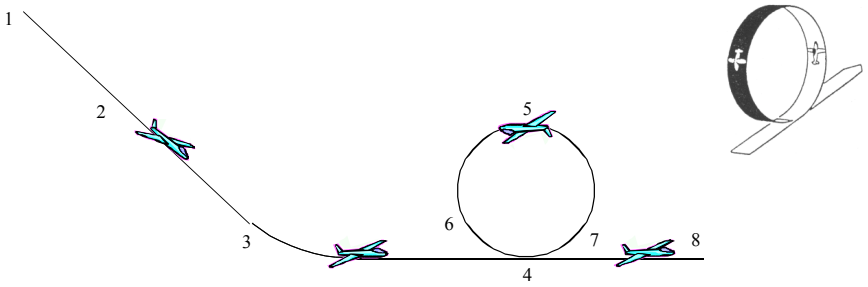
2003. Kilcunda - Ridge Road, Kilcunda.

South Slope

To follow are four specifically detailed examples in both extended and précised form.

CORRECTLY PERFORMING A MANOEUVRE

USING THE LOOP AS AN EXAMPLE



EXTENDED VERSION

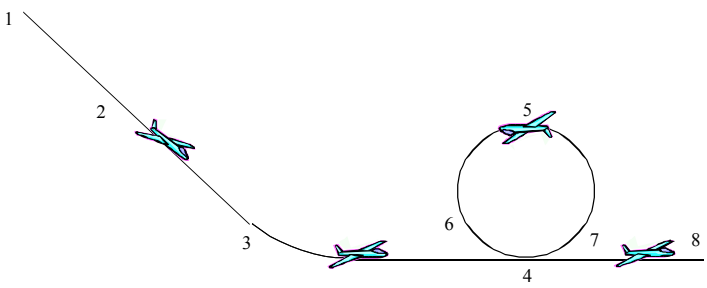
NOTE: Before commencing any manoeuvre read **PART 2** of **HIGHWAYS IN THE SKY.** The chapters, **SKYROADS, THE PERFECT SPOT, LENGTH OF SLOPE, WIND DIRECTION, DIRECTION OF GLIDER, ATTITUDE, SPEED CONTROL and FLIGHTPATH,** give important details on performing manoeuvres correctly.

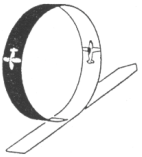
Firstly select or 'sight up' the PERFECT SPOT. i.e. the point at which you expect your glider to be situated half way through the actual loop.

1. **Gain sufficient height.** The starting point of the dive should be at a distance which will allow sufficient speed to be attained in order to perform the loop successfully. NOTE: If being judged, **the judges' allocated viewing window** does not come into being until the beginning of the horizontal plane.
2. **Dive your glider** - preferably at an angle of approximately 45º or less, depending upon the conditions. Diving too steeply will force you to pull out your glider to the horizontal plane too abruptly, causing an undesirable rapid loss of speed. Diving too shallowly will also not give the desired speed.
3. **Level out to the horizontal plane.** A common error in aerobatics is commencing the loop directly after the dive. If a **discernible** horizontal plane is not established, a judge cannot decipher a (standardised) beginning and an end to any given manoeuvre. However, if you are just having a go and don't care about the judging part, then don't get too stressed about doing the horizontal bit. Levelling out can come later when you are more confident in your ability to control your glider. Actually, there are times when flying particular scale aircraft, where the horizontal plane may not be applicable.
4. **Commence the loop proper by evenly pulling back on the elevator. Use the ailerons/rudder minimally to correct drifting.**
5. **At the top of the loop, ease off slightly on the elevator. Continue to ease off as the glider commences its vertical descent.** If this part is not performed properly, your glider will pull out of the loop too early due to the anomalies created by the incoming wind. During this procedure, you will most likely have to change the **attitude** of your glider in order to keep the loop circular. This procedure usually takes a lot of practise to get it right. See the chapter, **ATTITUDE (of a glider).**
6. **When coming out of the loop, slightly pull back on the elevator and ease back onto the horizontal plane.**
7. **Slightly push the elevator forward to prevent the glider from ballooning upwards.** (Ballooning is another common mistake.)
8. **Remain on the horizontal plane for a discernible distance (around one second or two) to complete the manoeuvre.**

~ CORRECTLY PERFORMING A MANOEUVRE ~

USING THE LOOP AS AN EXAMPLE





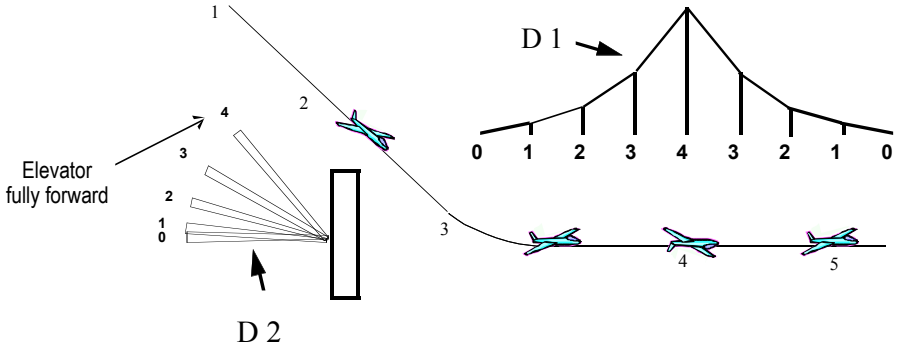
PRÉCISED VERSION

Gain sufficient height.
Dive your glider.
Level out to the horizontal plane.
Commence loop by evenly pulling back on elevator. Use ailerons/rudder to correct drifting or corkscrewing.
At top of loop, slightly ease off elevator.
When coming out of loop, slightly pull back on elevator and ease back into horizontal plane.
Minimally push elevator forward to prevent glider from ballooning upwards.
Remain on horizontal plane for a discernible distance before leaving horizontal plane.

South Coast Soarers, A300 Airbus. 1990's club project.
Maiden flight at Barrabool, near Geelong, Victoria.

~ CORRECTLY PERFORMING A MANOEUVRE ~

USING THE AXIAL ROLL AS AN EXAMPLE



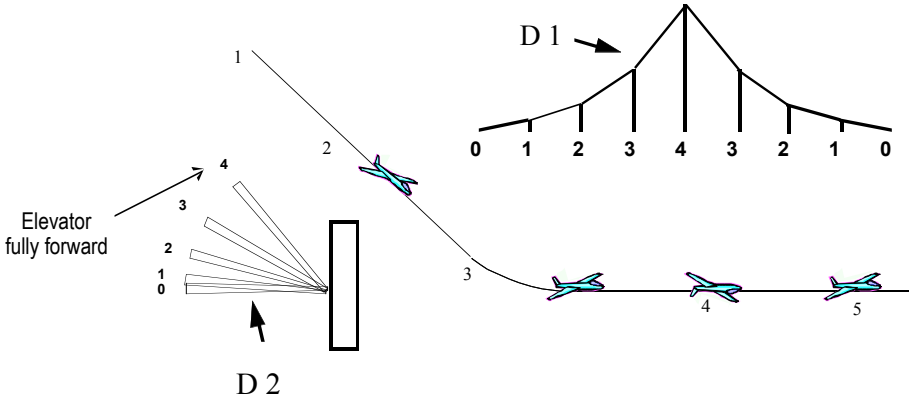
EXTENDED VERSION

NOTE: Before commencing any manoeuvre, read **PART 2 - HIGHWAYS IN THE SKY.** The chapters, **SKYROADS, THE PERFECT SPOT, LENGTH OF SLOPE, WIND DIRECTION, DIRECTION OF GLIDER, ATTITUDE, SPEED CONTROL AND FLIGHTPATH**, give important details on performing manoeuvres correctly.

Firstly select or 'sight up' the PERFECT SPOT. i.e. the point at which you expect your aircraft to be situated half way through the actual roll.

1. **Gain sufficient height.** The starting point of the dive should be at a distance which will allow sufficient speed to be attained in order to perform the roll successfully. NOTE: If being judged, the **judges' allocated viewing window** does not come into being until the beginning of the horizontal plane.
2. **Dive your glider** - preferably at an angle of approximately 45º or less, depending upon the conditions. Diving too steeply will force you to pull out your aircraft to the horizontal plane too abruptly, causing an undesirable rapid loss of speed. Diving too shallowly will also not give the desired speed.
3. **Level out to the horizontal plane.** A common error in aerobatics is commencing the roll directly after the dive. If a **discernible** horizontal plane is not established, a judge cannot decipher a (standardised) beginning and end to any given manoeuvre. However, if you are just having a go and don't care about the judging part, then don't get too stressed about doing the horizontal bit. Levelling out can come later when you are more confident in your ability to control your aircraft. Actually, there are times when flying particular scale aircraft, where the horizontal plane may not be applicable.
4. **Commence the roll proper** by evenly moving ailerons right (or left depending upon your preference). At the same time push the elevator forward, exponentially. i.e. gradually increasing the throw of the control stick. See diagrams (above) D1 - exponential graph and D2 - control stick. Some years ago, I accidentally discovered that it is better to start pushing the elevator forward immediately you start rolling, as opposed to when your aircraft is inverted. In using this procedure, you will prevent the aircraft from barrelling to one side (or wandering off the axial centre line or horizontal flightpath).
5. **When the model has rolled 360° (or has completed one full roll) centre the ailerons control,** so that the model is flying level and in the upright position.
6. **Remain on horizontal plane for a discernible distance,** before leaving the horizontal plane.

~ CORRECTLY PERFORMING A MANOEUVRE ~
USING THE AXIAL ROLL AS AN EXAMPLE

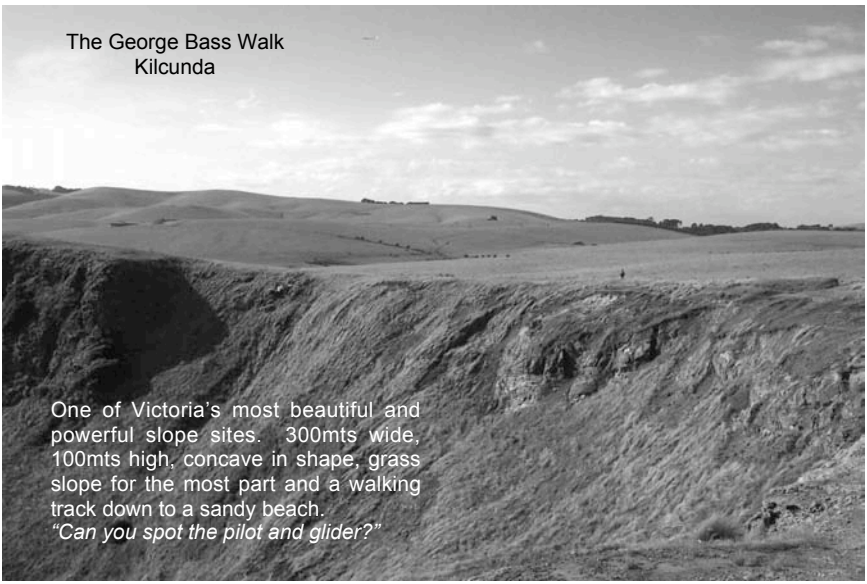


PRÉCISED VERSION
Gain sufficient height.
Dive your glider.
Level out to the horizontal plane.
Commence the roll proper by evenly moving ailerons right (or left depending upon your preference).
At the same time push the elevator forward in an exponential manner.
When inverted, pull back on the elevator in a vice-versa manner.
When the model has rolled 360°, centre the aileron control so the model is flying level and in the upright position.
By now the elevator should also be back in the centre position.
Remain on horizontal plane for a discernible distance before leaving horizontal plane.

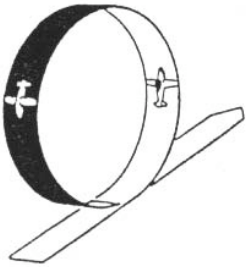

The 2005 Victorian Slope Aerobatics Championship, Mount Hollowback, Bald Hills.

Manoeuvres used for aerobatics events

		Kf
1.	Two consecutive loops	1.0
2.	Axial roll (entry & exit in same direction)	1.0
3.	Five second inverted flight (entry & exit in same direction)	1.0
4.	Two consecutive stall turns	1.0
5.	Three turn spin	1.0
6.	Optional manoeuvre #1 (to be nominated from list below)	
7.	Optional manoeuvre #2 (to be nominated from list below)	
	- Two outside loops	2.5
	- Four point roll	2.0
	- Three consecutive rolls	2.0
	- Cuban eight	2.0
	- Three turn inverted spin	2.5
	- Circle	1.5
	- Inverted circle	2.0
	- Barrel roll	1.5
	- Discernable knife edge – approximately 3 seconds	2.0
	- Double Immelman	2.0
	- Double Reverse Immelman	2.5
	- Eight point roll	2.0
	- Top hat – modified – no rolls, suit rudder/elevator models	1.5
	- Top hat – half roll upward leg, half roll downward leg	2.5
	- Extended loop - suit elevator/rudder models	1.0
	- Five second knife edge	2.0
	- Figure eight	2.0
	- Inverted figure eight	2.5
8.	Touch and go (includes rectangular pattern)	1.0
9.	Rectangular pattern	1.0
10.	Safety approach & land	1.0

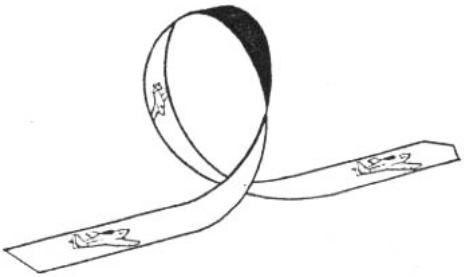


LOOP



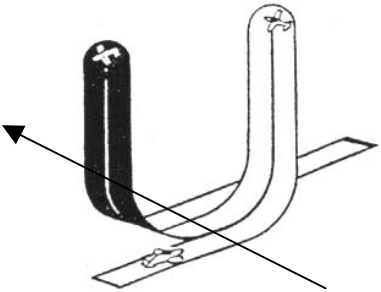
Flightpath on entry not a distinct horizontal line.
Wing or 'roll axis' not level or parallel to flightpath.
Loop/s not flown entirely in the vertical plane.
i.e. Aircraft drifts or corkscrews to one side.
Loop/s not a true circle or circular.
Consecutive loops (if required) do not superimpose one another.
Consecutive loops not flown without interruption.
Flightpath on exit not a distinct horizontal line.
Wing or 'roll axis' not level or parallel to flightpath.
Flightpath of exit not at same altitude as flightpath of entry.
Aircraft's flightpath changes heading during manoeuvre by more than 15 degrees to that of original heading.

BARREL ROLL - CIVILIAN



Flightpath on entry not a distinct horizontal line.
Wing or 'roll axis' not level or parallel to flightpath.
Roll does not have a crisp and well-defined start and stop.
Roll rate to inverted is not smooth and constant.
Model, when at the highest point of the roll (now inverted), is not lying horizontal and level and does not have its nose pointing at 90 degrees to the flightpath of entry.
Flightpath of model does not appear to be travelling around the outside of an imaginary cylinder.
Flightpath on exit not a distinct horizontal line.
Wing or 'roll axis' not level or parallel to flightpath.
Flightpath of exit not at same altitude as flightpath of entry.
Aircraft's flightpath changes heading during manoeuvre by more than 15 degrees to that of original heading.

TWO STALL TURNS



Ammended 2008:

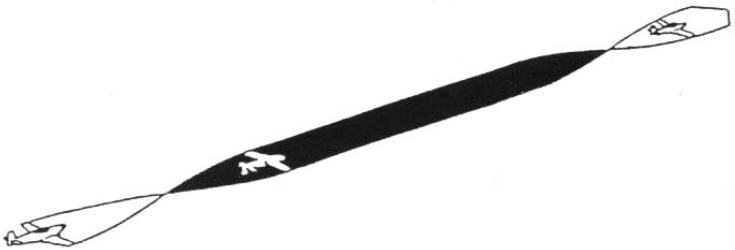
- Commence manoeuvre upwind, directly out from slope on a straight and level flightpath (as indicated by arrow).
- Turn 90° right (or left) and perform 1st stall turn.
- Continue to fly across slope to opposite side and perform 2nd stall turn.
- Fly back to centre, turn upwind and finish manoeuvre on same flightpath as you commenced.
- Presentation of manoeuvre to look symmetrical.

Flightpath on entry not a distinct horizontal line.
(Starting point to be at the same point of vertical section as the second stall turn.)
Wing or 'roll axis' not level or parallel to flightpath.
Quarter loop entry to the stall is not even or circular.
Upward vertical section not a distinct vertical line.
Stall turn not even and not on the yaw axis. Exit of turn must not 'pendulum' or yaw from side to side.
Downward vertical section not a distinct vertical line.
Semi-circle not circular and lowest part of semi-circle not at the same altitude as flightpath of entry and exit.
Upward vertical section of 2nd stall turn not a distinct vertical line.
Vertical section of 2nd stall turn not at the same point as starting point of manoeuvre.
Upward vertical section of 2nd stall turn not a distinct vertical line.
2nd stall turn not even and not on the yaw axis. Exit of turn must not "pendulum" or yaw from side to side.
Downward vertical section of 2nd stall turn not a distinct vertical line.
Quarter loop exit is not even or circular.
Flightpath on exit not a distinct horizontal line.
Wing or 'roll axis' not level or parallel to flightpath.
Manoeuvre does not finish discernibly past the vertical section of 1st stall turn.
Flightpath of exit not at same altitude as flightpath of entry.
Aircraft's flightpath changes heading during manoeuvre by more than 15 degrees to that of original heading.

AXIAL ROLL

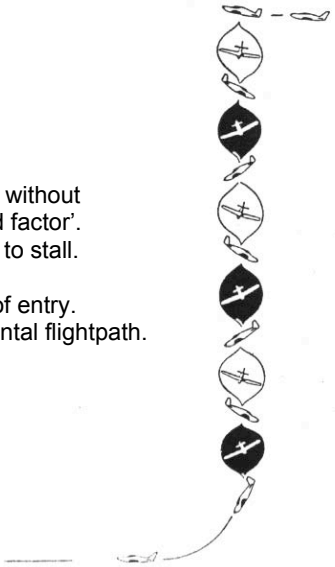
Flightpath on entry not a distinct horizontal line.
Wing or 'roll axis' not level or parallel to flightpath.
Roll does not have a crisp and well-defined start and stop.
Roll rate is not smooth and constant and/or flightpath shows a change in altitude.
Flightpath on exit not a distinct horizontal line.
Wing or 'roll axis' not level or parallel to flightpath.
Flightpath of exit not at same altitude as flightpath of entry.
Aircraft's flightpath changes heading during manoeuvre by more than 15 degrees to that of original heading.

INVERTED FLIGHT



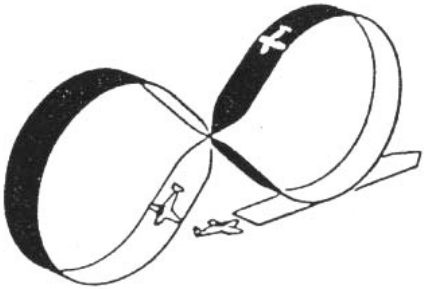
Flightpath on entry not a distinct horizontal line.
Wing or 'roll axis' not level or parallel to flightpath.
Roll to inverted does not have a crisp and well-defined start and finish.
Inverted flight is not smooth and even and/or changes altitude.
Roll to upright does not have a crisp and well-defined start and finish.
Roll rate from inverted to upright is different to that of upright to inverted.
Flightpath on exit not a distinct horizontal line
Wing (or 'roll axis') not level or parallel to flightpath.
Flightpath of exit not at same altitude as flightpath of entry.
Aircraft's flightpath changes heading during manoeuvre by more than 15 degrees to that of original heading.

THREE TURN SPIN



Flightpath on entry not a distinct horizontal line.
Wing or 'roll axis' not level or parallel to flightpath.
Note: Aircraft is allowed to gain altitude or fly in reverse without being downgraded whilst entering spin - due to the 'wind factor'.
Aircraft lifts one wing or does a 'Wingover' in attempting to stall.
Spins not tight, even and/or crisp.
Last spin is not completed on same flightpath direction of entry.
Aircraft does not complete a neat 1/4 circle to the horizontal flightpath.
Wing or 'roll axis' not level or parallel to flightpath.
Aircraft's flightpath changes heading during manoeuvre by more than 15 degrees to that of original heading.

CUBAN EIGHT



Flightpath on entry not a distinct horizontal line.
Wing or 'roll axis' not level or parallel to flightpath.
First 5/8 of loop not circular.
First loop (or part thereof) not flown in the vertical plane.
i.e. aircraft drifts or corkscrews to one side.
Roll-out from inverted to upright not performed evenly at 45 degrees to entry/exit flightpath.
First 5/8 of second loop not circular.
Second loop (or part thereof) not flown in the vertical plane.
Roll-out from inverted to upright not performed evenly at 45 degrees to entry/exit flightpath.
Aircraft does not complete a neat and proper 1/8 circle.
Flightpath on exit not a distinct horizontal line.
Wing or 'roll axis' not level or parallel to flightpath.
Flightpath of exit not at same altitude as flightpath of entry.
Aircraft's flightpath changes heading during manoeuvre by more than 15 degrees to that of original heading.

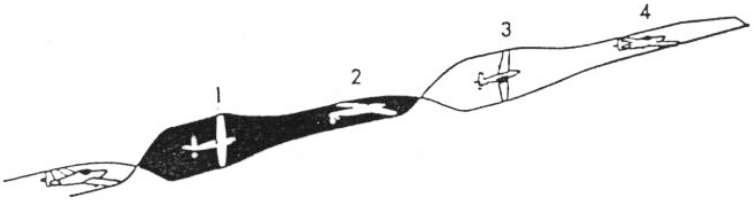
INVERTED CIRCLE

Flightpath on entry not a distinct horizontal line.
Wing or 'roll axis' not level or parallel to flightpath.
Roll rate to inverted does not have a crisp and well defined start and finish.
Inverted circle is not constant and/or circular.
Flightpath on completion of circle is different to that of entry.
Roll rate to upright does not have a crisp and well-defined start and finish.
Wing or 'roll axis' not level or parallel to flightpath.
Flightpath on exit not a distinct horizontal line.
Flightpath of exit not at same altitude as flightpath of entry.
Aircraft's flightpath changes heading during manoeuvre by more than 15 degrees to that of original heading.

OUTSIDE LOOP

Flightpath on entry not a distinct horizontal line.
Wing or 'roll axis' not level or parallel to flightpath.
Roll to inverted does not have a crisp and well-defined start and finish.
Outside loop/s not flown entirely in the vertical plane.
I.e. Aircraft drifts or corkscrews to one side.
Outside loop/s not a true circle or circular.
Consecutive outside loop/s (if required) does not superimpose one another.
Consecutive loops not flown without interruption.
Roll to upright does not have a crisp and well-defined start and finish.
Roll rate from inverted to upright is different to vice versa.
Flightpath on exit not a distinct horizontal line.
Wing or 'roll axis' not level or parallel to flightpath.
Flightpath of exit not at same altitude as flightpath of entry.
Aircraft's flightpath changes heading during manoeuvre by more than 15 degrees to that of original heading.

FOUR POINT ROLL

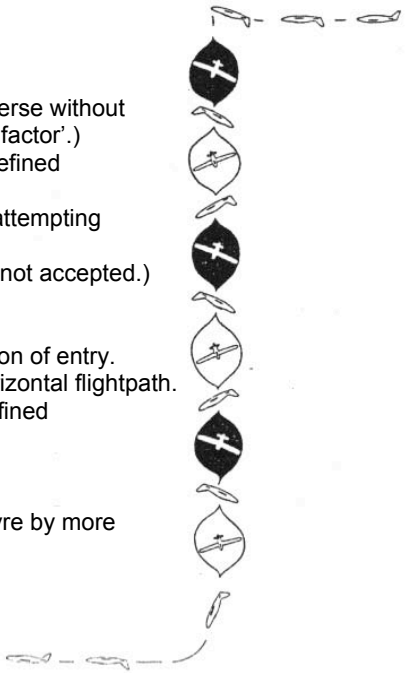


Flightpath on entry not a distinct horizontal line.
Wing or 'roll axis' not level or parallel to flightpath.
First 1/4 roll does not have a crisp and well defined start and finish, is not smooth and even and/or shows a change in altitude. (1 downgrade point per 1/4 roll – minimum.)
Second 1/4 roll - ditto.
Third 1/4 roll - ditto.
Fourth 1/4 roll - ditto.
Flightpath on exit not a distinct horizontal line.
Wing or 'roll axis' not level or parallel to flightpath.
Flightpath of exit not at same altitude as flightpath of entry.
Aircraft's flightpath changes heading during manoeuvre by more than 15 degrees to that of original heading.

THREE AXIAL ROLLS

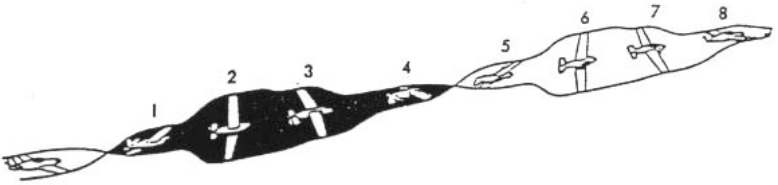
Flightpath on entry not a distinct horizontal line.
Wing or 'roll axis' not level or parallel to flightpath.
First roll does not have a crisp and well-defined start.
Roll rate is not smooth and constant and/or flightpath shows a change in altitude throughout the three rolls.
Third roll does not have a crisp and well-defined finish.
Flightpath on exit not a distinct horizontal line.
Wing or 'roll axis' not level or parallel to flightpath.
Flightpath of exit not at same altitude as flightpath of entry.
Aircraft's flightpath changes heading during manoeuvre by more than 15 degrees to that of original heading.

THREE TURN INVERTED SPIN



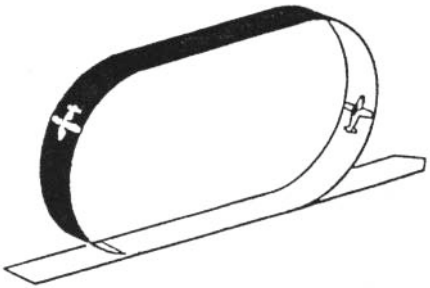
Flightpath on entry not a distinct horizontal line.
Wing or 'roll axis' not level or parallel to flightpath.
(Note: Aircraft is allowed to gain altitude, or fly in reverse without being downgraded whilst entering spin - due to 'wind factor'.)
Roll rate to inverted does not have a crisp and well-defined start and finish.
Aircraft lifts one wing tip or performs a 'Wingover' in attempting to stall.
First spin is not tight, even and crisp. (A slow dive is not accepted.)
Second spin - ditto.
Third spin - ditto.
Third spin is not completed on same flightpath direction of entry.
Aircraft does not complete a neat 1/4 circle to the horizontal flightpath.
Roll rate to upright does not have a crisp and well-defined start and finish.
Wing or 'roll axis' not level or parallel to flightpath.
Flightpath on exit not a distinct horizontal line.
Aircraft's flightpath changes heading during manoeuvre by more than 15 degrees to that of original heading.

EIGHT POINT ROLL



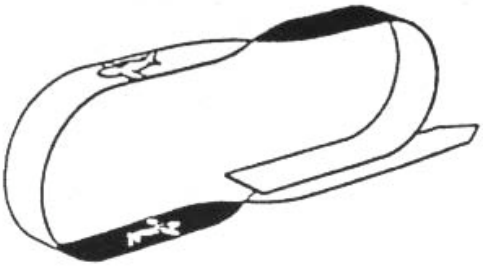
Flightpath on entry not a distinct horizontal line.
Wing or 'roll axis' not level or parallel to flightpath.
First 1/8 of roll does not have a crisp and well defined start and finish, is not smooth and even and/or shows a change in altitude.
Second 1/8 roll - ditto.
Third 1/8 roll - ditto.
Fourth 1/8 roll - ditto.
Fifth 1/8 roll - ditto.
Sixth 1/8 roll - ditto.
Seventh 1/8 roll - ditto.
Eighth 1/8 roll - ditto.
Wing or 'roll axis' not level or parallel to flightpath.
Flightpath on exit not a distinct horizontal line.
Flightpath of exit not at same altitude as flightpath of entry.
Aircraft's flightpath changes heading during manoeuvre by more than 15 degrees to that of original heading.

EXTENDED LOOP



Flightpath on entry not a distinct horizontal line.
Wing or 'roll axis' not level or parallel to flightpath.
Half loop not flown entirely in the vertical plane. i.e. aircraft drifts or corkscrews to one side.
First half loop is not circular.
Extended or inverted section does not comply to the required time of 3 seconds.
Extended section is not smooth and even and/or shows a change in altitude.
Second half of loop is not circular.
Wing or 'roll axis' not level or parallel to flightpath.
Flightpath on exit not a distinct horizontal line.
Flightpath of exit not at same altitude as flightpath of entry.
Aircraft's flightpath changes heading during manoeuvre by more than 15 degrees to that of original heading.

DOUBLE IMMELMANS

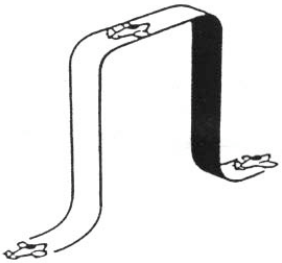


DOUBLE IMMELMAN - STANDARD
Performed as shown.

DOUBLE REVERSE IMMELAMAN
Performed similar except you roll the aircraft to inverted before commencing the manoeuvre proper. Bunt into 1st half loop, roll aircraft to inverted, pull into 2nd half loop and complete.

Downgrades below are for Double Immelman - standard
Flightpath on entry not a distinct horizontal line.
Wing or 'roll axis' not level or parallel to flightpath.
Half inside loop is not circular.
Half inside loop not flown entirely in the vertical plane. i.e. aircraft drifts or corkscrews to one side.
Half roll from inverted to upright not smooth and even.
Flightpath to 1/2 outside loop is not smooth and level.
Half inverted loop is not circular.
Half inside loop not flown entirely in the vertical plane. i.e. aircraft drifts or corkscrews to one side.
Half roll from inverted to upright not smooth and even.
Wing or 'roll axis' not level or parallel to flightpath.
Flightpath on exit not a distinct horizontal line.
Flightpath of exit not at same altitude as flightpath of entry.
Aircraft's flightpath changes heading during manoeuvre by more than 15 degrees to that of original heading.

TOP HATS

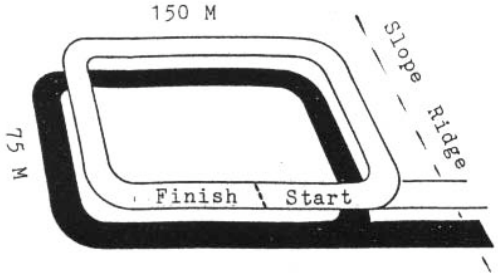


TOP HAT – MODIFIED
Performed as shown.

TOP HAT – WITH AXIAL ROLLS
Performed with one axial roll on the way up and one axial roll on the way down.

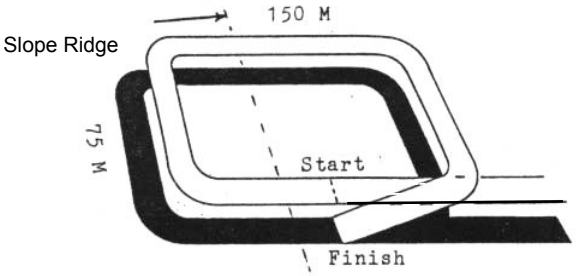
Downgrades below are for Top Hat - modified
1/4 loop to vertical leg not performed smoothly.
First vertical leg not a distinct vertical line.
1/4 bunt to horizontal not performed smoothly.
Horizontal leg not distinctly horizontal.
1/4 bunt to downward vertical leg not performed smoothly.
Second vertical leg not a distinct vertical line.
1/4 loop to horizontal leg not performed smoothly.
Wing or 'roll axis' not level or parallel to flightpath.
Flightpath on exit not a distinct horizontal line.
Flightpath of exit not at same altitude as flightpath of entry.
Aircraft's flightpath changes heading during manoeuvre by more than 15 degrees to that of original heading.

RECTANGULAR PATTERN



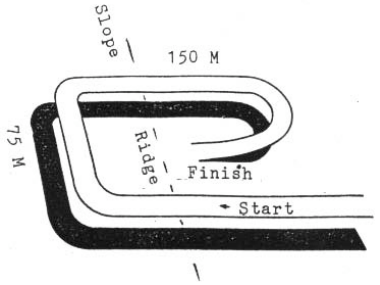
Flightpath on entry not a distinct horizontal line.
Wing or 'roll axis' not level or parallel to flightpath.
First leg is not level and/or changes altitude.
First turn is not smooth and even and/or changes altitude.
Second leg is not level and/or changes altitude.
Second turn is not smooth and even and/or changes altitude.
Third leg is not level and/or changes altitude.
Third turn is not smooth and even and/or changes altitude.
Fourth leg is not level and/or changes altitude.
Fourth turn is not smooth and even and/or changes altitude.
Return to first leg (or part thereof) is not level and/or changes altitude
and/or does not superimpose flight path entry (different altitude).
On reflection, some or all of the turns were not the same (or consistent).
On reflection, the rectangle was not performed evenly or in a rectangular manner.

RECTANGULAR APPROACH AND LANDING



Flightpath on entry not a distinct horizontal line.
Wing or 'roll axis' not level or parallel to flightpath.
1st leg is not level and/or changes altitude.
1st turn is not smooth and even and/or changes altitude.
2nd leg is not level and/or changes altitude.
2nd turn is not smooth and even and/or changes altitude.
3rd leg is not smooth and even and/or aircraft ascends. (Aircraft must descend only.)
3rd turn is not smooth and even and/or aircraft ascends.
4th leg is not smooth and even and/or aircraft ascends.
4th turn is not smooth and even and/or aircraft ascends.
Approach leg is not smooth and even.
Aircraft's landing is not performed neatly. Aircraft's nose is pointing more
than 45 degrees from approach flightpath.
On reflection, some or all of the turns were not the same (or consistent).
On reflection, the rectangle was not performed evenly or in a rectangular manner.

SAFETY APPROACH AND LANDING



Flightpath on entry not a distinct horizontal line.
Wing or 'roll axis' not level or parallel to flightpath.
1st leg is not level and/or changes altitude.
1st turn is not smooth and even and/or changes altitude.
2nd leg is not level and/or changes altitude.
2nd turn is not smooth and even and/or changes altitude.
3rd leg is not smooth & even and/or aircraft ascends. (Aircraft must descend only.)
Aircraft does not perform a smooth and even descending half circle.
(i.e. not circular or is out of shape.)
Approach leg is not smooth and even.
Aircraft's landing is not performed neatly. Aircraft's nose is pointing more than 45 degrees from approach flightpath.
On reflection, some or all of the turns were not the same (or consistent).
On reflection, the rectangle was not performed evenly or in a rectangular manner.

~ MANOEUVRES LISTED BELOW FROM RIBBON DRAWINGS - PLUS OTHERS ~

MANOEUVRES - OPEN

Two consecutive loops
Five second inverted flight
Two consecutive stall turns
Rectangular pattern
Two outside loops
Three consecutive rolls
Cuban eight
Four point roll
Three turn inverted spin
Inverted circle
Barrel roll - civilian
Inverted three turn spin
Axial roll
Three turn spin
Outward figure eight
Triangular pattern
Double Immelmann
Eight point roll
Modified top hat
Extended loop
Snap roll
Inverted figure eight
Split S
Modified double Immelmann

MANOEUVRES - NOVICE

Loop
Barrel roll - civilian
Rectangular pattern
Outward figure eight
Extended loop - three seconds
Stall turn
Two turn spin
Triangular pattern
Modified top hat
Snap roll

~ FREESTYLE AEROBATICS ~

Freestyle is something quite different to your usual run-of-the-mill aerobatics competition. If you can imagine combining ballroom dancing, ice-skating, springboard diving and of course slope soaring aerobatics, then welcome to **FREESTYLE**.

The good thing about this event is that you can use any type of aircraft for this event. If you hold this type of event, the following classes are suggested.

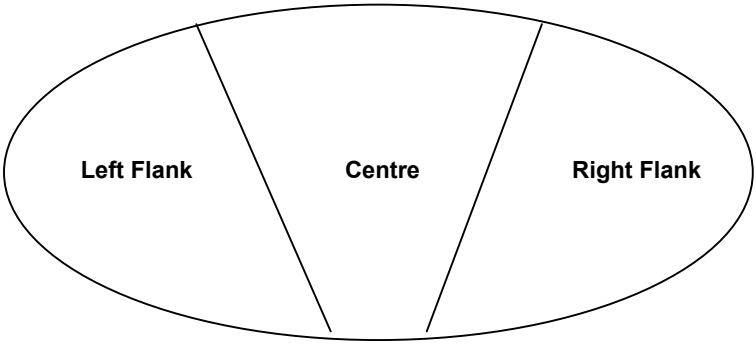
Open – any type of model.
One Class – restrictions such as flying wings or 2 metre rudder/elevator only etc.
Power Scale Soarers (PSS) – Jet or propeller class.

To make up a competition format, select appropriate manoeuvres from within this book. A round may require say, 10 manoeuvres in the routine.

The idea is to string together a series of manoeuvres, so as to give a smooth and graceful performance within a given area. The diagram below shows how you would break up the sky into three main areas. i.e. the left flank, the right flank and the centre.

To judge, you can use any one of the systems demonstrated in this book, such as ***MIND TWISTER***. You could also use your own rules (not enclosed) such as in powered aircraft.

Left Flank	**Centre**	**Right Flank**
Start →	Straight Pass →	Stall Turn
←	Axial Roll ←	
Immelmann →	Inverted Pass →	Split S
←	Barrel Roll ←	
Rolling turn →	Straight Pass →	Finish



~ A to Z CHECK LIST ~

A Always do a 30 metre range check with your aerial down before launching.

B Both receiver and transmitter aerial should be fully extended before launching.

C Regularly check batteries and/or battery packs for any signs of corrosion. Un-checked equipment may lead to battery failure at any time. One-piece battery packs are more suitable for aircraft.

D It is advisable (mandatory at some clubs) to have your radio equipment checked (certified) every 12 months by an approved technician.

E Make sure the control sticks on your transmitter are set correctly. i.e. for a two channel radio on mode one. When the left stick (elevator) is moved forward or up, your aircraft should descend. When the stick is moved back or down, your aircraft should ascend. When the right stick (rudder) is moved from left to right, your aircraft should move from left to right respectively.

F The on/off switch on your aircraft should be mounted in a position that can be clearly seen. It should also be in a position that cannot be easily knocked on accidentally.

G Be aware of other flyer's frequency before switching on your radio. Remember, it doesn't matter whether a set is AM, FM, or PCM. If the frequency on your radio's crystals read the same as another flyer's radio, then the radios will clash requencies.

H Always launch into the wind. For winch or hand-tow launching gliders, the wind direction should be coming in at no more than a 40 degrees variance to the direction that you are launching. For slope soaring, the variance should be no more than 20 degrees.

I Do not perform your maiden flight without an instructor.

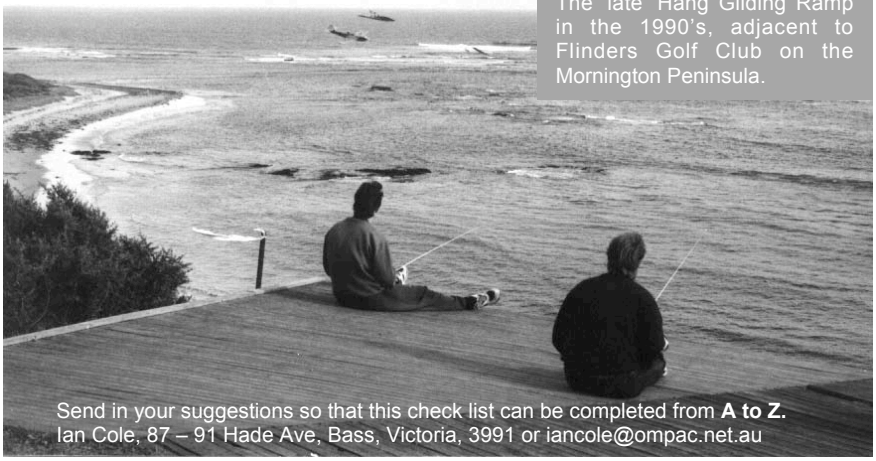
J If reversing switches on your transmitter (Tx) are easily knocked, cover them up with tape to avoid accidental switching.

K Always check that your aircraft control surfaces are operating correctly before launching.

L Always use appropriate glues for different surfaces/materials.

M Make sure that your aircraft is built without twists or warps, for maximum performance.

N If using Ni-rod for control linkages, make sure the outer casing is fixed permanently at either end.



The 'late' Hang Gliding Ramp in the 1990's, adjacent to Flinders Golf Club on the Mornington Peninsula.

Send in your suggestions so that this check list can be completed from **A to Z.**
Ian Cole, 87 – 91 Hade Ave, Bass, Victoria, 3991 or iancole@ompac.net.au

~ APPAREL FOR WINTER FLYING ~

Flying in cold conditions can be just as much fun as flying in warmer weather, providing you are appropriately dressed.

Winter flying can involve standing in chilly conditions where the ground is often wet. Obviously then, it's advantageous to dress correctly to maintain your body heat. Much of the heat loss comes from the exposed parts of the body. i.e. hands, head (face) and neck.

Let's start with the feet. It is important to keep the feet warm and dry, since you are usually not moving around much whilst slope soaring. Wear leather boots if possible. If the ground is wet, gum boots may be more appropriate although they don't hold body heat very well. Woollen socks are more suitable/effective than synthetic fibres.

Thick corduroy trousers and tracksuit pants will keep your legs warm. *Longjohns* will also avoid heat loss to some degree. Ski suits or the like keep you dry, but being made from synthetic materials, won't necessarily allow your body temperature to remain constant. Arguably, this could depend on how much you're prepared to spend. Waterproofs for the legs may be sufficient if conditions are extreme.

One or two jumpers worn over your tee shirt provide upper body warmth. Two medium or light-weight jumpers are better than one heavy jumper, as they provide for easier adjustment. A long Parka or jacket (preferably with a hood) is necessary. Keeping the wind out is imperative.

A balaclava is the best protection for head and neck. Otherwise use a scarf or beanie. A peaked cap or sunglasses are necessary, not only to protect your eyes against sun and wind burn, but also to give you better visibility.

Protection for the hands is a matter of preference. Whilst gloves will keep the heat in, they are very cumbersome for the fiddly tasks that flying entails. Fingerless gloves however, are ideal.

Keep your insides warm too. A thermos of hot soup or drink of some kind is the best remedy – especially since you will probably be some distance from a food store. Stay away from alcohol. The warming effect is largely an illusion, as it opens up the capillaries and actually speeds up heat loss.

Being too hot is as uncomfortable as being too cold. Just remember to always take more gear than you need. There is nothing worse than being cold and miserable on the slope.

Kilcunda - Ridge Rd.
North face, 2003.

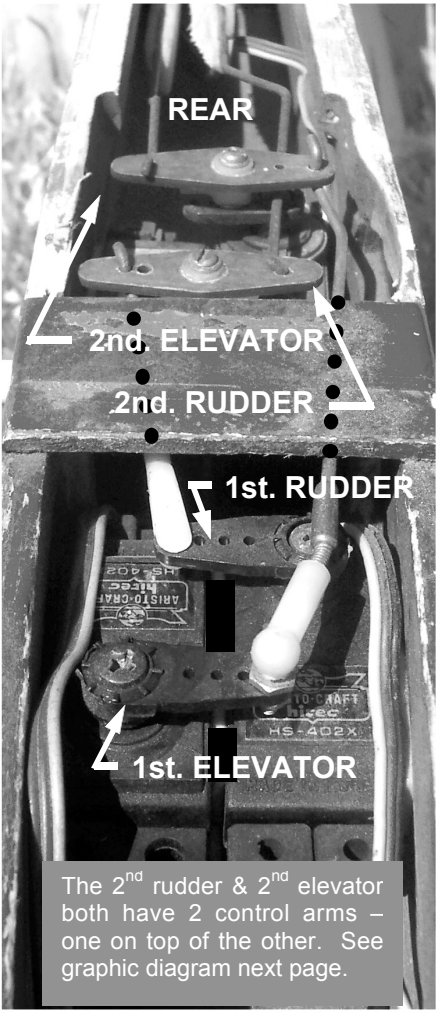
~ MULTI-MODE FLYING ~

INTRODUCTION: This is my (the editor's) multi-mode mixing system. The reason I developed it was so that I could learn to fly two models simultaneously. By operating the system using one transmitter only (and flying with one glider only - at this stage), I was able to learn to operate all modes of flying - simultaneously.
The **MMF** design came to me after studying Ralph Learmont's clever elevator/flap mixing system he designed, which I installed into my Ricochet. His system sure made landing fast models, much easier.
The photo below and the diagrams (next page) show how I have set up the **MMF** mixing system into my **Prelude**. There wasn't much room to fit the gear. Next time I would probably design the set-up differently.

ASSEMBLY: The servos had to be mounted at the same height, again due to limited space. To get all of the rods to by-pass the servo arms without obstruction, I've used a combination of metal rods, ball-links and quick-links. The servo arms are a combination of standard and home-made arms.

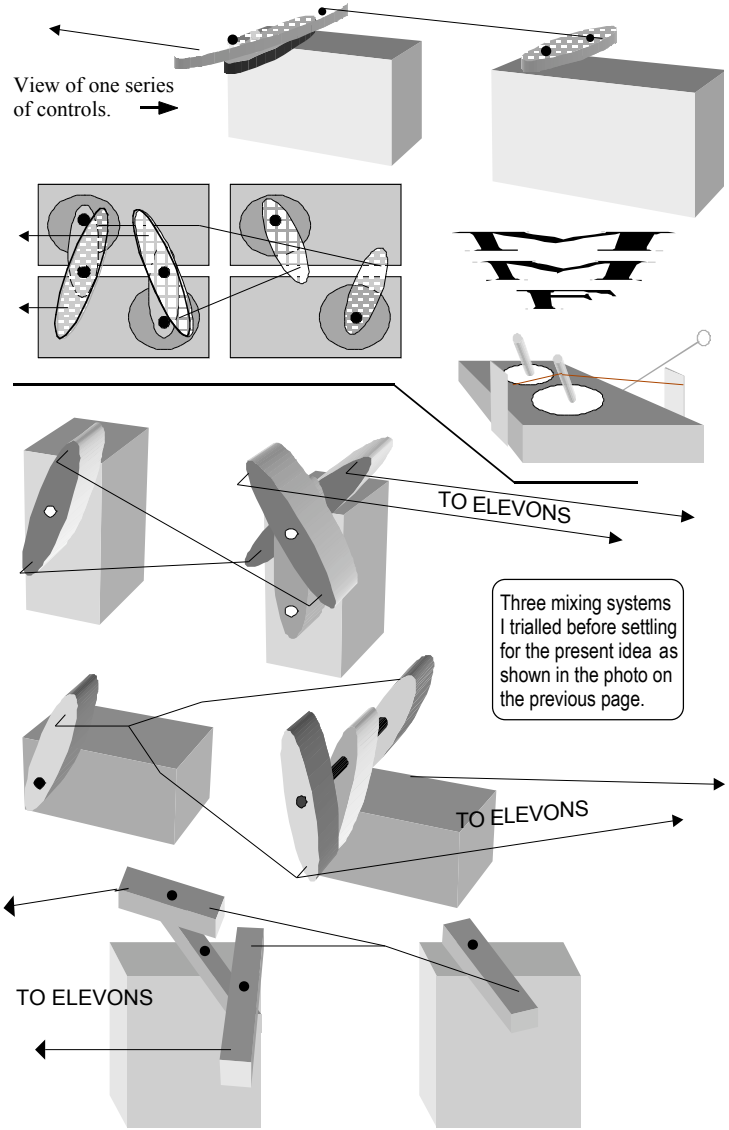
HOW IT WORKS: The diagrams on the next page indicate how the system works and not necessarily how I have set up my glider (pictured right). With so many combinations and at the risk of describing a method which may be inadequate for your model, I'm leaving it up to you to work out your own method of construction.

RATES: I suggest that you mock-up some cardboard templates and experiment with them on a table to get the desired rates for each channel. I haven't done much experimenting with the rates, however, my initial set-up has the rates of each pair of controls moving differently from each other. i.e. the left rudder for example has a different rate to the right rudder, and so on. It's just the way it worked out. I know if I spent a lot more time experimenting, I could fine-tune the movements to be the same. Don't be too concerned about where the centres of any particular servo arms sit. If they are not where you think they should be, it will simply mean that your set-up may experience some unwanted differential but it will still work satisfactorily.



The 2nd rudder & 2nd elevator both have 2 control arms – one on top of the other. See graphic diagram next page.

TRANSMITTER SET-UP: The dual rudder controls are on both the left and right sticks, likewise with the elevator controls. Now you can practise being ambidextrous. The U-shaped bracket is held in place by either rubber bands or double-sided tape. To centre the right-hand control stick, use either two rubber bands or better still, two fine tension springs. In my case I was able to unscrew the control stick, (which separated about half-way down) put the spring in place, then screw the top half of the stick back in place. However, if you can obtain a genuine spring to go in the appropriate position (inside the transmitter), this would obviously be the way to go.




Kilcunda

~ CONCLUSION ~

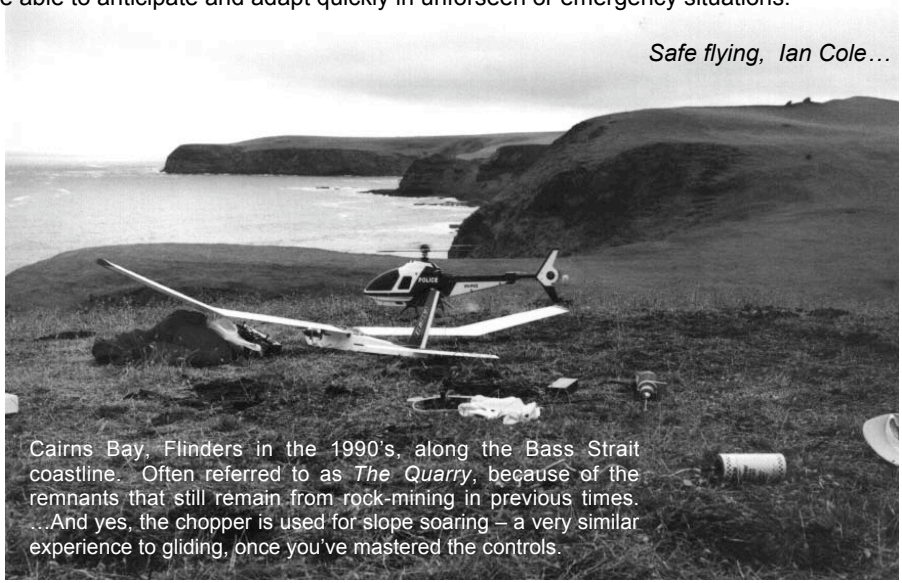
There is no doubt that the most difficult problem area of this handbook is the conversion from **Linear** to **Percentage**, particularly when you throw in the **Penalty Downgrading**, which must appear to be somewhat contradictory at first. The easiest way to learn to judge and gain confidence is to practise with other people, particularly if the same people are judging the same competition. Past performances with this system of judging, has proven this to be the case beyond all doubt.

We would all agree that there have been competitions where judges have had absolutely no qualifications, yet have somehow managed to come up with similar scores. You may have wondered if each judge was downgrading for the same reasons or if they were possibly using the previous aircraft's performance as a benchmark. Then again, maybe they were just guessing? To be a capable judge who can adjudicate fairly, consistently and accurately on a regular basis, one needs to have a common system to follow and to be able to freely discuss this system with others.

I am aware that these guidelines are not the perfect solution to eliminating subjective matter from aerobatics judging. However, they do go a long way towards making competitive aerobatics more inviting to the prospective aerobatics enthusiast. A judge using some, or all of the various judging guidelines as set out in this handbook, will be accurately adjudicating everyone in the fairest and most consistent way possible.

Finally, the aerobatics and accompanying data on flight requirements described in ***Aerobatics Plus***, go much further than just teaching you how to become accomplished at aerobatics. You will gain confidence, be able to fly more safely (including during launching and landing), become more aware of your surrounds and be able to anticipate and adapt quickly in unforseen or emergency situations.

Safe flying, Ian Cole…



Cairns Bay, Flinders in the 1990's, along the Bass Strait coastline. Often referred to as *The Quarry*, because of the remnants that still remain from rock-mining in previous times. …And yes, the chopper is used for slope soaring – a very similar experience to gliding, once you've mastered the controls.