Aerobatics for RC Slope Soaring

A guide to judging and competing
in slope aerobatics

Author: Ian Oliver Cole

~ Introduction ~

Aerobatics for RC Slope Soaring provides technical guidance for pilots and judges who are interested in learning the rudiments of slope aerobatics. This form of gliding takes advantage of the lift generated by the incoming wind flowing upwardly atop mountains, cliffs or steep hills to perform aerobatic manoeuvres - usually at speed.

Aerobatics for RC Slope Soaring is an updated version of ***Aerobatics Plus***, which was first published in 1998. This latest publication has 27 more pages than its predecessor and many new features, including eight new aerobatic manoeuvres.

Below are four known disciplines of aerobatics for winged model aircraft:

- **Pattern:** To perform a set of mandatory manoeuvres consecutively in an unbroken routine
- **Scale:** To perform a set of scale-like manoeuvres one at a time using a scale model aircraft
- **Slope Sequential:** To perform a set of mandatory manoeuvres one at a time
- **Freestyle:** To perform a free-flowing aerobatics routine of the pilot's choice with a selection of mandatory manoeuvres threaded throughout the routine

The Artwork: Microsoft Publisher combined with GNU Image Manipulation Program (GIMP) were used to create and enhance the drawings, respectively. The manoeuvres were modelled from scale mock-ups or part thereof with poetic license taken to improve their visual perception and general appearance. The end result is an array of picturesque manoeuvres presented in a step-by-step way.

About the Author: I began flying remote controlled gliders in 1979 at the age of 29. I flew in parks with basic gliders, launching them with a bungie and eventually with my home-made winch. In the mid 1980s I experienced slope soaring for the first time and immediately became hooked on aerobatics, most likely because it has technical similarities to a couple of my favourite pastimes, acrobatics and aquatic diving. In the 1990s I digressed to powered model aircraft, earned my Bronze and Gold Wings then qualified to become a flight instructor. Towards the end of the decade I learnt to fly helicopters. This form of aeromodelling requires steady hands to operate a throttle and three guidance controls simultaneously. Without a doubt helicopters improved my dexterity in slope aerobatics. In 2011, after a rewarding era in competitive slope soaring spanning four decades, I took time out to pursue other interests.

As with most sports, slope aerobatics requires many hours of practise to hone one's skills but the theory part is also important. Enter ***Aerobatics for RC Slope Soaring***. The book shares my knowledge of this underrated sport, including how to become proficient at performing and judging slope aerobatics. Formats to run four aerobatics contests are also listed with a selection of 25 manoeuvres from which to choose.

I'll leave you with this quote. '*You don't have to be the best pilot on the day, you just have to be dedicated, determined and well-rehearsed, moreso than your opposition'.*
Enjoy your slope soaring wherever the winds take you. Ian Cole.

The section on **The Mechanics of Judging Aerobatics** is quite daunting at first but once you've studied the literature thoroughly the information will eventually make sense. One might call it a new language and learning any language usually takes time to grasp. For this section to work well in practice the user will need to read most of the literature in the book because many of the sections tie in with each other.

The **Traditional** and **Extended** methods of judging explained in this book may have similarities to other forms of judging but this is merely coincidental. Both methods were designed from scratch. The **Traditional** method is targeted more toward novice judges but experienced judges would also find the content beneficial. Which method is used at a contest will depend on at least three of the following factors:

- The experience of the judges
- The calibre of the pilots competing
- The level of judging that will best suit the event

The **Judges Scoreboard**, used in conjunction with the recommended guidelines, is unique to aircraft judging. It provides an uncomplicated and concise way of helping the judges to score the manoeuvres with great accuracy.

In contests where experienced pilots are competing, judging should be conducted at a very high level. Whereas if novice pilots are competing, the level of judging might need to be moderated to encourage the pilots. To ensure consistency when multiple judges are called for, the judges need to be clear as to which level of judging they are going to adhere to. Naturally, a well-organised slope aerobatics contest should have foolproof rules, clear guidelines and built-in allowances for the variable weather conditions, the latter of which is to be expected at most slope soaring venues.

Cover Photo: A popular site at Kilcunda along the Bass Coast of Victoria, Australia.

~ Index ~

~ The Mechanics of Judging ~

This is a challenging section partly due to the difficulty of judging slope aerobatics subjectively or if you like, judging based on personal opinions. Nevertheless, once the user becomes familiar with the literature, judging fairly will become second nature.

Quality Judging

It goes without saying that we rely on the judges to score accurately, spontaneously and with consistency but they do not get it right all of the time, such is the nature of subjective judging. So the author came up with a concise but effective way to better manage the scoring. This was achieved by splitting the progression of a manoeuvre in flight into five manageable parts, visually speaking, then translating these parts into a collective of brief points written in shortened English. By adopting this method, the judges have an accurate way to identify possible penalties during an aerobatics flight. The sixth point listed below is to assess the overall performance once a flight has been completed. For example, to score a manoeuvre, each of the points below are assigned a numerical value, so that collectively a manageable score of minus 10 is able to be forfeited. If a manoeuvre is performed perfectly, a score of 10 out of 10 should be given. If a manoeuvre is failed, a score of 0 out of 10 should be given. As the manoeuvres can take up to 15 seconds to perform, it would not be advisable for the judges to refer to an instruction manual while a flight is in progress. Therefore, all six points would be expected to be memorised off by heart. Below are examples of these points, collectively known as the Deductions List.

(The Deductions List can be printed and attached to a Judges Scoreboard. See page 6.)

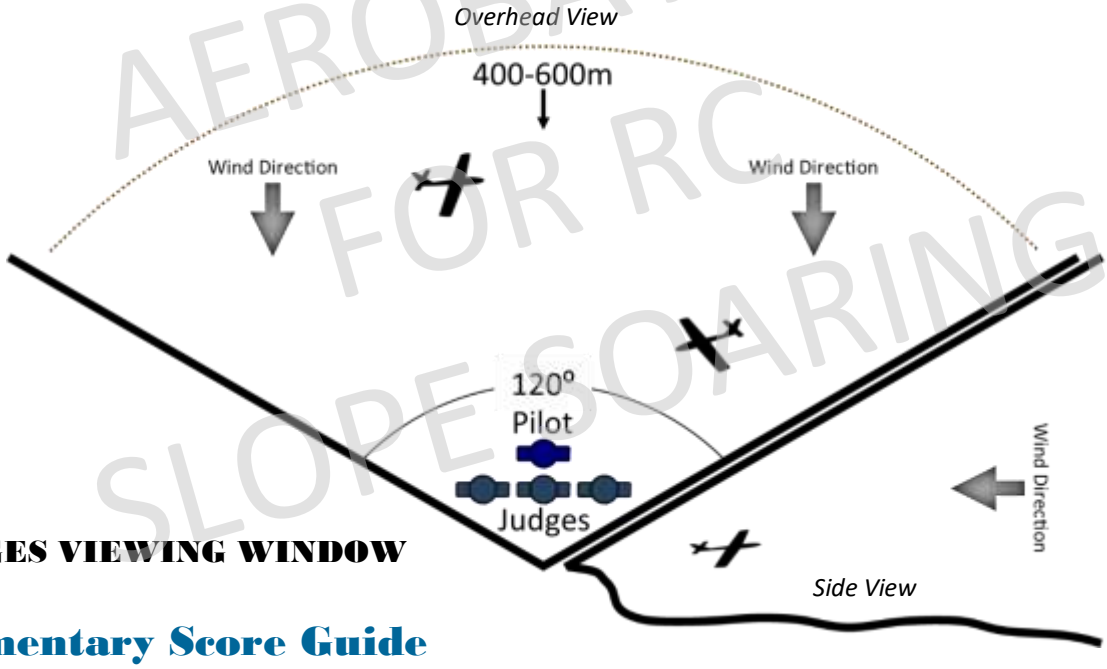
- Flightpath on entry not a distinct horizontal line nor the wings level ..... -2
- Precision of the manoeuvre not as required ..... -2
- Flightpath on exit not a distinct horizontal line nor the wings level ..... -2
- Flightpath on entry and exit not flown at the same altitude ..... -1
- Flightpath on exit deviates from entry by more than 15°..... -1
- Presentation of the manoeuvre not centred ..... -2

The K-factor (KF)

As the manoeuvres have varying degrees of difficulty, they all need to be rated with a specific value known as a K-Factor or KF. By calculating a K-Factor into the score, a judge needs to assess only the fundamentals of a flight, as laid out in the Deductions List above. The K-Factor is calculated into the score at the end of each round Note: The K-Factor inclusion applies only to the Traditional method of judging because the Extended method has the K-Factor built into it.

Judges Viewing Window

One of the requirements at an aerobatics contest is for the model to be flown within a designated area. Aerobatics events held at airfields use an imaginary cube, while similar events held at slope soaring venues use an imaginary cone. Setting the ceiling and floor heights of the cone depend on the terrain and the weather conditions. The Contest Director will usually set the parameters for the Judges Viewing Window.
(The diagram below can be printed and attached to a Judges Scoreboard. See page 6.)



JUDGES VIEWING WINDOW

Elementary Score Guide

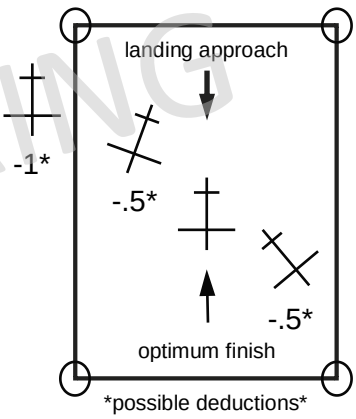
This guide is a simple but effective way to score the manoeuvres. It can be used in conjunction with the Traditional and Extended methods of judging. Beginners would find this guide very useful as an introduction to aerobatics judging. It is also used in other sports where subjective judging is applied. *(The Elementary Score Guide below can be printed and attached to a Judges Scoreboard. See page 6.)*

0	1 - 2	3 - 4	5	6 - 7	8 - 9	10
Failed	**unsatisfactory**	**deficient**	**satisfactory**	**good**	**very good**	**excellent**

Landing Procedure

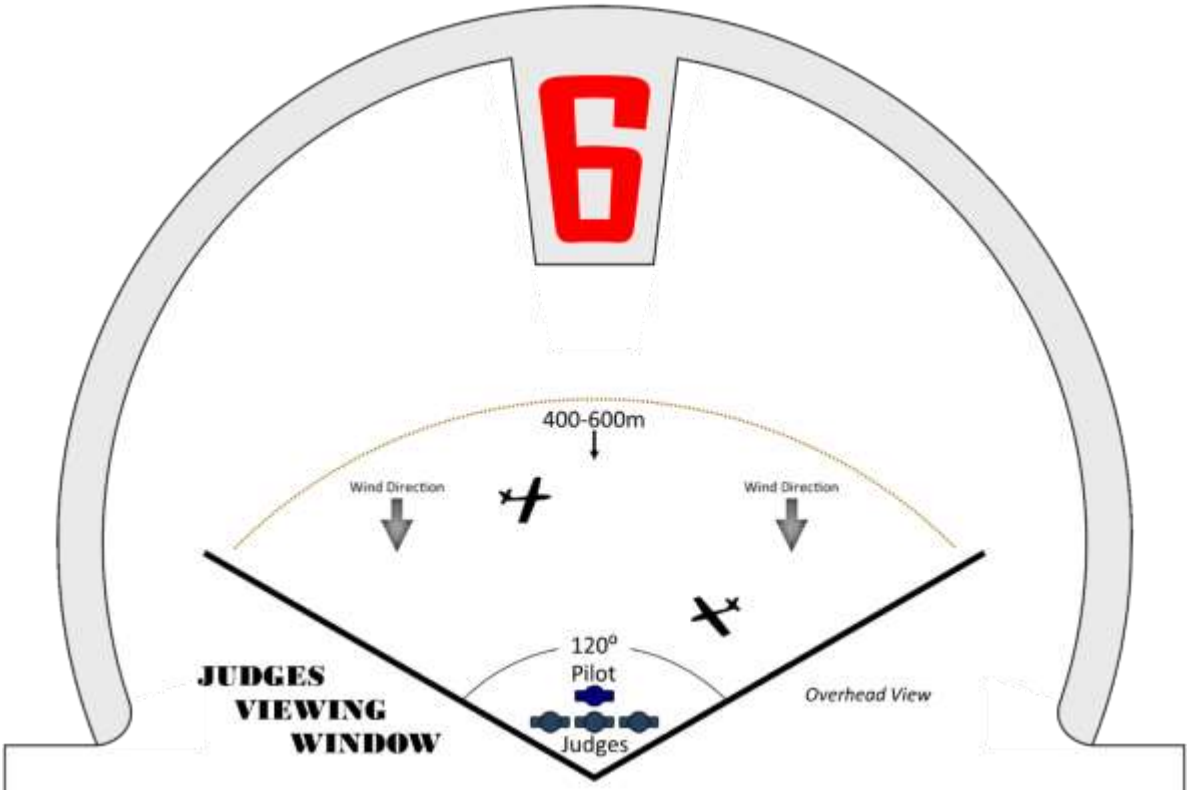
The landing itself could be viewed as an aerobatic manoeuvre. Landing a glider precisely in a designated area is no easy feat. When a glider is flown toward the landing zone, the pilot has only a short period to sum-up the strength of the wind and any turbulence behind the slope. A hasty adjustment to the glider's speed at this point may need to be considered for the glider to land on the target. Imagine the slope as an inverted wing. A high-pressure zone is created when the incoming wind passes over the slope in a horizontal manner. A low-pressure zone is created when the incoming wind follows the contour of the land, which falls away at most slope venues. This phenomenon can create a void or vacuum effect thus causing the model to rapidly lose height and without any warning. Pilots need to stay alert to this potential hazard. *(The diagram on the right can be printed and attached to a Judges Scoreboard. See page 6.)*

LANDING



Judges Scoreboard

The Judges Scoreboard, depicted below, is a very useful judging aid. It covers all areas of scoring aerobatics when used in conjunction with the Judges Viewing Window, Elementary Score Guide, Deductions List and Landing. The example shown has a rotating disc with the numbers 0 to 10. The scoreboard can greatly assist the judges if a scorekeeper is available to write down the scores after each manoeuvre has been flown. For example, a judge would rotate the disc on the scoreboard to the desired score then place the scoreboard above shoulder height in view of the scorekeeper, who in turn would write down the score. *(Instructions on how to make a Judges Scoreboard are detailed on pages 30, 31 and 32.)*



ELEMENTARY SCORE GUIDE

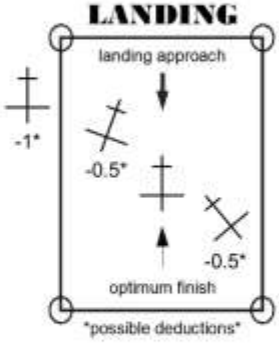
0	1 - 2	3 - 4	5	6 - 7	8 - 9	10
failed	unsatisfactory	deficient	satisfactory	good	very good	excellent

DEDUCTIONS

(Maximum of 10 points may be deducted according to the severity of any inaccuracies.)

- Flightpath on entry is not a distinct horizontal line nor the wings level ..... -2
- Precision of the manoeuvre is not as required ..... -2
- Flightpath on exit is not a distinct horizontal line nor the wings level ..... -2
- Flightpaths on entry and exit are not flown at the same altitude ..... -1
- Flightpath on exit deviates from entry by more than 15° ..... -1
- Presentation of the manoeuvre is not central to the judges viewing window ... -2

LANDING



JUDGES VIEWING WINDOW

A manoeuvre shall be performed within the specified area as set out in the Judges Viewing Window. If the task is not carried out to the satisfaction of the judge/s, one or more deductions may be given. Likewise for the landing requirements if it is to be included in the program. The parameters shall be determined by the Contest Director on the day of the contest.

Traditional Method of Judging

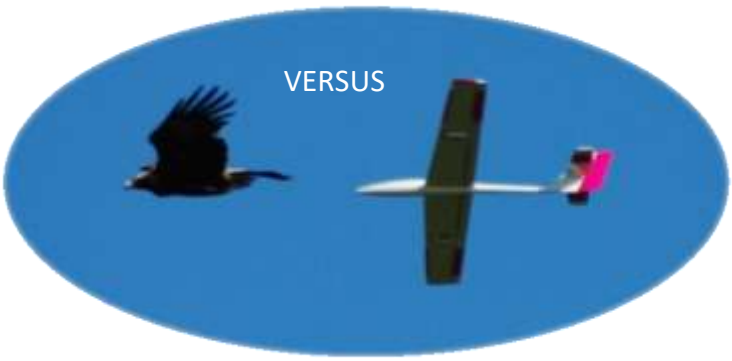
While this method may have similarities to other known aircraft judging guidelines, there are subtle differences to cater for slope soaring. The Deductions List, described earlier, is used to judge the manoeuvres, regardless of their individual intricacies.

Apart from the information published in ***Aerobatics for RC Slope Soaring*** and its predecessor, a common way to learn to judge is to become the master's apprentice. For example, at a contest a learner would stand side by side with an experienced judge, take mental notes then develop one's own method with the aid of written guidelines. In practice, a judge would scrutinise the performance of a manoeuvre in flight, memorise any deductions then make a 'subjective' evaluation. Subjectivity is a moot point in sports involving non-tangible means of judging. Enter ***Aerobatics for RC Slope Soaring***. The two examples below using the Traditional method show how a judge would mark the manoeuvres in flight using the Deductions List. Ideally, the deductions should be memorised or else they could be referred to on the Judges Scoreboard. This is a reliable method because it enables the judges to target specific areas of a manoeuvre and mark spontaneously, accurately and with consistency.

Two Inside Loops (KF1) **Potential** = 10 possible deductions	**Potential**	**Deductions**
Flightpath on entry not a distinct horizontal line nor the wings level.	-2	-1
Precision of the manoeuvre not as required.	-2	
Flightpath on exit not a distinct horizontal line nor the wings level.	-2	-1
Flightpath on entry and exit not at the same altitude.	-1	
Flightpath on exit deviates by more than 15º from the same flightpath on entry.	-1	
Presentation of the manoeuvre not centred.	-2	-2
Total Deductions:		-4
Raw Score: (possible deductions 10 - 4 actual deductions = 6)		6
Total: (6 x KF1 = 6)		6

Double Immelmann (KF2.5) **Potential** = 10 possible deductions	**Potential**	**Deductions**
Flightpath on entry not a distinct horizontal line nor the wings level.	-2	-1
Precision of the manoeuvre not as required.	-2	-1
Flightpath on exit not a distinct horizontal line nor the wings level.	-2	
Flightpath on entry and exit not at the same altitude.	-1	
Flightpath on exit deviates by more than 15º from the same flightpath on entry.	-1	
Presentation of the manoeuvre not centred.	-2	-1
Total Deductions:		-3
Raw Score: (possible deductions 10 - 3 actual deductions = 7)		7
Total: (7 x KF2.5 = 17.5)		17.5

'Wedge-Tailed Eagle'



'Ricochet 'Bullet'

Extended Method of Judging

In contrast to the Traditional method, the Extended method evaluates all parts of the manoeuvres, whatever their individual intricacies. As such, a specific scoresheet is required for each manoeuvre in the program. The advantage of this method is that the K-Factor (the degree of difficulty bonus point/s) isn't needed because it is already built into this method of scoring.

The Extended method requires a judge/s to target specific areas of a manoeuvre in flight, memorise any faults then give a fair and reasonable score once the manoeuvre has been flown. While this might seem unachievable, if one learns one's craft well, this method of judging will become spontaneous over time. It's a matter of studying the literature thoroughly and memorising it off by heart, as you would for any other subjective judging, such as aquatic diving, gymnastics, equestrian or the like.

Both methods, Traditional or Extended, give similar outcomes. While the Extended method is more precise, it requires more preparation. But it does provide an in-depth analysis of the manoeuvres and their individual intricacies. Learning both methods would be an advantage because it would give the judges a better understanding of judging aerobatics in general, even if the Traditional method is the preferred option.

Below is an example using the Extended method. If this were to be used, a specific deductions list would be required for each manoeuvre flown in the program. For clarification, sentences in *italics* have been added to the example but these would not appear on any paperwork at a contest.

Two Inside Loops (KF1) Potential = 11 possible deductions	Potential	Deductions
Flightpath on entry not a distinct horizontal line.	-1	
Aircraft's wings not level to the flightpath. *Detailed explanation: The aircraft enters the loop along the horizontal flightpath with one wing slightly tilted or yaw-like.*	-1	-1
Loop/s not flown entirely in a level plane. In other words, the aircraft drifts or corkscrews to one side.	-1	
Loop/s not a true circle. *Detailed explanation: The first loop was not round and appeared to be considerably out of shape.*	-1	-1
Consecutive loops not superimposed with each other. *Detailed explanation: The second loop did not superimpose the first loop satisfactorily.*	-1	-1
Consecutive loops not flown without interruption.	-1	
Flightpath on exit not a distinct horizontal line. *Detailed explanation: The aircraft exits the second loop via the horizontal flightpath with its wings level but then veered downward and therefore off the horizontal flightpath to some degree.*	-1	-1
Aircraft's wings not level to the flightpath.	-1	
Flightpath on entry and exit not flown at the same altitude.	-1	
Flightpath on exit deviates by more than 15º from the same flightpath on entry. *Detailed explanation: Minor fault because on completion of the manoeuvre, it was noticed that the direction of the aircraft had varied from its intended flightpath by more than the 15º allowed.*	-1	-1
Presentation of the manoeuvre not centred. *Detailed explanation: Minor fault because the overall flightpath of the aircraft was not seen to be performed central to the Judges Viewing Window.*	-1	-1
Total Deductions:		-6
Raw Score: (possible deductions 11 - 6 actual deductions = 5)		5
Total: (highest normalised score 10 ÷ 11 possible deductions x 5 raw score = 4.5)		4.5

~ Linking You, Your Glider, Your Sky ~

Skyroads

Ever driven a vehicle across rough terrain? If so, you would have had to seek a clear pathway and avoid any obstacles along the way. When flying aerobatic manoeuvres, a pilot also needs to seek a clear pathway and avoid any obstacles. In the sky, these pathways are deciphered as imaginary skyroads and the obstacles are the prevailing conditions. As the conditions may not be the same at every venue, a reconnaissance flight is advisable to assess the area prior to the start of a contest. This should include visualising a suitable skyroad as well as selecting some suitable areas to launch the glider, gain height, perform the manoeuvre then safely land the glider. If the terrain and the weather conditions are not correctly summed up at a contest, a pilot's gliding routine could be severely affected and attaining high marks from the judges might be difficult to achieve.

The Sweetspot

Following on from Skyroads, most slope venues have an invisible sweetspot. This is an area distant from the face of the slope and it should be close to the halfway mark of the manoeuvre being performed. If the sweetspot is not detected beforehand, this could affect the quality of the flight, which may result in an aerobatic manoeuvre not being completed to the requirements.

So how can this invisible sweetspot be recognised? On a reconnaissance flight, the pilot needs to search for an area which has at least three features:

- Where there is minimal turbulence
- Where the lift is most consistent
- Where the judges are going to have the best view of the performance

Width of Slope

Flying in an area distant from the face of the slope is a good place to begin. A narrow slope, especially a convex-shaped one, can cause a glider to fly erratically due to the incoming wind swooping around the sides of the slope. This natural occurrence has a tendency to cause turbulence and the likelihood of a glider rapidly losing height. As a consequence, a pilot may be left with only a short length of skyroad along which to fly safely. A concave slope (as opposed to a convex slope) usually provides better lift. Having said the above, a desirable speed is also crucial for optimum performance.
(See also the section on Speed Control.)

Wind Direction

The wind should be incoming to the slope for optimum performance. If it is not, then this could drastically affect the characteristics of the glider in flight. Identifying the wind direction is also crucial when choosing the desired flight direction or flightpath that will best suit an aerobatics routine.

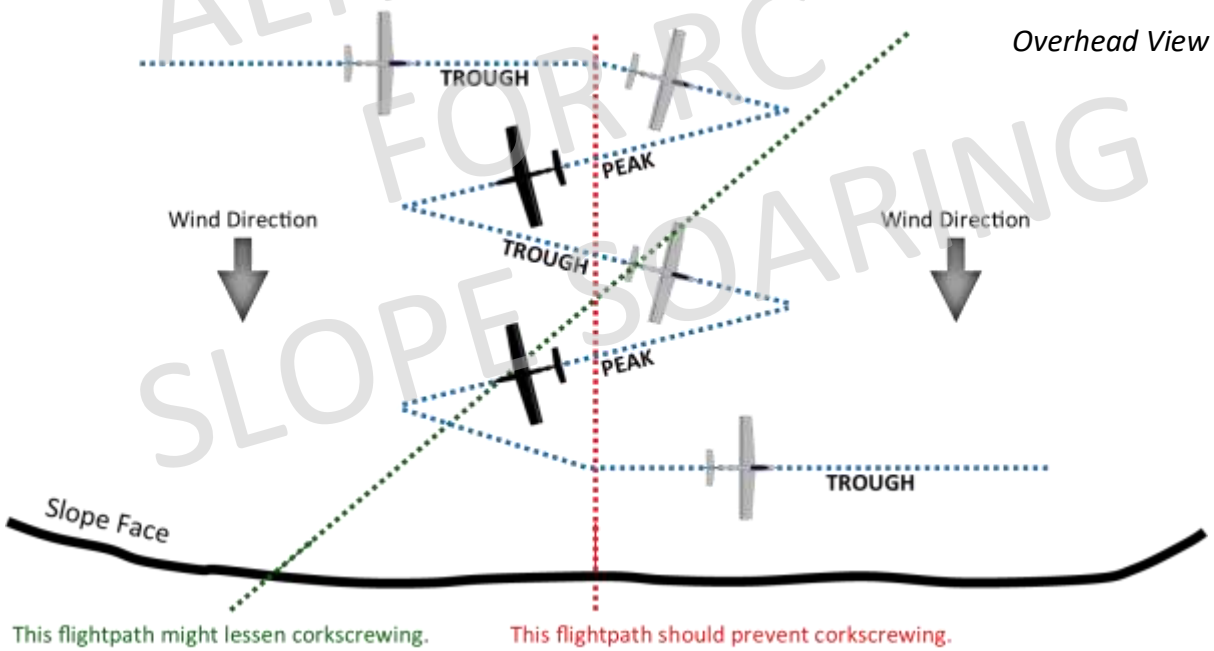
Optimum Positioning

A common mistake in performing aerobatics is to start a manoeuvre in the wrong area, often with dire consequences. To keep within the Judges Viewing Window or the designated area, there are times when a pilot should consider performing certain manoeuvres by starting from one side of the slope and flying out/upwind at an acute angle and finishing on the other side. Other options are to fly across the slope or directly out/upwind from the slope. These options greatly depend on several factors:

* manoeuvre type * glider type * capable speed of the particular glider
* pilot skill * wind strength * wind direction * judges optimum view

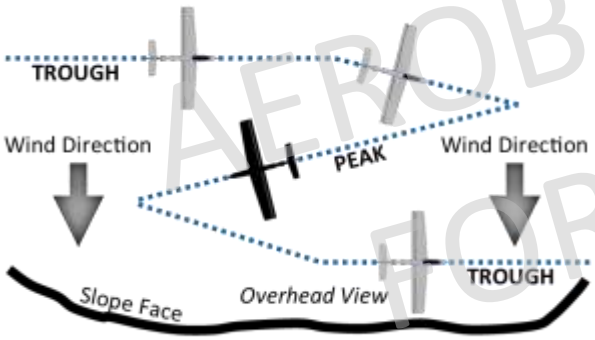
The seven points above are crucial factors for a good performance. But compromises can be met. The pilot will need to decide if the manoeuvre should start parallel to the slope, at 90° to the slope or somewhere in between. The ideal starting point will be determined by the K-Factor rating of the manoeuvre, the type of terrain and/or the prevailing conditions at a contest. Once these factors have been evaluated, the pilot should be able to map the sky and visualise where the manoeuvre is to be flown. Summing up the optimum position to start a manoeuvre is essential to attaining high marks from the judges.

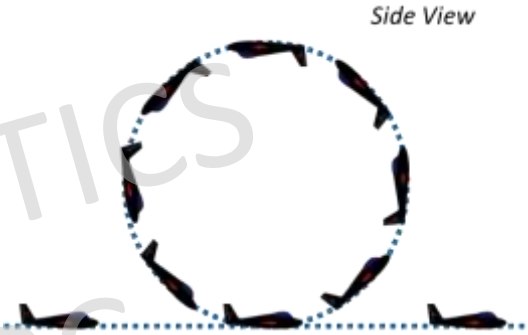
Let's use the Inside Loop as an example, as illustrated in the diagram below. Flying across or parallel to the slope is ideal from a judge's perspective but this might risk corkscrewing due to the wind wanting to push the model toward the slope face thus incurring a penalty. Rudder input might overcome corkscrewing but this could be difficult to implement. Flying out/upwind from or at 90° to the slope should minimise corkscrewing but this might obscure a judge's view and could also result in a penalty. As one can see, there's more to performing aerobatic manoeuvres than just 'flying wherever'. There are many factors to consider during an aerobatics routine for the various manoeuvres to be flown. Compromises will need to be considered but where to make them will be a decision for the pilot to determine on the day of the contest.



Attitude Compensation

This view shows the likely outcome of a loop if an attitude adjustment using the rudder (or other controls) is not given.





This view shows a very slight attitude adjustment where the glider's nose has been tilted upward at the backend of the manoeuvre to keep it on track.

Speed Control

The flying characteristics of a glider performing aerobatics are largely influenced by the incoming wind, moreso than flying a powered aircraft at an airfield. Controlling a glider's speed is very important. An unintended burst or loss of speed at the wrong moment could ruin a performance and also cause the glider to momentarily become uncontrollable, which would not help matters. Hence, pilots should be at the ready to make spur-of-the-moment adjustments to the glider in flight to compensate for any unpredictable changes in the conditions. Pilots should also become familiar with their surrounds and the prevailing conditions prior to starting their routine.

Take for example the Inside Loop. When pulling up into the loop proper, the glider's speed might need to be adjusted in flight in order to maintain the required flightpath. If corrective action is not taken, the circle could end up looking oval-shaped. If the manoeuvre is flown well, in that the circle appears circular, the necessary changes in speed at particular points of the circle will in all likelihood be inconsistent, which is not a bad thing; judges should stay alert to this. In essence, the overall appearance of the manoeuvre is far more important than inconsistencies in the glider's speed.
(This section also ties in with the definitions on Flightpath and Attitude.)

Precision and Presentation

Below is a full description of two key points, Precision and Presentation, which can be found in the Deductions List accompanying the Judges Scoreboard. Deductions for presentation and/or precision could incur penalties for the following reasons:

- On reflection, the manoeuvre was not performed gracefully or evenly.
- The glider's flightpath was not consistent with the requirements, though not necessarily noticed to any degree until the manoeuvre had been completed.
- The manoeuvre was not performed in the required window allocated by the judges, known as the Judges Viewing Window.
- The manoeuvre was not performed central to the Judges Viewing Window.
- The manoeuvre was not performed precisely. For example, it was performed the quickest and easiest way possible to avoid mistakes.
- The glider may have varied its direction from the original heading but not necessarily noticed to any degree until the manoeuvre had been completed.

Example: Inside Loop

Shortened Version

- Launch and gain height
- Dive the glider
- Level out
- Pull back on elevator (up elevator)
- Use ailerons/rudder to correct drift
- Ease off elevator at top
- Pull back on elevator (up elevator)
- Push forward on elevator to prevent ballooning (down elevator)
- Remain on horizontal flightpath for a discernible distance

Standard Version

Prior to launching your glider, try to envisage a sweetspot. This should be the central point of the Inside Loop. To determine the sweetspot or an area where you would prefer to fly, it makes good sense to conduct a reconnaissance flight.

- Launch and 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 successfully execute the perfect circle. The glider is not required to enter the Judges Viewing Window until it reaches the horizontal section of the flightpath or skyroad).*
- Announce the manoeuvre before diving your glider. *(Ideally, the dive needs to be flown at approximately 45° to the horizontal plane. Naturally, the angle of the dive will depend on the strength and/or the lift generated by the wind or the type of glider being flown. If you dive the glider too steeply, you may need to pull it up abruptly to level out and this could result in an undesirable loss of speed. On the other hand, if you do not dive the glider steeply enough, the desired speed might be difficult to attain.)*
- Dive your glider to the desired distance, level out and fly to the central point then pull back on the elevator control to commence the circle. *(The judges must be able to distinguish a distinct, though subtle beginning and ending to the circle.)*
- Continue to pull back steadily on the elevator control while the model progresses to the top of the circle. Minimally use the ailerons and/or rudder to compensate for any drifting or corkscrewing off the flightpath.
- At the top of the circle, ease off on the elevator control. Continue to ease off as your glider commences its vertical descent. *(If this section is not performed well, the glider could pull out of the circle prematurely. Contributing factors to a poor circle could be the variable weather conditions or the glider's undesirable speed. At the backend of the circle, the attitude (not altitude) of the glider might need to be adjusted to keep the circle round-looking. This procedure could take many hours of practise to perfect.) (See also the section on Attitude.)*
- As your glider passes through the three quarter mark, pull back on the elevator to ease it back onto the horizontal part of the flightpath. *(A slight forward elevator adjustment might be necessary at this point to prevent the glider from ballooning upward; not being alert to this adjustment is quite common amongst pilots.)*
- Continue to fly your glider along the flightpath for a discernible distance before announcing the completion of the manoeuvre.

Example: Axial Roll

Shortened Version

- Launch and gain height
- Dive the glider
- Level out
- Roll by moving the ailerons to the right (right aileron) and the elevator forward (down elevator)
- Centre the controls to complete the roll
- Remain on the horizontal flightpath for a discernible distance

Standard Version

Prior to launching your glider, try to envisage a sweetspot. This should be the central point of the Inside Loop. To determine the sweetspot or an area where you would prefer to fly, it makes good sense to conduct a reconnaissance flight.

- Launch and 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 successfully execute the perfect roll. The glider is not required to enter the Judges Viewing Window until it reaches the horizontal section of the flightpath or skyroad.)*
- Announce the manoeuvre before diving your glider. *(Ideally, the dive needs to be flown at approximately 45° to the horizontal plane. Naturally, the angle of the dive will depend on the strength and/or the lift generated by the wind or the type of glider being flown. If you dive the glider too steeply, you may need to pull it up abruptly to level out and this could result in an undesirable loss of speed. On the other hand, if you do not dive the glider steeply enough, the desired speed might be difficult to attain.)*
- Dive your glider to the desired distance, level out then execute the roll. *(The glider should be inverted at the central point of the manoeuvre. The judges must be able to distinguish a distinct, though subtle beginning and ending to the roll.)*
- During the roll part thereof, steadily move the ailerons' control to the right or left (depending on your mode of preference) and at the same time move the elevator control forward. *(Generally speaking, the ailerons may need to be moved with more throw than the elevator. This may vary depending on the choice of glider, how quickly it needs to be rolled, the sensitivity of the transmitter gimbals and/or how you have set up your transmitter. The flight conditions on the day will also play a vital role in accurately performing the task at hand.)*
- On completing the 360° roll, centre the ailerons and elevator ensuring that your glider is flying level along the horizontal flightpath and in the upright position.
- Continue to fly your glider along the flightpath for a discernible distance before announcing the completion of the manoeuvre.

(Note: If the glider has a rudder, it can be used in conjunction with the ailerons and elevator, although it may take a considerable amount of practise to coordinate all three of the transmitter controls at once. Some pilots choose to opt out of using the rudder for the roll procedures, even if their gliders have a functioning rudder.)

~ Flying Definitions ~

Manoeuvre: A manoeuvre well done is performed with grace and accuracy. It is commenced and completed with clarity and a sense of crispness. Each manoeuvre should be flown central to the Judges Viewing Window or in the designated area.

Commence: A competitor shall clearly and distinctly voice the word ***commence*** at the start of a manoeuvre, ideally at the start of the dive, where applicable.

Complete: A competitor shall clearly and distinctly voice the word ***complete*** at the finish of a manoeuvre, i.e. when the model exits the working area.

Roll: Rolls or part thereof when executed during a manoeuvre, shall roll in the same direction, unless otherwise stated.

Area: Used in some circumstances to describe one of a collective of parts belonging to a manoeuvre. When judging, visualising these areas during a contestant's flight is a manageable way to identify any faults.

Deduction: Also referred to as a penalty or fault, this is the means by which to deduct or take away points from a manoeuvre to determine a fair score.

Flightpath: This is an imaginary line, pathway or skyroad along which to fly a model. In preparing for an aerobatics routine, a pilot should have a flightpath in mind in order to successfully execute the manoeuvres, bearing in mind that the routine is to be flown within a designated area. If the model veers significantly from the intended flightpath without just cause, a penalty may be given.

Attitude: The attitude (not altitude) is the angle at which a model is facing while in flight. This applies particularly to a slope glider. For example, to successfully perform an Inside Loop, a pilot might need to change the pitch or yaw attitudes of the glider to prevent it from drifting off the designated flightpath. For the pitch attitude, the glider might need to be pointed slightly up or down at certain points of the circle and seemingly off line from its intended flightpath in order to keep the glider travelling in a circular fashion. For the yaw attitude, the glider might need to be pointed left or right at some stage to prevent the glider from being swept toward the slope face; this effect is known as corkscrewing. If these factors are not taken into consideration, the manoeuvre could become drastically out of shape and therefore incur a penalty. In summing up, the pilot should endeavour to perform an aerobatic manoeuvre in the ideal position and confidently make any necessary attitude adjustments, rather than performing the manoeuvre with minimal attitude adjustments and as a consequence obscuring the glider from the judges' view. *(Also refer to the sections on Attitude Compensation and Speed Control.)*

~ Manoeuvres for Slope Soaring ~

MANOEUVRES - OPEN (in alphabetical order)

Axial Roll - optimum roll rate 2-3 seconds
Axial Roll x 3
Axial Roll x 4 Point
Axial Roll x 8 Point
Barrel Roll - civilian type
Circle
Circle Inverted
Cuban 8
Cuban 8 Reverse
Figure 8 Inward
Figure 8 Inverted Inward
Figure 8 Inverted Outward
Figure 8 Outward
Immelmann Double*
Immelmann Double Reverse*
Inverted Flight - maintain invert for 5 seconds
Loop Extended - maintain invert for 2 seconds
Loop Inside
Loop Inverted
Loop Triangular
Loop Triangular Reverse
Loop Square
Rectangular Circuit
Spins x 3
Spins Inverted x 3
Stall Turns x 2
Top Hat - no rolls

Immelmanns
To overcome a glider's expected loss of momentum during the roll procedures, there is a provision for the glider to be rolled at any point along the horizontal sections, rather than at the exit points of the half loops, which is required for powered model aircraft.

MANOEUVRES - NOVICE (in alphabetical order)

Barrel Roll - civilian type
Circle
Figure 8 Inward
Figure 8 Outward
Loop Extended - maintain invert for 2 seconds
Loop Inside
Loop Triangular
Rectangular Circuit
Spins x 2
Stall Turn
Top Hat - no rolls

A favourite flying site at the Township of Anderson, Bass Coast Region, State of Victoria, Australia.
In the distance lies the Township of Cape Woolamai on Phillip Island. The Island is famous for its penguins.
Glider: Southern Sailplanes, *'Ricochet Bullet'*. Radio: JR 3810.

~ Model Aircraft Check List ~

Owners of 2.4GHz radios are advised to carry out a 100-metre range check. Other radios on 29MHz or 36MHz with extendable aerials require at least a 30-metre range check with the aerial retracted. A moot point is whether or not 2.4GHz receivers should operate on 4.8 volts or 6 volts. Either way, when using rechargeable nickel metal hydride (NiMH) batteries, 4AAs (4.8 volts) or 5AAs (6 volts) are recommended.

Regularly check the batteries in your radio equipment for signs of corrosion on the terminals. If using battery packs, keep the leads clean using a recommended cleaning agent. For the long-term life of the batteries, regularly recycle them and maintain them at about ¾ charge. For the best results, a computer charger is recommended.

It is recommended (mandatory at some clubs) to have your radio equipment checked or certified from time to time by an approved technician.

Check that the gimbals (aka, controls or joysticks) on your transmitter are set to the correct mode of flying. With 4-channel radios the following usually applies for Australian fliers, depending on the pilot's mode of preference: Mode 1: Left gimbal (elevator) when moved forward your model should descend or pitch down. Left gimbal (rudder) when moved to the left your model should turn left or yaw left. Right gimbal (ailerons) when moved to the left your model should also turn left or roll left.

The on/off switch on your model should be mounted in a position where it cannot be accidentally switched off when launching by hand.

For radios on 29MHz or 36MHz, check the radio frequencies of other users if they are nearby 'before' turning on your radio. Whether you have AM, FM or PCM equipment, the frequency number is what counts. Radios on the same frequency will clash and this will result in models flying nearby to lose transmission and possibly your own.

Gliders should be launched into the wind wherever possible. For winch or hand-tow launches the wind direction should be incoming to the launch as near as possible. For slope soaring, the wind variance should be no more than about 20° for safety.

If possible, ask an experienced pilot to accompany you on your model's maiden flight.

If reversing switches on the transmitter are noticeably exposed, cover them over with tape to avoid being accidentally knocked.

Check that the control surfaces on your model's maiden flight are functioning before flying and most importantly check that they are working in the desired direction.

To ensure stability in flight, check for twists or warps in your model's lifting surfaces and use recommended glues when building or repairing.

~ Freestyle Slope (or Pattern Aerobatics) ~

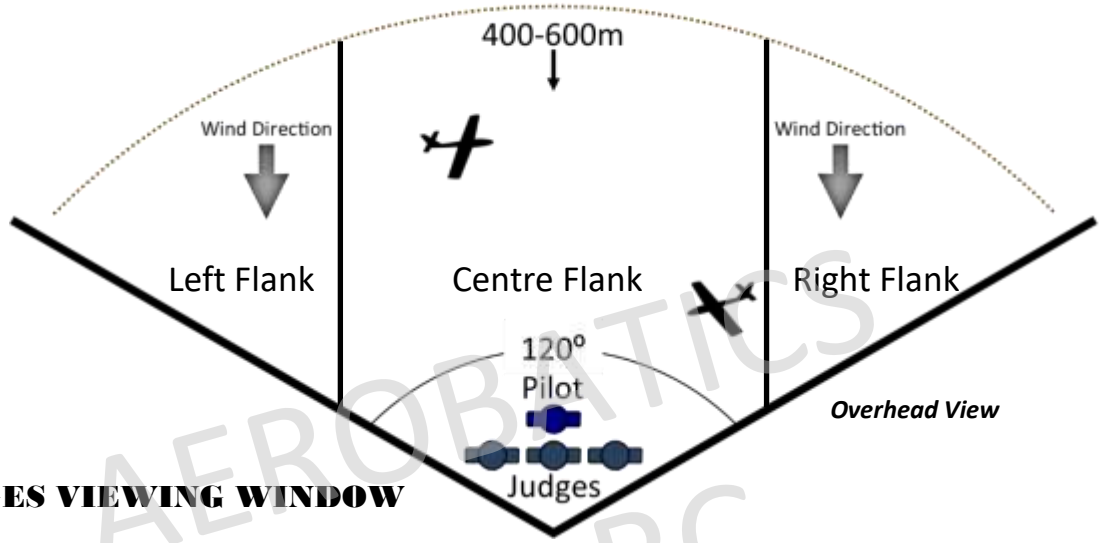
Freestyle Slope is considerably different to your run-of-the-mill aerobatics. Envisage combining ballroom dancing, ice-skating, acrobatics and the like with slope soaring aerobatics then welcome to Freestyle Slope.

The convenient thing about Freestyle is that any type of aircraft can be used. When holding these events, the following classes of models are recommended.

- Open - any type of glider
- One Class - restrictions such as flying wings or 2-metre rudder/elevator only
- Power Scale Soarers (PSS) - aircraft with imitation or non-working motors

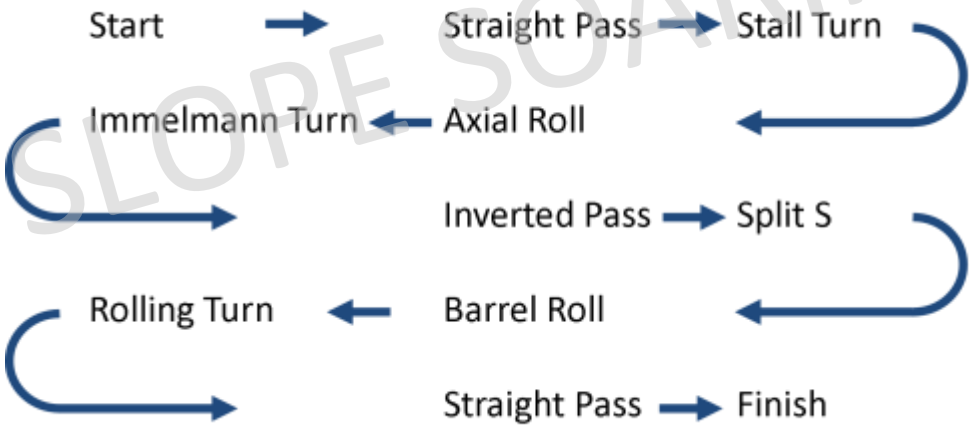
Organisers preparing for a Freestyle Slope contest can choose from a selection of manoeuvres listed in this book.

The task is to fly a smooth, unbroken routine in a specified area. The diagram below shows the sky divided into three sections.



JUDGES VIEWING WINDOW

A routine could include 10 manoeuvres, as shown below. To judge and score, one of the methods in this book can be used. The routine would be flown within the Judges Viewing Window and flown on the same flightpath in an unbroken routine.



~ Apparel for Winter Flying ~

Flying in cold and blustery conditions can be almost as enjoyable as flying in hot weather as long as you are dressed for the occasion.

Winter flying can involve standing in chilly conditions where the ground is often wet. Naturally, it is an advantage to dress correctly to retain body heat.

Be sure to keep your feet dry and warm. Wear waterproof boots where necessary. If the ground is soggy, gumboots may be more appropriate, although they do not retain body-heat all that well. Wear woollen socks in preference to socks made from synthetic materials.

Consider wearing thick pants to keep your legs warm. A long johns undergarment will also help retain body-heat. Ski suits or the like will keep your body dry but because they are made from synthetic materials, your body-heat may fluctuate throughout the day, depending on how active you are. If it rains at the venue, waterproof pants are another option.

One or two jumpers worn over a T-shirt will provide good upper body-warmth. Two medium or lightweight jumpers are better than one cumbersome jumper because they are easier to adjust. A long parka or hoodie that sits below the waistline is ideal. Keeping the wind from entering the body is paramount on very windy days.

A balaclava is good protection for your head and neck. A scarf or beanie is another option. A peaked cap accompanied with sunglasses should be used to protect your face and eyes against harsh sunlight and windburn. There is nothing worse than having to squint or having one's eyes water while flying. Applying a sunscreen lotion is also a sensible option.

Protection for your hands is a matter of preference. While normal gloves might keep your hands warm, they are very awkward for the fiddly tasks required to manipulate the transmitter gimbals and switches. Fingerless gloves are another option.

Keep your insides warm with soup or other warm liquids. Avoid alcohol because the warming effect is largely an illusion, as it actually increases 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. Dressed appropriately, you can concentrate on the flying and enjoy the day.

ONE on ONE slope aero duel

ONE on ONE slope aero duel

THE TASK

Two contestants shall fly off against each other in a round-robin duel. The challenger in each duel shall select and perform two manoeuvres of his or her choice from one of the applicable lists below. The defender shall perform the same two manoeuvres. The same manoeuvres can be selected and repeated throughout the rounds. The same landing shall be performed by both contestants, that's if the landing is to be included.

LANDING

If the weather conditions permit, additional points shall be awarded for the Slope Circuit & Landing.
Example: Upwind leg, cross leg, downwind leg, half descending circle and land.

SCORING GUIDELINES

Contestants can score a possible 3 points for the best manoeuvre, 1 point for the second-best manoeuvre or 2 points each if the manoeuvres are inseparable. The overall winner is to be decided by a tally of the points.

JUDGING

The judging format shall be decided at the contest with one or multiple judges. If independent judges are not available, the contestants shall judge on a rotation system. Each judge shall decide the best performance from the pair of contestants flying. Each judge shall place the figures 1, 2 or 3 into the **M1**, **M2**, **M3** and **M4** boxes as a reference for each manoeuvre being flown then total these figures into each applicable **score** box when the round has finished. Alternatively, each judge can forgo the **M** boxes and place one figure only into the applicable **score** box at the end of each round. Judges on reflection are allowed to alter their **M** figures.

DEDUCTIONS

These are set out in three sections of the contest. This is a reliable method because it enables the judges to target specific areas of a manoeuvre and mark spontaneously, accurately and with consistency.

THE TACTICS

The objective for both the challenger and the defender is not only to perform well but to try and outwit each other. Pilots must carefully select manoeuvres that they can perform well. Knowing one's own piloting skills must be carefully weighed up and used to each other's advantage.

PRE-FLIGHT BRIEFING

A pre-flight briefing shall be held prior to the start of the contest to ensure that all of the contestants clearly understand the rules and requirements.

ALLOWANCES

Novices can use a helper to launch, stabilise the glider in flight or be coached on the landing. However, should a helper take control of the aircraft during the time a manoeuvre is being performed, that is between the time the words ***commence*** and ***complete*** are announced, no score shall be given for that manoeuvre. This rule also applies to the landing.

MANOEUVRES - OPEN (in alphabetical order)

Axial Roll - optimum roll rate 2-3 seconds
Axial Roll x 3
Axial Roll x 4 Point
Axial Roll x 8 Point
Barrel Roll - civilian type
Circle
Circle Inverted
Cuban 8
Cuban 8 Reverse
Figure 8 Inward
Figure 8 Inverted Inward
Figure 8 Outward
Figure 8 Inverted Outward
Immelmann Double*
Immelmann Double Reverse*
Inverted Flight - maintain invert for 5 seconds
Loop Extended - maintain invert for 2 seconds
Loop Inside
Loop Inverted
Loop Triangular
Loop Triangular Reverse
Loop Square
Rectangular Circuit
Spins x 3
Spins Inverted x 3
Stall Turns x 2
Top Hat - no rolls

MANOEUVRES - NOVICE (in alphabetical order)

Barrel Roll
Circle
Figure 8 Inward
Figure 8 Outward
Loop Extended - maintain invert for 2 seconds
Loop Inside
Loop Triangular
Rectangular Circuit
Spins x 2
Stall Turn
Top Hat - no rolls

Immelmanns

To overcome a glider's expected loss of momentum during the roll procedures, there is a provision for the glider to be rolled at any point along the horizontal sections, rather than at the exit points of the half loops, which is required for powered model aircraft.

ONE on ONE slope aero duel

ONE on ONE slope aero duel

Challenger _____ **Defender** _____

JUDGING & SCORING GUIDELINES

The judging format shall be decided at the contest with one or multiple judges. If independent judges are not available, the contestants shall judge on a rotation system. Each judge shall decide the best performance from the pair of contestants flying. Each judge shall place the figures 1, 2 or 3 into the M1, M2, M3 and M4 boxes as a reference for each manoeuvre being flown, then total these figures into each applicable score box when the round has finished. Alternatively, each judge can forgo the M boxes and place one figure only into the applicable score box at the end of each round. Judges on reflection are allowed to alter their M figures. LEGEND: MD = Manoeuvre Deduction/s.

	M1	M2	possible deductions for manoeuvres **M1** & **M2**	M1	M2	
M1 Challenger score			1. Flightpath on entry not a distinct horizontal line nor the wings level. (MD2)			**M1 Defender** score
			2. Precision of the manoeuvre not as required. (MD2)			
			3. Flightpath on exit not a distinct horizontal line nor the wings level. (MD2)			
M2 Challenger score			4. Flightpath on entry and exit not flown at the same altitude, where applicable. No penalty within + or – 3 metres. (MD1)			**M2 Defender** score
			5. Flightpath on exit deviates from entry by more than 15º. (MD1)			
			6. Presentation of the manoeuvre not centred. (MD2)			

	M3	M4	possible deductions for manoeuvres **M1** & **M2**	M3	M4	
M3 Defender score			1. Flightpath on entry not a distinct horizontal line nor the wings level. (MD2)			**M3 Challenger** score
			2. Precision of the manoeuvre not as required. (MD2)			
			3. Flightpath on exit not a distinct horizontal line nor the wings level. (MD2)			
M4 Defender score			4. Flightpath on entry and exit not flown at the same altitude, where applicable. No penalty within + or – 3 metres. (MD1)			**M4 Challenger** score
			5. Flightpath on exit deviates from entry by more than 15º. (MD1)			
			6. Presentation of the manoeuvre not centred. (MD2)			

M5 LANDING

Contestants are to perform landings as specified by the judges

Landing Challenger score		1. Legs not even or level. (Specific dimensions are not required in the manoeuvre's flightpath.) (MD2)	**Landing Defender** score
		2. The descent (which should commence toward the end of the third leg) not constant. (MD2)	
		3. The glider fails to land gently nor facing toward the front of the slope. (MD2)	

Challenger _____ **Defender** _____

TOTAL SCORE _____ MD denotes maximum deductions **TOTAL SCORE** _____

SEQUENTIAL and FREESTYLE
SLOPE AEROBATICS

COMPULSORIES
Inside Loops x 2
Axial Roll - optimum roll rate 2-3 seconds
Stall Turns x 2

GROUP 1
Extended Loop - maintain invert for 2 seconds
Barrel Roll - civilian type
Circle
Top Hat - no rolls
Triangular Loop

GROUP 2
Figure 8 Inward or Outward
Inverted Circle
Reverse Triangular Loop
Square Loop
4 Point Roll

GROUP 3
Axial Rolls x 3
Reverse Cuban 8
Reverse Double Immelmann*
Spins x 3
8 Point Roll

GROUP 4
Cuban 8
Double Immelmann
Inverted Figure 8 Inward or Outward
Inverted Spins x 3
Outside Loops x 2

PATTERN
Inside Loop, Axial Roll,
Figure 8 Inward

LANDING
Most Impressive Landing

THE TASKS

To perform the following:

A: 3 of 5 manoeuvres from GROUPS 1, 2, 3 & 4

B: Pattern (3 manoeuvres)

C: Slope Circuit & Landing

Immelmanns
To overcome a glider's expected loss of momentum during the roll procedures, there is a provision for the glider to be rolled at any point along the horizontal sections, rather than at the exit points of the half loops, which is required for powered model aircraft.

2009 Victorian Slope Aerobatics Championship
'Mount Hollowback', Township of Bald Hills,
Central Highlands Region, State of Victoria, Australia
On this day the author (second from the right) competed with an Australian-Made, Southern Sailplanes, *'Ricochet Bullet'*.

~ Ultimate Slope Aerobatics Challenge ~

This is an ideal contest to get the most out of pilots wanting to pursue the highest level in slope aerobatics, whether just starting out in the sport or already an expert flier. It also gives novice pilots a chance to mix it with their more experience opposition when or if there is only one class of contest on hand. The information below can also be used as a pilot's card by cutting along the dotted lines and sticking both pieces onto some rigid material.

MANDATORY MANOEUVRES

		K-Factor Rating
1	**Rectangular Circuit**	1
2	**Inside Loops x 2**	1
3	**Axial Roll** - optimum roll rate 2-3 seconds	1
4	**Inverted Flight** - maintain invert for 5 seconds	1
5	**Stall Turns x 2**	1
6	**Optional Manoeuvre no. 1**	
7	**Optional Manoeuvre no. 2**	

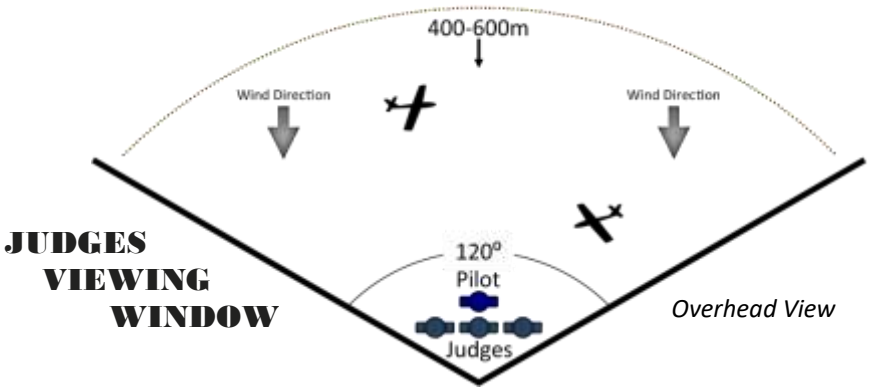
OPTIONAL MANOEUVRES

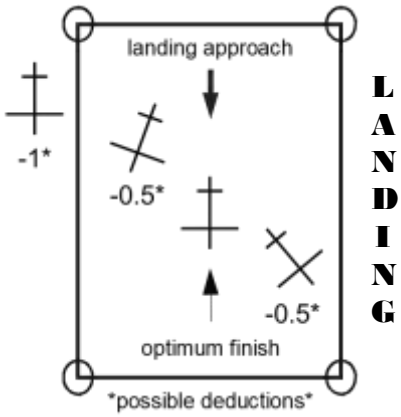
Extended Loop - maintain invert for 2 sec.	1.5
Barrel Roll	1.5
Circle	1.5
Top Hat - no rolls	1.5
Triangular Loop	1.5
Axial Rolls x 3	2.5
Reverse Cuban 8	2.5
Reverse Double Immelmann*	2.5
Spins x 3	2.5
8 Point Roll	2.5
Figure 8 - inward or outward	2
Inverted Circle	2
Reverse Triangular Loop	2
Square Loop	2
4 Point Roll	2
Cuban 8	3
Double Immelmann*	3
Inverted Figure 8 - inward or outward	3
Inverted Spins x 3	3
Outside Loops x 2	3

8	**Pattern** - Axial Roll, Inside Loop, Figure 8	1
9	**Slope Circuit & Landing** - upwind leg, cross leg, downwind leg, half descending circle and land	1

*** Rolls in the Immelmanns can be executed at any time during their horizontal sections.**

Round 1	Round 2	Round 3	Round 4
Mandatory 1-5 & 8-9	Mandatory 1-5 & 8-9	Mandatory 1-5 & 8-9	Mandatory 1-5 & 8-9
Optional 6-7 KF1.5 & KF2	Optional 6-7 KF2 & KF2.5	Optional 6-7 KF2.5 & Kf3	Optional 6-7 KF3 & KF1.5





ELEMENTARY SCORE GUIDE

0	1 - 2	3 - 4	5	6 - 7	8 - 9	10
Failed	unsatisfactory	deficient	satisfactory	good	very good	excellent

DEDUCTIONS

Maximum of 10 deductions may apply according to the severity of any inaccuracies.

- **Flightpath on entry is not a distinct horizontal line nor the wings level ..... -2**
- **Precision of the manoeuvre is not performed as required ..... -2**
- **Flightpath on exit is not a distinct horizontal line nor the wings level ..... -2**
- **Flightpaths on entry and exit are not flown at the same altitude ..... -1**
- **Flightpath on exit deviates from entry by more than 15º..... -1**
- **Presentation of the manoeuvre is not central to the judges viewing window ..... -2**

JUDGES VIEWING WINDOW

A manoeuvre shall be performed within the specified area as set out in the Judges Viewing Window. If the task is not carried out to the satisfaction of the judge/s, one or more deductions may be given. Likewise for the landing requirements if it is to be included in the program. The parameters shall be determined by the Contest Director on the day of the contest.

~ Rules, Guidelines and Requirements for the Ultimate Slope Aerobatics Challenge ~

1) Electric Power-Assisted Gliders
If these gliders are called for, the pilot shall turn off the motor at least 15 seconds before the start of a manoeuvre, at which time the pilot should clearly voice the words, ***motor off***. The pilot shall not power into the dive with the motor running. Once the motor is switched off, the pilot shall not turn on the motor again until the manoeuvre has been completed. The Contest Director has the discretion to vary the motor running time depending on the circumstances. The intent is for the contestants to perform their manoeuvres assisted primarily by the prevailing weather conditions whenever possible but with safety in mind.

Should a pilot turn on the motor after making it known that it has been turned off in readiness to commence a manoeuvre or has commenced a manoeuvre but not completed it, a score of zero may be given. Possible reasons for aborting a manoeuvre could be as follows:

- A sudden drop in lift
- At risk of crashing the glider
- At risk of colliding with a competitor's glider
- Endangering lives
- Accidentally switching on the motor
- Other unforeseen circumstances

It will be at the discretion of the Contest Director to decide whether or not to allow a second attempt at a manoeuvre, depending on the circumstances at the time.

2) Flight Order
Contestants shall be selected at random or by a random draw. Where possible, novices shall be placed toward the end of the flight order so that they can gain valuable experience by watching the more experienced pilots fly the manoeuvres.

3) Guides and Aids
The book, ***Aerobatics for RC Slope Soaring*** is available on the MAAA's website as a Manual of Procedures (MOP) titled Slope Soaring Contests.

4) Entry/Exit Procedures for Aero Manoeuvres
Each manoeuvre shall begin no later than the start of the horizontal flightpath. The manoeuvre shall be completed along the horizontal flightpath and at the same altitude from when it started with the exception of manoeuvres that start and finish at different altitudes. Manoeuvres that do not require a dive to gather speed shall start at a discernible distance from the manoeuvre proper.

5) Pilot Manoeuvre Announcement Procedures
A pilot shall announce the start of a manoeuvre by clearly voicing the word, ***commence***, prior to starting the manoeuvre, which shall be at a point predetermined by the pilot and/or prior to the start of the horizontal flightpath. Manoeuvres which do not require a dive shall be announced at a discernible distance from the manoeuvre proper. After completing a manoeuvre, the pilot shall clearly voice the word, ***complete***.

6) Judges Scoreboard
A judges scoreboard/s should be used whenever possible. Detailed instructions on how to make a scoreboard are on pages 29, 30 and 31. Further tips on how to use one are in point **8** on this page.

7) Judges Viewing Window
A manoeuvre shall be performed centrally within a specified area as depicted in the Judges Viewing Window diagram or as designated by the Contest Director. If the pilot does not fly the glider within the designated area, a penalty may be incurred if the manoeuvre is not performed as required.

8) Deductions
Other penalties may also apply to a manoeuvre according to the severity of the inaccuracies. Refer to the Deductions List on the previous page.

9) Scoring Procedures
Should one of the methods in this book be chosen, the judge or judges shall hold up their scoreboards high above shoulder height for the scorekeeper. The scorekeeper shall write down the scores from the judges for tallying when required.

10) Requirements for specific manoeuvres
Immelmanns for powered aircraft are required to execute the half roll procedures directly after the half loop procedures. However, a glider flown at most slope venues would not be expected to do the same without losing momentum and possibly stalling the model. Therefore, an allowance has been made for glider pilots to execute the half roll procedures at any point along the horizontal sections but distinctly before the following half loop procedure.

11) Roll Procedures
A roll or part thereof executed at any time during a manoeuvre shall be rolled in the same direction, unless otherwise stated.

12) Landing Requirements
The Contest Director shall provide four markers such as witches hats or the like. These should be placed in an area deemed safe for landing. The narrow sides should be parallel with the face of the slope. A nominal size shall be 8m long x 6m wide.

13) Final Results
Contest Directors shall ensure that the final results (including a breakdown of the judges' scores for the rounds) are made available to the contestants. This shall be done by email, uploaded onto a website or posted by snail mail. Results of any State Championships shall be forwarded to the State's governing body.

15) Protests
If a contestant finds inconsistencies in the scores once the contest has ended, the contestant is advised to contact the Contest Director as soon as possible after the event, if not before.

16) Progressive Scores
A progressive scoreboard could be considered.

~ Colour Template of the Tallysheet ~

MANDATORY MANOEUVRES	KF		R1			R2			R3			R4		
1. Rectangular Circuit	1													
2. Inside Loops x 2	1													
3. Axial Roll - optimum roll rate 2-3 seconds	1													
4. Inverted Flight - maintain invert for 5 seconds	1													
5. Stall Turns x 2	1													
6. Optional Manoeuvre No. 1														
7. Optional Manoeuvre No. 2														
OPTIONAL MANOEUVRES														
Extended Loop - maintain invert for 2 seconds	1.5													
Barrel Roll - civilian type	1.5													
Circle	1.5													
Top Hat - no rolls	1.5													
Triangular Loop	1.5													
Figure 8 Inward or Outward	2													
Inverted Circle	2													
Reverse Triangular Loop	2													
Square Loop	2													
4 Point Roll	2													
Axial Rolls x 3	2.5													
Reverse Cuban 8	2.5													
Reverse Double Immelmann*	2.5													
Spins x 3	2.5													
8 Point Roll	2.5													
Cuban 8	3													
Double Immelmann*	3													
Inverted Figure 8 Inward or Outward	3													
Inverted Spins x 3	3													
Outside Loops x 2	3													
8. Pattern	5													
9. Slope Circuit & Landing	1													

~ B&W Template of the Tallysheet ~

MANDATORY MANOEUVRES	KF		R1			R2			R3			R4		
1. Rectangular Circuit	1													
2. Inside Loops x 2	1													
3. Axial Roll - optimum roll rate 2-3 seconds	1													
4. Inverted Flight - maintain invert for 5 seconds	1													
5. Stall Turns x 2	1													
6. Optional Manoeuvre No. 1														
7. Optional Manoeuvre No. 2														
OPTIONAL MANOEUVRES														
Extended Loop - maintain invert for 2 seconds	1.5													
Barrel Roll - civilian type	1.5													
Circle	1.5													
Top Hat - no rolls	1.5													
Triangular Loop	1.5													
Figure 8 Inward or Outward	2													
Inverted Circle	2													
Reverse Triangular Loop	2													
Square Loop	2													
4 Point Roll	2													
Axial Rolls x 3	2.5													
Reverse Cuban 8	2.5													
Reverse Double Immelmann*	2.5													
Spins x 3	2.5													
8 Point Roll	2.5													
Cuban 8	3													
Double Immelmann*	3													
Inverted Figure 8 Inward or Outward	3													
Inverted Spins x 3	3													
Outside Loops x 2	3													
8. Pattern	5													
9. Slope Circuit & Landing	1													

Ultimate Slope Aerobatics Challenge - Round 1

NAME ……. MAAA/AMAS No ……. DATE …….

CLUB ……..

MANDATORY MANOEUVRES	KF	R1
1. Rectangular Circuit	1	
2. Inside Loops x 2	1	
3. Axial Roll - optimum roll rate 2-3 seconds	1	
4. Inverted Flight - maintain invert for 5 seconds	1	
5. 2 Consecutive Stall Turns	1	
6. Optional Manoeuvre No. 1		
7. Optional Manoeuvre No. 2		
OPTIONAL MANOEUVRES		
Extended Loop - maintain invert for 2 seconds	1.5	
Barrel Roll - civilian type	1.5	
Circle	1.5	
Top Hat - no rolls	1.5	
Triangular Loop	1.5	
Figure 8 Inward or Outward	2	
Inverted Circle	2	
Reverse Triangular Loop	2	
Square Loop	2	
4 Point Roll	2	
8. Pattern - Axial Roll, Inside Loop, Figure 8 Inside	1	
9. Landing - upwind leg, crosswind leg, downwind leg, half descending circle and land	1	

Ultimate Slope Aerobatics Challenge - Round 2

NAME ……. MAAA/AMAS No ……. DATE …….

CLUB ……..

MANDATORY MANOEUVRES	KF	R2
1. Rectangular Circuit	1	
2. Inside Loops x 2	1	
3. Axial Roll - optimum roll rate 2-3 seconds	1	
4. Inverted Flight - maintain invert for 5 seconds	1	
5. 2 Consecutive Stall Turns	1	
6. Optional Manoeuvre No. 1		
7. Optional Manoeuvre No. 2		
OPTIONAL MANOEUVRES		
Figure 8 Inward or Outward	2	
Inverted Circle	2	
Reverse Triangular Loop	2	
Square Loop	2	
4 Point Roll	2	
Axial Rolls x 3	2.5	
Reverse Cuban 8	2.5	
Reverse Double Immelmann*	2.5	
Spins x 3	2.5	
8 Point Roll	2.5	
8. Pattern - Axial Roll, Inside Loop, Figure 8 Inside	1	
9. Landing - upwind leg, crosswind leg, downwind leg, half descending circle and land	1	

Ultimate Slope Aerobatics Challenge - Round 3

NAME ……. MAAA/AMAS No ……. DATE …….

CLUB ……..

MANDATORY MANOEUVRES	KF	R3
1. Rectangular Circuit	1	
2. Inside Loops x 2	1	
3. Axial Roll - optimum roll rate 2-3 seconds	1	
4. Inverted Flight - maintain invert for 5 seconds	1	
5. 2 Consecutive Stall Turns	1	
6. Optional Manoeuvre No. 1		
7. Optional Manoeuvre No. 2		
OPTIONAL MANOEUVRES		
Axial Rolls x 3	2.5	
Reverse Cuban 8	2.5	
Reverse Double Immelmann*	2.5	
Spins x 3	2.5	
8 Point Roll	2.5	
Cuban 8	3	
Double Immelmann*	3	
Inverted Figure 8 Inward or Outward	3	
Inverted Spins x 3	3	
Outside Loops x 2	3	
8. Pattern - Axial Roll, Inside Loop, Figure 8 Inside	1	
9. Landing - upwind leg, crosswind leg, downwind leg, half descending circle and land	1	

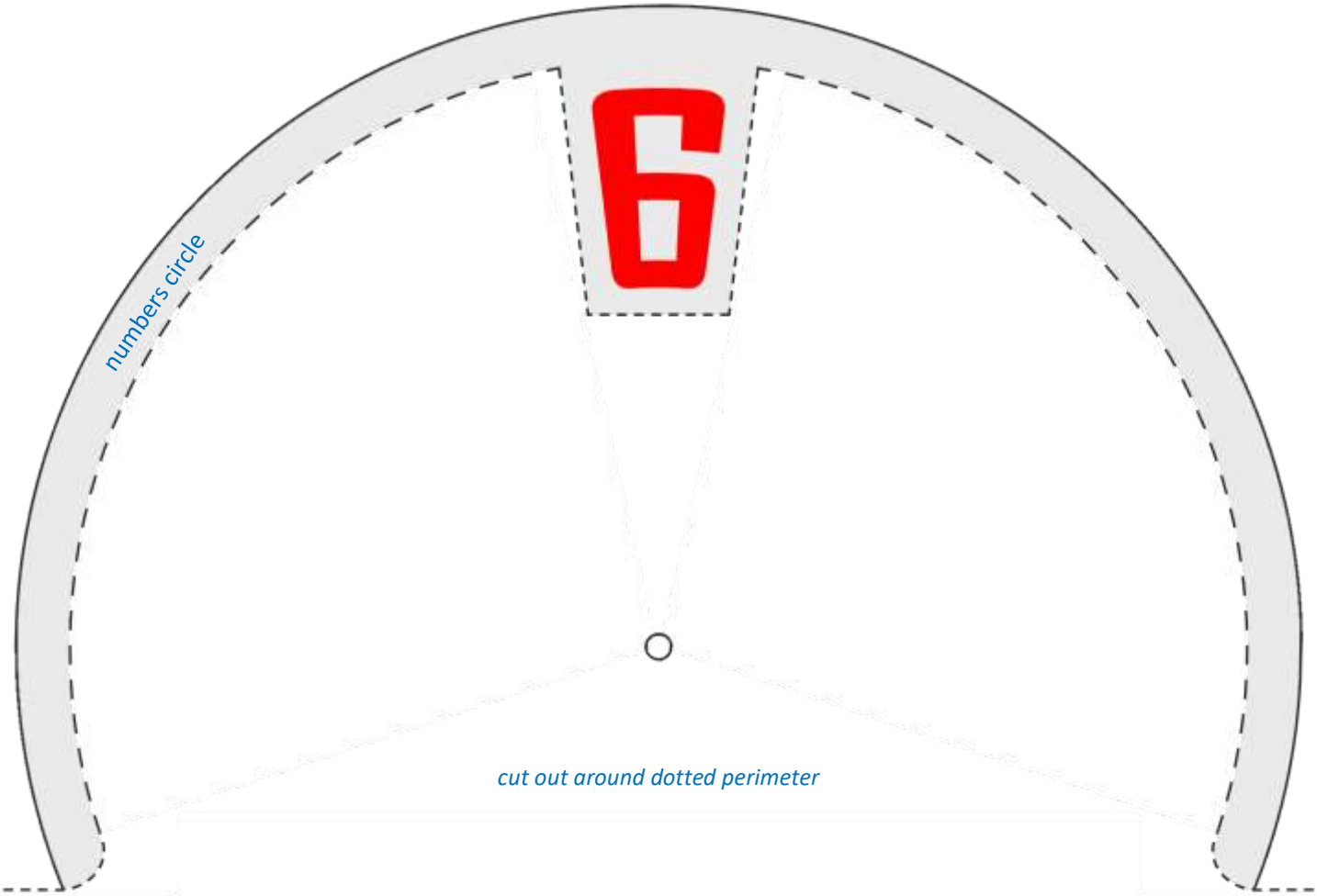
Ultimate Slope Aerobatics Challenge - Round 4

NAME ……. MAAA/AMAS No ……. DATE …….

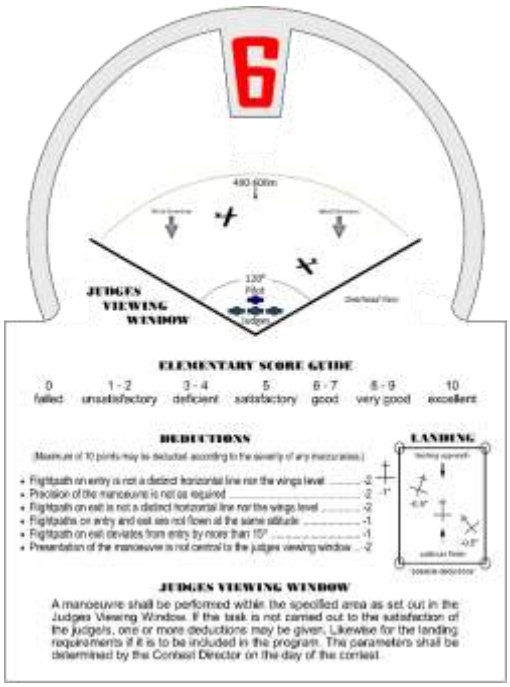
CLUB ……..

MANDATORY MANOEUVRES	KF	R4
1. Rectangular Circuit	1	
2. Inside Loops x 2	1	
3. Axial Roll - optimum roll rate 2-3 seconds	1	
4. Inverted Flight - maintain invert for 5 seconds	1	
5. 2 Consecutive Stall Turns	1	
6. Optional Manoeuvre No. 1		
7. Optional Manoeuvre No. 2		
OPTIONAL MANOEUVRES		
Cuban 8	3	
Double Immelmann*	3	
Inverted Figure 8 Inward or Outward	3	
Inverted Spins x 3	3	
Outside Loops x 2	3	
Extended Loop - maintain invert for 2 seconds	1.5	
Barrel Roll - civilian type	1.5	
Circle	1.5	
Top Hat - no rolls	1.5	
Triangular Loop	1.5	
8. Pattern - Axial Roll, Inside Loop, Figure 8 Inside	1	
9. Landing - upwind leg, crosswind leg, downwind leg, half descending circle and land	1	

~ Template for a wooden or plastic backing board for a Judges Scoreboard ~



cut out around dotted perimeter

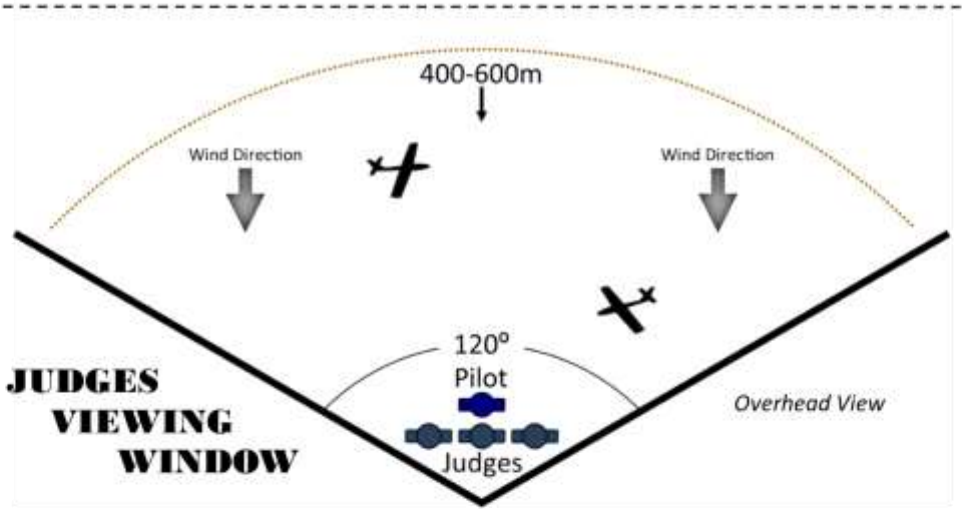


~ Guides for a Judges Scoreboard ~

Directions

Cut around the perimeter of the guides chart where indicated, laminate it, then adhere it to the wooden or plastic backing board with thin double-sided tape, as shown on the previous page.

cut out around dotted perimeter



ELEMENTARY SCORE GUIDE

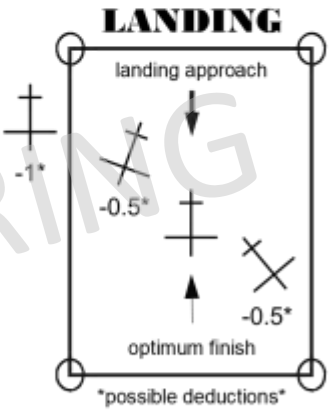
0	1 - 2	3 - 4	5	6 - 7	8 - 9	10
failed	unsatisfactory	deficient	satisfactory	good	very good	excellent

DEDUCTIONS

(Maximum of 10 points may be deducted according to the severity of any inaccuracies.)

- Flightpath on entry is not a distinct horizontal line nor the wings level ..... -2
- Precision of the manoeuvre is not as required ..... -2
- Flightpath on exit is not a distinct horizontal line nor the wings level ..... -2
- Flightpaths on entry and exit are not flown at the same altitude ..... -1
- Flightpath on exit deviates from entry by more than 15° ..... -1
- Presentation of the manoeuvre is not central to the judges viewing window ... -2

LANDING



JUDGES VIEWING WINDOW

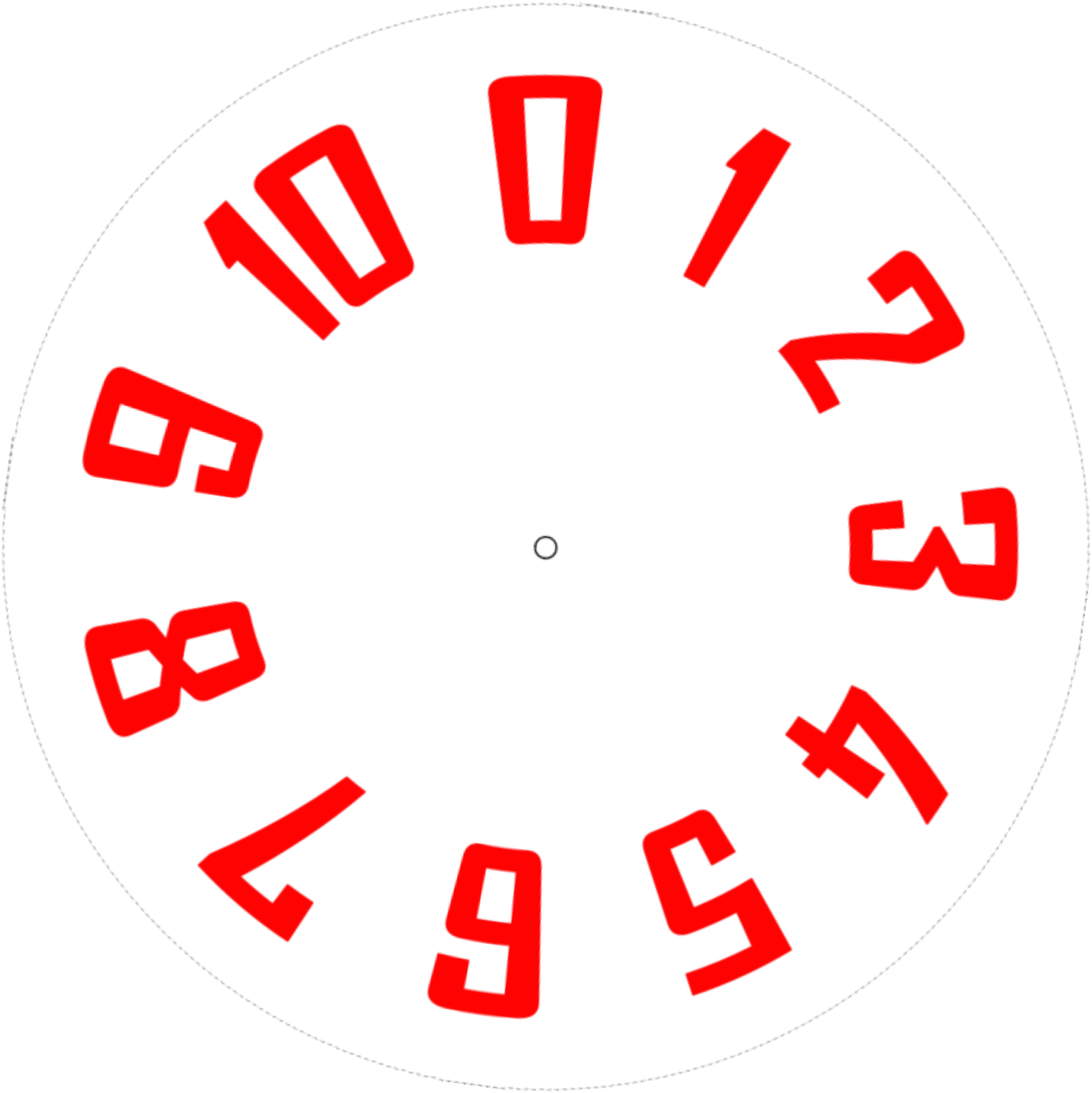
A manoeuvre shall be performed within the specified area as set out in the Judges Viewing Window. If the task is not carried out to the satisfaction of the judge/s, one or more deductions may be given. Likewise for the landing requirements if it is to be included in the program. The parameters shall be determined by the Contest Director on the day of the contest.

~ Template of the Numbers Circle for a Judges Scoreboard ~

Directions

Drill a hole in the middle of the circle and the backing board, then attach the numbers plate to the backing board with a 4-6mm metal thread screw and nut and include a washer either side. Adjust the numbers plate tightly enough so that it can be turned with one finger.

cut out around dotted perimeter



~ Inside Loop ~

The **Inside Loop** is a mandatory manoeuvre in most slope aerobatics contests. Though it is fairly straightforward to perform, it is still easy to get out of shape. The key point to attaining a high mark is to prevent the model from wandering off its intended flightpath throughout the duration of the circle. The wandering affect is known as corkscrewing.

ABREVIATIONS: EF/B = move elevator joystick forward/backward. **AL/R** = ditto ailerons left/right. **RL/R** = ditto rudder left/right. **CA** = corrective action.

Performance in Flight

- Launch and gain height
- Dive steeply for a discernible distance to gain optimum speed to perform the manoeuvre
- Level out for a discernible distance (**1**) then at the central point pull up (EB) into the circle (**2**) and continue around in a smooth fashion (**3**)
- Level out (EF-CA) back onto the horizontal section in the upright position (**4**) and head directly to the finish (**5**)
- Maintain level flight for a discernible distance before exiting the flightpath

(*ALERT: During the circular part of the manoeuvre, the elevator control might have to be moved backward or forward at particular points to compensate for the wind and gravity variables.*)

Deductions

- Flightpath on entry not a distinct horizontal line nor the wings level
- Aircraft flies off line or corkscrews from its intended flightpath
- Flightpath on exit not a distinct horizontal line nor the wings level
- Flightpath on entry and exit not flown at the same altitude
- Flightpath on exit deviates from entry by more than 15°
- Presentation of the manoeuvre not centred

~ Extended Loop ~

The **Extended Loop** primarily caters for competitors who take part in events with a glider controlled by only a rudder and elevator. These two controls are sufficient for a pilot to perform manoeuvres that require a roll to the inverted position without the use of ailerons. Nevertheless, this is still a neat, stand-alone manoeuvre to perform, particularly for beginners.

ABREVIATIONS: EF/B = move elevator joystick forward/backward. **AL/R** = ditto ailerons left/right. **RL/R** = ditto rudder left/right. **CA** = corrective action.

Performance in Flight

- Launch and gain height
- Dive steeply for a discernible distance to gain optimum speed to perform the manoeuvre
- Level out for a discernible distance (**1**) then just past the central point pull up (EB) onto the first half circle and continue around (**2**)
- Level out (EF-CA) onto the horizontal section and continue on for three seconds minimum with the model inverted (**3**) (*ALERT: During the inverted section, be sure to use more forward elevator input than usual to prevent the model from dropping offline.*)
- Pull back (EB) onto the second half circle and continue around (**4**)
- Level out (EF-CA) back onto the lower horizontal section (**5**) and head directly to the finish (**6**)
- Maintain level flight for a discernible distance before exiting the flightpath

Deductions

- Flightpath on entry not a distinct horizontal line nor the wings level
- Aircraft flies off line or corkscrews from its intended flightpath during the first half circle
- Aircraft does not maintain a steady horizontal line while inverted
- Aircraft flies off line or corkscrews from its intended flightpath during the second half circle
- Flightpath on exit not a distinct horizontal line nor the wings level
- Flightpath on entry and exit not flown at the same altitude
- Flightpath on exit deviates from entry by more than 15°
- Presentation of the manoeuvre not centred

~ Square Loop ~

The **Square Loop** appears to be an almost impossible manoeuvre to perform, especially when flown with a glider. But it can be done and done well. The two key points are: A: Gain as much speed as possible so that the model does not run out of momentum on the first perpendicular leg. B: Learn how to correctly manipulate the elevator control during the perpendicular legs. When performed with precision, this manoeuvre is impressive viewing.

ABREVIATIONS: EF/B = move elevator joystick forward/backward. **AL/R** = ditto ailerons left/right. **RL/R** = ditto rudder left/right. **CA** = corrective action.

Performance in Flight

- Launch and gain height
- Dive steeply for a discernible distance to gain optimum speed to perform the manoeuvre
- Level out for a discernible distance (**1**) then just past the central point pull up (EB) onto the first perpendicular leg and continue (**2**)
- Pull back (EB) onto the upper horizontal leg with the glider inverted and continue (**3**)
- Pull back (EB) onto the second perpendicular leg and continue (**4**)
- Level out (EB *then* EF-CA) back onto the lower horizontal section (**5**) and head directly to the finish (**6**)
- Maintain level flight for a discernible distance before exiting the flightpath

Deductions

- Flightpath on entry not a distinct horizontal line nor the wings level
- Perpendicular and upper horizontal legs not flown in a steady line
- On reflection, all four corner turns not negotiated with consistency
- Flightpath on exit not a distinct horizontal line nor the wings level
- Flightpath on entry and exit not flown at the same altitude
- Flightpath on exit deviates from entry by more than 15°
- Presentation of the manoeuvre not centred

~ Triangular Loop ~

The **Triangular Loop** is a relatively easy manoeuvre to perform, though it does take a considerable amount of practise to master the elevator movements during the vertical legs. Once perfected, this manoeuvre makes for a good spectacle.

ABREVIATIONS: EF/B = move elevator joystick forward/backward. **AL/R** = ditto ailerons left/right. **RL/R** = ditto rudder left/right. **CA** = corrective action.

Performance in Flight

- Launch and gain height
- Dive steeply for a discernible distance to gain optimum speed to perform the manoeuvre
- Level out for a discernible distance (**1**) then just past the central point tightly pull up (EB) onto the first vertical leg and continue (**2**)
- At the peak tightly pull back (EB) onto the second vertical leg and continue (**3**)
- Level out (EB *then* EF-CA) back onto the horizontal section (**4**) and head directly to the finish (**5**)
- Maintain level flight for a discernible distance before exiting the flightpath

Deductions

- Flightpath on entry not a distinct horizontal line nor the wings level
- Vertical legs not flown in a steady line
- On reflection, all three corner turns not negotiated with consistency
- Flightpath on exit not a distinct horizontal line nor the wings level
- Flightpath on exit deviates from entry by more than 15°
- Presentation of the manoeuvre not centred

~ Reverse Triangular Loop ~

The **Reverse Triangular Loop** is quite difficult to perform, despite its apparent looks. Perfecting the elevator movements while flying along the vertical legs may take some time to perfect, moreso than its closest relative, the **Triangular Loop**.

ABREVIATIONS: EF/B = move elevator joystick forward/backward. **AL/R** = ditto ailerons left/right. **RL/R** = ditto rudder left/right. **CA** = corrective action.

Performance in Flight

- Launch and gain height
- Dive steeply for a discernible distance to gain optimum speed to perform the manoeuvre
- Level out for a discernible distance (**1**) then at the central point pull up (EB) onto the first vertical leg and continue (**2**)
- Tightly pull back (EB) onto the upper horizontal leg with the glider inverted and continue (**3**)
- Tightly pull back (EB) onto the second vertical leg and continue (**4**)
- Level out (EB *then* EF-CA) back onto the lower horizontal section and head directly to the finish (**5**)
- Maintain level flight for a discernible distance before exiting the flightpath

Deductions

- Flightpath on entry not a distinct horizontal line nor the wings level
- Vertical legs and upper horizontal leg not flown in a steady line
- On reflection, all three corner turns not negotiated with consistency
- Flightpath on exit not a distinct horizontal line nor the wings level
- Flightpath on entry and exit was not flown at the same altitude
- Flightpath on exit deviates from entry by more than 15°
- Presentation of the manoeuvre not centred

~ Top Hat ~

modified for gliders, i.e. rolls not required

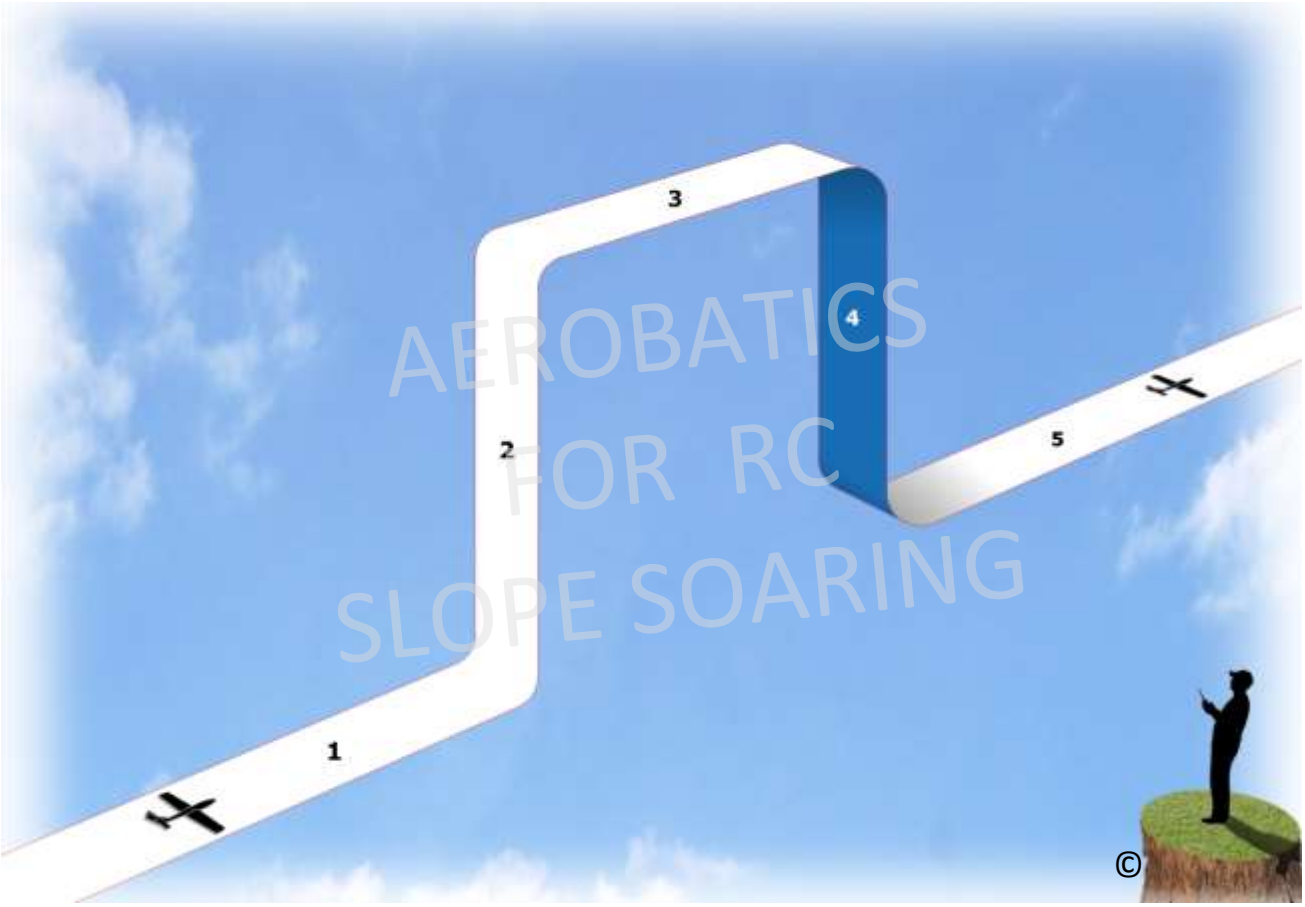
The **Top Hat** is aptly named but do not be fooled by its apparent simplicity. The perpendicular legs in particular can easily bring pilots unstuck should they have a momentary lapse in concentration.
ABREVIATIONS: EF/B = move elevator joystick forward/backward. **AL/R** = ditto ailerons left/right. **RL/R** = ditto rudder left/right. **CA** = corrective action.

Performance in Flight

- Launch and gain height
- Dive steeply for a discernible distance to gain optimum speed to perform the manoeuvre
- Level out for a discernible distance (**1**) then pull up (EB) onto the first perpendicular leg and continue (**2**)
- Push forward (EF) onto the upper horizontal leg and continue (**3**)
- Push forward (EF) onto the second perpendicular leg and continue (**4**)
- Level out (EB *then* EF-CA) back onto the lower horizontal section and head to the finish (**5**)
- Maintain level flight for a discernible distance before exiting the flightpath

Deductions

- Flightpath on entry not a distinct horizontal line nor the wings level
- Perpendicular legs and upper horizontal leg not flown in a steady line
- Flightpath on exit not a distinct horizontal line nor the wings level
- Flightpath on entry and exit not flown at the same altitude
- Flightpath on exit deviates from entry by more than 15°
- Presentation of the manoeuvre not centred



~ Barrel Roll ~

The **Barrel Roll** (*civilian type*) (*anti-clockwise turn shown*) is an attractive manoeuvre on paper but looks can deceive. It is actually quite difficult to master. The key point to watch out for is that when the model is fully inverted, it should be facing at 90° to the start.

ABREVIATIONS: EF/B = move elevator joystick forward/backward. **AL/R** = ditto ailerons left/right. **RL/R** = ditto rudder left/right. **CA** = corrective action.

Performance in Flight

- Launch and gain height
- Dive steeply for a discernible distance to gain optimum speed to perform the manoeuvre
- Level out for a discernible distance (**1**) then just before the central point pull up and left (AL/EB) onto the circular part of the manoeuvre (**2**) and continue (**3**) (*ALERT: At the peak, when the aircraft is fully inverted, the model should be facing at 90° to the start.*)
- Level out gradually (AR/EF-CA) back onto the horizontal section and head to the finish (**4**)
- Maintain level flight for a discernible distance before exiting the flightpath

Deductions

- Flightpath on entry not a distinct horizontal line nor the wings level
- Top half circle not facing at 90° to the horizontal section
- Flightpath on exit not a distinct horizontal line nor the wings level
- Flightpath on entry and exit not flown at the same altitude
- Flightpath on exit deviates from entry by more than 15°
- Presentation of the manoeuvre not centred

~ Stall Turns x 2 ~

The **Two Stall Turns** look simple enough but there is one critical factor a pilot needs to stay alert to. At the point when the model is about to stall, i.e. at the peak of the perpendicular legs, the model will become momentarily uncontrollable. Therefore, each peak should be reached with the model lined up in the ideal position. Using the rudder with precision (providing the model has a rudder) is the key to a successful outcome. (*See the **Spins x 3** for the description of a 'wingover'.*)

ABREVIATIONS: EF/B = move elevator joystick forward/backward. **AL/R** = ditto ailerons left/right. **RL/R** = ditto rudder left/right. **CA** = corrective action.

Performance in Flight

- Launch and gain height
- Dive steeply for a discernible distance to gain optimum speed to perform the manoeuvre
- Level out for a discernible distance (**1**) then just past the central point pull back (EB) onto the first quarter circle and continue
- Proceed along the perpendicular leg to the first peak (**2**)
- At the stall point, pivot the aircraft on its axis (AL/E *steady* /RL) (*do not cause a wingover*)
- Head back onto the horizontal section and repeat the procedure on the opposite side (**3**)
- When the second stall turn procedure has been completed (**4**) head directly to the finish (**5**)
- Maintain level flight for a discernible distance before exiting the flightpath

Deductions

- Flightpath on entry not a distinct horizontal line nor the wings level
- Perpendicular sections not flown in a steady line nor with consistency
- Stall turns not executed at the same altitude
- Flightpath on exit not a distinct horizontal line nor the wings level
- Flightpath on entry and exit not flown at the same altitude
- Flightpath on exit deviates from entry by more than 15°
- Presentation of the manoeuvre not centred

~ Double Immelmann ~

The **Double Immelmann** is rather tricky to perform. It requires immense concentration, especially when executing the half rolls. Maintaining level flight while rolling from upright to inverted and vice versa is one of the key ingredients to scoring a high mark.

ABREVIATIONS: EF/B = move elevator joystick forward/backward. **AL/R** = ditto ailerons left/right. **RL/R** = ditto rudder left/right. **CA** = corrective action.

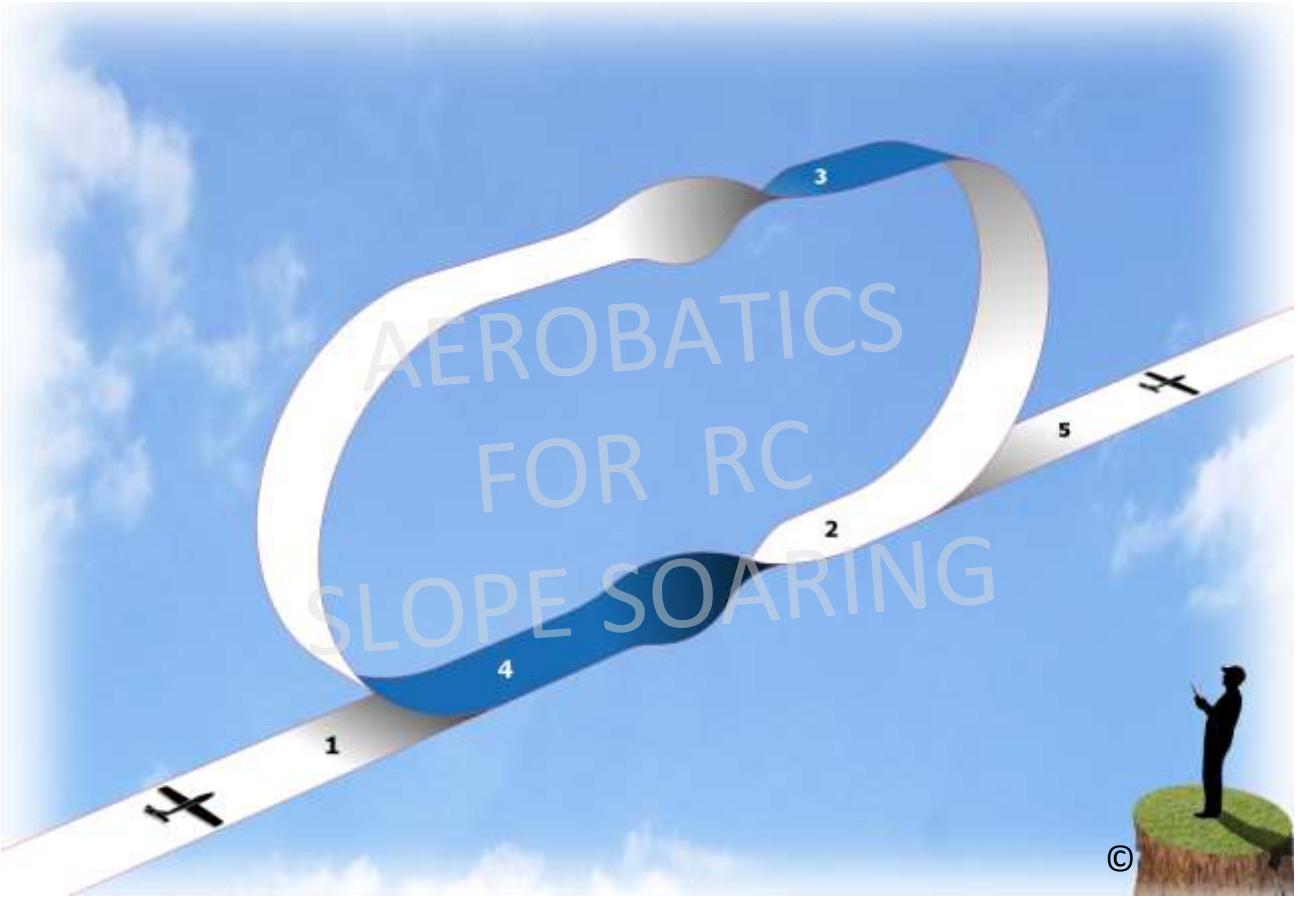
Performance in Flight

- Launch and gain height
- Dive steeply for a discernible distance to gain optimum speed to perform the manoeuvre
- Level out and fly for a short distance (**1**) then just past the central point pull back (EB) onto the first half circle (**2**) and continue
- Level out (EF-CA) onto the horizontal section and fly inverted for a short distance (**3**) then just before the central point roll to upright (AR/EF) and continue for a short distance
- Push forward (EF) onto the second half circle and continue
- Level out (EB-CA) back onto the horizontal section (**4**) roll to upright (AR/EF) and head directly to the finish (**5**)
- Maintain level flight for a discernible distance before exiting the flightpath

Deductions

- Flightpath on entry not a distinct horizontal line nor the wings level
- Aircraft flies offline or corkscrews from its intended flightpath during the first half circle
- Aircraft does not maintain a steady line after the first half roll
- Aircraft flies offline or corkscrews from its intended flightpath during the second half circle
- Aircraft does not maintain a steady line after the second half roll
- Flightpath on exit not a distinct horizontal line nor the wings level
- Flightpath on entry and exit not flown at the same altitude
- Flightpath on exit deviates from entry by more than 15°
- Presentation of the manoeuvre not centred

Modified for gliders, i.e. rolls can be executed anywhere along the horizontal sections.



~ Reverse Double Immelmann ~

The **Reverse Double Immelmann** is similar to the **Double Immelmann**. The differences are that the half rolls and other areas are opposed. But there are similar pitfalls in both manoeuvres. It's just a matter of practising these manoeuvres repeatedly to iron out their most difficult areas.

ABREVIATIONS: EF/B = move elevator joystick forward/backward. **AL/R** = ditto ailerons left/right. **RL/R** = ditto rudder left/right. **CA** = corrective action.

Performance in Flight

- Launch and gain height
- Dive steeply for a discernible distance to gain optimum speed to perform the manoeuvre
- Level out for a discernible distance (**1**) then just before the central point roll to inverted (AR/EF) (**2**), fly for a short distance then push forward (EF) onto the first half circle (**3**) and continue
- Level out onto the horizontal section (EF *followed by* EB-CA), fly for a short distance (**4**) then just before the central point roll to inverted (AR/EF), fly for a short distance then pull back (EB) onto the second half circle and continue
- Level out (EF-CA) back onto the horizontal section (**5**) and head directly to the finish (**6**)
- Maintain level flight for a discernible distance before exiting the flightpath

Deductions

- Flightpath on entry not a distinct horizontal line nor the wings level
- Aircraft flies offline or corkscrews from its intended flightpath during the first half circle
- Aircraft does not maintain a steady horizontal flightpath after the first half roll
- Aircraft flies offline or corkscrews from its intended flightpath during the second half circle
- Aircraft does not maintain a steady horizontal flightpath after the second half roll
- Flightpath on exit not a distinct horizontal line nor the wings level
- Flightpath on entry and exit not flown at the same altitude
- Flightpath on exit deviates from entry by more than 15°
- Presentation of the manoeuvre not centred

Modified for gliders, i.e. rolls can be executed anywhere along the horizontal sections.

~ Outward Figure 8 ~

The **Outward Figure 8** (*left to right shown*) looks easy enough to perform but do not be fooled by this deceptive-looking manoeuvre. It requires a considerable amount of momentum to successfully complete without losing altitude. Usually having to fly two areas upwind, two downwind and four crosswind, not compensating for these variables could be detrimental to the desired outcome.

ABREVIATIONS: EF/B = move elevator joystick forward/backward. **AL/R** = ditto ailerons left/right. **RL/R** = ditto rudder left/right. **CA** = corrective action.

Performance in Flight

- Launch and gain height
- Dive steeply for a discernible distance to gain optimum speed to perform the manoeuvre
- Level out for a discernible distance (**1**) then just before the central point turn left onto the left-hand circle momentarily (AL/EB) (**2**)
- Veer across to the right-hand circle (AR/EB) (**3**) and continue in a clockwise direction (**4**)
- Proceed along the straight section momentarily then head back out along the right-hand circle momentarily (**5**)
- Veer across to the left-hand circle (AL/EB) (**6**) and continue in an anti-clockwise direction (**7**)
- Return to the straight section (AR/EF-CA) (**8**) and head directly to the finish (**9**)
- Maintain level flight for a discernible distance before exiting the flightpath

Deductions

- Flightpath on entry not a distinct horizontal line nor the wings level
- Circles not flown evenly nor with roundness
- Flightpath on exit not a distinct horizontal line nor the wings level
- Flightpath on entry and exit not flown at the same altitude
- Flightpath on exit deviates from entry by more than 15°
- Presentation of the manoeuvre not centred

~ Outward Inverted Figure 8 ~

The **Outward Inverted Figure 8** (*left to right shown*) is considerably more difficult to perform than its counterpart. While it may have the same wind variables, the added complexities of the half rolls and the inverted circles ranks this manoeuvre amongst the most difficult ones to perform.

ABREVIATIONS: EF/B = move elevator joystick forward/backward. **AL/R** = ditto ailerons left/right. **RL/R** = ditto rudder left/right. **CA** = corrective action.

Performance in Flight

- Launch and gain height
- Dive steeply for a discernible distance to gain optimum speed to perform the manoeuvre
- Level out for a discernible distance then roll to inverted (AR/EF) (**1**) then just before the central point turn left onto the left-hand circle momentarily (AL/EF) (**2**)
- Veer across to the right-hand circle (AR/EF) (**3**) and continue in a clockwise direction (**4**)
- Proceed along the straight section momentarily then head back out along the right-hand circle momentarily (AR/EF) (**5**)
- Veer across to the left-hand circle (AL/EF) (**6**) and continue in an anti-clockwise direction (**7**)
- Return to the straight section (AR/EB-CA) (**8**)
- Proceed for a short distance, then roll to upright (AL/EF) (**9**) and head to the finish (**10**)
- Maintain level flight for a discernible distance before exiting the flightpath

Deductions

- Flightpath on entry not a distinct horizontal line nor the wings level
- Circles not flown evenly nor with roundness
- Half rolls not executed evenly nor with consistency
- Flightpath on exit not a distinct horizontal line nor the wings level
- Flightpath on entry and exit not flown at the same altitude
- Flightpath on exit deviates from entry by more than 15°
- Presentation of the manoeuvre not centred

~ Inward Figure 8 ~

The **Inward Figure 8** (*left to right shown*) looks easy enough to perform but do not be fooled by this deceptive-looking manoeuvre. It requires a substantial amount of momentum to successfully complete without losing altitude. Usually having to fly two areas upwind, two downwind and four crosswind, not compensating for these variables could be detrimental to the desired outcome.
ABREVIATIONS: EF/B = move elevator joystick forward/backward. **AL/R** = ditto ailerons left/right. **RL/R** = ditto rudder left/right. **CA** = corrective action.

Performance in Flight

- Launch and gain height
- Dive steeply for a discernible distance to gain optimum speed to perform the manoeuvre
- Level out for a discernible distance (**1**) then just past the central point turn left onto the right-hand circle (AL/EB) (**2**) and continue in an anti-clockwise direction (**3**)
- Veer across to the left-hand circle momentarily (AR/EB) (**4**)
- Proceed along the straight section momentarily then head back out along the left-hand circle (AR/EB) (**5**) and continue in a clockwise direction
- Veer across to the right-hand circle momentarily (AL/EB) (**7**) then return to the straight section (AR/EF-CA) (**8**) and head directly to the finish (**9**)
- Maintain level flight for a discernible distance before exiting the flightpath

Deductions

- Flightpath on entry not a distinct horizontal line nor the wings level
- Circles not flown evenly nor with roundness
- Flightpath on exit not a distinct horizontal line nor the wings level
- Flightpath on entry and exit not flown at the same altitude
- Flightpath on exit deviates from entry by more than 15°
- Presentation of the manoeuvre not centred

~ Inward Inverted Figure 8 ~

The **Inward Inverted Figure 8** (*left to right shown*) is considerably more difficult to perform than its counterpart. While it may have the same wind variables, the added complexities of the rolls part thereof and the inverted circles, ranks this manoeuvre amongst the more difficult ones to perform.
ABREVIATIONS: EF/B = move elevator joystick forward/backward. **AL/R** = ditto ailerons left/right. **RL/R** = ditto rudder left/right. **CA** = corrective action.

Performance in Flight

- Launch and gain height
- Dive steeply for a discernible distance to gain optimum speed to perform the manoeuvre
- Level out for a discernible distance then roll to inverted (AR/EF) (**1**) then just past the central point turn left onto the right-hand circle (AL/EF) (**2**) and continue in an anti-clockwise direction (**3**)
- Veer across to the left-hand circle momentarily (AR/EF) (**4**)
- Proceed along the straight section momentarily then head back out along the left-hand circle (AR/EF) (**5**) and proceed in a clockwise direction
- Veer across to the right-hand circle momentarily (AL/EF) (**7**) then return to the straight section (AR/EB-CA) (**8**)
- Proceed for a short distance then roll to upright (AR/EF) (**9**) and head to the finish (**10**)
- Maintain level flight for a discernible distance before exiting the flightpath

Deductions

- Flightpath on entry not a distinct horizontal line nor the wings level
- Circles not flown evenly nor with roundness
- Half rolls not executed evenly nor with consistency
- Flightpath on exit not a distinct horizontal line nor the wings level
- Flightpath on entry and exit not flown at the same altitude
- Flightpath on exit deviates from entry by more than 15°
- Presentation of the manoeuvre not centred

~ Spins x 3 ~

The **Spins x 3** (*clockwise spins shown*) can be one of the most hazardous manoeuvres to perform due to the model's rapid loss of altitude as it descends from top to bottom. Many pilots have come unstuck with this manoeuvre by over-committing to all three spins but not having enough altitude to fully recover. An important area to be alert to is entering the first spin correctly and not causing a 'wingover'. If for example, should the spins be commenced in a clockwise direction, the right-hand wing should drop downward; the left-hand wing should not lift upward. Failing to enter the spins correctly could incur a penalty. So be sure to stall the model before executing the spins.

ABREVIATIONS: EF/B = move elevator joystick forward/backward. **AL/R** = ditto ailerons left/right. **RL/R** = ditto rudder left/right. **CA** = corrective action.

Performance in Flight

- Launch and gain height
- Level out for a discernible distance (**1**)
- At the central point (**2**) drop the right-hand wing by simultaneously moving the ailerons all the way to the right, the elevator all the way back and the rudder all the way to the right (*if the model has a rudder*) (AR/EB/RR) and commence the spins
- Level out from the third spin (AL/EF/RL-CA) onto the lower horizontal section (**3**) and head to the finish (**4**)
- Maintain level flight for a discernible distance before exiting the flightpath

Deductions

- Flightpath on entry not a distinct horizontal line nor the wings level
- Upon entering the spins, a wingover is executed, instead of a stall
- Spins not flown with consistency
- Aircraft does not pull out level after the last spin
- Flightpath on exit not a distinct horizontal line nor the wings level
- Flightpath on entry and exit not flown in the same direction
- Flightpath on exit deviates from entry by more than 15°
- Presentation of the manoeuvre not centred

~ Inverted Spins x 3 ~

The **Inverted Spins x 3** (*clockwise spins shown*) is without a doubt one of the hardest manoeuvres to perform. As with the upright **Spins x 3**, the pilot has to contend with the model's rapid loss of altitude in a very short period and with the added complexity of performing all three spins with the model inverted. This manoeuvre requires a great deal of airtime to master. The pilot needs to make sure he or she has allowed enough altitude to complete the manoeuvre without incident, moreso than with the upright spins. As with the **Spins x 3**, all control surfaces need to be moved to their extremities. This manoeuvre is indeed a very gutsy one that few pilots are game to attempt.

ABREVIATIONS: EF/B = move elevator joystick forward/backward. **AL/R** = ditto ailerons left/right. **RL/R** = ditto rudder left/right. **CA** = corrective action.

Performance in Flight

- Launch and gain height
- Level out for a discernible distance (**1**) then roll to inverted (AL/EF)
- At the central point (**2**) drop the left-hand wing by simultaneously moving the ailerons all the way to the right, the elevator all the way forward and the rudder all the way to the left (*if the model has a rudder*) (AR/EF/RL) and commence the spins
- Level out from the third spin (AL/EB/RR-CA) onto the lower horizontal section (**3**) then roll to upright (AR/EF) and head to the finish (**4**)
- Maintain level flight for a discernible distance before exiting the flightpath

Deductions

- Flightpath on entry not a distinct horizontal line nor the wings level
- Upon entering the spins, a wingover is executed, instead of a stall
- Entry/exit half rolls and spins not executed or flown with consistency, respectively
- Aircraft does not pull out level after the last spin
- Flightpath on exit not a distinct horizontal line nor the wings level
- Flightpath on entry and exit not flown in the same direction
- Flightpath on exit deviates from entry by more than 15°
- Presentation of the manoeuvre not centred

~ Circle ~

The **Circle** (*anti-clockwise circle shown*) is one of the easiest manoeuvres to perform. Nevertheless, care must still be taken to fly it with precision. From a judge's perspective, the easier a manoeuvre appears to be, the more conspicuous are any errors.

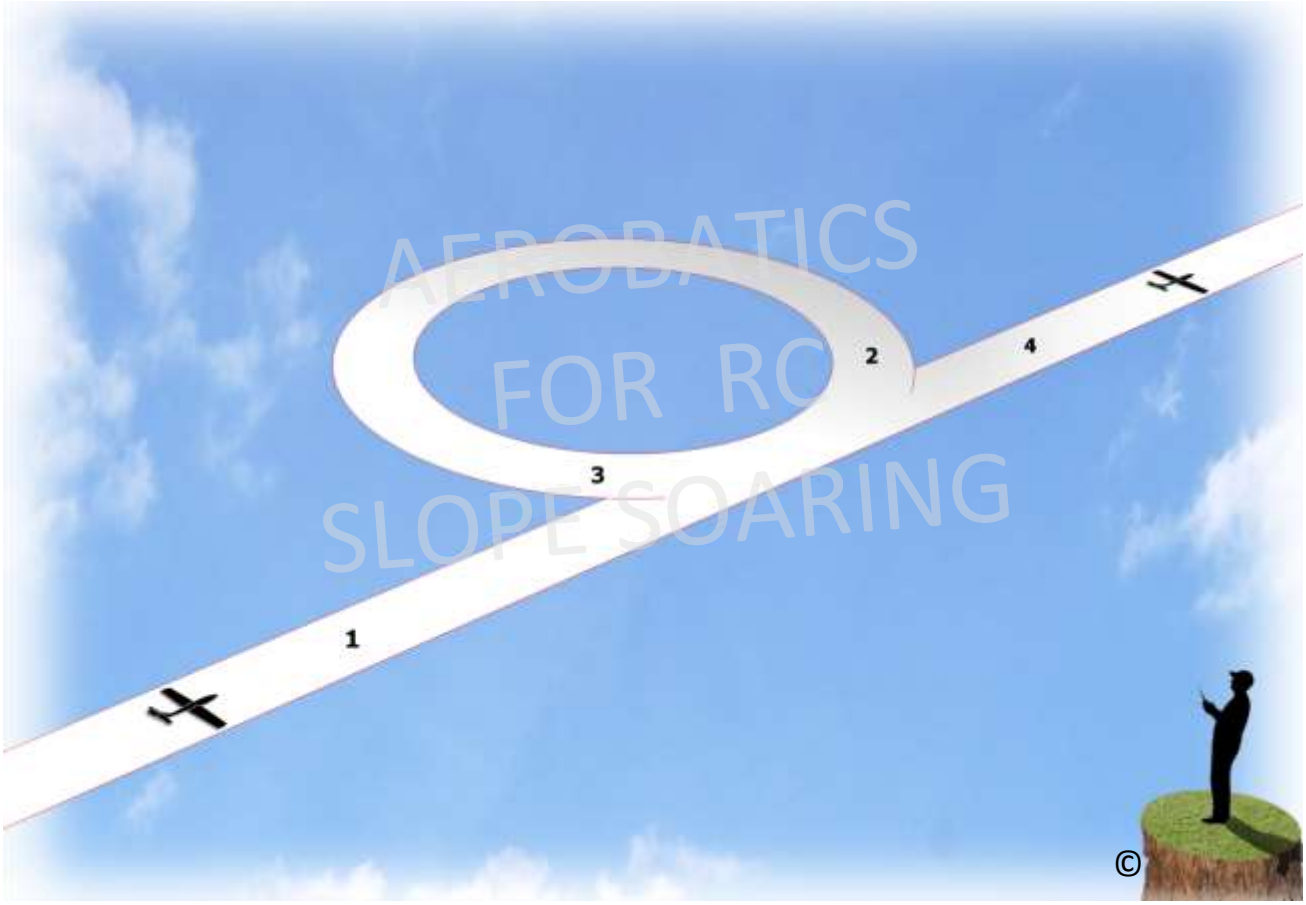
ABREVIATIONS: EF/B = move elevator joystick forward/backward. **AL/R** = ditto ailerons left/right. **RL/R** = ditto rudder left/right. **CA** = corrective action.

Performance in Flight

- Launch and gain height
- Level out for a discernible distance (**1**) then at the central point ease onto the circle proper (AL/EB) (**2**)
- Complete the circle in an anti-clockwise direction (AL/EB) (**3**) and return to the straight section (AR/EF-CA) and head to the finish (**4**)
- Maintain level flight for a discernible distance before exiting the flightpath

Deductions

- Flightpath on entry not a distinct horizontal line nor the wings level
- Circle not flown evenly nor with roundness
- Flightpath on exit not a distinct horizontal line nor the wings level
- Flightpath on entry and exit not flown at the same altitude
- Flightpath on exit deviates from entry by more than 15°
- Presentation of the manoeuvre not centred



~ Inverted Circle ~

The **Inverted Circle** (*anti-clockwise circle shown*) turns a relatively easy upright circle into a more complex manoeuvre by having the added complexity of the two half rolls, as well as having to perform the circle upside down. Flying any manoeuvre inverted is always tricky, especially when being flown with a glider on the slope.

ABREVIATIONS: EF/B = move elevator joystick forward/backward. **AL/R** = ditto ailerons left/right. **RL/R** = ditto rudder left/right. **CA** = corrective action.

Performance in Flight

- Launch and gain height
- Level out for a discernible distance then roll to inverted (AR/EF) (**1**) then at the central point ease onto the circle proper (AL/EF) (**2**)
- Complete the circle in an anti-clockwise direction (AR/EF) (**3**) and return to the straight section (AR/EB-CA) (**4**)
- Fly for a short distance then roll to upright (AL/EF) and head to the finish (**5**)
- Maintain level flight for a discernible distance before exiting the flightpath

Deductions

- Flightpath on entry not a distinct horizontal line nor the wings level
- Circle not flown evenly nor with roundness
- Half rolls not executed evenly nor with consistency
- Flightpath on exit not a distinct horizontal line nor the wings level
- Flightpath on entry and exit not flown at the same altitude
- Flightpath on exit deviates from entry by more than 15°
- Presentation of the manoeuvre not centred

~ Axial Roll ~

The **Axial Roll** (*clockwise roll shown*) may appear to be an easy manoeuvre to perform and in essence it is. However, to score a high mark the pilot needs to extend the manoeuvre so that it takes about three seconds to complete, generally speaking. The perfect roll is one that appears smooth and graceful to the judges. Guiding the model through a steady roll takes surprisingly more skill than one might think, as opposed to performing the roll hastily to get it over and done.

ABREVIATIONS: EF/B = move elevator joystick forward/backward. **AL/R** = ditto ailerons left/right. **RL/R** = ditto rudder left/right. **CA** = corrective action.

Performance in Flight

- Launch and gain height
- Dive steeply for a discernible distance to gain optimum speed to perform the manoeuvre
- Level out for a discernible distance (**1**) then slowly roll the aircraft 360° (AR/EF) and head to the finish (**2**)
- Maintain level flight for a discernible distance before exiting the flightpath

Deductions

- Flightpath on entry not a distinct horizontal line nor the wings level
- Roll not executed smoothly nor with grace
- Flightpath on exit not a distinct horizontal line nor the wings level
- Flightpath on entry and exit not flown at the same altitude
- Flightpath on exit deviates from entry by more than 15°
- Presentation of the manoeuvre not centred

~ Axial Rolls x 3 ~

The **Axial Rolls x 3** (*clockwise rolls shown*) is attractive on paper but it needs two main ingredients for a successful outcome. Firstly, the model needs speed, lots of speed, without which the glider is not likely to perform all three rolls consecutively without dropping off line. Secondly, the pilot must be precise in combining the ailerons with the elevator in order to execute the rolls with consistency and to keep the model on track. As a rule of thumb, the gimbal that controls the ailerons may need to be moved further than the gimbal that controls the elevator. However, these movements are dependent on the type of model being flown and how quickly the rolls need to be executed. Pilots will generally come up with their own techniques, depending on their model, the venue and the prevailing weather conditions, amongst other variables. So what about using the rudder? Adding a third procedure to the mix is fine if you can master using all three controls simultaneously. But sometimes it is better to keep it simple and just stick with the two primary controls.

ABREVIATIONS: EF/B = move elevator joystick forward/backward. **AL/R** = ditto ailerons left/right. **RL/R** = ditto rudder left/right. **CA** = corrective action.

Performance in Flight

- Launch and gain height
- Level out for a discernible distance (**1**) then perform three axial rolls consecutively (AR/EF) (*i.e. perform the rolls one after the other without hesitation between each full roll*) and head to the finish (**2**)
- Maintain level flight for a discernible distance before exiting the flightpath

Deductions

- Flightpath on entry not a distinct horizontal line nor the wings level
- Rolls not executed smoothly nor with consistency
- Flightpath on exit not a distinct horizontal line nor the wings level
- Flightpath on entry and exit not flown at the same altitude
- Flightpath on exit deviates from entry by more than 15°
- Presentation of the manoeuvre not centred

~ 4 & 8 Point Rolls ~

The **4 Point Roll** (*clockwise rolls shown*) is considerably difficult to perform. While flying upright and inverted might be basic flying procedures, the two perpendicular sections require steady hands. In fact, all throughout this manoeuvre steady hands are needed to give a smooth performance from beginning to end. This manoeuvre requires ailerons, elevator and rudder for the best outcome.
ABREVIATIONS: EF/B = move elevator joystick forward/backward. **AL/R** = ditto ailerons left/right. **RL/R** = ditto rudder left/right. **CA** = corrective action.

The **8 Point Roll** is similar to the **4 Point Roll** but with four extra rolls. This manoeuvre usually has to be performed over a similar distance to the **4 Point Roll**, otherwise the aircraft could end up flying out of the Judges Viewing Window, which could cost valuable points.

Performance in Flight (4 Point Roll description)

- Launch and gain height
- Level out for a discernible distance then roll to perpendicular and hold steady for about one second (AR/EF/RL) (**1**)
- Roll to inverted (**2**) and hold steady for about one second (AR/EF/RL)
- Roll to perpendicular (**3**) and hold steady for about one second (AR/EF/RL)
- Roll to upright (AR/EF/RL) (**4**) and head to the finish (**5**)
- Maintain level flight for a discernible distance before exiting the flightpath

Deductions

- Flightpath on entry not a distinct horizontal line nor the wings level
- Quarter rolls not executed smoothly nor with consistency
- Upright, inverted and perpendicular sections not even
- Flightpath on exit not a distinct horizontal line nor the wings level
- Flightpath on entry and exit not flown at the same altitude
- Flightpath on exit deviates from entry by more than 15°
- Presentation of the manoeuvre not centred

~ Cuban 8 ~

The **Reverse Cuban 8** needs a lot of speed to begin with to compensate for the expected loss of momentum during the two half rolls and two circles part thereof. But don't let the word 'reverse' be off-putting because it is actually easier to perform than its counterpart.

ABREVIATIONS: EF/B = move elevator joystick forward/backward. **AL/R** = ditto ailerons left/right. **RL/R** = ditto rudder left/right. **CA** = corrective action.

Performance in Flight

- Launch and gain height
- Dive steeply for a discernible distance to gain optimum speed to perform the manoeuvre
- Level out for a discernible distance (**1**) then just past the central point pull up (EB) onto the right-hand circle (**2**) and continue for three quarters of the way round (**3**)
- Nearing the central point of the first 45° section roll to upright (AR/EF), complete this section then pull up (EB) onto the left-hand circle (**4**) and continue for three quarters of the way round (**5**)
- Nearing the central point of the second 45° section roll to upright (AR/EF), complete this section then head back onto the right-hand circle momentarily
- Level out (EF-CA) back onto the horizontal section (**6**) and head directly to the finish (**7**)
- Maintain level flight for a discernible distance before exiting the flightpath

Deductions

- Flightpath on entry not a distinct horizontal line nor the wings level
- Circles part thereof not round
- Half rolls not executed evenly nor with consistency
- Aircraft flies offline or corkscrews from its intended flightpath
- Flightpath on exit not a distinct horizontal line nor the wings level
- Flightpath on entry and exit not flown at the same altitude
- Flightpath on exit deviates from entry by more than 15°
- Presentation of the manoeuvre not centred

~ Reverse Cuban 8 ~

The **Cuban 8** needs a lot of speed to begin with to compensate for the expected loss of momentum during the two half rolls and two circles part thereof. It is important for the model to gain optimum speed during the initial dive in order to get through the performance without incident.

ABREVIATIONS: EF/B = move elevator joystick forward/backward. **AL/R** = ditto ailerons left/right. **RL/R** = ditto rudder left/right. **CA** = corrective action.

Performance in Flight

- Launch and gain height
- Dive steeply for a discernible distance to gain optimum speed to perform the manoeuvre
- Level out for a discernible distance (**1**) then pull up (EB) onto the first 45° section (**2**)
- Nearing the central point roll to inverted (AR/EF), complete this section and continue for three quarters of the way round (**3**)
- Nearing the central point of the second 45° section roll to inverted (AR/EF) complete this section and continue around the left-hand circle (EB) (**4**)
- Level out (EF-CA) back onto the horizontal section (**5**) and head directly to the finish (**6**)
- Maintain level flight for a discernible distance before exiting the flightpath

Deductions

- Flightpath on entry not a distinct horizontal line nor the wings level
- Circles part thereof not round
- Half rolls not executed evenly nor with consistency
- Aircraft flies offline or corkscrews from its intended flightpath
- Flightpath on exit not a distinct horizontal line nor the wings level
- Flightpath on entry and exit not flown at the same altitude
- Flightpath on exit deviates from entry by more than 15°
- Presentation of the manoeuvre not centred

~ Inverted Flight ~

At first glance, the **Inverted Flight** looks rather mundane. However, it does have a purpose. It tests a pilot's dexterity in being able to keep a model absolutely straight and level while flying inverted for an extended period. In blustery conditions, which are to be expected at most slope venues, this manoeuvre requires very steady hands.

ABREVIATIONS: EF/B = move elevator joystick forward/backward. **AL/R** = ditto ailerons left/right. **RL/R** = ditto rudder left/right. **CA** = corrective action.

Performance in Flight

- Launch and gain height
- Level out for a discernible distance (**1**) then roll to inverted (AR/EF)
- Fly for five seconds then roll to upright (AR/EB) (**2**) and head to the finish (**3**)
- Maintain level flight for a discernible distance before exiting the flightpath

Deductions

- Flightpath on entry not a distinct horizontal line nor the wings level
- Half rolls not flown evenly nor with consistency
- Inverted flight not flown straight and level and/or wanders offline
- Flightpath on exit not a distinct horizontal line nor the wings level
- Flightpath on entry and exit not flown at the same altitude
- Flightpath on exit deviates from entry by more than 15°
- Presentation of the manoeuvre not centred

~ Rectangular Circuit ~

The **Rectangular Circuit** is a fairly basic manoeuvre and is ideal for beginners. Nevertheless, even competent pilots have difficulty flying each leg or section evenly and at the same altitude. Ensuring that the opposing sections are flown at the same distance or at least appear to be flown at the same distance, from a judge's perspective, is essential to achieving maximum points.

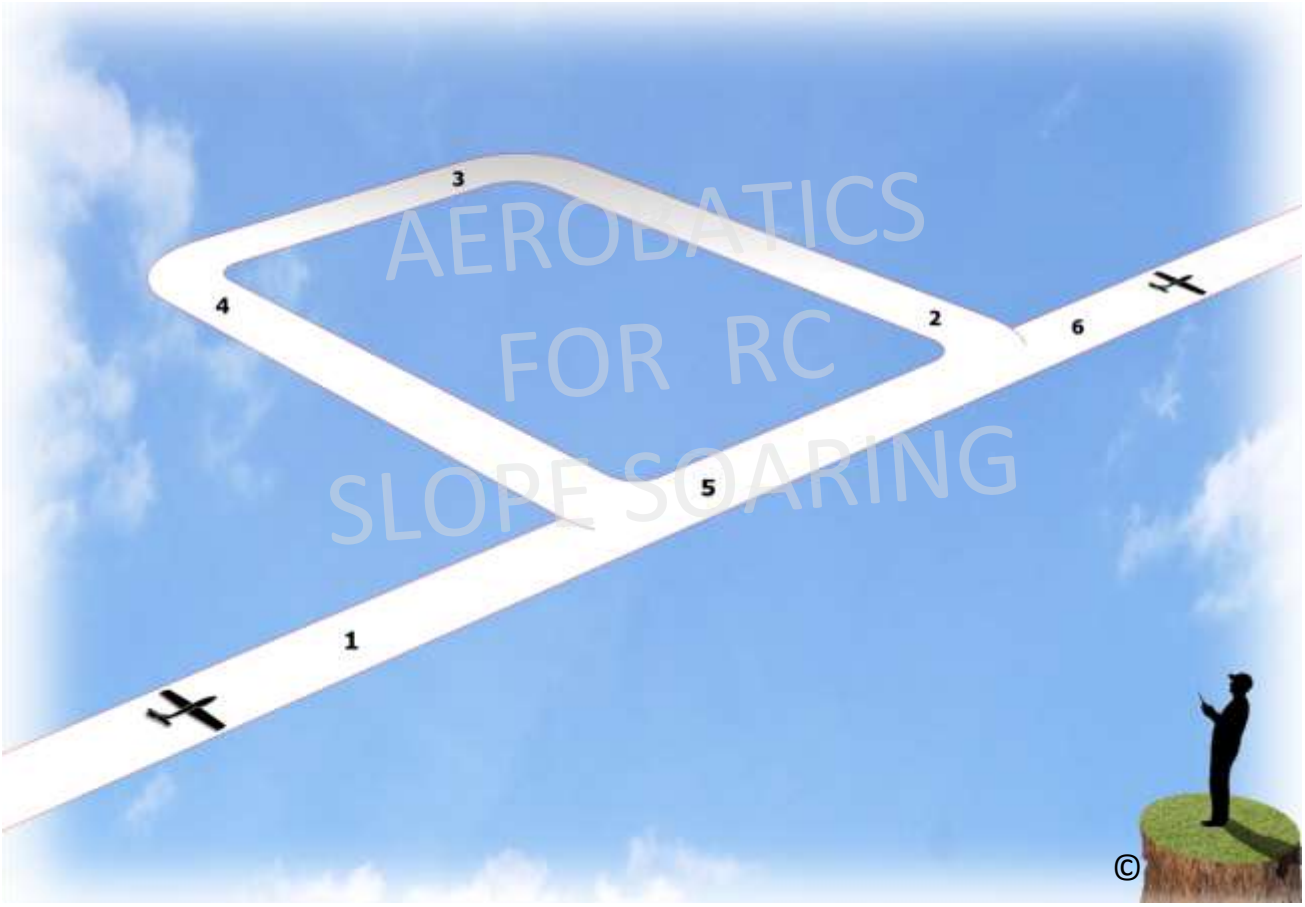
ABREVIATIONS: EF/B = move elevator joystick forward/backward. **AL/R** = ditto ailerons left/right. **RL/R** = ditto rudder left/right. **CA** = corrective action.

Performance in Flight

- Launch and gain height
- Level out for a discernible distance (**1**) then a short distance past the central point turn onto the first leg (AL/EB) (**2**)
- Turn onto the second leg (AR/EB) (**3**)
- Turn onto the third leg (AL/EB) (**4**)
- Return to the start/finish section (AL/EB) (**5**) and head to the finish (**6**)
- Maintain level flight for a discernible distance before exiting the flightpath

Deductions

- Flightpath on entry not a distinct horizontal line nor the wings level
- Legs not flown evenly nor with consistency
- Turns not executed evenly nor with consistency
- Flightpath on exit not a distinct horizontal line nor the wings level
- Flightpath on entry, exit and in between not flown at the same altitude
- Flightpath on exit deviates from entry by more than 15°
- Presentation of the manoeuvre not centred



~ Slope Circuit & Landing ~

The **Slope Circuit & Landing** is named as such because it is practical and a more common way to land a glider at slope venues. While the conventional rectangular circuit and landing is sometimes used, it is not ideal. Reason being, once the model reaches the backend of the slope, the lift can drop off dramatically, especially at venues where the landing area is lower than the face of the slope. This potential hazard can cause an unexpected vacuum effect, leaving the model stranded and struggling to stay aloft, particularly on the final approach. The **Slope Circuit & Landing** looks the part on the slope and it is safer to perform.

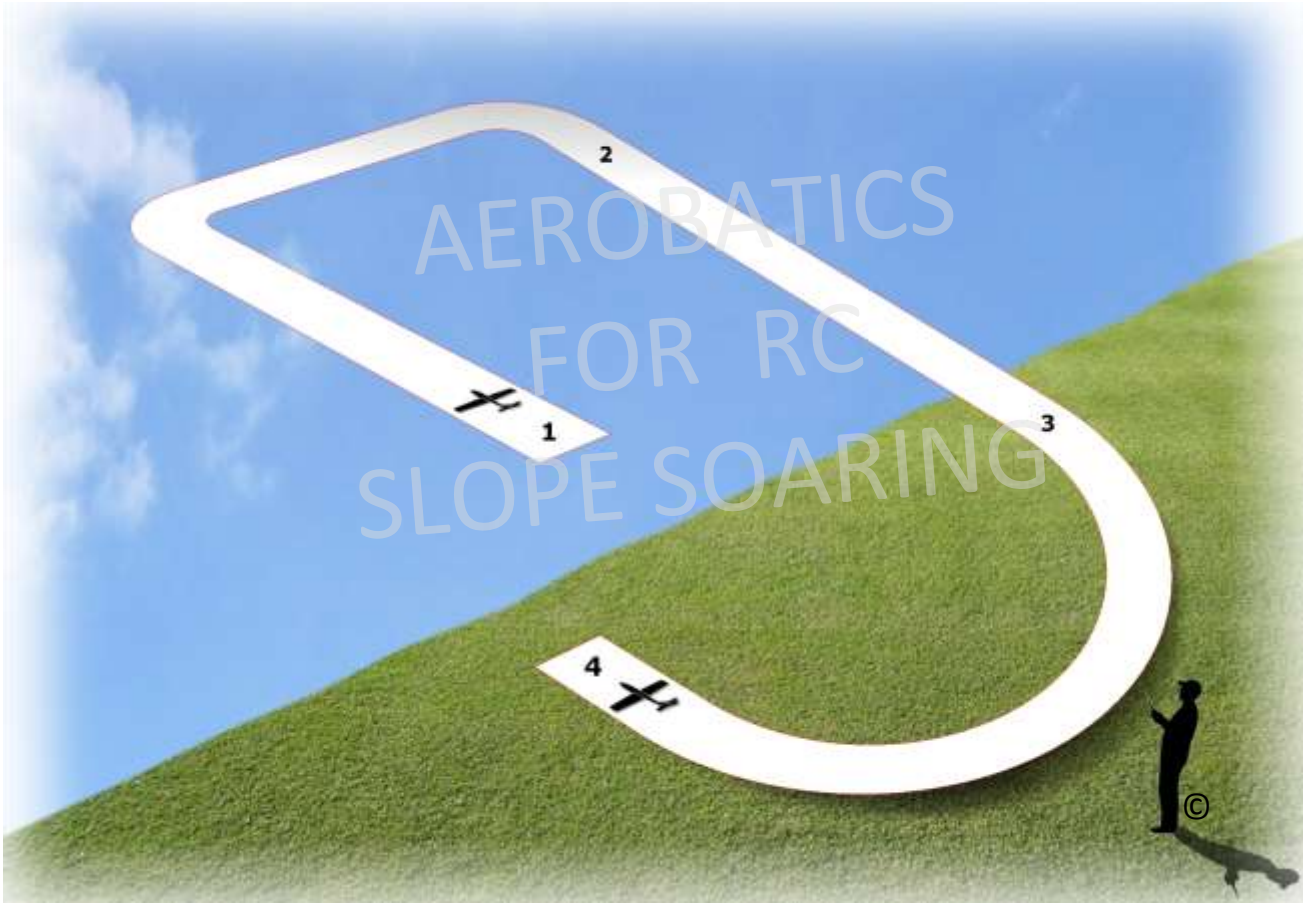
ABREVIATIONS: **EF/B** = move elevator joystick forward/backward. **AL/R** = ditto ailerons left/right. **RL/R** = ditto rudder left/right. **CA** = corrective action.

Performance in Flight

- Set an upwind course to start the circuit (**1**)
- Proceed along the first leg and maintain the same altitude
- Turn right (AR/EB) onto the second leg and continue while maintaining the same altitude
- Turn right (AR/EB) onto the third leg and start to descend slowly and steadily (EF) (**2**)
- Execute a half circle while still descending (AR/EF) (**3**)
- Level out (EB-CA) and land (**4**)

Deductions

- Flightpath on the first and second legs not distinctly horizontal nor the wings level
- Turns not executed evenly nor with consistency
- Third leg, including the half descending circle, not flown evenly
- When landed, the aircraft does not come to a stop inside the designated landing area
- Presentation of the manoeuvre not centred



~ Aeromodelling Qualifications ~

Model Aircraft Association of Australia (MAAA)	Bronze and Gold Wings for Powered Aircraft Bronze Wings for Glider Flight Instructor for Powered Aircraft

~ Aeromodelling Achievements in Slope Aerobatics ~

Third place in the 2009 online International Slope Soaring Contest.

Local events not mentioned below were not competed in or were cancelled.

Victorian Slope Aerobatics Championship		2011 - 1st
" " " "		2010 - "
" " " "		2009 - "
" " " "		2008 - "
" " " "		2007 - "
" " " "	provisional	2005 - "
" " " "		2003 - "
" " " "		1996 - "
" " " "		1995 - "
Victorian Slope Aerobatics/Pylon Championship		1994 - "
Kilcunda Slope Aerobatics		1993 - 2nd
Yarragon Slope Aerobatics		1992 - 1st
Victorian Slope Aerobatics/Pylon Championship		1988 - 9th
Wantirna Towline Aerobatics		1988 - 5th
Victorian Slope Aerobatics/Pylon Championship		1987 - 5th
Wantirna Towline Aerobatics		1986 - 6th
Victorian Slope Aerobatics/Pylon Championship		1986 - 5th
Pakenham Aerobatics		1985 - 11th
Victorian Slope Aerobatics/Pylon Championship		1984 - 6th

2005 Victorian Slope Aerobatics Championship
'Mount Hollowback'
Township of Bald Hills, Central Highlands Region, State of Victoria, Australia
On this day the author (far right) competed with an Australian-Made, Southern Sailplanes, *'Ricochet Bullet'*.

Aerobatics for RC Slope Soaring

Competitive slope soaring for spirited pilots

Winter in the 1990s hovering in gale-force winds approximately 700 metres above the Township of Yarragon, West Gippsland Region, State of Victoria, Australia.