



Supplementary Explanations to the

F3 RC Aerobatic Aircraft Manoeuvre Execution Guide

**FAI Sporting Code Section 4 – Aeromodelling
Volume F3 Radio Control Aerobatics, Annex 5B**



The purpose
of the

Manoeuvre Execution Guide

is to give

accurate guidelines

for the proper execution of aerobatic manoeuvres

to both, judges and competitors



The **flight path** of a model aircraft
is used to judge the

shape of all manoeuvres

Every manoeuvre must be
entered and exited with a

straight level upright or inverted flight
of recognisable length



Centre manoeuvres start and finish on the same heading, while turn-around manoeuvres finish on a track 180 degrees to entry.

When appropriate, entry and exit of centre manoeuvres must be at the same altitude, unless specified otherwise.

Positioning adjustments in altitude are allowed in turn-around manoeuvres.



QUALITIES OF A GOOD JUDGE...

CONSISTENCY
JUDGING ACCURACY
IMPARTIALITY



Judging **ACCURACY**

Downgrade by **up to 1** point for a minor defect
Downgrade by **up to 2** points for a larger defect
Downgrade by **3, 4, 5**, more points for major defect

Do NOT downgrade 4 points for a minor defect
Do NOT downgrade 1 point for a major defect



CONSISTENCY

Minor defect on manoeuvre 3 = score 9 ✓

Minor defect on manoeuvre 7 = score 9 ✓

Major defect on manoeuvre 9 = score 4 ✓

Major defect on manoeuvre 11 = score 4 ✓

Minor defect on manoeuvre 12 = score 6 ✗

Major defect on manoeuvre 15 = score 9 ✗

*(Scores must be in the same range,
for similar defects)*



MAINTAIN YOUR STANDARD!

PILOT 1	480	- 1,2	495	+8,8	477	-4,2	484	+2,8	470 - 11,2
PILOT 2	364	- 14,8	385	+6,2	416	+37,2	374	- 4,8	355 - 23,8
PILOT 3	491	- 2,6	513	+19,4	486	- 7,6	496	+2,4	482 - 11,6
PILOT 4	505	+9,4	502	+6,4	461	-34,6	511	+15,4	491 - 4,6
PILOT 5	460	- 3,0	477	+14,0	432	-31,0	464	+1,0	482 +19





IMPARTIALITY

A judge must not, under any circumstances, favour a competitor, or a national team, or a particular flying style, or brand of equipment, or propulsion method.

Defects by “Celebrity-Competitors” must be downgraded the same way as with “Average-Competitors”

Judges must only look at the lines of manoeuvres described in the sky.



IMPARTIALITY

Conversely, acts of negative bias towards a competitor, or a national team, or a flying style, or brand of equipment, or a propulsion method, must be viewed in a serious light, and corrective action may be necessary.

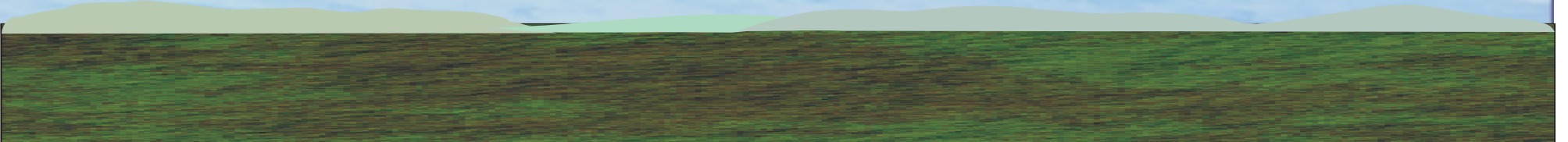


PRINCIPLES

THE PRINCIPLES of flying and judging the performance of a competitor in an R/C Aerobatic competition, is based on the PERFECTION with which the competitor's model aircraft executes the aerobatic manoeuvres as described in Annex 5A.



Geometrical accuracy of the manoeuvre





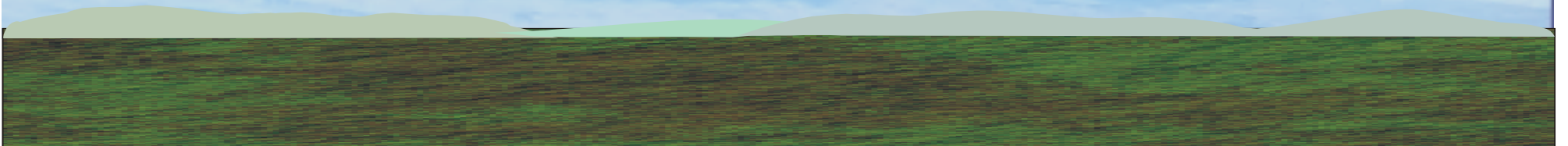
**Smoothness
and gracefulness
of the manoeuvre**



Positioning of the manoeuvre within the manoeuvring zone

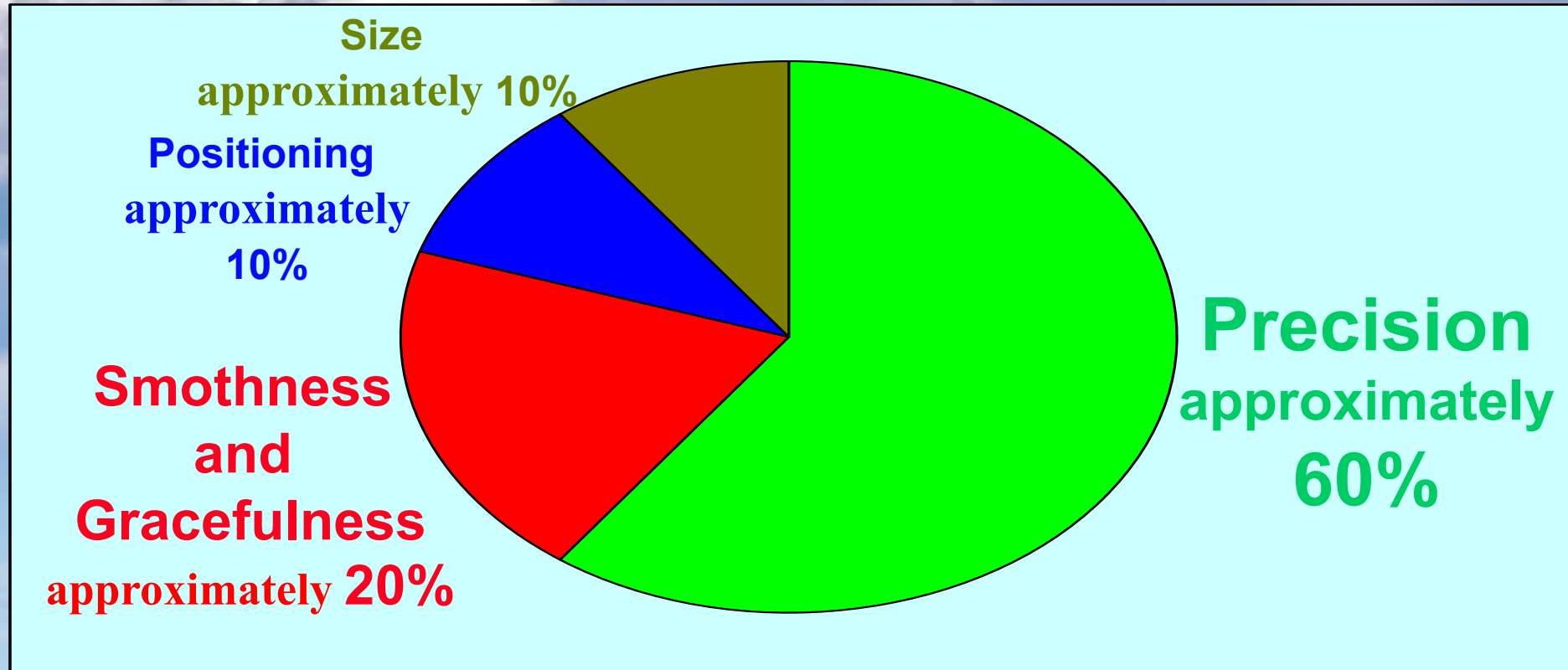


Size of the manoeuvre





WEIGHTING



Additional deducts for Center Positioning and Distance



Proportion of the manoeuvre outside of the manoeuvring zone



GENERAL CRITERIA FOR DOWNGRADING MANOEUVRES

**“Criteria...are standards by
which something can be judged”**



1. WHAT WAS THE DEFECT, or mistake?

- ! Over, or under-rolling (or spin, or snap)
- ! Poor shape or geometry
- ! Rolls not on middle of lines
- ! Absence of lines
- ! Entry, exit poor
- ! Wrong angles
- ! Misrelation between line lengths
- ! Different roll rates
- ! Etc.



2. HOW SERIOUS was the defect, or mistake?

! Was it big (major)?

! Or was it small (minor)?



3. **HOW OFTEN** did you see the same defect,
or mistake in a particular manoeuvre?

How many defects were there in **TOTAL**?



4. WHAT WAS THE POSITIONING of the
manoeuvre?



5. WHAT WAS THE **SIZE** of the manoeuvre?



6. Was the manoeuvre **partially or completely outside** of the manoeuvring zone?



100% PRECISION

+

**SMOOTHNESS &
GRACEFULNESS**

+

**CORRECT
POSITIONING**

+

CORRECT SIZE

=

NO DOWNGRADE

=

10 POINTS!



Deduct/Downgrade System

**Use the deduction/downgrade system
not impression!**

ALWAYS START WITH PERFECT 10 ...
As the pilot starts!

Then

9.5...9...8.5...8...7.5...7...6.5...6...5.5...5... etc..

A mark resulting from downgrading steps must not be upgraded again in any case, ie. because the manoeuvre contained „something nice“!



Deduct/Downgrade System

Score input without scribe



**Electronic Scribe
by Peter Vogel/USA**



Notaumatic/FRA



**Escribe from
Switzerland**



**Bartovsky
System/CZE,
similar to
Kraiwiesen
system by
O.Hajek/AUT**

- + No scribes needed.
- + Scores input directly to the computer.
- + Live scoring is possible.
- Very experienced judges needed, especially with unknown schedules.

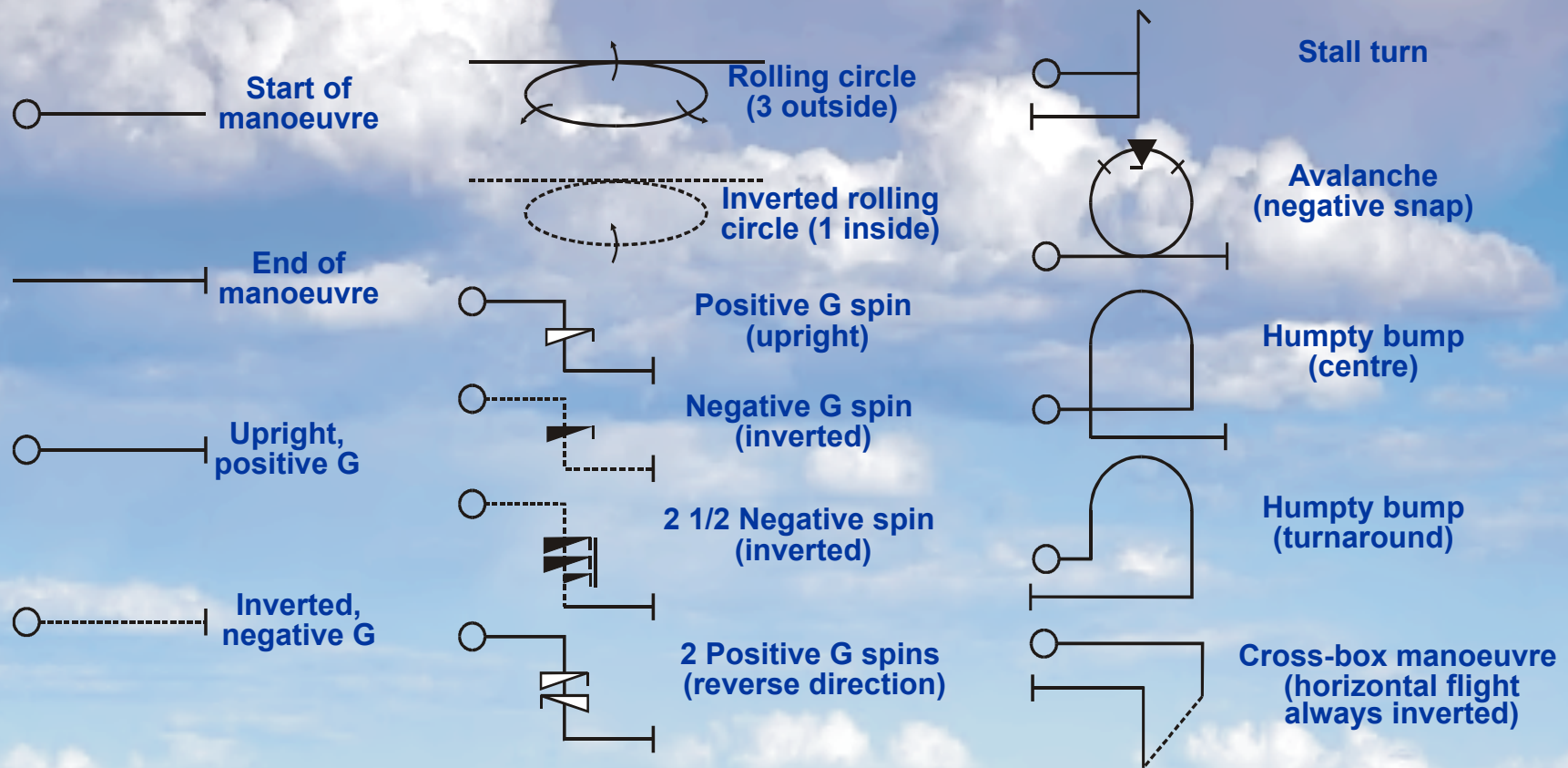


CRITERIA FOR JUDGING INDIVIDUAL MANOEUVRES

(Method)

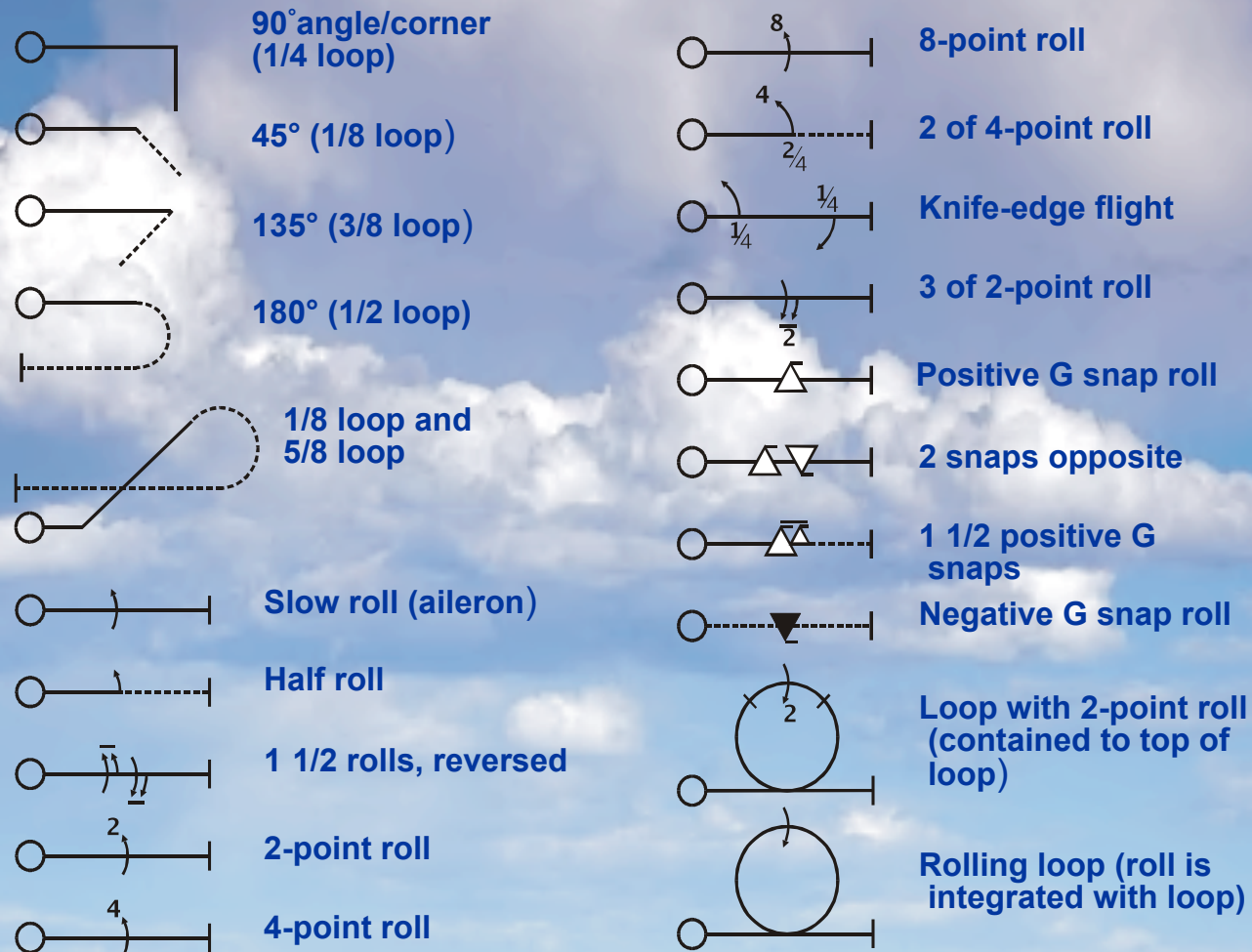


ARESTI SYSTEM

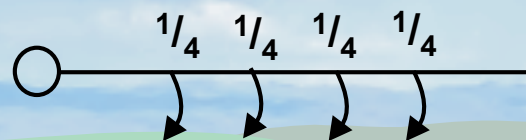




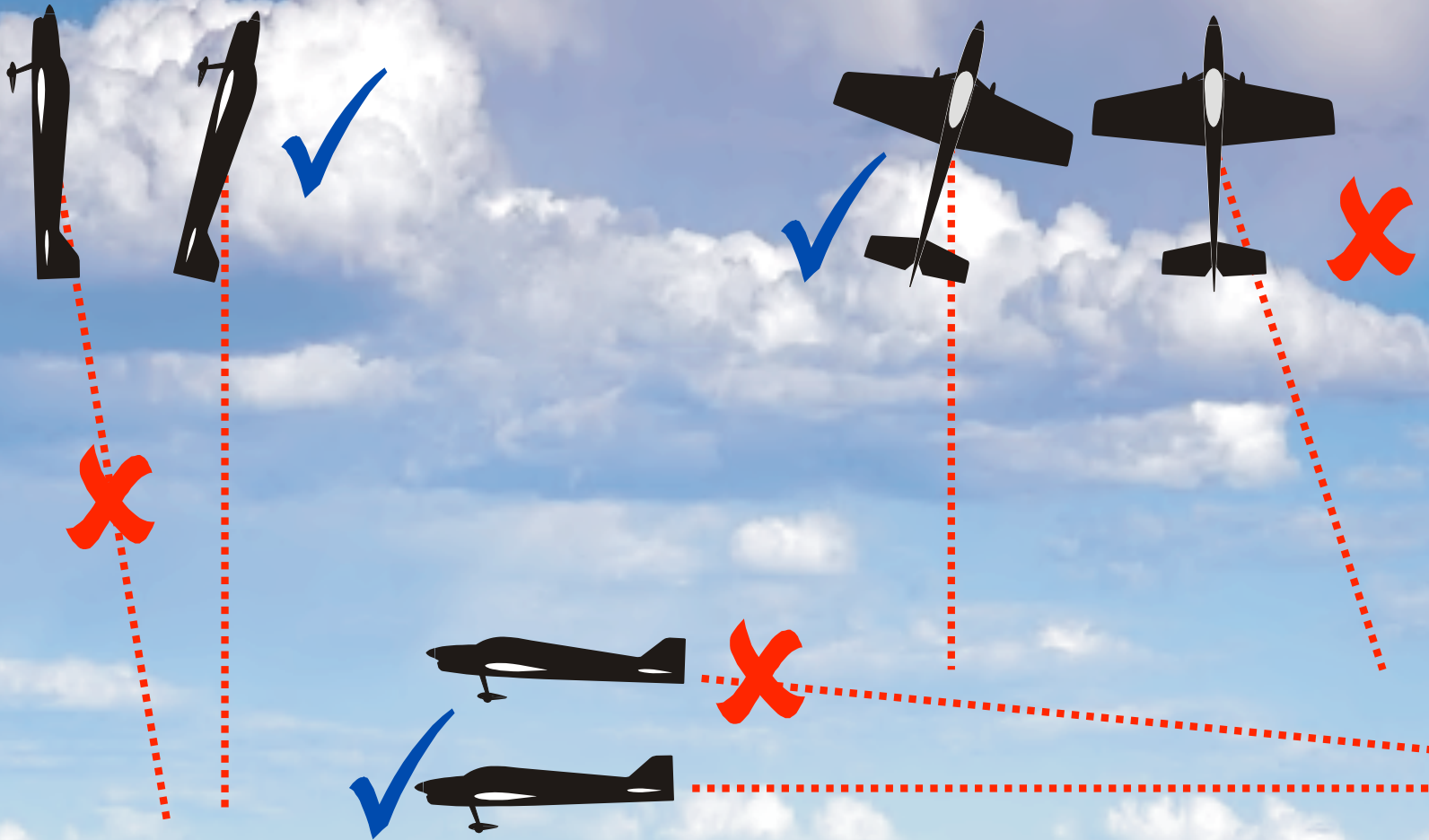
ARESTI SYSTEM



Point rolls were „buried“ in 2009. Since 2012 we have consecutive part rolls.



ATTITUDE vs. FLIGHT PATH



The flight path of a model aircraft is the trajectory of its centre of gravity. The attitude is the direction of the fuselage centreline in relation to the flight path. If not otherwise stated, all judging is based on flight path.



Wind Correction

All manoeuvres are required to be wind corrected,
except SNAP ROLLS, SPINS, and STALL TURNS
(the model aircraft is in a stalled condition)

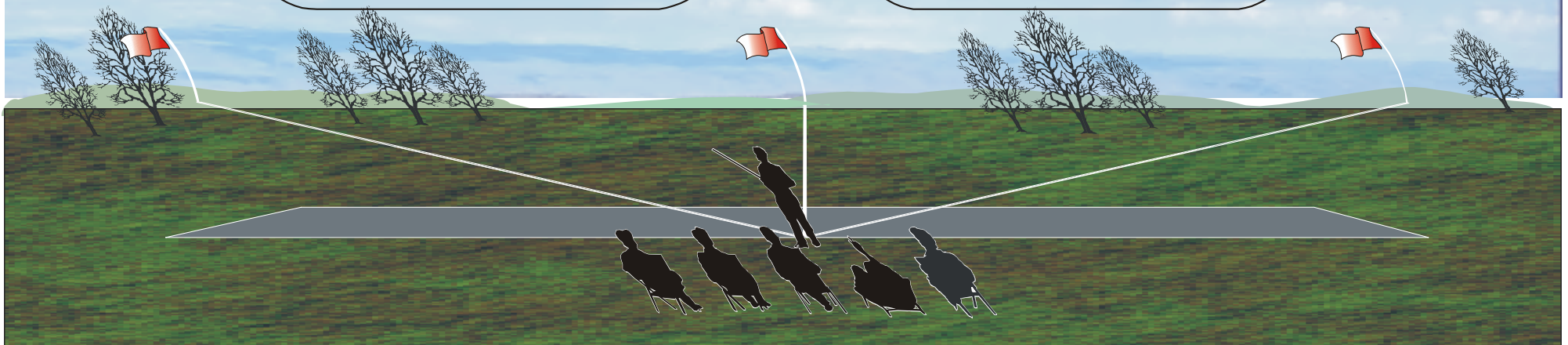
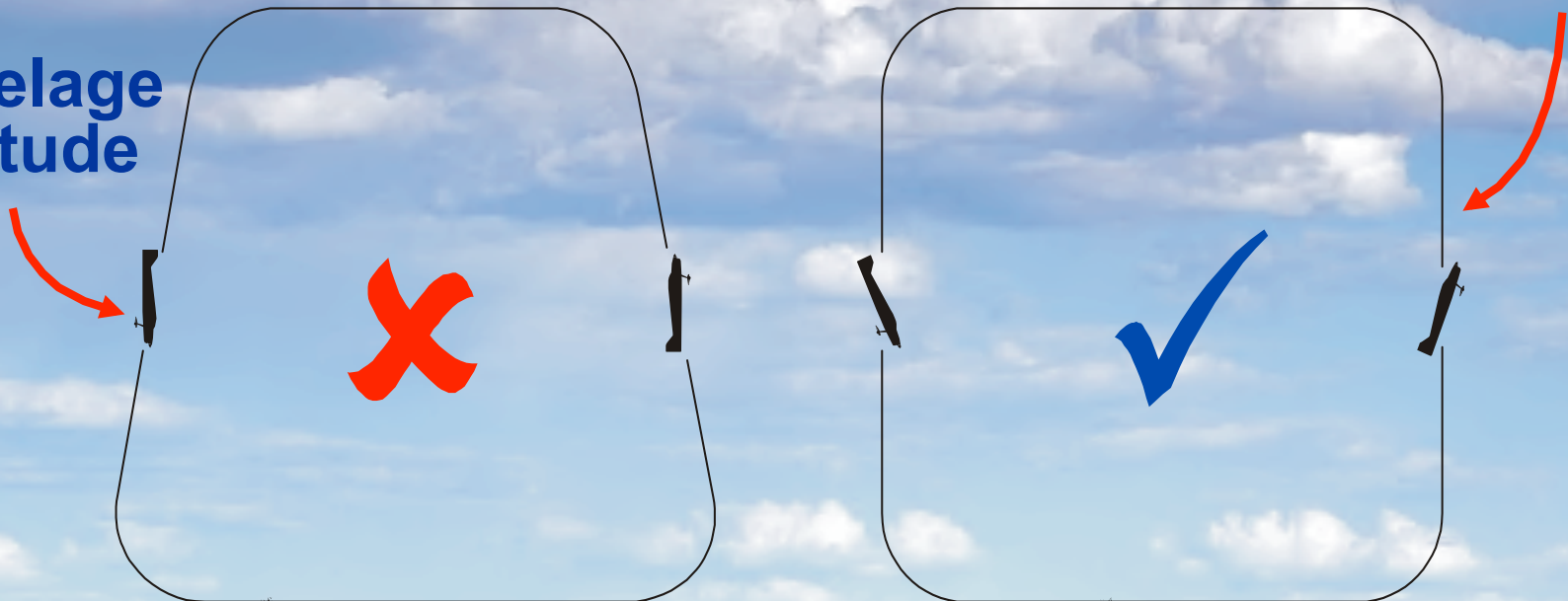


Wind Correction

**Flight path of model aircraft
must describe correct geometric shape**

**Flight
path**

**Fuselage
attitude**





GEOMETRICAL ACCURACY OF THE MANOEUVRE

As a guide for downgrading deviations from the defined manoeuvre geometry, the manoeuvres are divided into their different components:

Lines, loops, rolls, snap-rolls, horizontal circles,

Line/loop/roll/horizontal circle combinations,

Stall turns, and spins.



1 POINT PER 15° DEVIATION

Perfect geometry =
No downgrade

Up to 15° error =
1 point downgrade

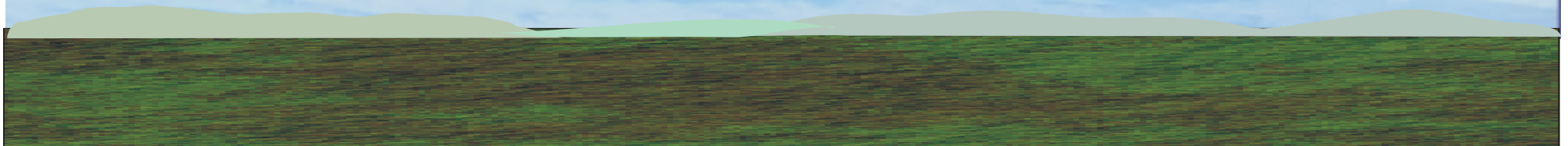
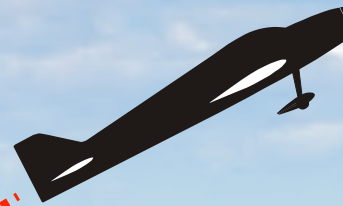
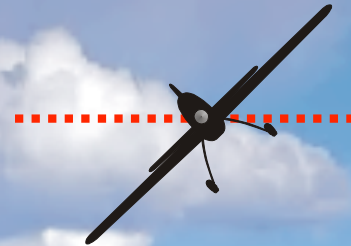
Up to 30° error =
2 point downgrade

Up to 45° error =
3 point downgrade

Wings
level -
roll axis



Horizontal
lines -
pitch axis





1 POINT PER 15° DEVIATION

Perfect geometry =
No downgrade

Up to 15° error =
1 point downgrade

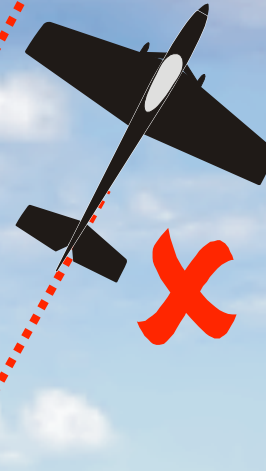
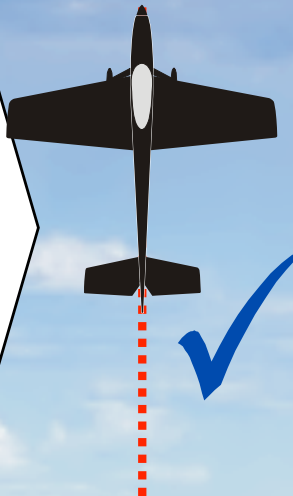
Up to 30° error =
2 point downgrade

Up to 45° error =
3 point downgrade

Vertical lines -
pitch axis



Vertical lines -
yaw axis





1 POINT PER 15° DEVIATION

In general, lines must be judged more critically than deviations in yaw and roll.



LINES

Horizontal



90°



60°



45°





LINES

5B.8.3 All aerobatic manoeuvres are entered and exited by a horizontal line of recognisable length.

When no horizontal line is flown between two manoeuvres, the just-completed manoeuvre must be downgraded by 1 point and the upcoming manoeuvre must be downgraded by 1 point.

All lines within a manoeuvre have a start and an end which define their length. They are preceded and followed by part loops.

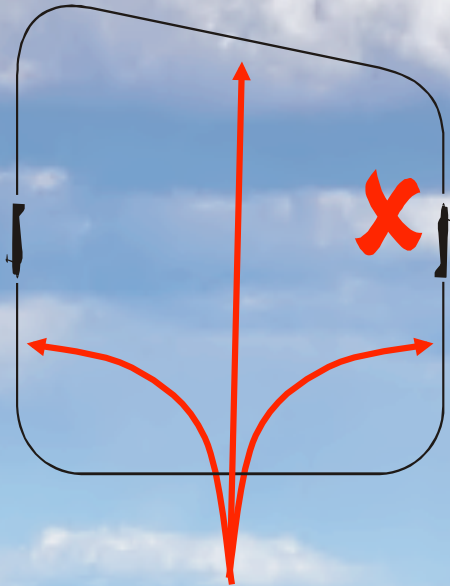
The length of a line should only be graded when a manoeuvre contains more than one line with a given relationship to each other ie as in a square loop.

If there is a minor deviation in the relationship then 0.5 point is subtracted, and more points are subtracted for greater deviations.



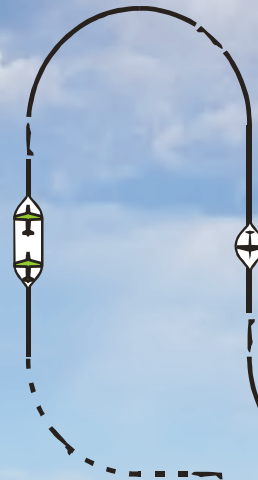
LINES

Minor mis-relation
between line lengths
= minus 0,5 point!



(This example maybe
minus 2 or 3!)

No line
between
manoeuvres...
= minus
1 point here...
and minus 1
point here!



Line after and
Before roll =
not equal...
up to minus
2 points!

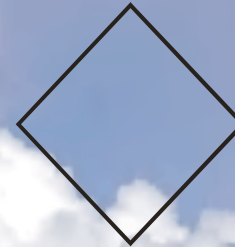
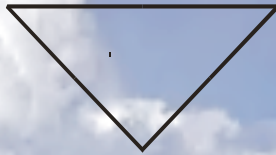


No line
after roll... =
minus
3 points!





LOOPS



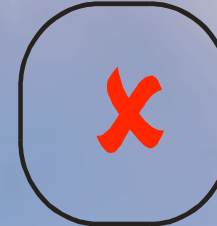


LOOPS

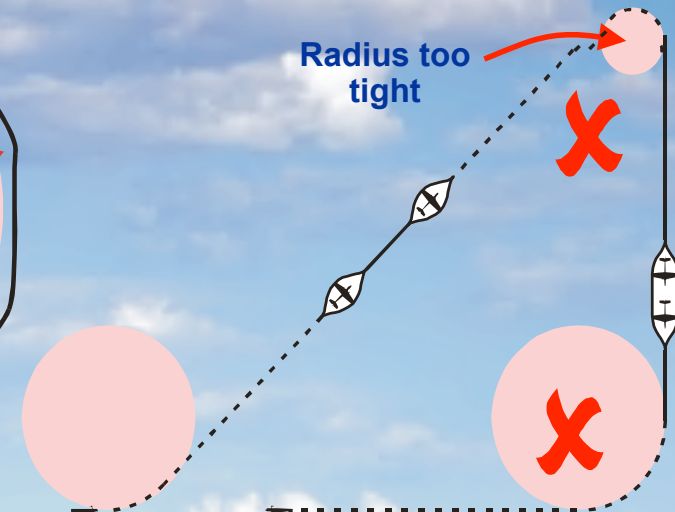
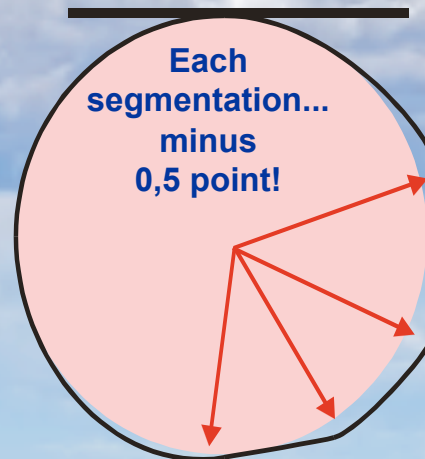
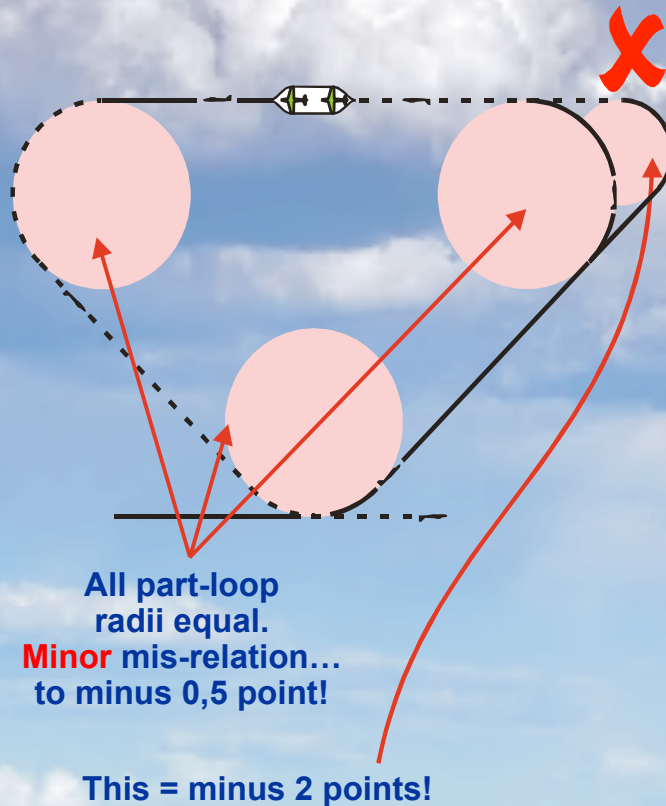
Radii too tight...



...too open/loose...



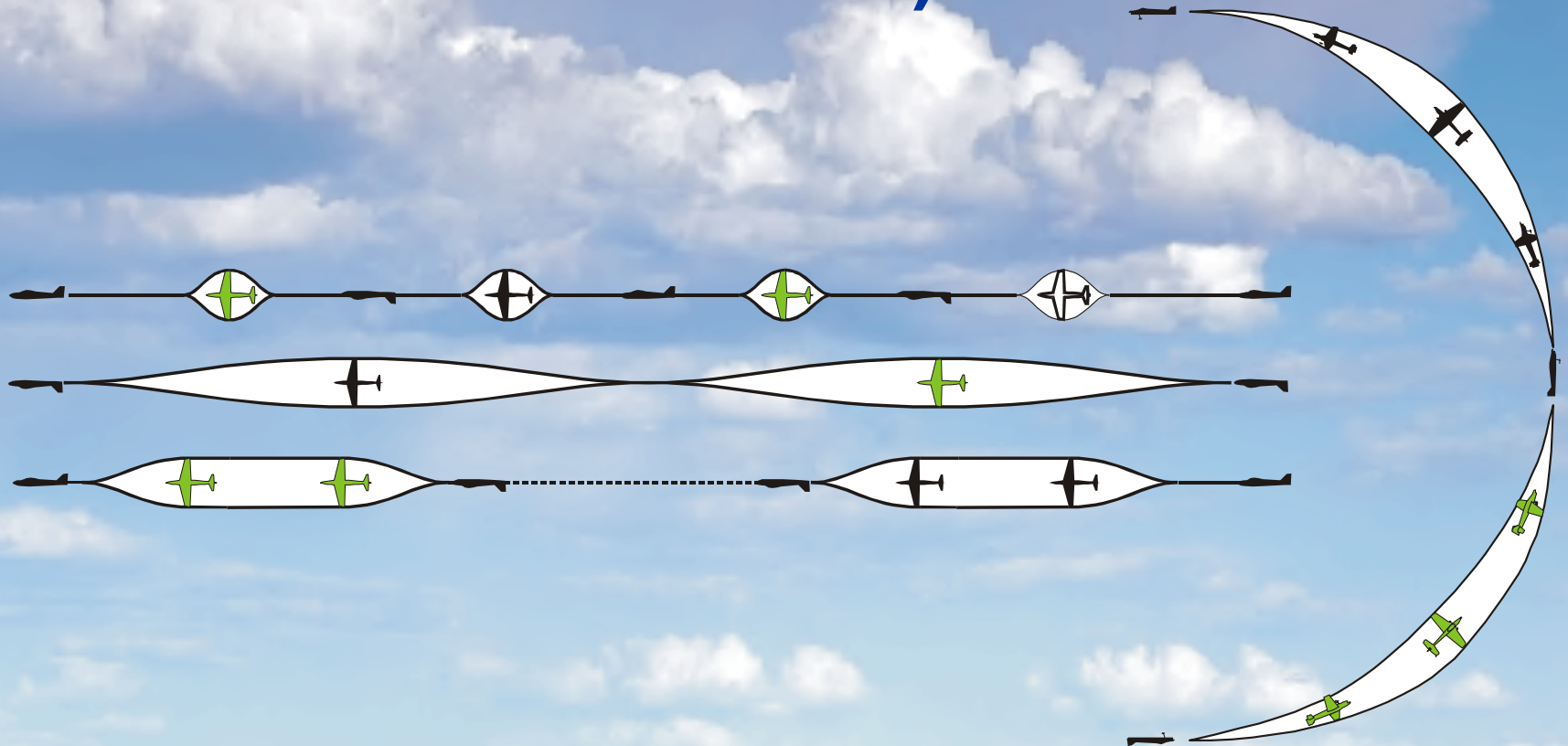
Good compromise!



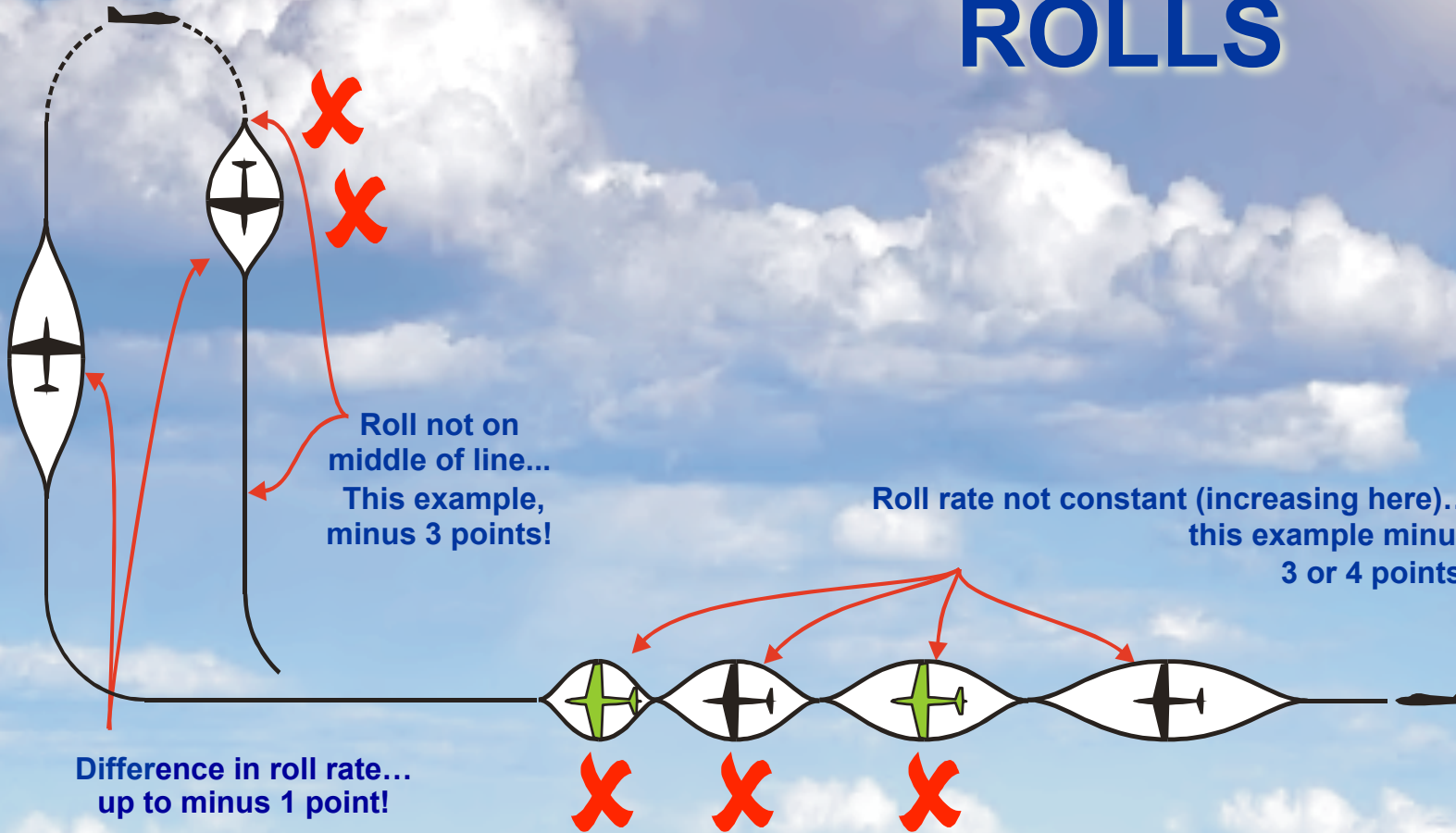
The first radius of a manoeuvre does not define the radii for the remaining radii of a manoeuvre but it is a starting point. As the manoeuvre progresses, the judge will compare each radius that was just flown to the last radius flown and if there is a difference, then a downgrade will be given based on the severity of the difference.



Rolls (Continuous Rolls and Part-Rolls)

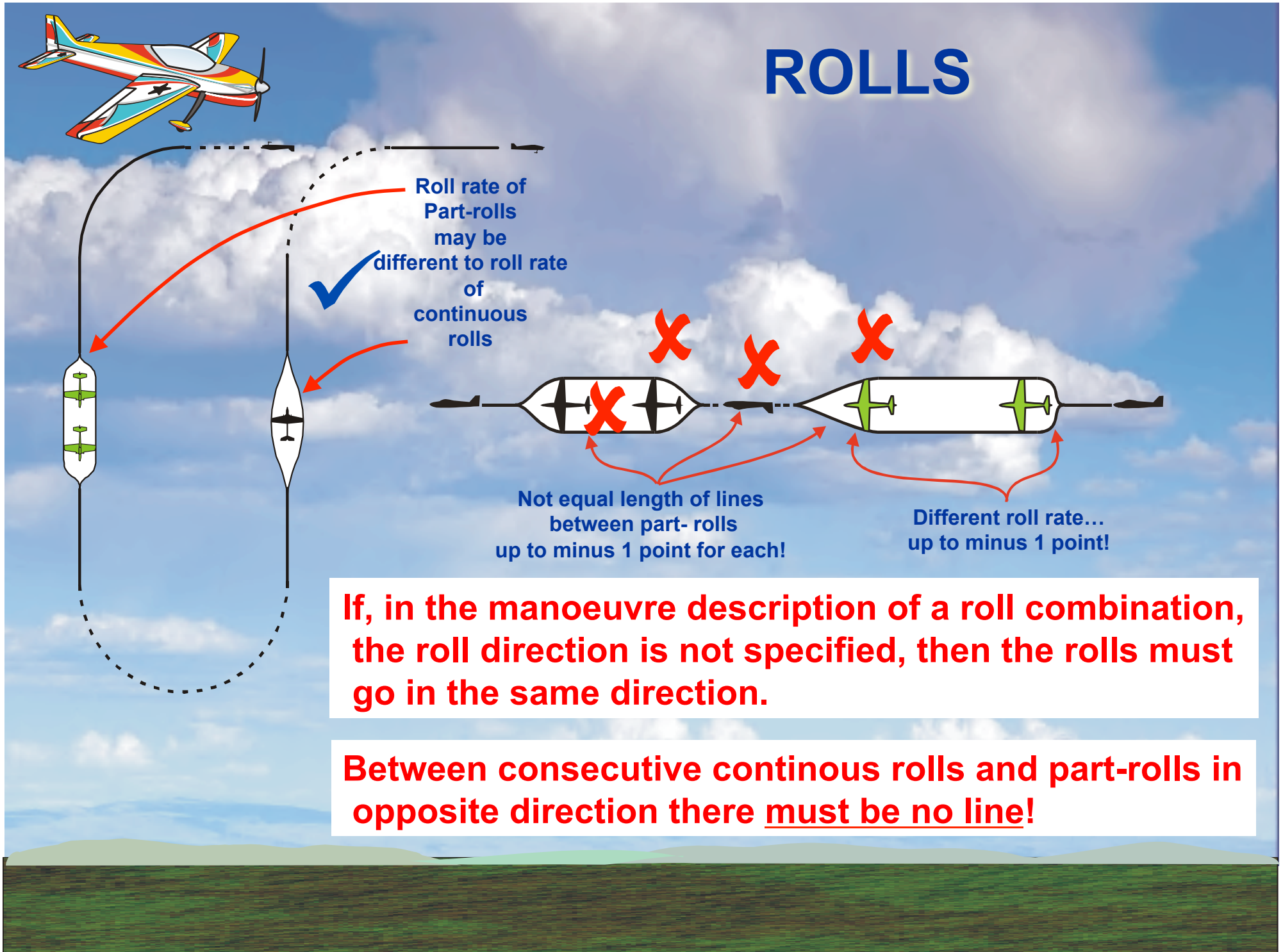


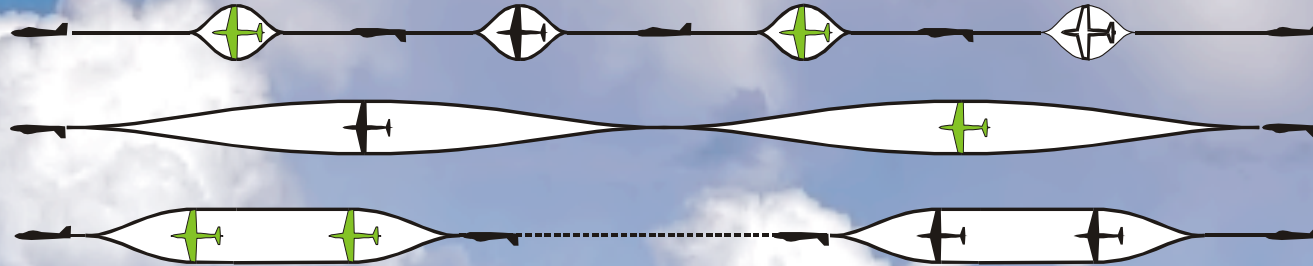
ROLLS



The start and stop of the rotation must be crisp and well-defined. If a start or stop is badly defined, 0.5 or more points are to be subtracted for each.

ROLLS





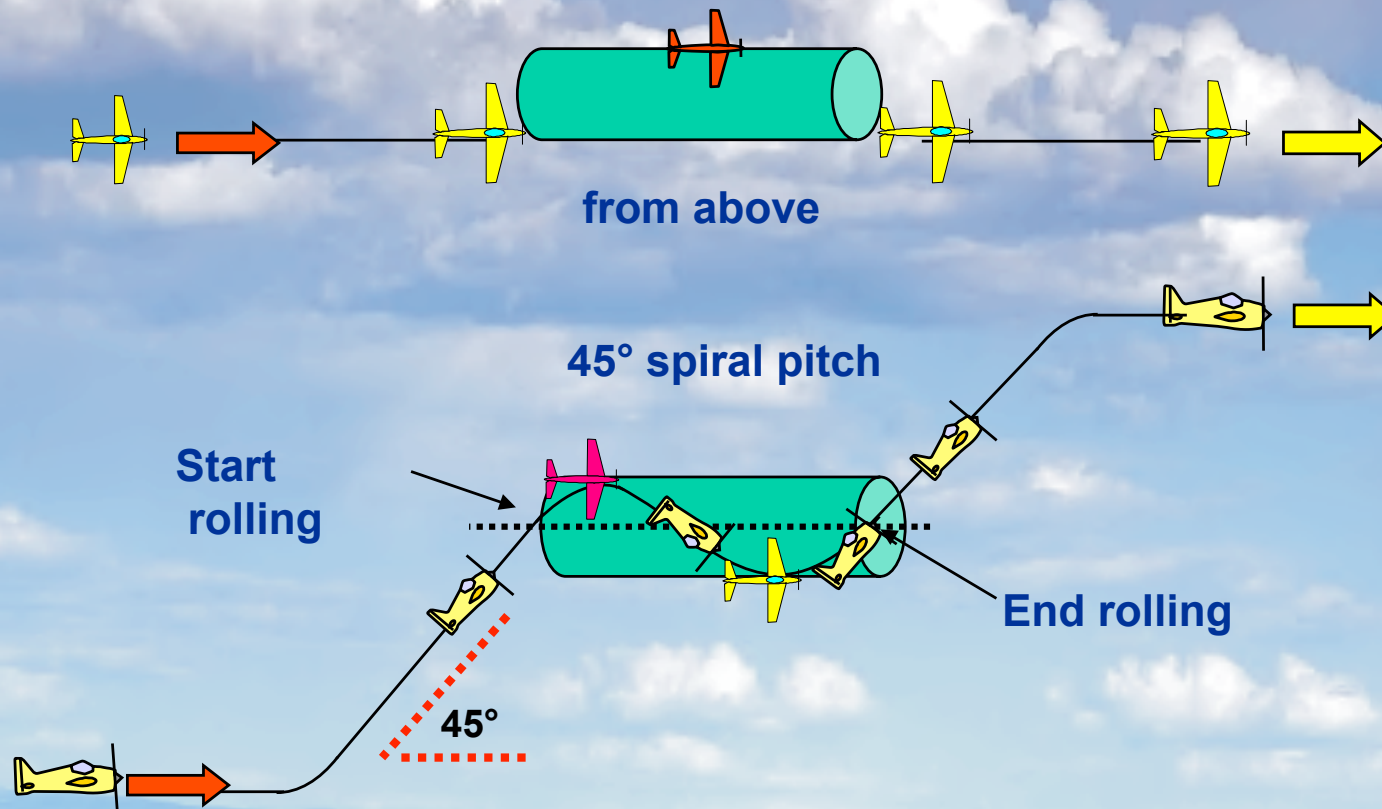
Missing or additional Part-Rolls: Use the 1 point per 15° rule

- 1 missing $\frac{1}{2}$ roll: (180 degrees) = **Zero points**
- 1 missing $\frac{1}{4}$ roll : (90 degrees) = **- 6 points**
- 1 missing $\frac{1}{8}$ roll : (45 degrees) = **- 3 points**
- the same deductions apply with additional part-rolls



Barrel Rolls

You first pull into a 45° upline, then at mid level you start to perform a full roll with the flight path going around a horizontal cylinder in a spiral (as the thread of a screw in a 45° pitch).





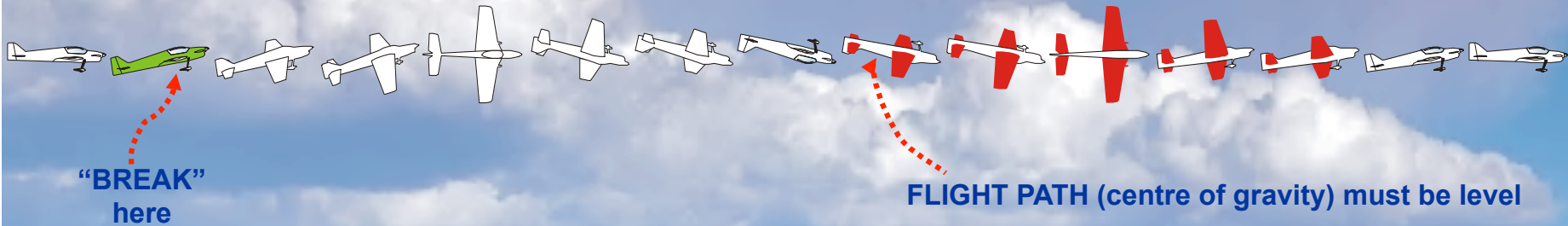
SNAP ROLLS

A SNAP ROLL is basically a spin in the horizontal axis.

The model aircraft rolls rapidly, with a continuous high angle of attack (positive or negative).

The tail should describe a corkscrew path.

SNAP ROLLS



Separation of fuselage attitude
from flight path



SNAP ROLLS

NEGATIVE SNAP ROLL

—



DOWN elevator

POSITIVE SNAP ROLL

+



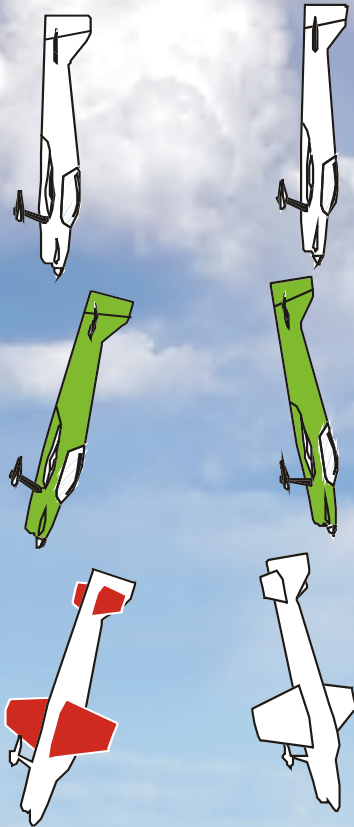
UP elevator

In the F3A schedules snap rolls may be positive or negative!

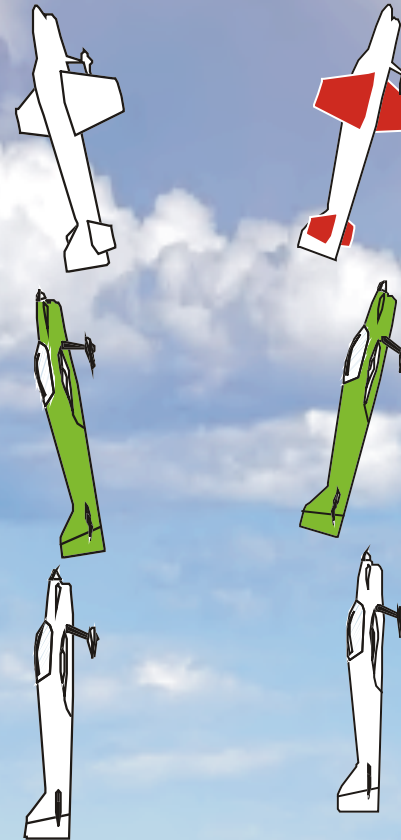


SNAP ROLLS, DOWN (and UP)

NEGATIVE SNAP
= DOWN elevator



POSITIVE SNAP
= UP elevator



NEGATIVE SNAP
= DOWN elevator





**Barrel roll or axial roll instead of
snap roll:
downgrade more than - 5 points**





Spotters say:

If it is not a BARREL ROLL...



...and it's not an an AXIAL ROLL...

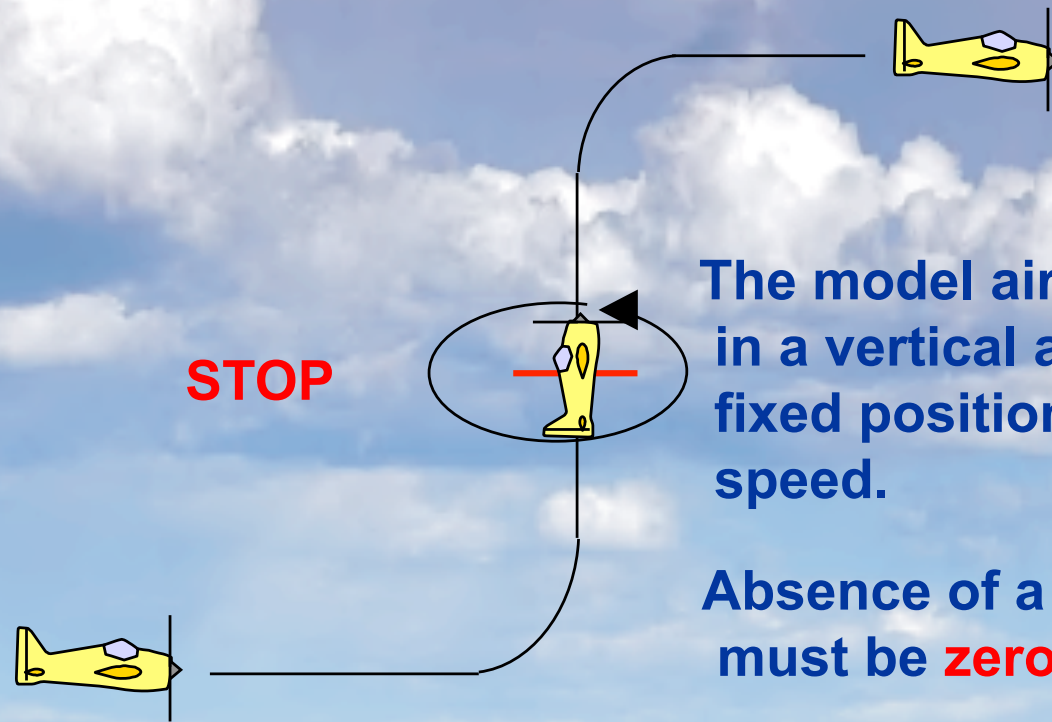


...then it's probably...

A SNAP ROLL!



Torque - Rolls



The model aircraft is hovering in a vertical attitude and in a fixed position at no flying speed.

Absence of a hover must be **zeroed**.

Otherwise torque - rolls are judged the same way as axial rolls.



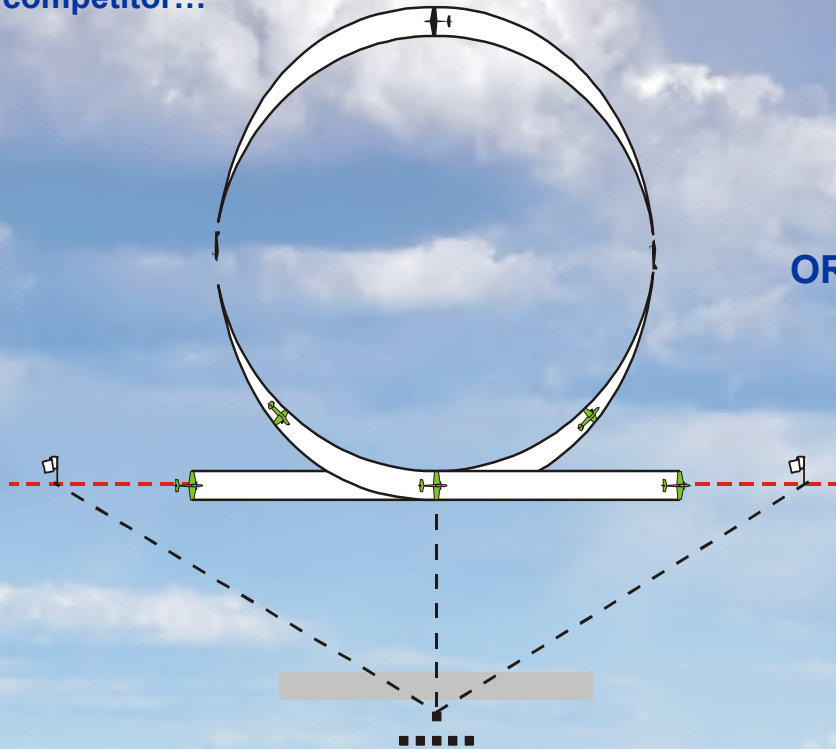
Horizontal Circles

- **Constant high or low altitude**
- **Circular flight path maintained**
- **Continuous rolling, at constant rate**
- **Rolls positioned correctly**
- **Any reversals to be immediate**

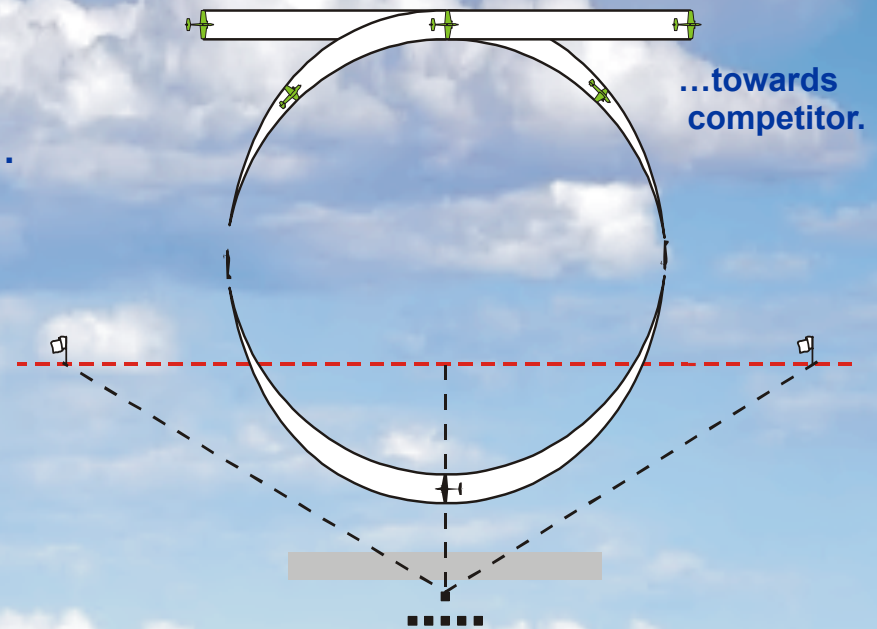


Horizontal Circles (Rolling Circles)

May be AWAY from
competitor...

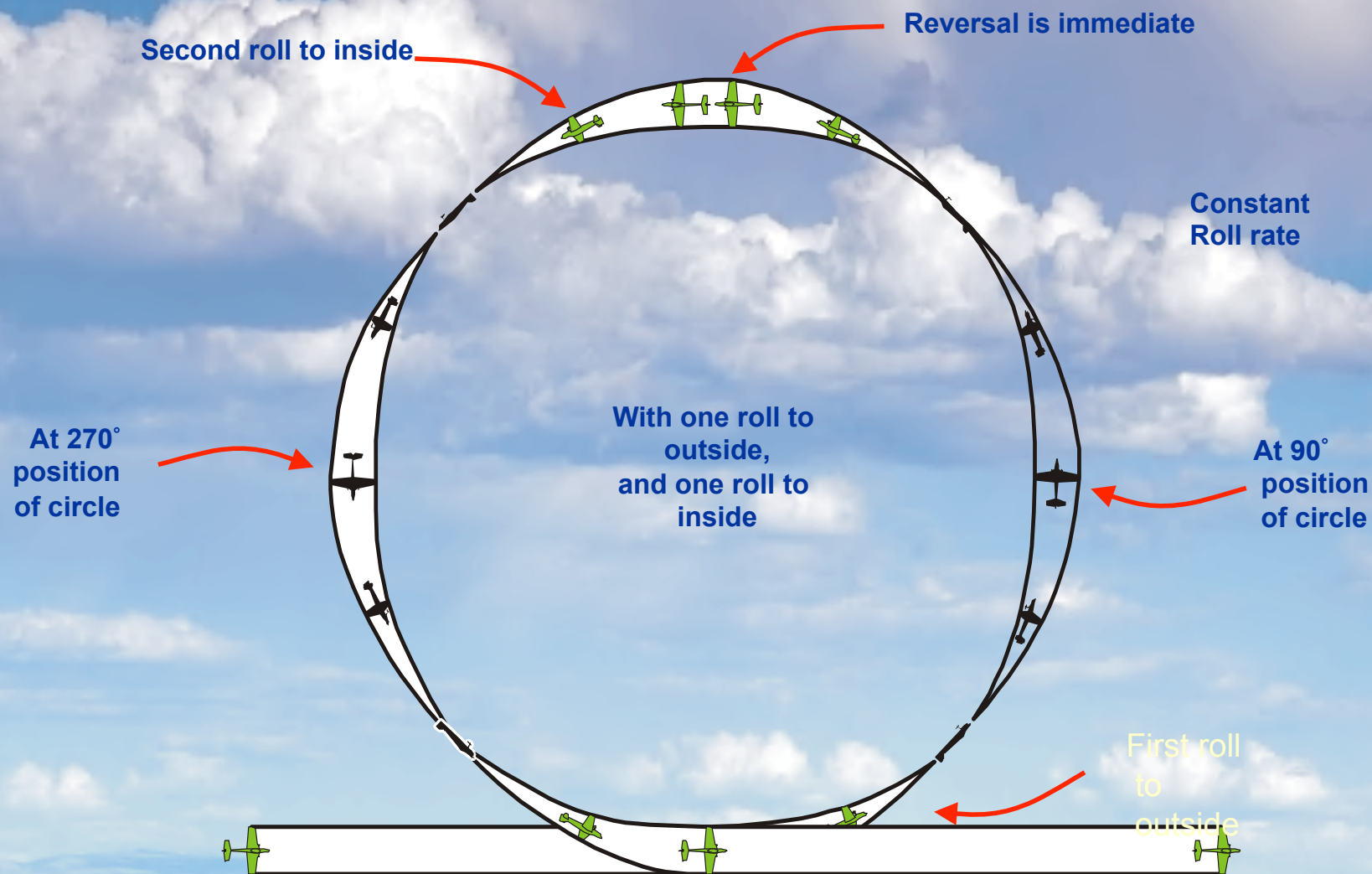


OR...



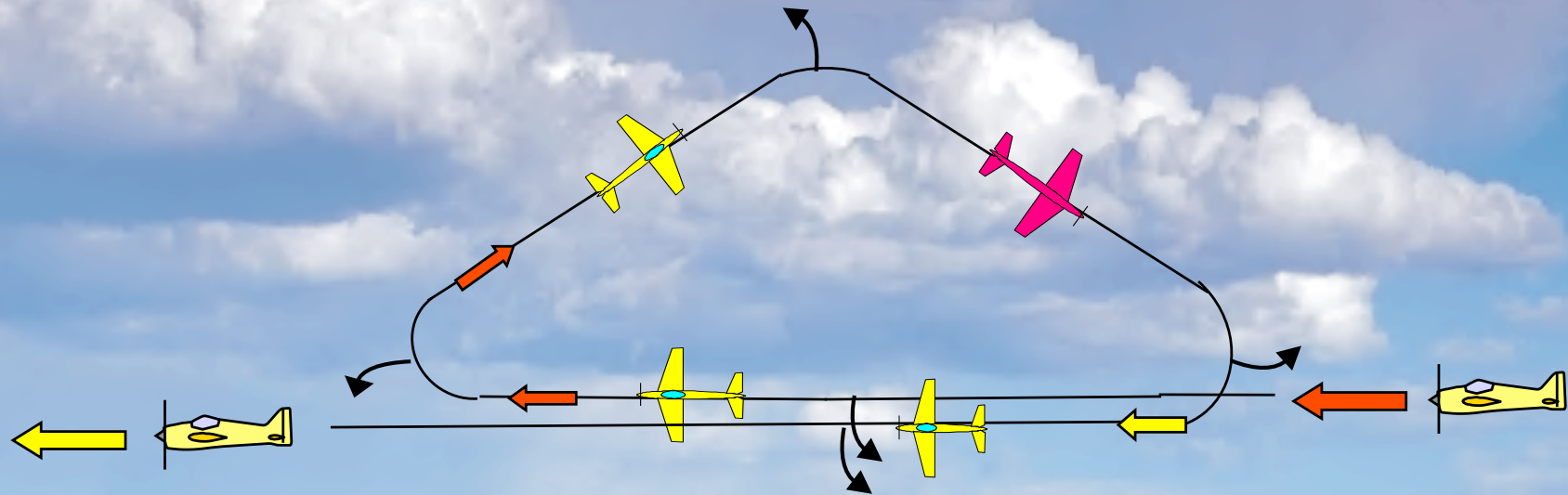


Horizontal Circles (Rolling Circles)



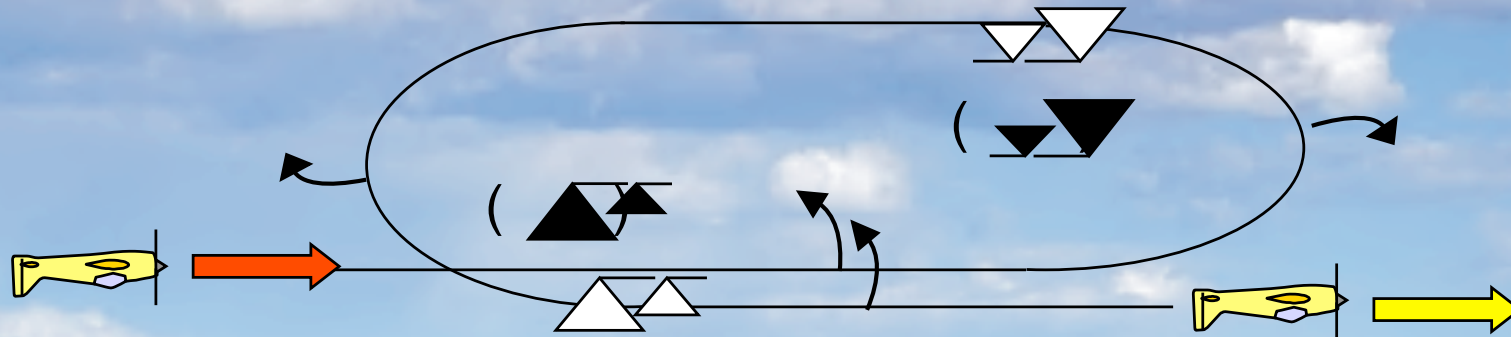


Horizontal Circles (Triangle)



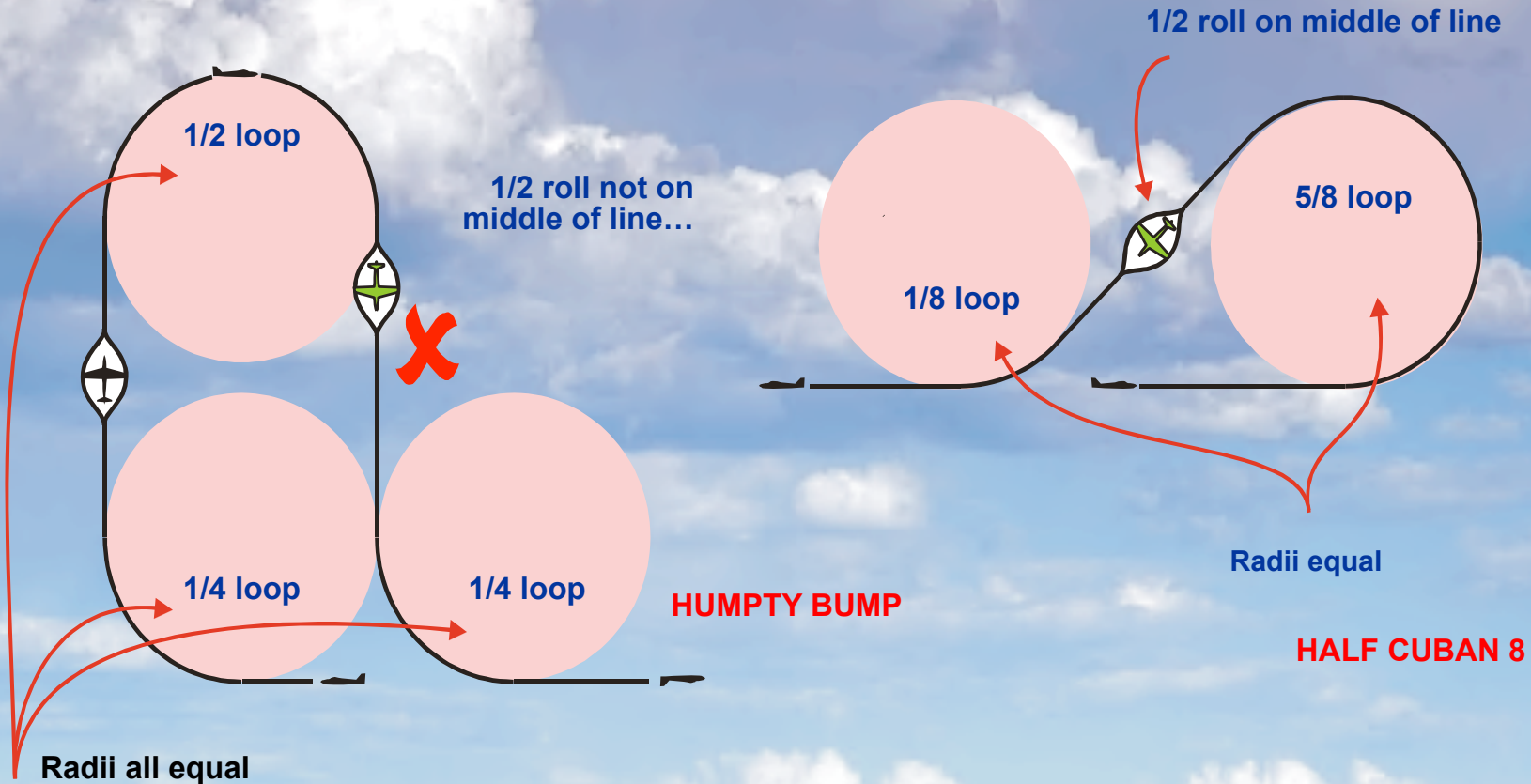


Horizontal Circles (Double Immelmann)





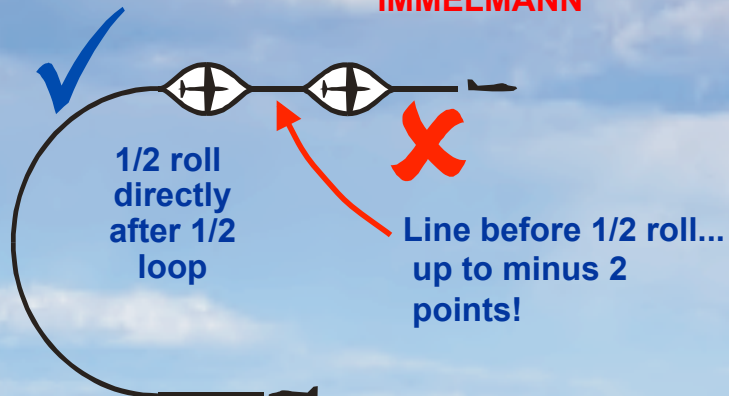
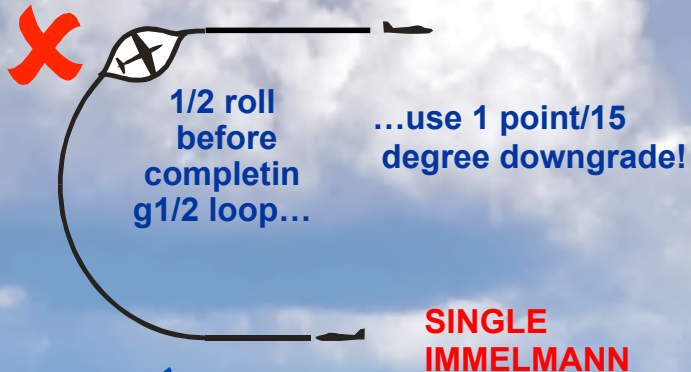
Line/Loop/Roll/Horizontal Circle COMBINATIONS



Whenever a continuous roll, part-roll, snap roll, or a consecutive combination of these is placed on a line, the length of the line before and after the roll or the combination of consecutive rolls must be equal. 0.5 point is subtracted for a minor difference, and 1 or more points for a major difference. If there is a complete absence of a line before or after the roll, 3 points are subtracted.



Line/Loop/Roll/Horizontal Circle COMBINATIONS



Radii are equal

Double IMMELMANN

Line before 1/2 roll... up to minus 2 points! **X**

✓ 1/2 roll directly after 1/2 loop

There is nothing about the length of the lines between the part loops in the Sporting Code!



Line/Loop/Roll/Horizontal Circle COMBINATIONS

**SQUARE LOOP
ON CORNER**

All lines 45°. All
lines equal
length

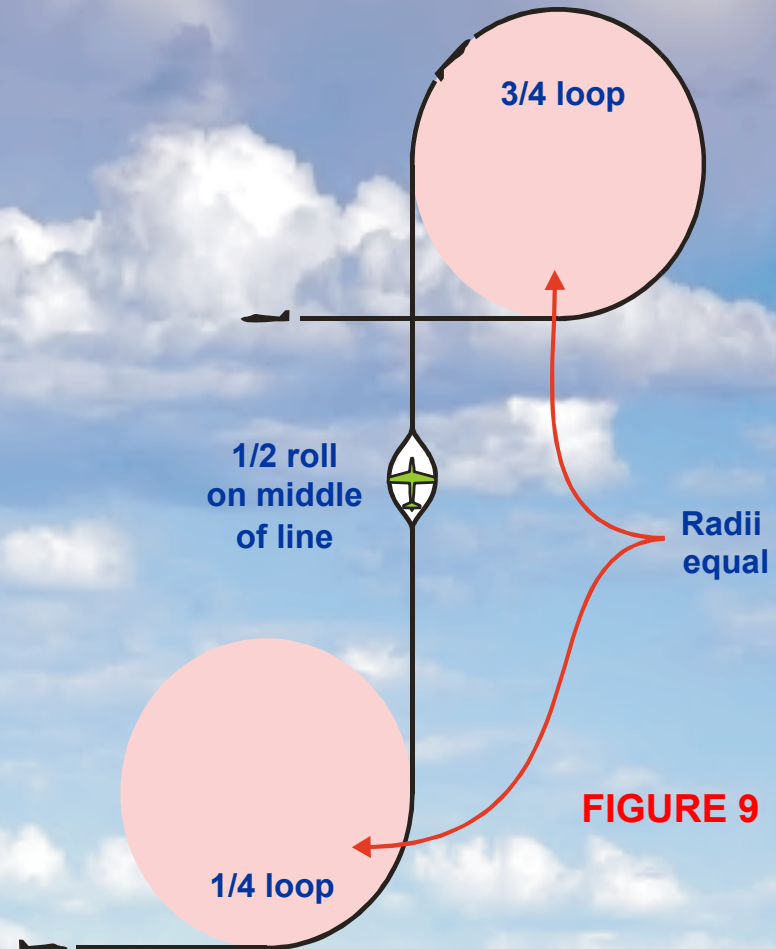
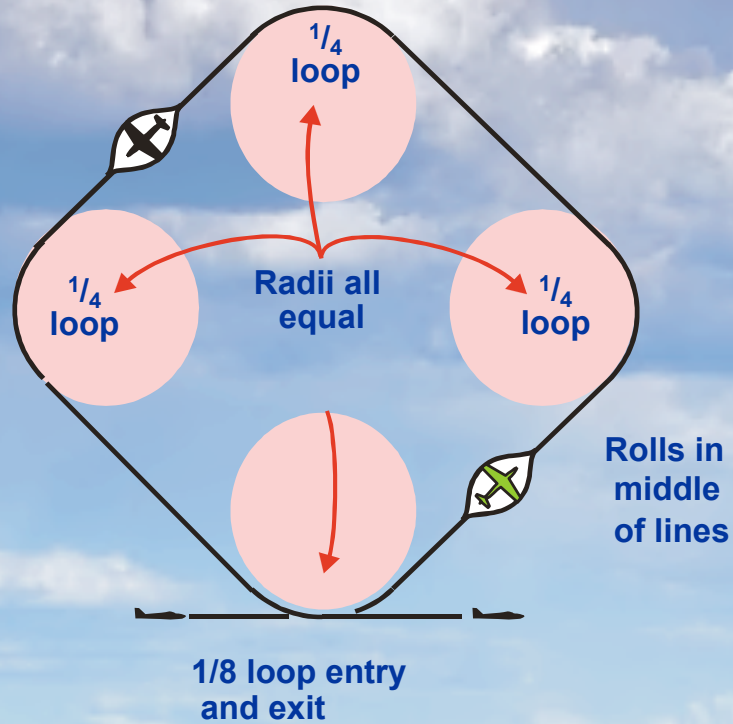
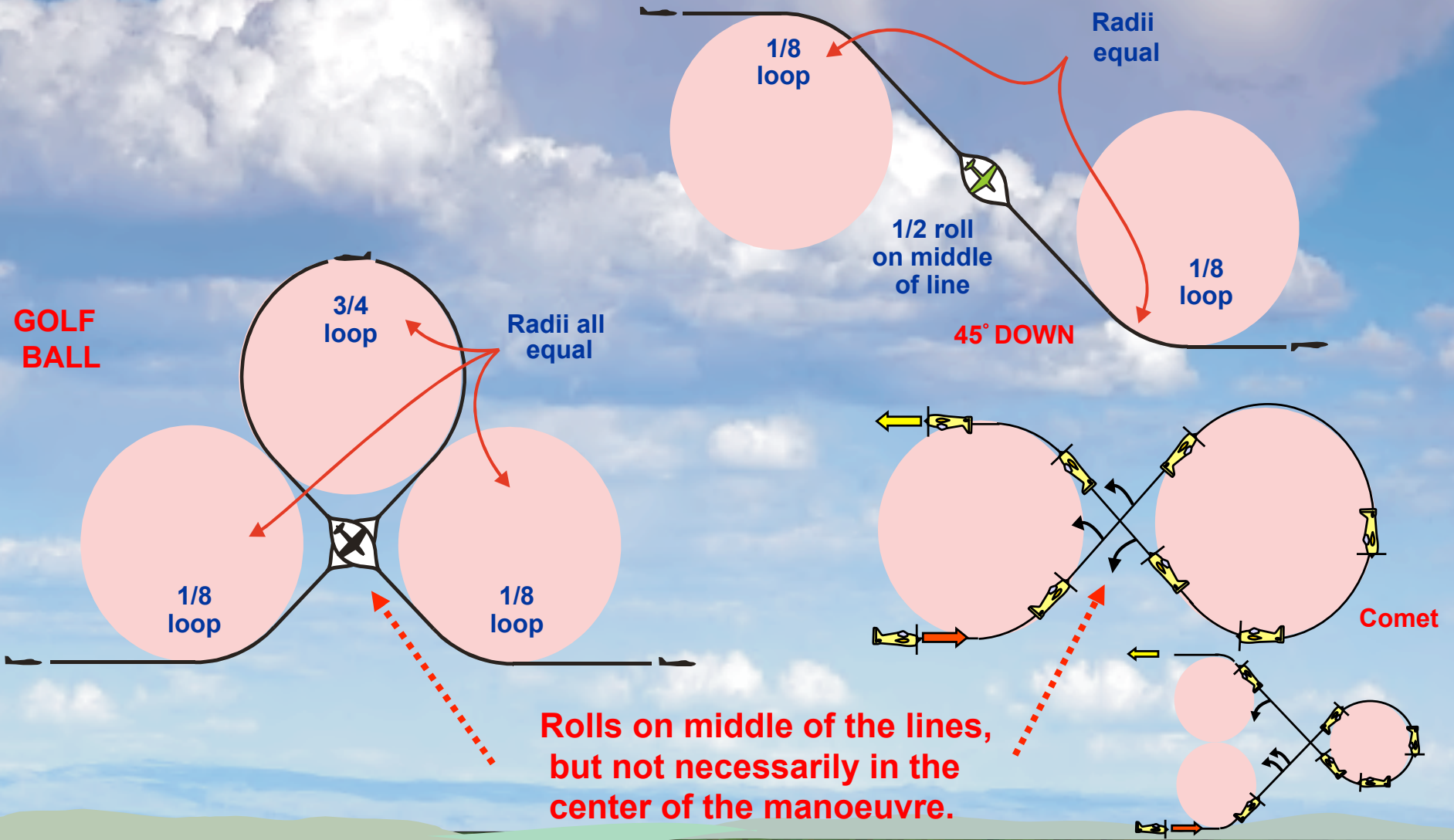


FIGURE 9



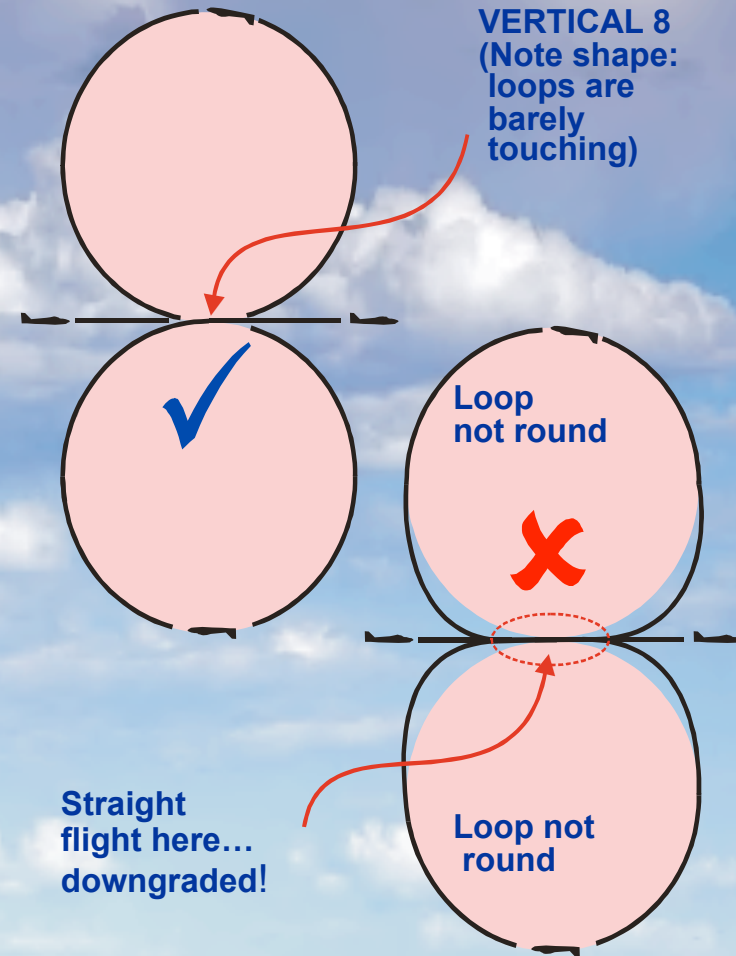
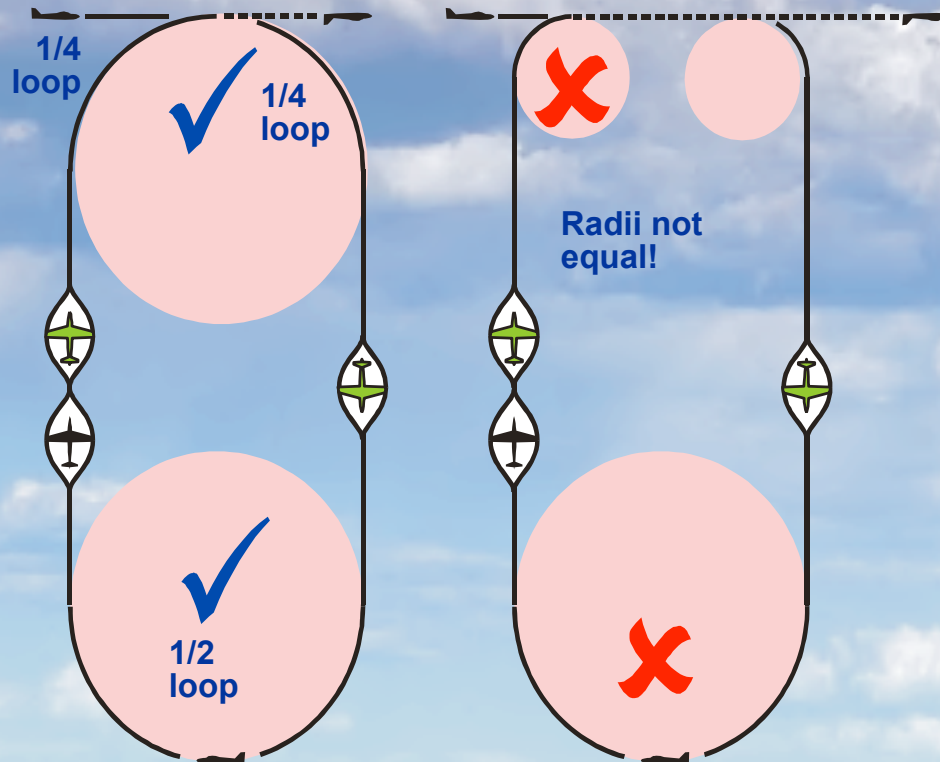
Line/Loop/Roll/Horizontal Circle COMBINATIONS





Line/Loop/Roll/Horizontal Circle COMBINATIONS

HUMPTY BUMP



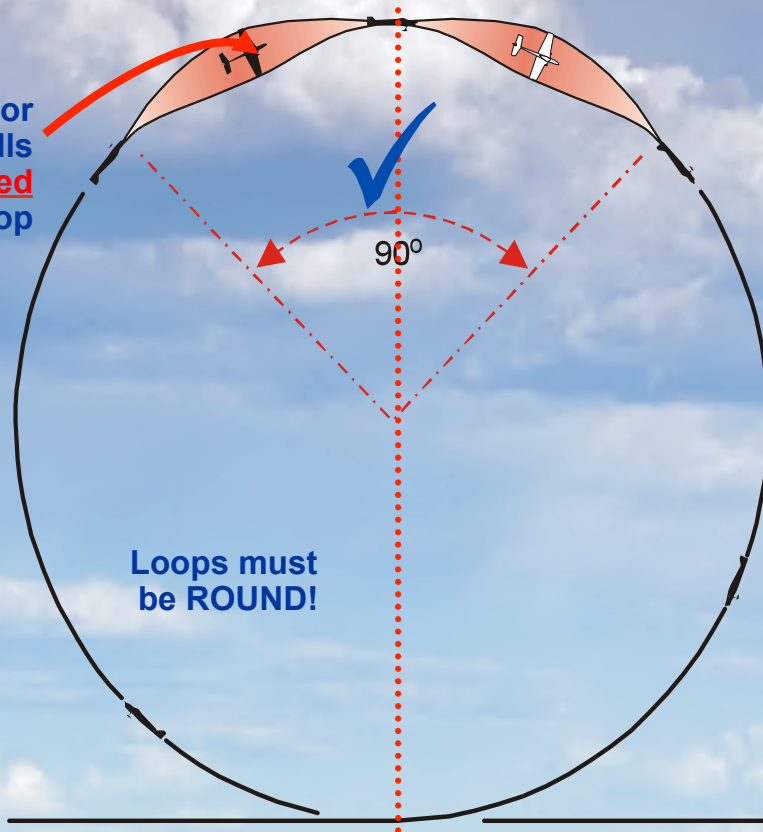


Line/Loop/Roll/Horizontal Circle COMBINATIONS

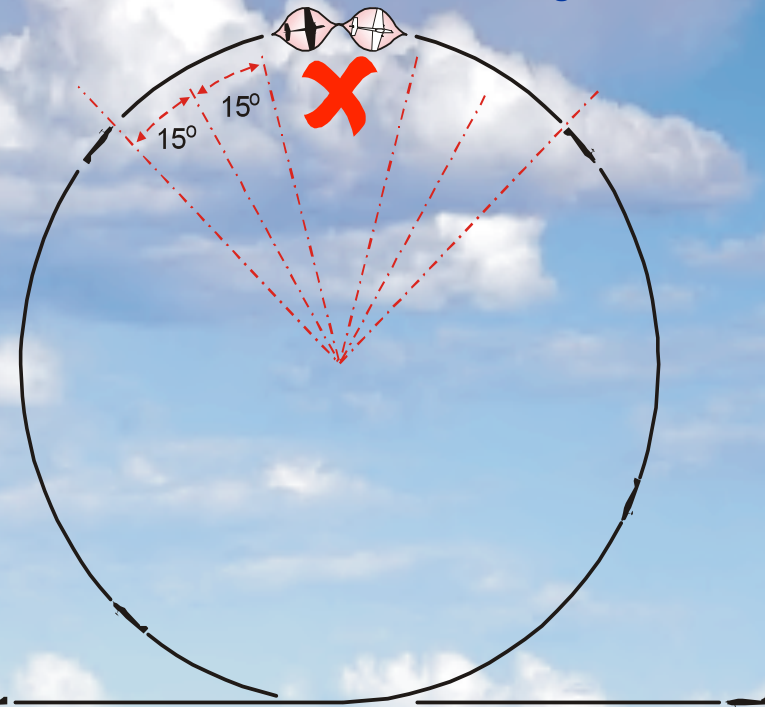
LOOPS WITH INTEGRATED ROLLS

Rapid rolls **MUST** score less. This
example = minus 4 for non
-integration of roll

Rolls or
part rolls
integrated
with loop



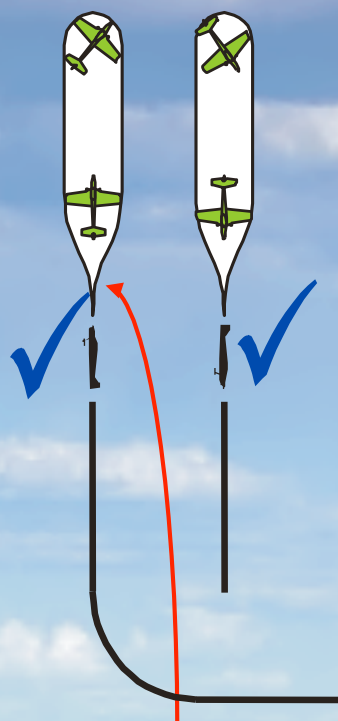
Loops must
be ROUND!





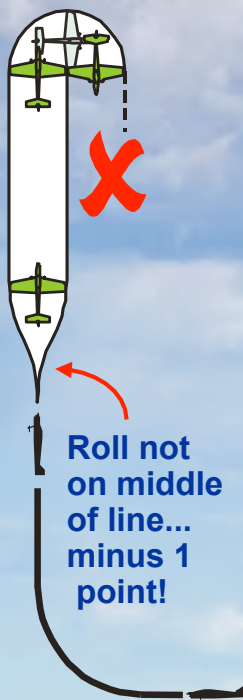
STALL TURNS

Pivot on CG...
no downgrade!



Roll on middle of line...
no downgrade!

Up to $\frac{1}{2}$ span
radius of pivot...
minus 1 point!



Roll not
on middle
of line...
minus 1
point!

Up to one wing
span radius...
minus $\frac{2}{3}$ points!



Pendulum
after
stall...
minus 1!

No line before roll...
minus 3 points!

More than $1\frac{1}{2}$
span radius but
less than two
minus $\frac{4}{5}$ points!



Over 15°
off vertical...
minus 2 points!

Roll not on
middle...
minus 1 point!

The model must stop before pivot. If not downgrade.



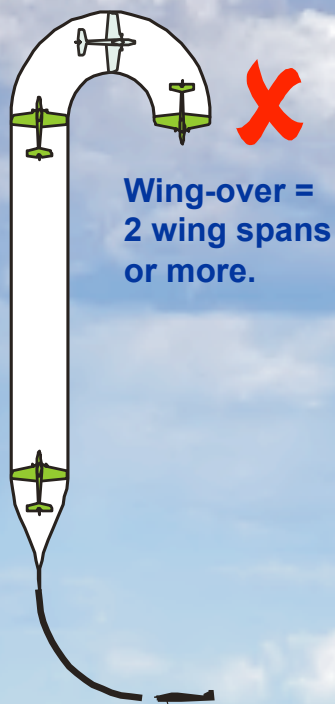
STALL TURNS

“Skid” or “no stop”
before reaching
Stall position...



Minus
1 point!

Wing-over...
ZERO!

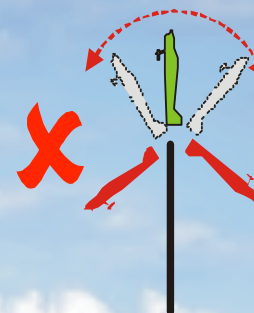


Wing-over =
2 wing spans
or more.

Torque-off...
1pt/15 degree
downgrade



Flop forwards,
or backwards... **ZERO!**



Drift of the model aircraft during the stalled condition must be ignored, provided the model aircraft does not drift outside the manoeuvring zone.

SPINS



Level entry

Nose-up attitude increases

Stall...
nose and wing drops...
rotation starts

Nose-up attitude

Model aircraft spins around CG

Up to 15°
...minus 1!

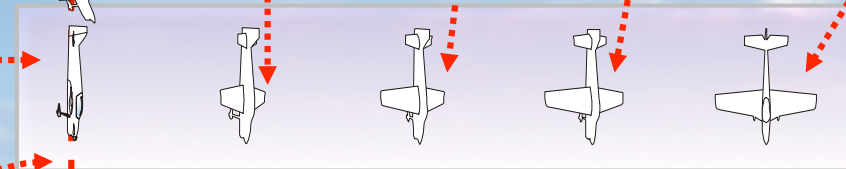
15° to 30°
...minus 2!

30° to 45°
...minus 3!

90° overspin
...minus 6!

STOP, with
no over- or
under-spin

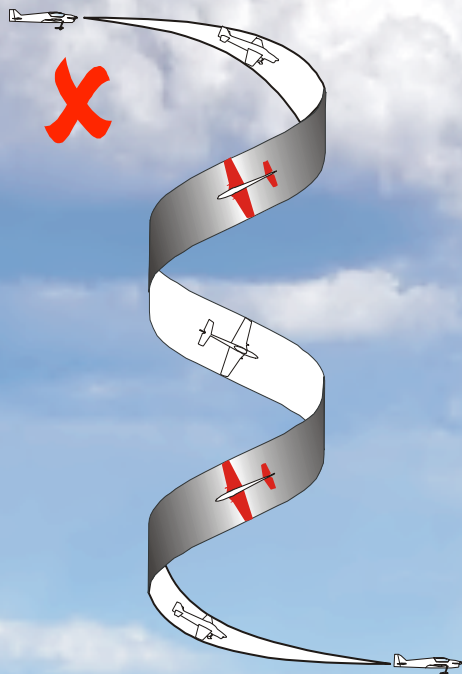
Vertical downline
after spin





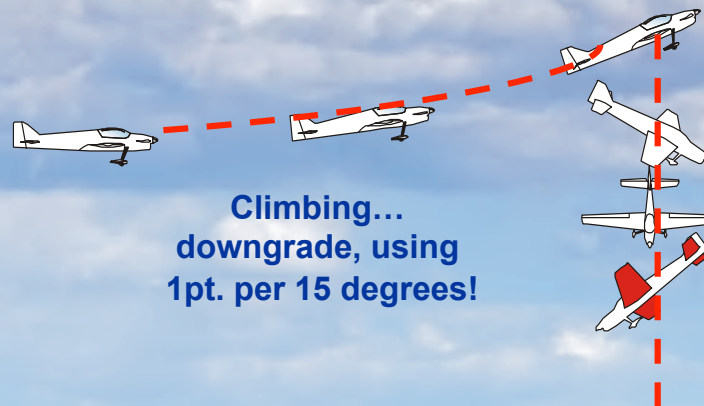
SPINS

Wing lift (snap entry)...ZERO!



Spiral dive...scores ZERO!

Forced with
down-elevator...
minus 4 or 5!



Climbing...
downgrade, using
1pt. per 15 degrees!

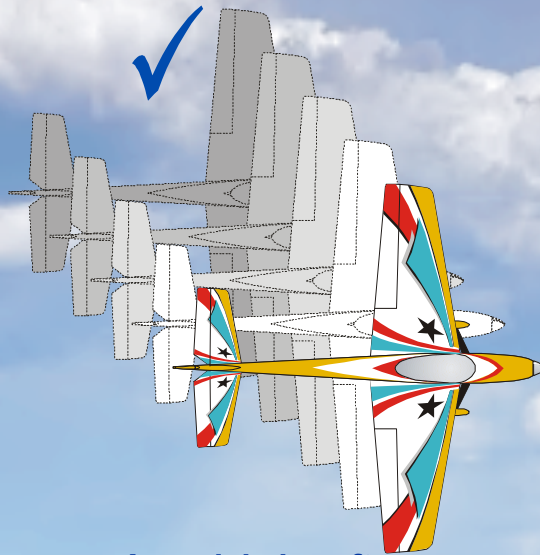


SPIN: DRIFT, OR WEATHERCOCK?



A weathercock is fixed to the earth, but free to swivel into the prevailing wind.

No penalty for drifting with wind.



A model aircraft is not fixed to anything!



Direction of flight

Up to 15° off...
minus 1 point!

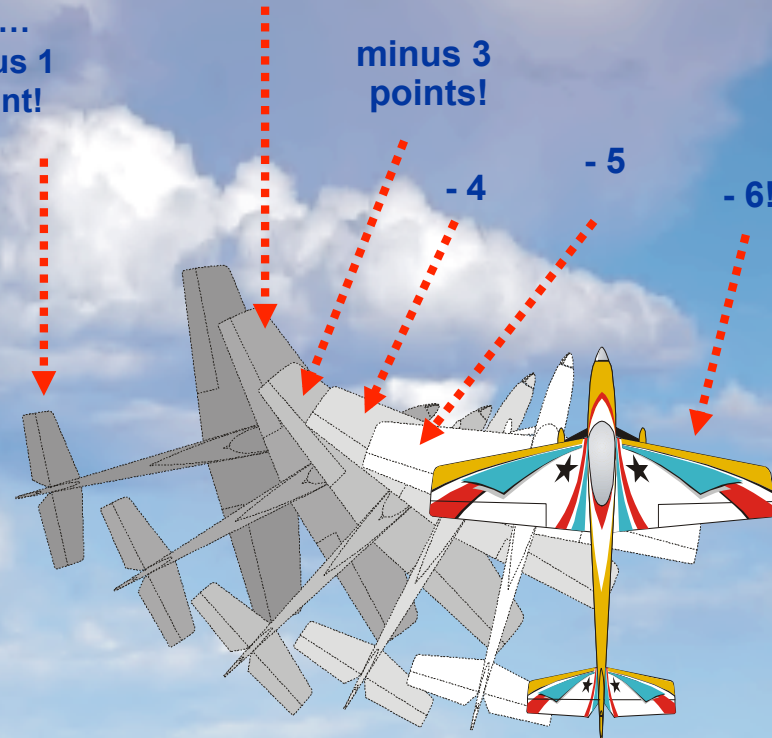
Up to 30° off...
minus 2 points!

minus 3 points!

- 4

- 5

- 6!





Smoothness and Gracefulness of the Manoeuvre

Harmonic appearance of the entire manoeuvre

Constant flightspeed

Radii not too tight and not too loose

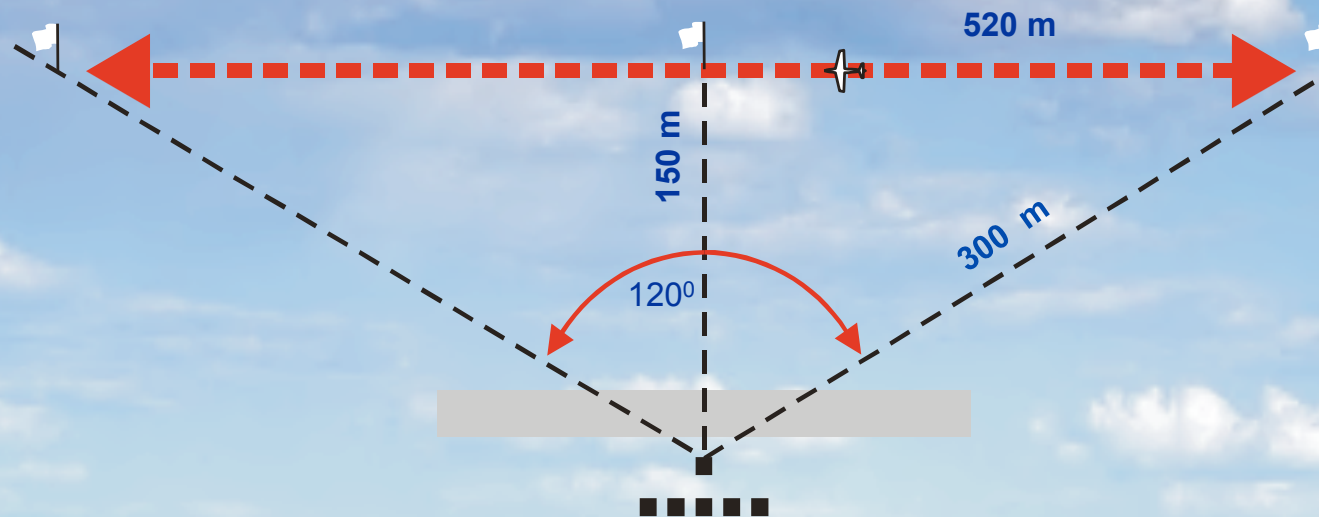
Rolling speed not too low or too high



LONGITUDINAL POSITIONING

Manoeuvres should be primarily performed along a line of flight approximately 150m

Exceptions to this rule are cross-box manoeuvres, 3D - manoeuvres, or manoeuvres in a stalled condition, as well as the horizontal circle manoeuvres which, of necessity, may deviate from the 150m distance of flight.

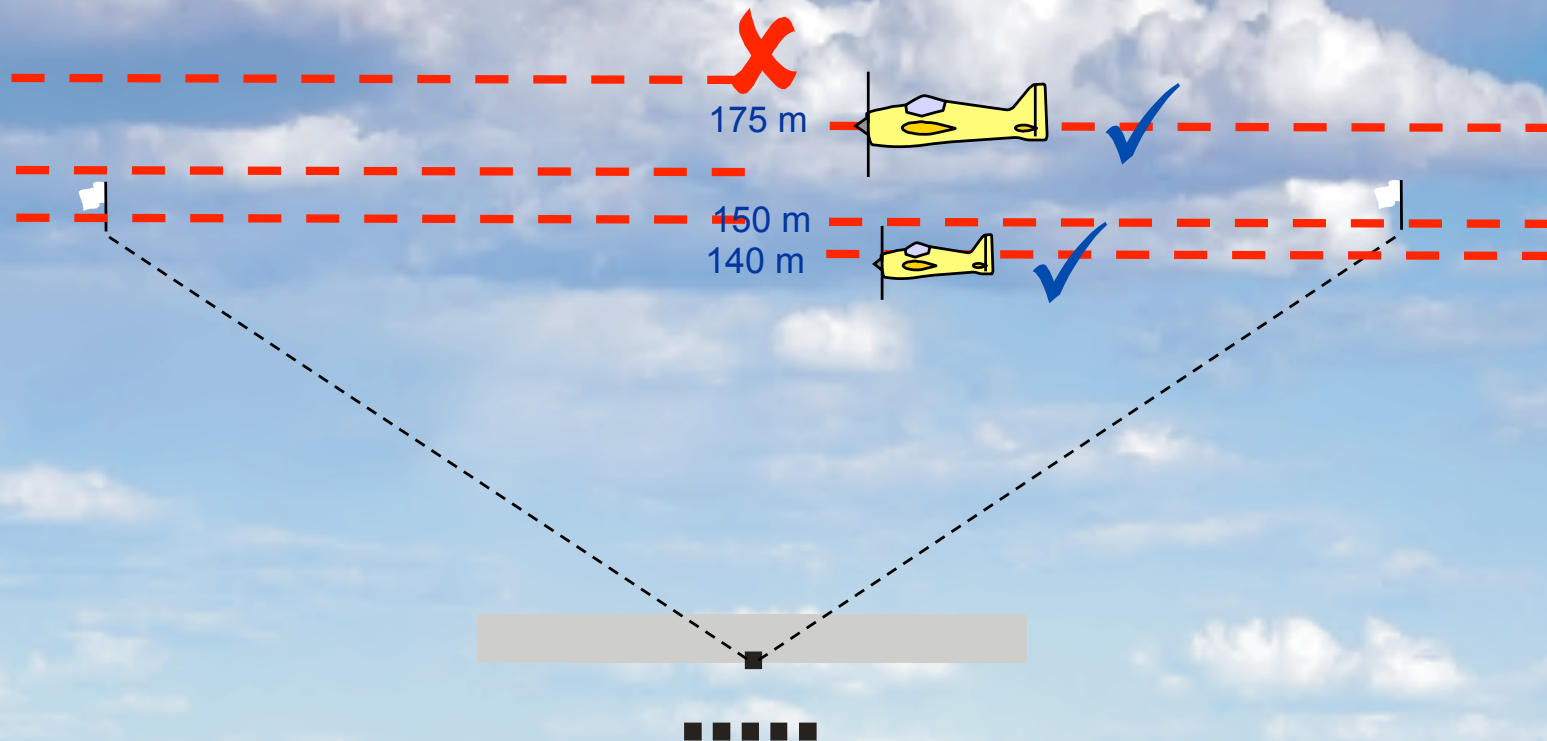




LONGITUDINAL POSITIONING

5B.10: “Manoeuvres on a line greater than
175 m **MUST BE DOWNGRADED**”

The main criterion is *visibility*!





LONGITUDINAL POSITIONING

more than 200 m
minus -2 to 3 points

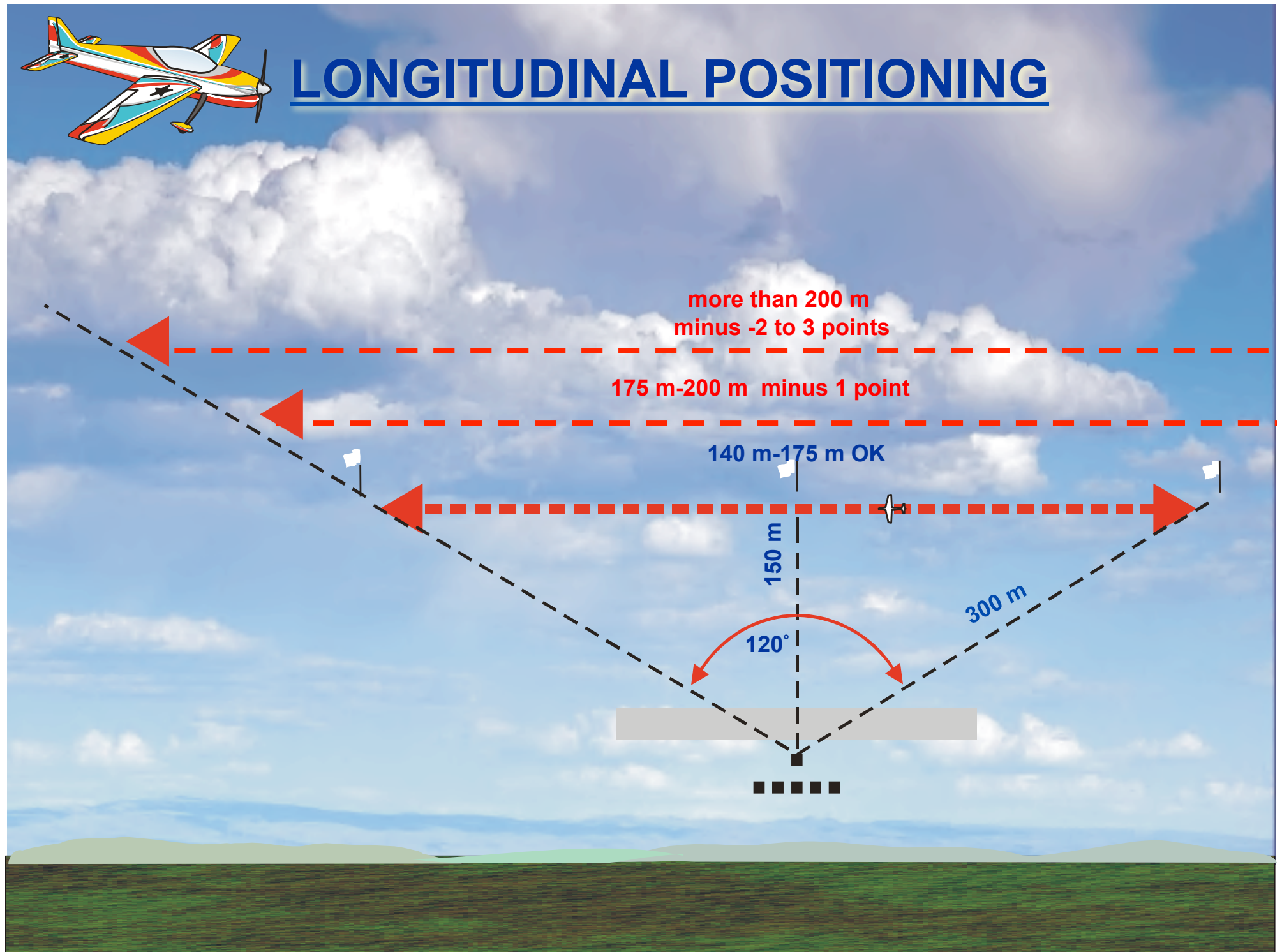
175 m-200 m minus 1 point

140 m-175 m OK

150 m

300 m

120°



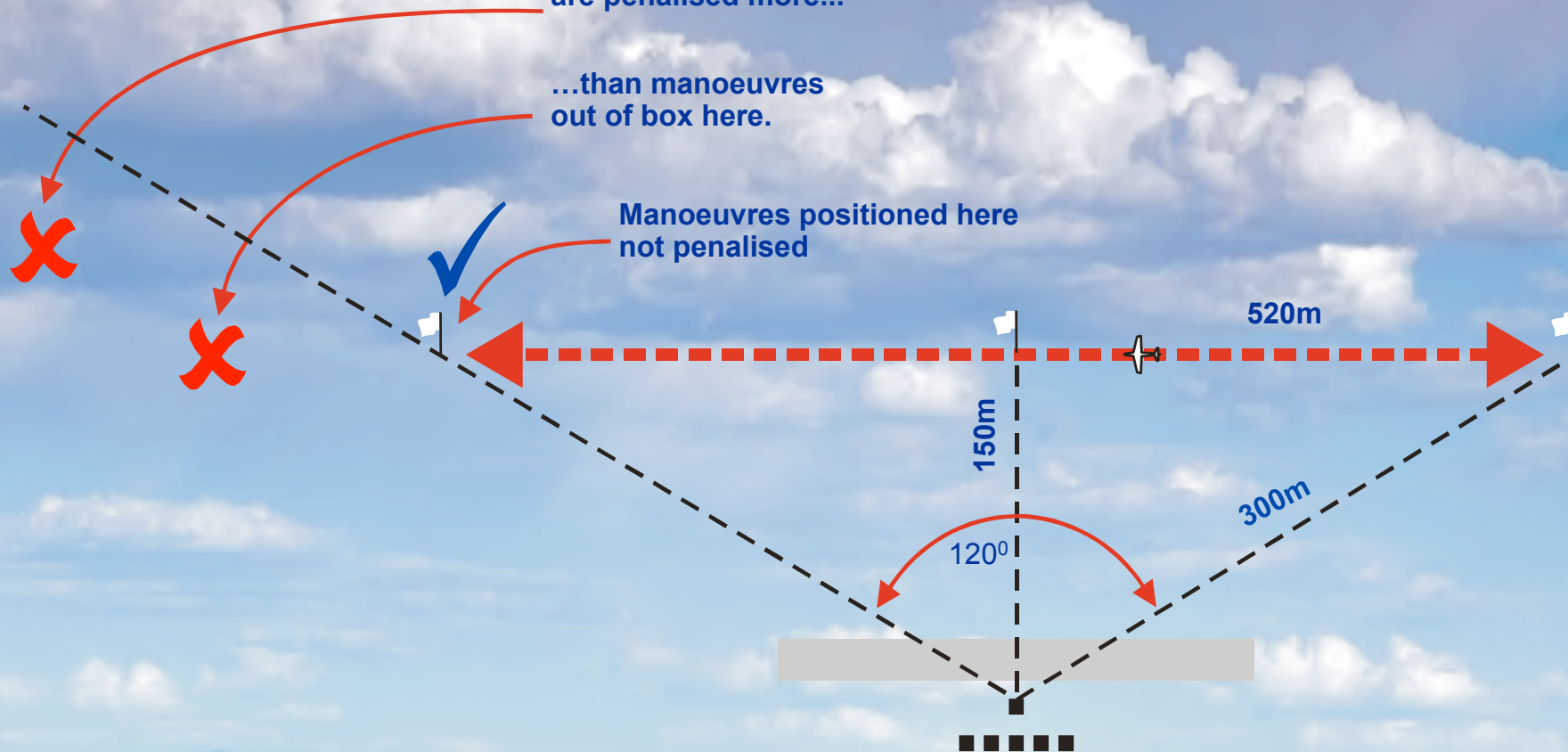


LONGITUDINAL POSITIONING

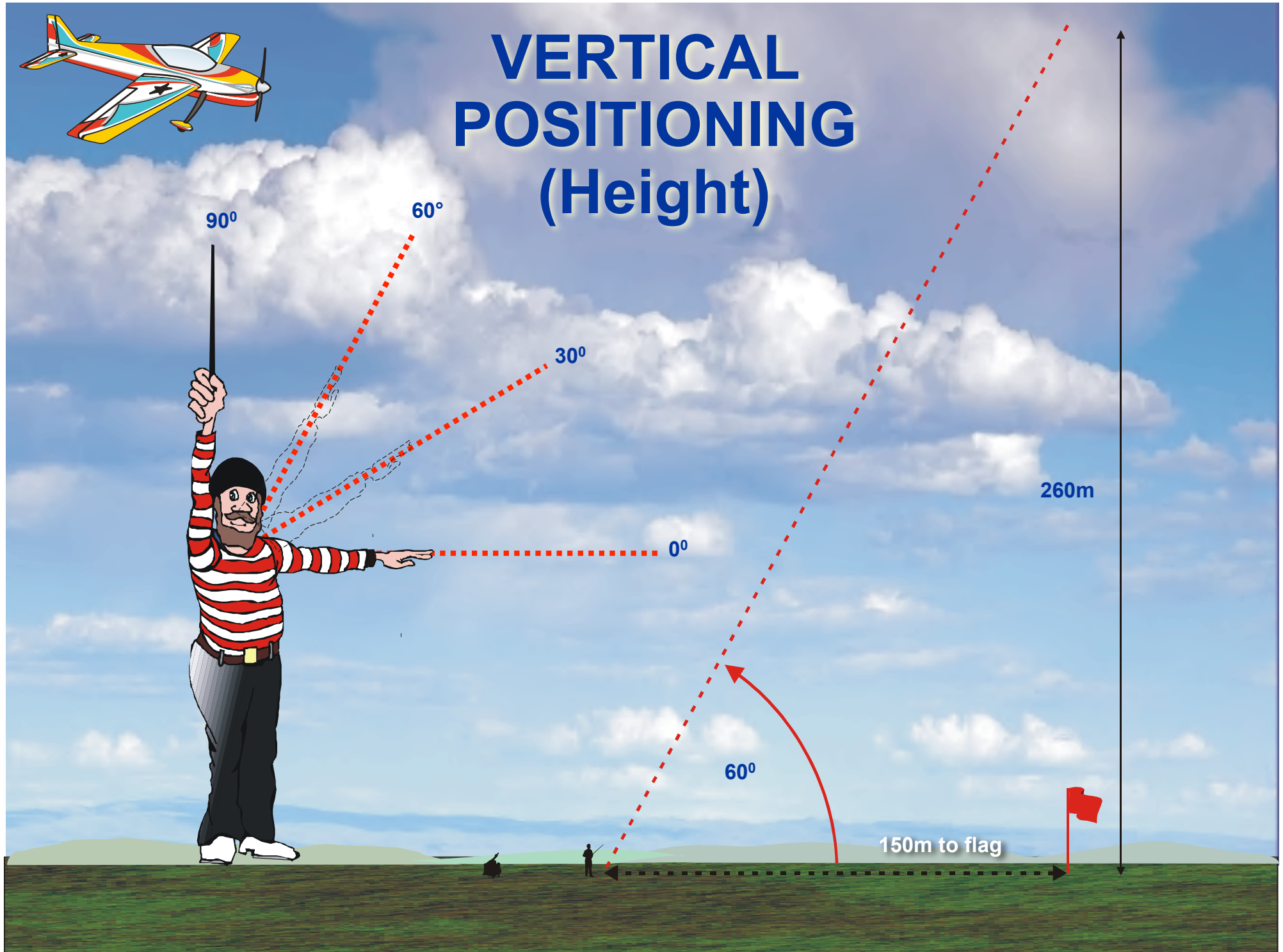
Manoeuvres out of box here,
are penalised more...

...than manoeuvres
out of box here.

Manoeuvres positioned here
not penalised



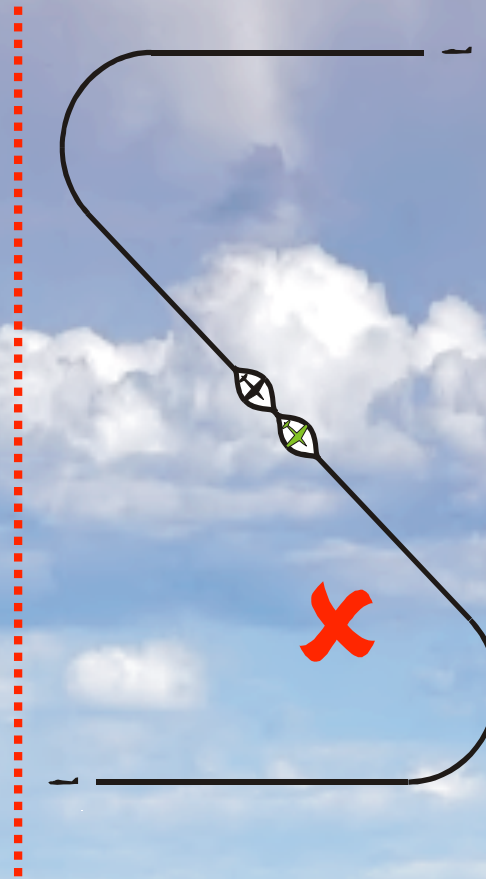
VERTICAL POSITIONING (Height)



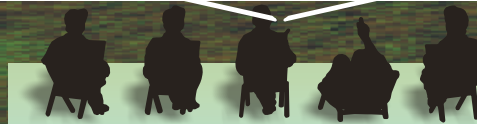


CENTRE POSITIONING

Off-centre positioning...
minus 3 or 4 points!
(for this example)



A centre manoeuvre must be flown so that it is centred on the centre line indicated by the centre flag. If the manoeuvre is flown off-centre, it must be downgraded according to the misplacement. This may be in the range of 0.5 to 4 points subtracted. The centre of a centre manoeuvre is in the middle between vertical limits left and right.





Size of the manoeuvres

The size of a manoeuvre is scored by its matching size relative to the size of manoeuvring zone and relative size of the other manoeuvres performed throughout the schedule

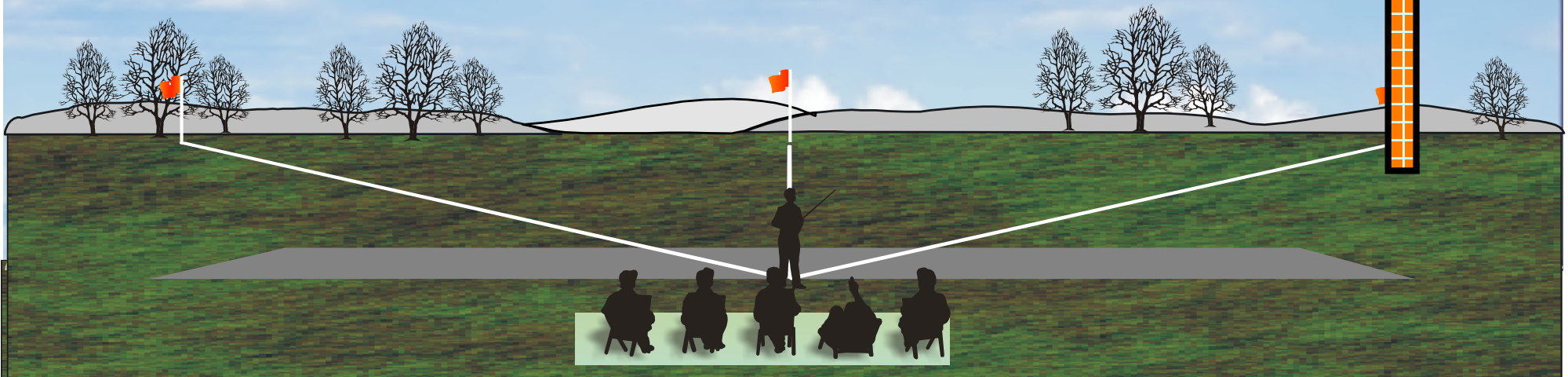


Proportion of the manoeuvre outside of the manoeuvring zone



Box markers are indicators only.

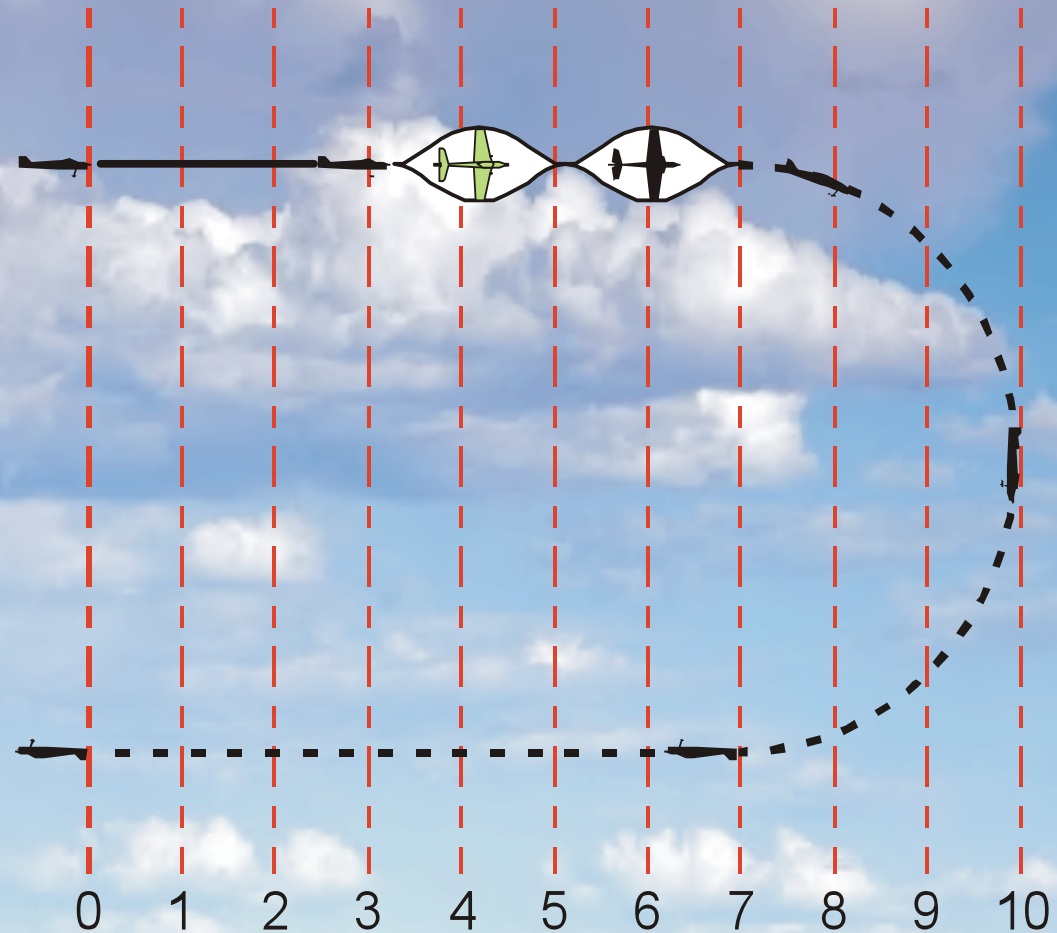
Do not downgrade unnecessarily!





Proportion of the manoeuvre outside of the manoeuvring zone

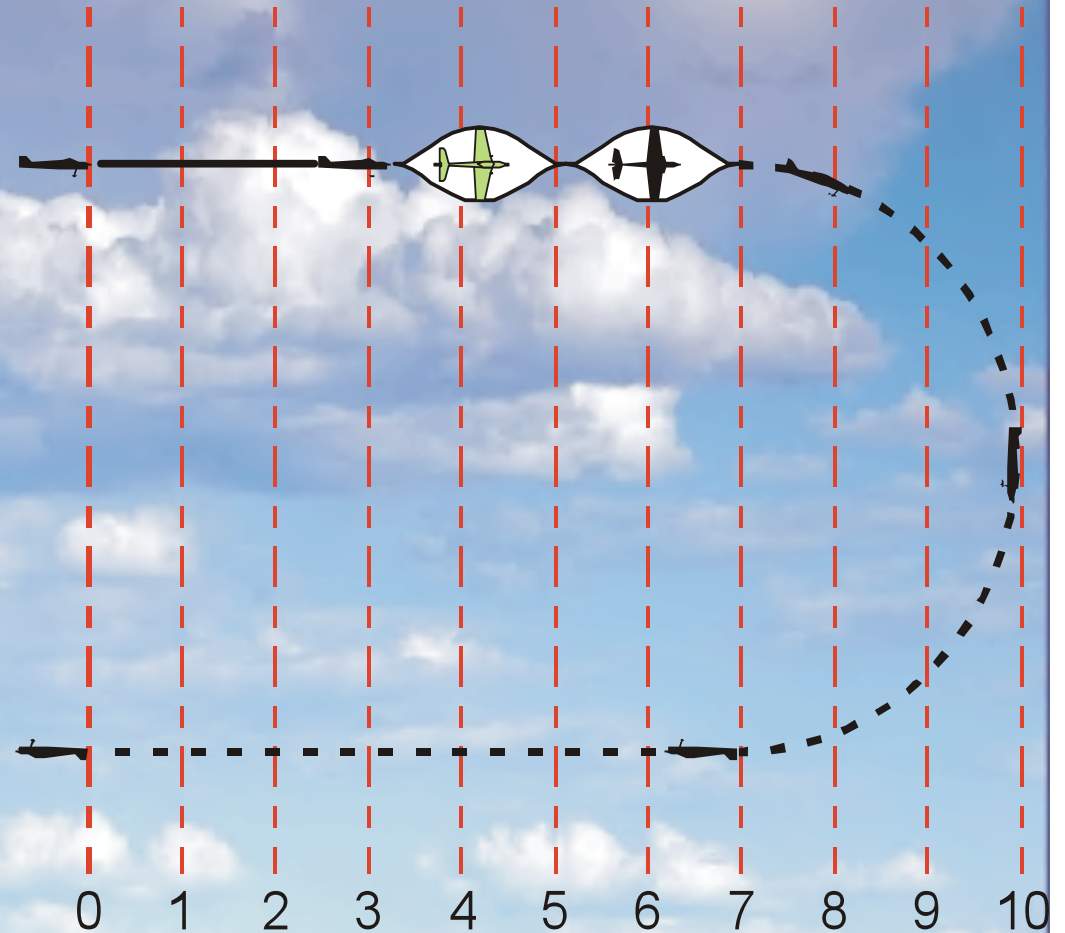
No downgrade
(positioning only)
(Entire manoeuvre
= inside box marker)





Proportion of the manoeuvre outside of the manoeuvring zone

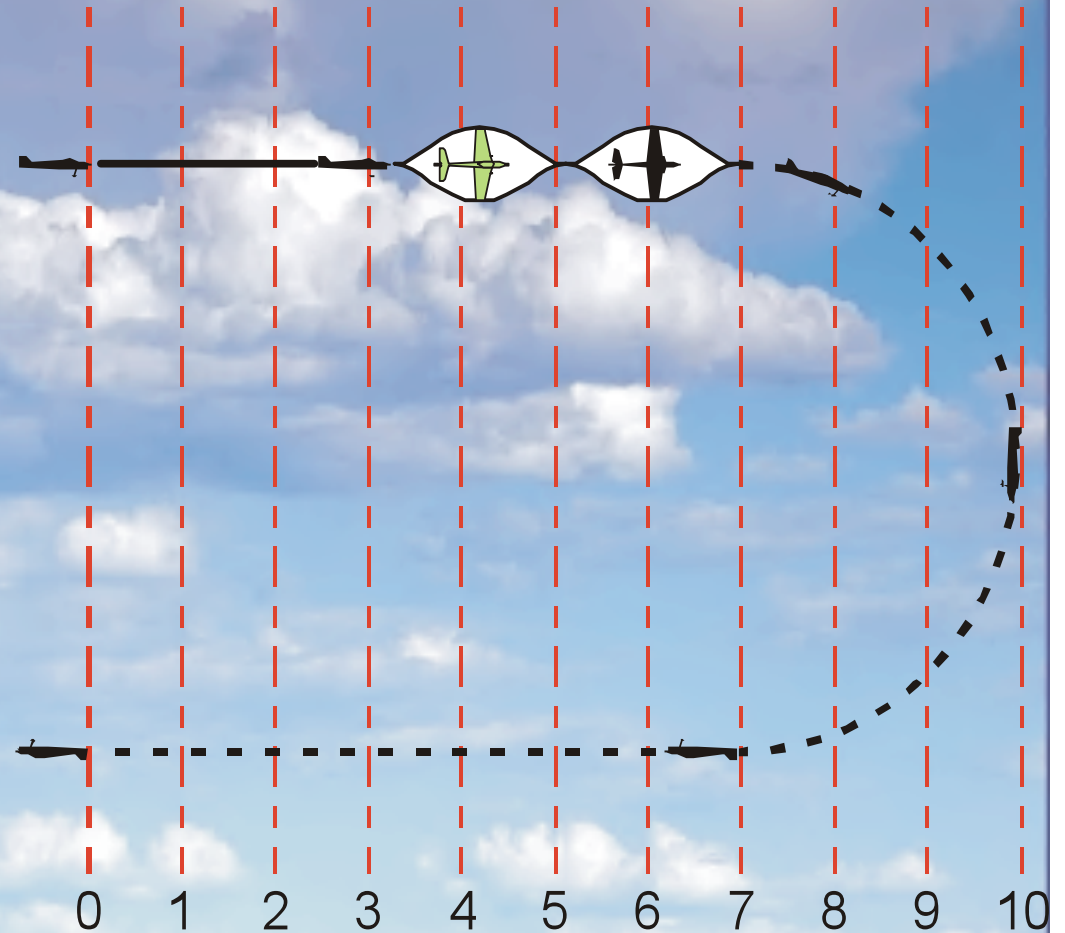
2 points downgrade
(20% of manoeuvre = outside)





Proportion of the manoeuvre outside of the manoeuvring zone

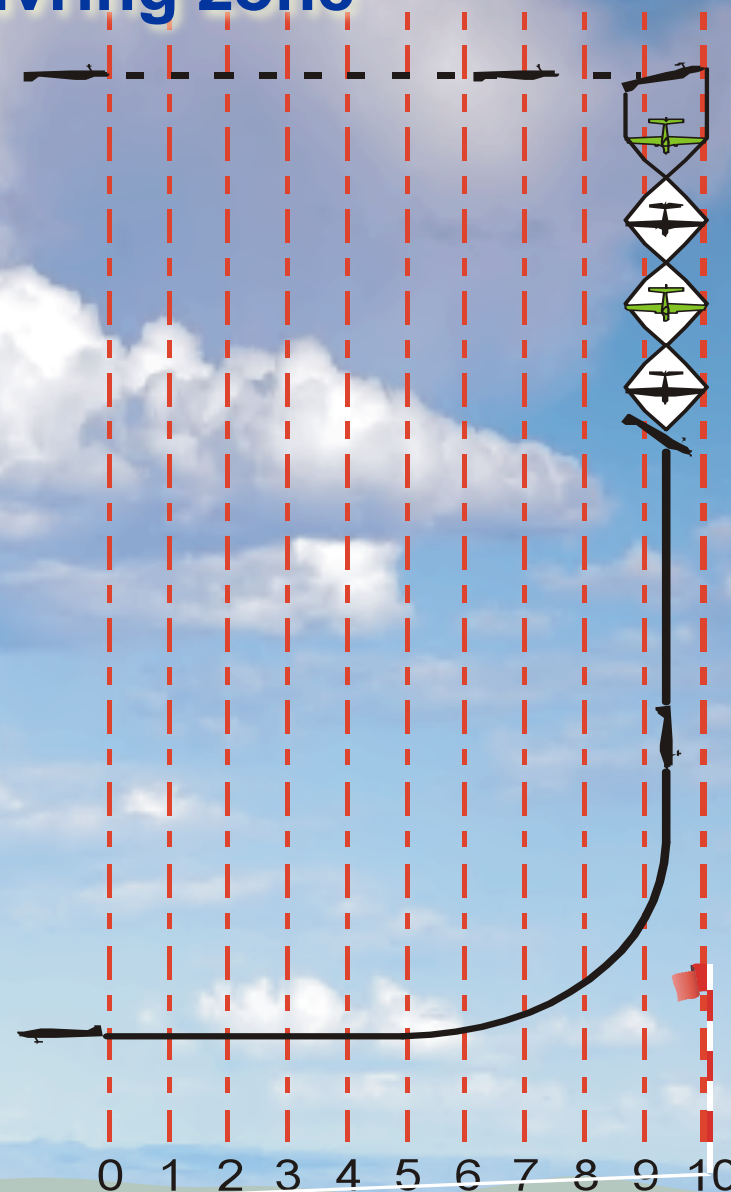
5 points downgrade
(50% of manoeuvre = outside)





Proportion of the manoeuvre outside of the manoeuvring zone

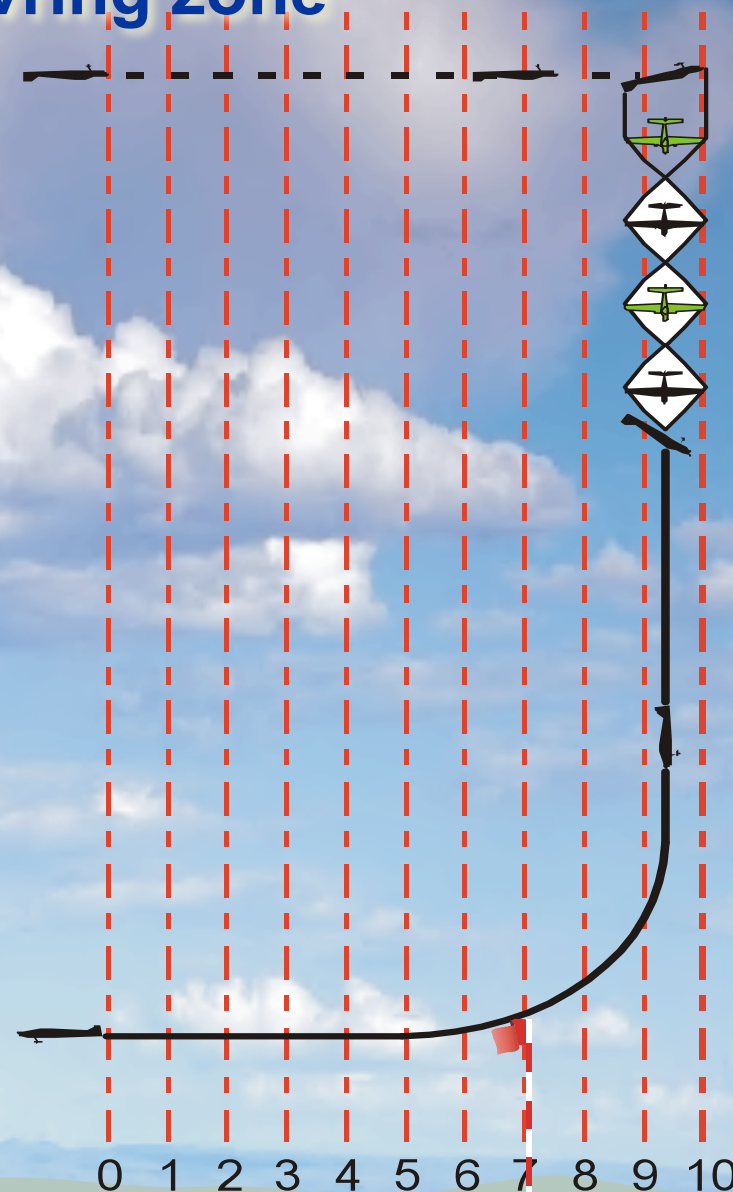
No downgrade
(Entire manoeuvre = inside box marker)





Proportion of the manoeuvre outside of the manoeuvring zone

3 points downgrade for positioning.
(30% of manoeuvre = outside box marker)





How to prepare as a judge?

- Know your schedule(s)!!
 - Like you would fly it yourself or even better
 - Know where the options are so you won't be surprised
- Be able to read Aresti quickly as a backup reminder sheet
- Make sure you get regular breaks
- Have some protection with you:
 - Sun
 - Rain
 - Wind
- Bring your own (good) chair



SCORE BETWEEN

10 and 0!

(NOT 8,5-7,5-6,5 or 6,5-6-5,5 or 6-5-4!)

Use Deduct /Downgrade System



**EVERY COMPETITOR...
STARTS EVERY FLIGHT...**

**WITH A
PERFECT SCORE!**



BE CONSISTENT!

BE ACCURATE!

BE IMPARTIAL!



**DON'T DISCUSS
FLIGHTS WITH
FELLOW JUDGES**



USE N/O (NOT OBSERVED)

Be FAIR to competitors,
and yourself!



Remember

Forget WHO is flying

(friend, rival, countryman, flier from other nation)

Forget WHAT is flying

(2-stroke, 4-stroke, electric, turbine, rubber
-power)

LOOK ONLY AT LINES DESCRIBED IN
THE SKY!

(and the precision, smoothness, positioning, and
size)

What is the game?

- The pilot is to do as good as a job to hide errors and as such try to fool the judges
- The judges are there to spot the errors and judge how good the flight appears to be.

Respect each other

- Pilots and judges are all human...
- Humans make errors, pilots and judges
- People who work make errors
- People who work a lot make a lot of errors
- I do know people who don't make errors.....
- So, judges are just humans and can have it wrong or miss sometimes something.



Enjoy flying and judging!

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