

The Stall Turn

To start on how to judge the figure, let's first look at the Official Judging Rules from the **FAI/CIVA Sporting Code Section 6 Part 1 – Powered Aircraft**

And starting with basic judging rules before the actual criteria for the Stall Turn (Hammerhead)

B.3. Flight Path And Attitude

B.3.1. Flight Path

B.3.1.1. Think of the aircraft condensed into a single dot and watch the path this dot takes through the sky. This is the flight path, or track, of the aircraft's centre of gravity. Judging the flight path or the track over the ground consists of comparing the observed path with fixed references such as the horizon or the main and secondary axes of the Aerobatic Box. (Figure 1)

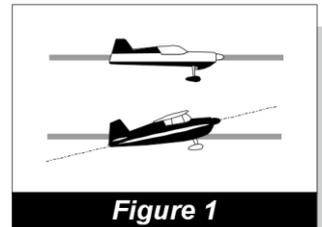


Figure 1

B.3.2. Vertical Attitude

B.3.2.1. Judging vertical lines is based on the attitude of the aircraft and not its flight path. When an aircraft's flight path, in a zero wind condition, is exactly 90 degrees to the horizon, the wings are being held at the correct angle to produce no lift. The aircraft's attitude while in this condition (zero lift) defines the proper judging criterion for vertical attitude. This is called the zero-lift axis. a) When this zero-lift axis is vertical, the longitudinal axis of some aircraft may not appear to be vertical. (Figure2) The Judge must determine the proper vertical attitude for each aircraft type according to its zero-lift axis.

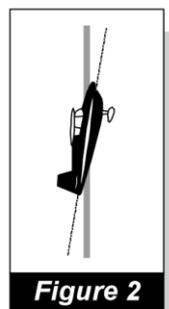


Figure 2

The best opportunity to make this determination is to observe practice flights and note the different aircrafts' vertical attitudes, both up and down.

- b) An aid for judging the perfect vertical (zero-lift) attitude is to observe vertical rolls. During a truly vertical roll, the aircraft's wings will constantly be parallel to the horizon, something which is especially noticeable after 90 degrees of roll.
- c) Be aware that aircraft types whose zero-lift axis does not pass through the tail will make a

spiral with the tail during a perfect vertical roll. From the Judges' perspective, this spiral will look as if the tail is shifting off-axis from the zero-lift axis flight path.

B.3.2.2. When there is a wind of any kind, the observed flight path will be offset from perpendicular to the horizon by some degree. This wind effect must be completely ignored by the Judge, who must only evaluate the accuracy of the vertical attitude. (Figure 3)

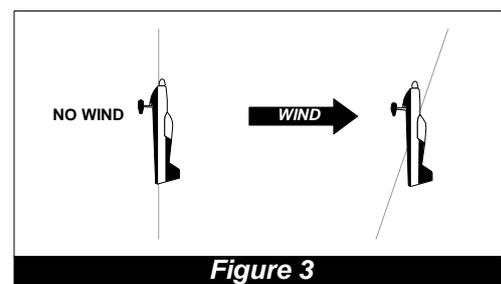


Figure 3

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B.3.3. The 45 Degree Attitude

B.3.3.1. This is the vertical attitude plus or minus 45 degrees. In view of the difficulty in judging 45 degree lines accurately, scoring deductions should be applied with care. When flown into the wind, a perfect 45 degree line will appear to be steep while the opposite is true when flown downwind. (Figure 4) As with the vertical attitude, this wind effect must be completely ignored by the Judge who must only evaluate the accuracy of the 45 degree attitude. The prescribed deduction is one (1) point per five (5) degrees of deviation from the correct geometry (0.5 points per 2.5 degrees).

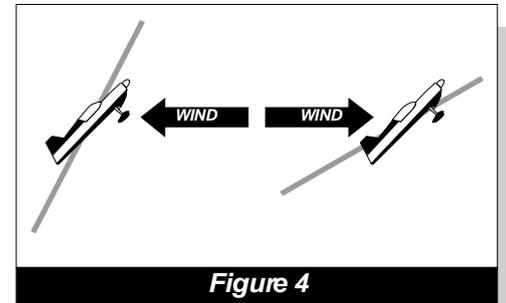


Figure 4

B.8.1.2. Whenever any kind of roll is placed on an interior line (except when any type of roll follows a spin), the lengths of the two parts of the line before and after the roll must be equal. Judges should take care to judge the symmetry of the length of lines in a figure using only the length of the lines and not by elapsed time taken to fly each segment. This difference in length versus elapsed time is most noticeable in figures where rolls are placed on up-lines. As the aircraft loses airspeed, the time it takes to fly a line after the roll will be greater than the time required to fly the line of the same length before the roll.

B.8.1.3. If within a figure two or more lines must be of the same length, an observed variation is penalised by reducing the mark in the following manner: (Figures 11 & 12) a) a visible variation - 1 point deduction;

- b) if the lengths vary by 1:2 - 2 point deduction
- c) and so forth up to a 3 point deduction.
- d) No line before or after roll, 4 point deduction.

B.8.1.4. The basis for judging line length is the first line flown. The absence of one of these lines before OR after a roll has to be penalised by 1 additional point. If there are no lines before AND after the roll, the total penalty is two (2) points only.

Example: The competitor is to fly a 45 degree up-line with a full roll on the line. However, the airplane is returned to level flight immediately after the roll. The deduction is 4 points: 3 points are deducted because the lines are of vastly different length and another 1 point is deducted because of the absence of one of the lines.

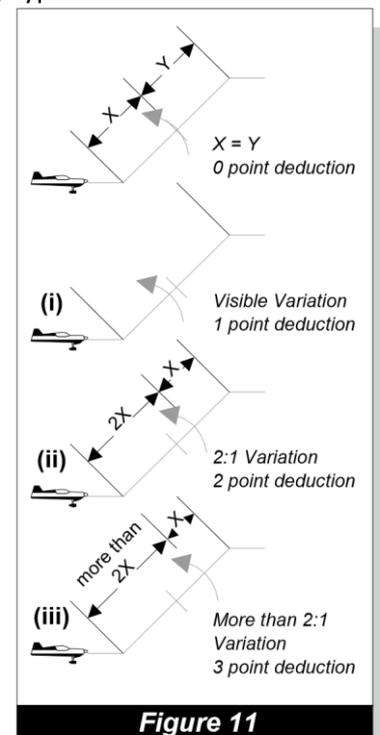


Figure 11

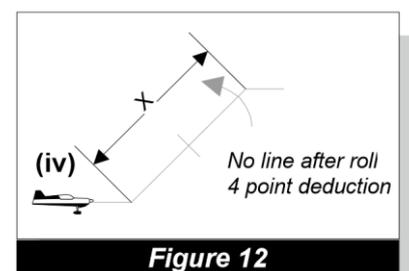


Figure 12

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B.8.1.5. All 90 degree and 45 degree lines are preceded by the execution of a part-loop. Since we have in this part-loop a significant angle-of-attack, the aircraft's attitude in the part-loop will differ from its flight path. Therefore, when the aircraft's attitude reaches the desired line after transitioning from the part-loop, this difference between attitude and flight path will be carried on and will be the same as the angle-of-attack. For this reason, the only criterion for judging in that moment of reaching the desired line is to be the attitude of the aircraft and not its flight path. It would then be very illogical suddenly to change the criterion of judgement from the visible and straight line of attitude to the unrecognizable and curved line of flight path. Therefore, the judging of 90 degree and 45 degree lines can only be based on attitude, not flight path.

B.9.5. Family 5 - Stall Turns

B.9.5.1. In its most basic form (Figure 19), the stall turn begins when the aircraft leaves horizontal flight and flies a quarter loop to establish a vertical climb. At the top of the vertical line, the aircraft pivots and establishes a vertical descent, with the figure ending as the aircraft is returned to horizontal flight.

B.9.5.2. The judging criteria are:

- Vertical and 45° attitudes must comply with Appendix B.3. Any deviation will result in a deduction of one (1) point per (5) degrees of error.
- Any rolls must be centred on their underlying lines (Figure 20). For deductions see B.8.1.3.
- The lines may all be of different lengths.
- During the vertical climb or vertical descent, the wings must remain parallel to the horizon. There will be a one (1) point deduction per five (5) degrees of deviation of the vertical (yaw) axis from horizontal. This deviation is often referred to as "dragging a wing".
- As the aircraft nears the point where it would stop climbing, it must pivot in a plane parallel to vertical. Ideally, the aircraft pivots around its centre of gravity. To avoid a deduction, the aircraft must pivot around an axis point which cannot not be farther away from its centre of gravity than its wingtips (1/2 wingspan, Pivot Point Range from A to B, Figure 21). The downgrade (often referred to as "flying over the top") is one (1) point per half wingspan that the point of rotation exceeds the maximum allowed (Pivot Point B, Figure 21).
- The rate at which the aircraft pivots around its vertical axis is not a judging criterion.
- The wings must remain in the vertical geometric plane throughout the turnaround, and the aircraft's attitude before and after the turnaround must be absolutely vertical, with no pitch or roll. If there is movement around the roll axis, often referred to as "torqueing" (Figure 22), there is a deduction of one (1) point for each five (5) degrees off axis.

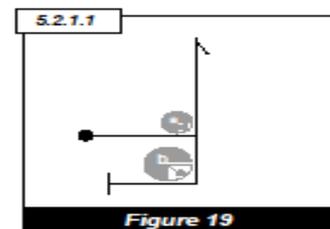


Figure 19

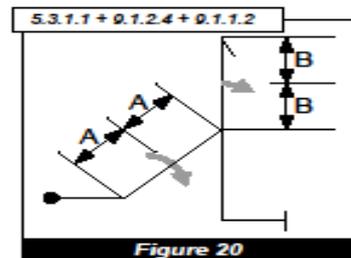


Figure 20

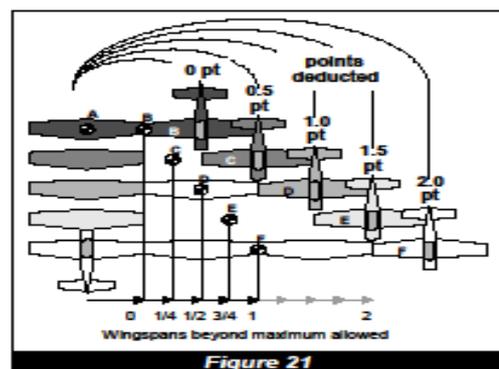


Figure 21

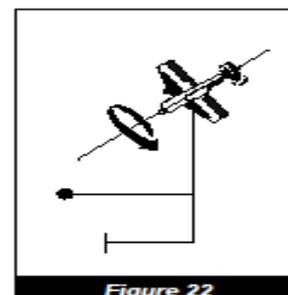


Figure 22

The Stall Turn

From CIVA's Judges Training Seminars -

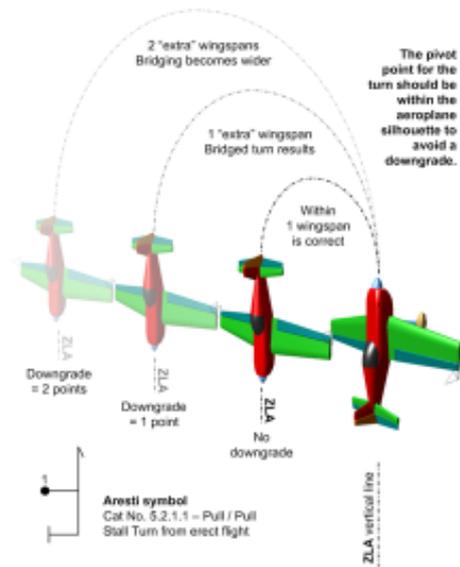


Stall Turns

The Stall Turn is one of the most graceful aerobatic figures.
The figure can be divided into a series of sections for judging:

- Smooth radius CGT entry and pull / push to the vertical.
- The ZLA vertical up-line, and assessment of any rolls super-imposed.
- The turn itself, which must be purely yaw with no rolling or pitching.
- The ZLA down-line, and assessment of any rolls super-imposed.
- The smooth radius pull / push and exit to level CGT flight.

Stall Turns with 45° entry and/or exit segments may also have rolls super-imposed there.



Happy judging, be critical and fair.

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