IJMC Scale Jet Classes

2022

ATTACHMENT NO. 1 TO THE RULEBOOK:

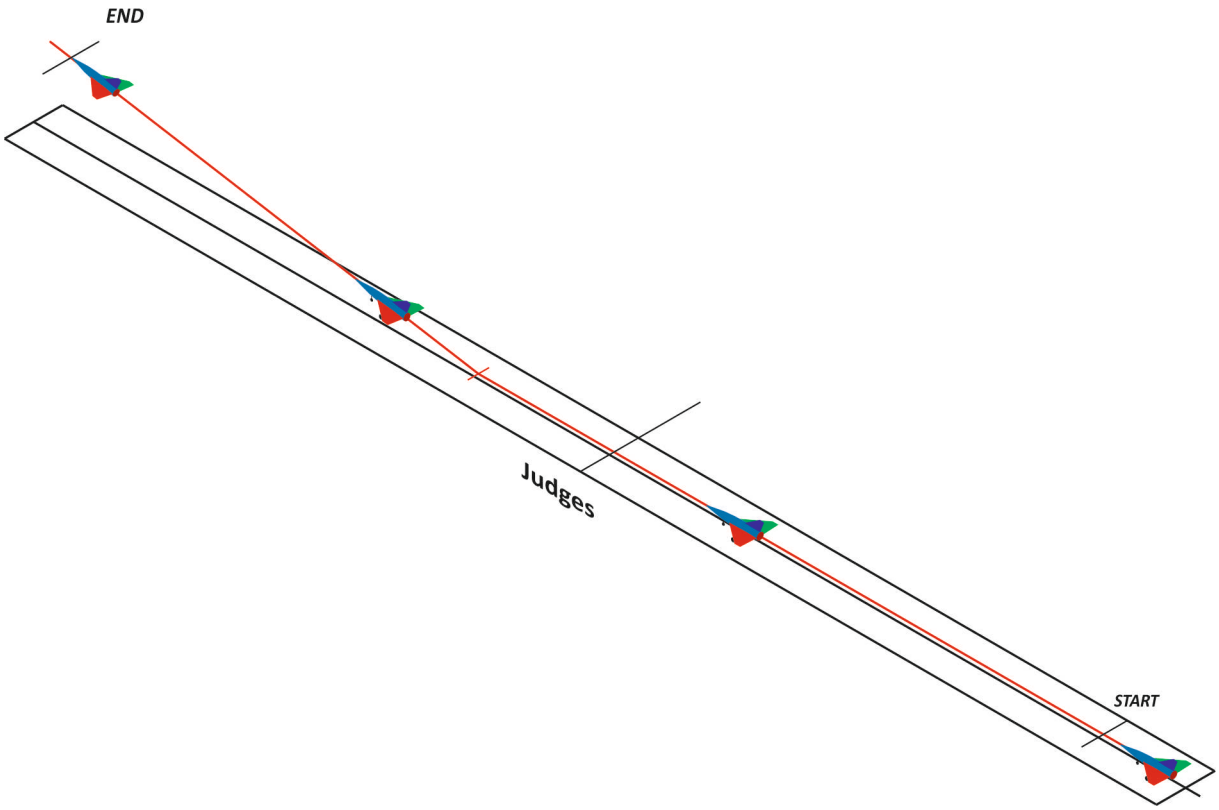
DIAGRAMS & FULL DETAILS OF ALL MANOEUVRES

Compiled by Pavel Lapshov, IJMC Technical Advisor

Last revised March 1st, 2020

5.0.5 Mandatory manoeuvres (all types)

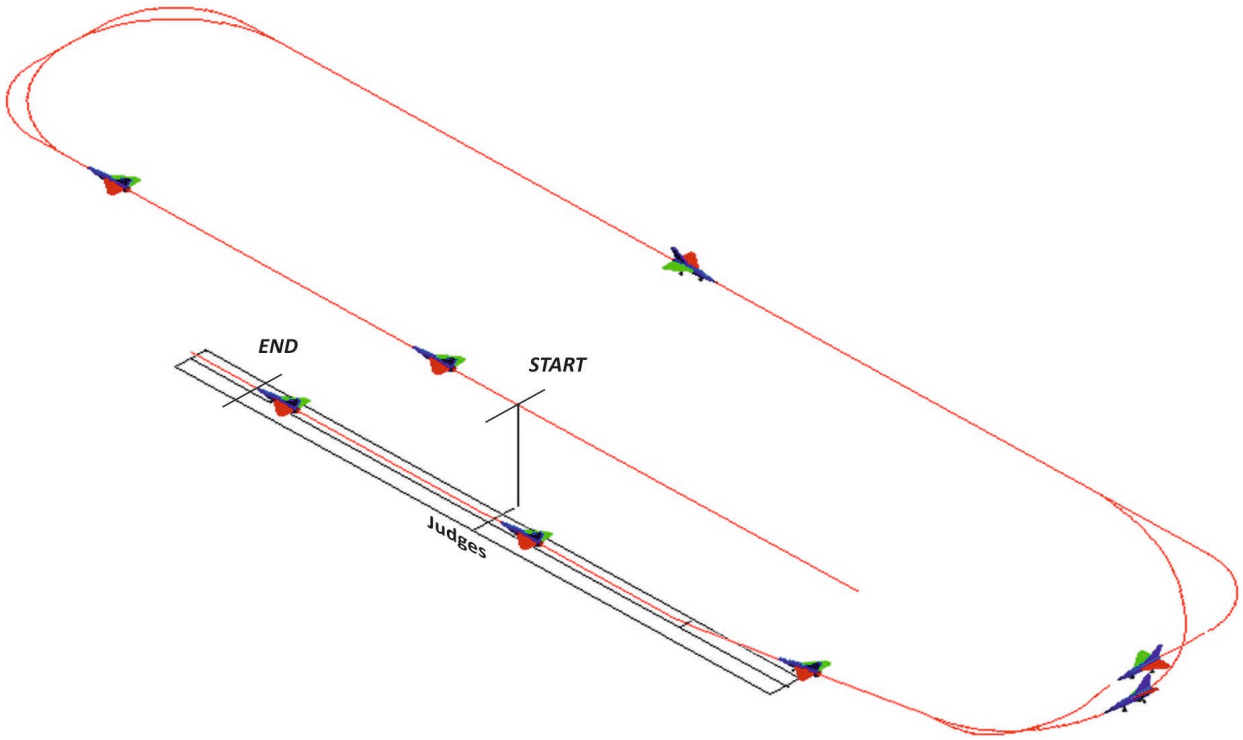
(a) **Take-off** - The model shall leave the runway after the judge's centreline and climb away on a constant heading and climb angle appropriate to the prototype for a duration of minimum five seconds, "End " is called before entering the circuit. During this time, if fitted, the landing gear retraction sequence must be initiated. Judging commences when "Start" is called and the brakes are released at the beginning of the take-off run, the taxi out prior to take-off is not judged.



Errors:

- *Model is touched after start is called (zero marks)*
- *Model veers off runway direction on take-off*
- *Take-off distance is not in keeping with the prototype*
- *Speed unrealistic or acceleration too rapid*
- *Lift-off not smooth*
- *Climb rate and nose attitude during climb not in keeping with the prototype*
- *Nose attitude during climb not in keeping with the prototype*
- *Flaps not used if applicable*
- *Landing gear sequence not initiated if applicable*
- *Climb-out track not the same as the track of the take-off run*
- *Climb out too short*
- *Failure to call Start and/or End*

(b) **Circuit, Approach and Landing** - Beyond the runway and at an appropriate height the model approaches the judge's centreline at which point "Start" is called and the model performs a circuit and landing in the manner of the prototype aircraft, extending the gear during the downwind leg and using all installed means (landing gear, flaps and drag inducing equipment if fitted) to restrict the speed to a safe minimum as normally achieved during the height reduction turn into a landing approach before touching down on the runway centreline before the judge's centreline and braking to a halt after a straight deceleration at which point "End" is called and judging and flight timing stops. The taxi back will not be judged. Retractable landing gear (where fitted) to be extended during the downwind leg of the circuit, and flaps, spoilers, speed brakes etc., are to be extended as per the full-size prototype and weather conditions.



Errors:

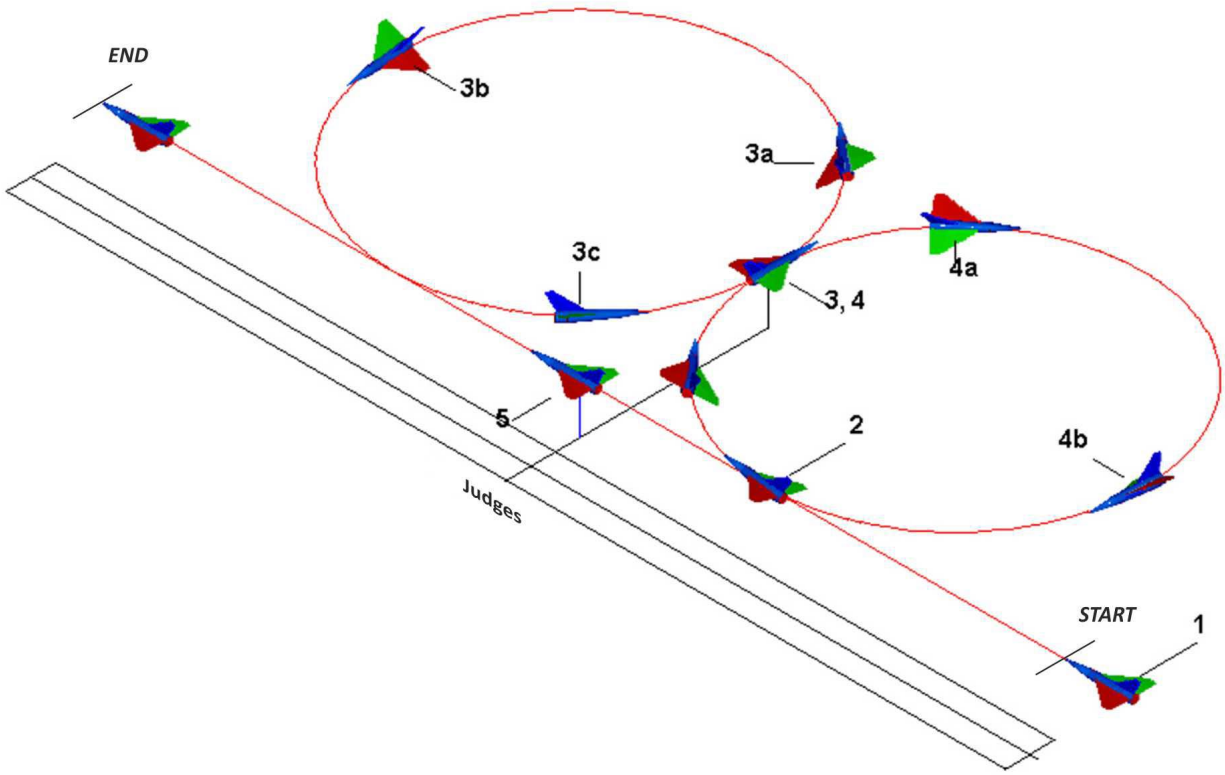
- *Flight not completed within allocated time, at which point judging stops*
- *Manoeuvre does not commence parallel to the runway on the upwind leg*
- *Variation of altitude during first crosswind pass and before the downwind leg*
- *Circuit is not centred on the judge's centreline*
- *Downwind track not parallel to runway axis*
- *Landing gear not extended on downwind leg*
- *Altitude changed before appropriate descent point*
- *Descent not smooth and continuous*
- *Model does not adopt a landing attitude appropriate to subject type*
- *Model bounces on touch down*
- *Model does not come to a gradual and smooth stop after landing*
- *Model touches wing tip on the ground during landing*
- *One gear leg collapses after touch down = 20% penalty (same if one gear not extended*
- *during approach)*
- *Two or all gear legs collapse after touch down = 50% penalty (same if two or all gear legs*
- *not extended during approach)*
- *Failure to call Start and/or End*
- *Landing run not straight*
- *Manoeuvre too far away, too close, too high or too low*

Note: All landings ending with the model on its back will be regarded as a crash landing and scored zero.

5.0.6 Optional Manoeuvres

Group 1

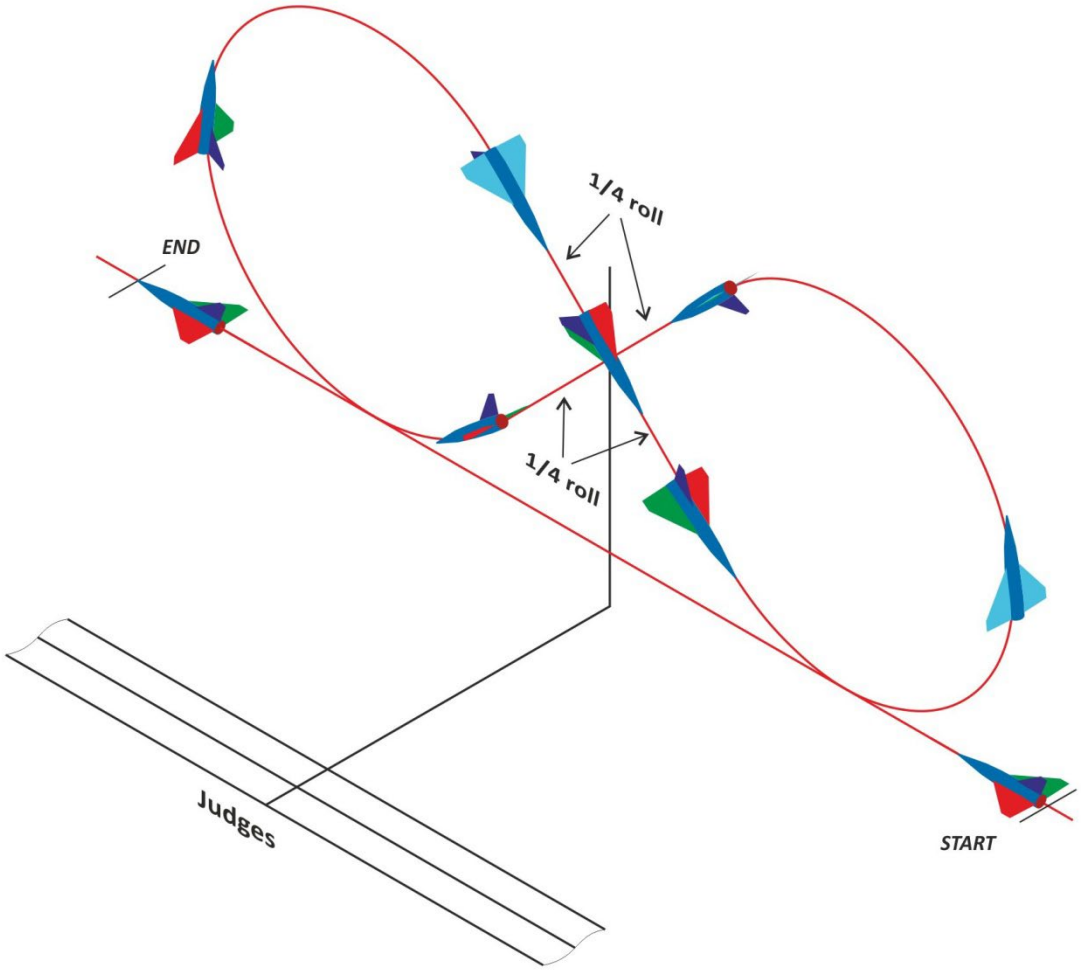
(11) Horizontal Figure of Eight (non aerobatic only) - Beyond the runway and at an appropriate height "Start" is called and the model approaches in straight and level flight at a safe height (1), then makes a one-quarter circle turn in a direction away from the judges (2), followed (3) by a 360° circle turn (3a, 3b, 3c) in the opposite direction. This is followed (4) by a three-quarter circle turn (4a, 4b) in the same direction as the first turn, completing a figure-of-eight, parallel to the runway centreline and at a constant altitude. "End" is called well after the judge's centreline. The manoeuvre ends on the same altitude and heading as the start, and should be centred on the judge's centreline.



Errors:

- *Entry into first circle not at right angles to original flight path*
- *Circles are of unequal size*
- *Circles misshapen*
- *Constant height not maintained*
- *Intersection not centred on judge's centreline*
- *Entry and exit paths not contiguous and parallel with runway*
- *Overall size of manoeuvre not realistic for prototype*
- *Model flight path not smooth and steady*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

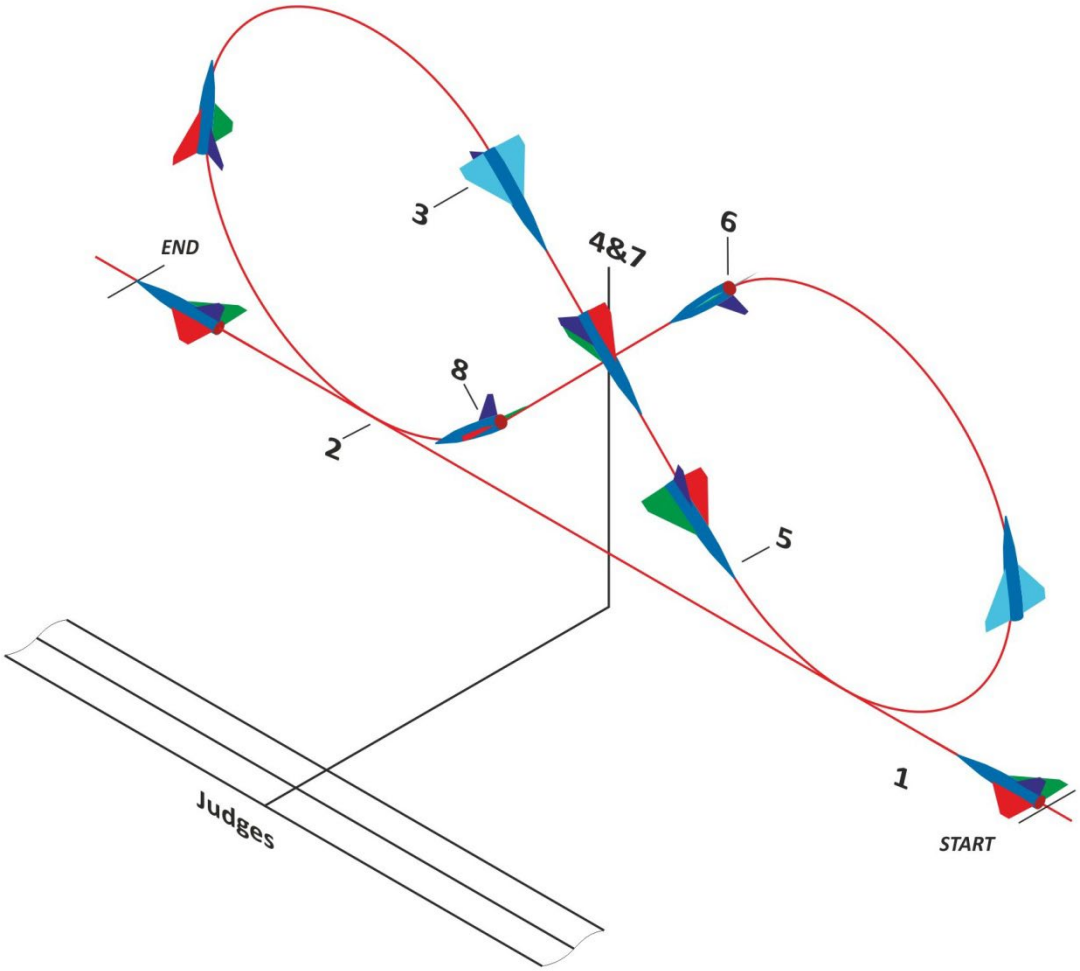
(12) Cuban 8 with two 1/4 rolls (aerobatic only) - The model approaches parallel with and well beyond the runway in level flight at a safe height. "Start" is called and, after passing the judge's centreline, the model pulls up into 5/8th's of an inside loop and continues heading downward at 45 degrees, inverted. The model performs two quarter rolls on the judge's centreline to upright on the 45-degree downline, followed by a 3/4's inside loop to 45 degrees down inverted. The model then executes two quarter rolls on the judge's centreline of the 45-degree downline to upright flight, recovering through a 1/8th loop to straight and level upright flight on the same track, heading and altitude as at the start of the manoeuvre.



Errors:

- *Manoeuvre not performed in a constant vertical plane that is parallel with the judges line*
- *Loops are not in keeping with the prototype*
- *Loops are not the same size*
- *Quarter rolls are not centred on judge's centreline - aircraft should be in knife-edge at crossover point*
- *45 degree descent path not achieved*
- *Entry and exit paths not contiguous or parallel with the runway*
- *Inappropriate use of throttle*
- *Size and speed of loops not in manner of prototype*
- *Entry and exit paths not contiguous or parallel with the runway*
- *Failure to call Start and/or end*
- *Manoeuvre too far away, too close, too high or too low*

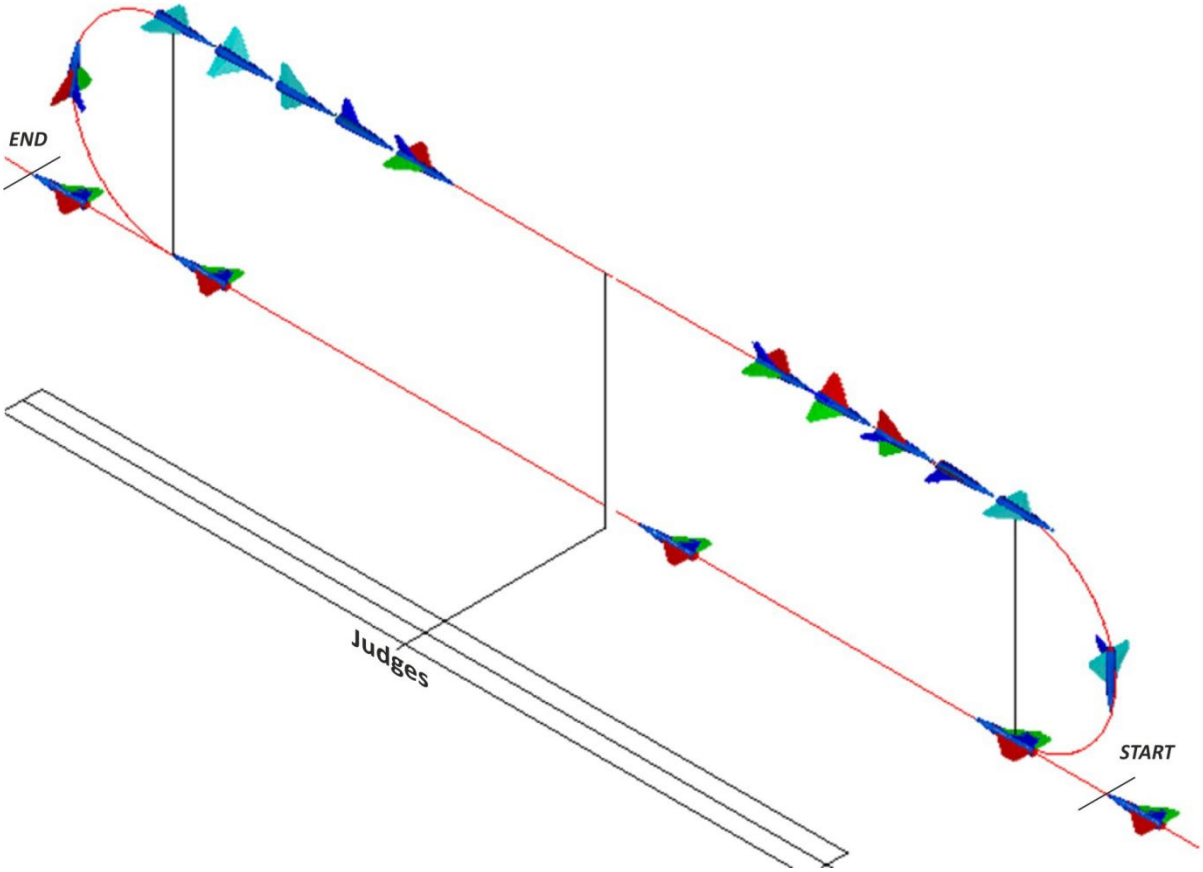
(13) Cuban Eight (aerobatic only) - Beyond the runway and at an appropriate height "Start" is called the model approaches parallel to and well beyond the runway (1). After passing the judges' centreline, the model pulls up (2) into approximately 5/8 of an inside loop and continues heading downward (3) at 45°, inverted. The model performs a half roll at the intersection (on the judges' centreline), followed (5) by another approximately 3/4 inside loop to 45° inverted (6). The model then executes a half-roll to normal flight (7) on the judges' centreline, and then recovers (8) to straight and level flight on the same track, heading and altitude as the start.



Errors:

- *Manoeuvre not performed in a constant vertical plane that is parallel with the judges line*
- *Loops not in keeping with the prototype*
- *Loops not the same size*
- *Half rolls not centred on judge's centreline*
- *45° descent path not achieved*
- *Model does not exit manoeuvre at same height as entry*
- *Entry and exit paths not contiguous and parallel with runway*
- *Inappropriate use of throttle*
- *Size and speed of loops not in manner of prototype*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

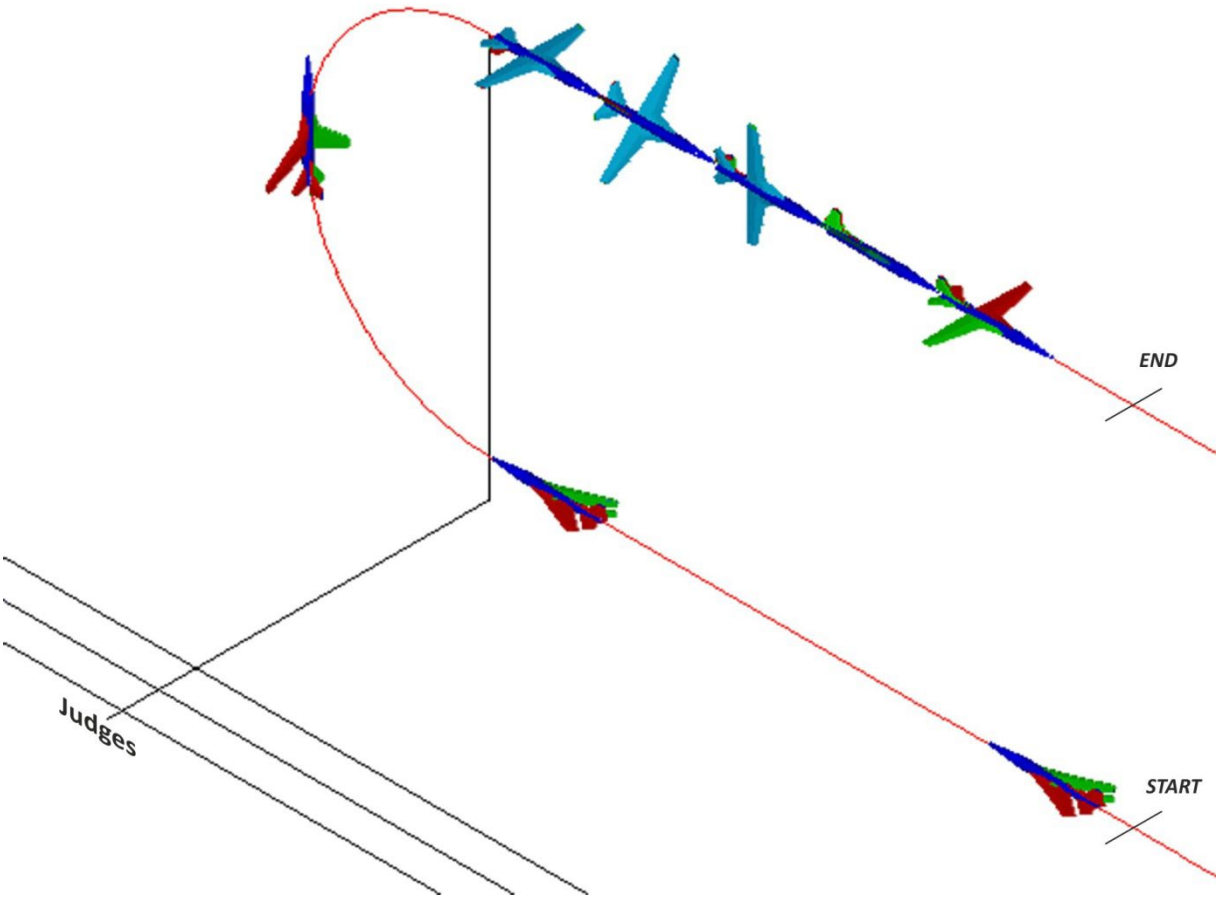
(14) Combination Immelman/Split-S (aerobatic only) - parallel to and well beyond the runway "Start" is called the model approaches in straight and level flight at a safe height and approximately 75 meters after it has passed the judges centreline it pulls up into a half inside loop and immediately executes a half roll to normal attitude. After straight and level flight of approx.150 meters, the model performs a half roll to inverted, and an immediate half inside loop downwards to recover into level flight on the same heading and altitude as at the start.



Errors:

- *Track of the half loop not in a vertical plane*
- *Half loops not accurately semi-circular*
- *First roll start too late, second roll starts too early*
- *Excessive height loss in the rolls*
- *The size of half loops not equal*
- *Track veers during the rolls*
- *Entry and exit paths not contiguous and parallel with runway*
- *Manoeuvre not centred on judge's centreline*
- *Size of manoeuvre and speed not in manner of the prototype*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

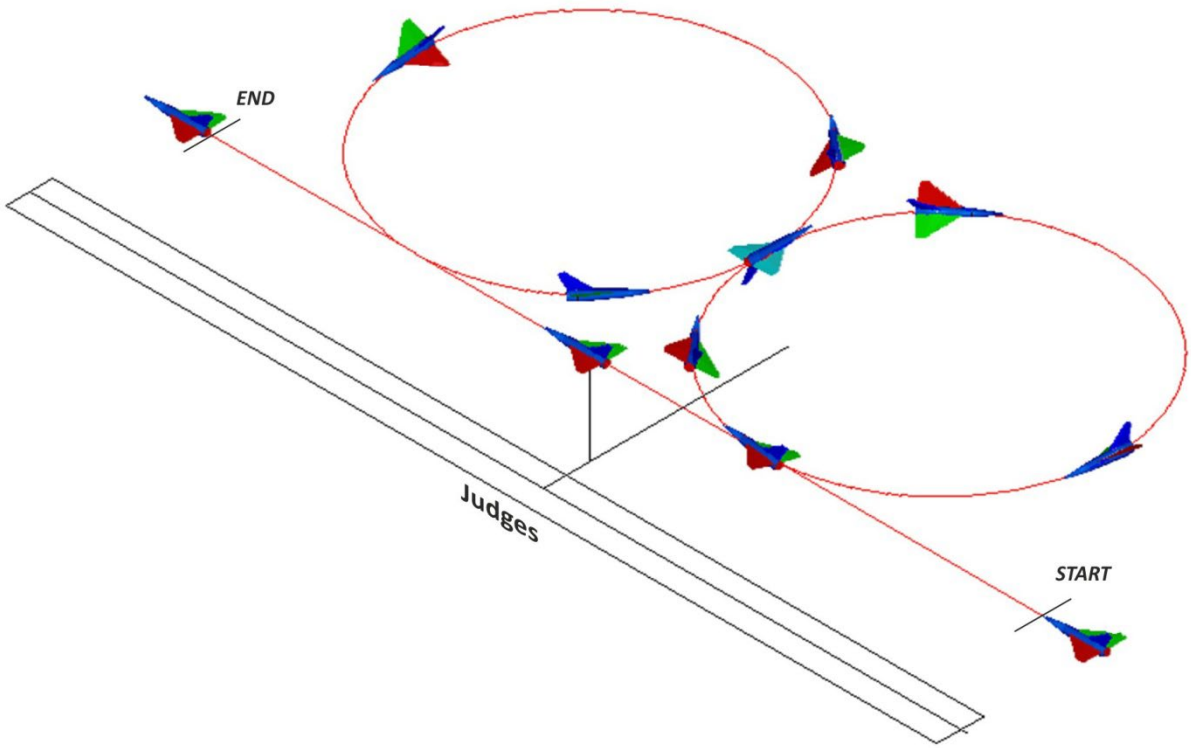
(15) Immelman – Variable Geometry wing (aerobatic only) - parallel to and well beyond the runway at a safe height "Start" is called the model commences the manoeuvre at a safe height with wings swept back and performs a half inside loop upwards, starting at the judges centreline. During the half loop the wings are to be swept forward. On completion of the half loop the aircraft then immediately executes a half roll to resume normal level flight, on a reciprocal track parallel to that at the start. Note: this option is only available for aerobatic models equipped with Variable Geometry wings.



Errors:

- *Half loop is not semi-circular*
- *Plane of the half loop not vertical or parallel with the runway*
- *Half loop not centred on judges centreline*
- *Half loop is not in keeping with the prototype*
- *Inappropriate use of throttle*
- *Model inverted for too long or too short a time*
- *Roll starts too early or too late*
- *Excessive height loss in the roll*
- *Track veers during the roll*
- *Model does not resume straight and level flight on the opposite track to entry*
- *Manoeuvre not flown parallel with the runway*
- *Size and speed of manoeuvre not in the manner of the prototype*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

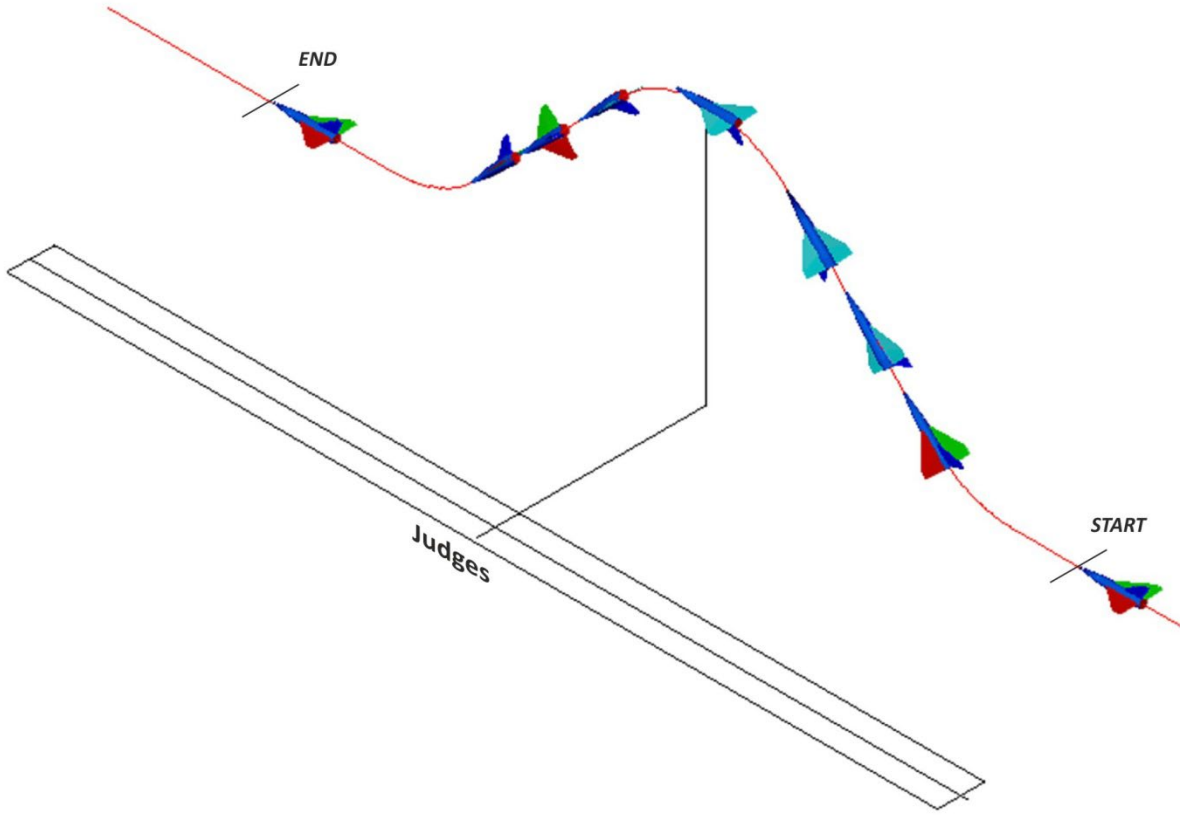
(16) Horizontal Derry Eight (aerobatic only) - the model approaches in straight and level flight, parallel to and beyond the runway at a safe height "Start" is called and the model makes a one-quarter circle horizontal turn in a direction away from the judges. After the end of this quarter circle immediately turn the model about 3/4 rolls in the direction of the turn. The model continues to enter a 360-degree circle horizontal turn in the opposite direction. The model will stop rolling when upright and banked in the direction of the turn. After the end of this 360-degree circle turn immediately the model rolls about 3/4 in the direction of the turn. The model continues to roll to enter a 270 degree horizontal circle turn in the same direction as the first turn. The model will stop rolling when upright and banked in the direction of the final turn reaching horizontal flight before the judge's centreline after which "End" is called. The manoeuvre ends on the same altitude and heading as the start, and should be centred on the judge's centreline.



Errors:

- *Entry into first circle not at right angles to original flight path*
- *Circles are of unequal size*
- *Circles misshapen*
- *Constant height not maintained*
- *Intersection not centred on judge's centreline*
- *Entry and exit path not contiguous and parallel with runway*
- *Entry and exit path not parallel with judges line*
- *Overall size of manoeuvre not realistic for prototype*
- *Model flight path not smooth and steady*
- *Manoeuvre too far away, too close, too high or too low*
- *Failure to call Start and/or End*
- *Inappropriate roll rates*

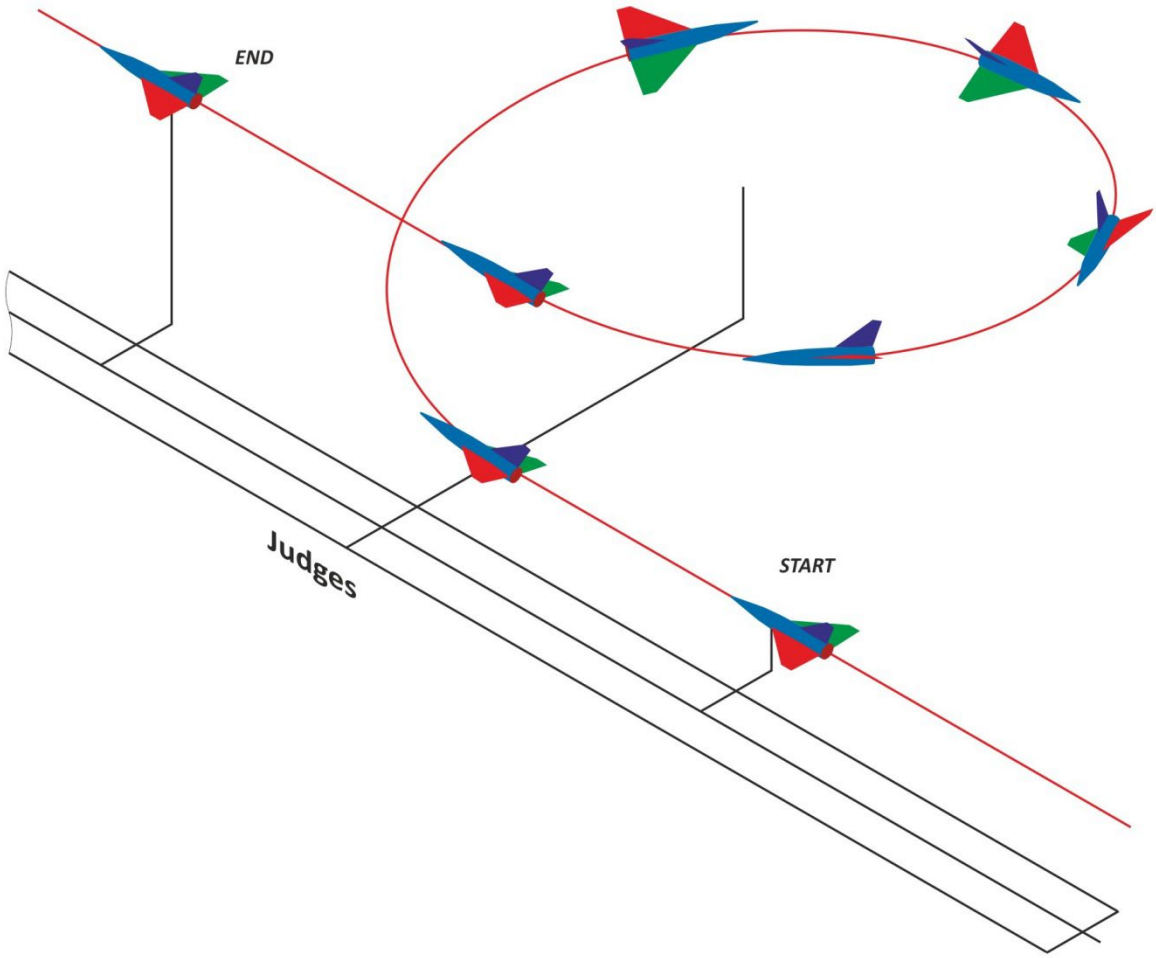
(17) Cobra Roll (aerobatic only) - parallel to and well beyond the runway at a safe height the model approaches in straight and level flight, pulls up into a 45 degree climb and executes a half roll to inverted. It then completes a 1/4 inside loop into a 45 degree dive, executes a half roll to upright, and recovers to level flight at the same altitude and heading as the start. The highest point of the 1/4 inside loop should be on the judge's centreline.



Errors:

- *Manoeuvre not performed in a vertical plane that is parallel with the runway*
- *Quarter loop is not centred on judge's centreline*
- *45 degree climb and descent paths not achieved*
- *Half rolls not centred in climb and descent part of figure*
- *Entry and exit path not contiguous and parallel with runway*
- *Model does not exit manoeuvre at same height as entry*
- *Inappropriate use of throttle*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

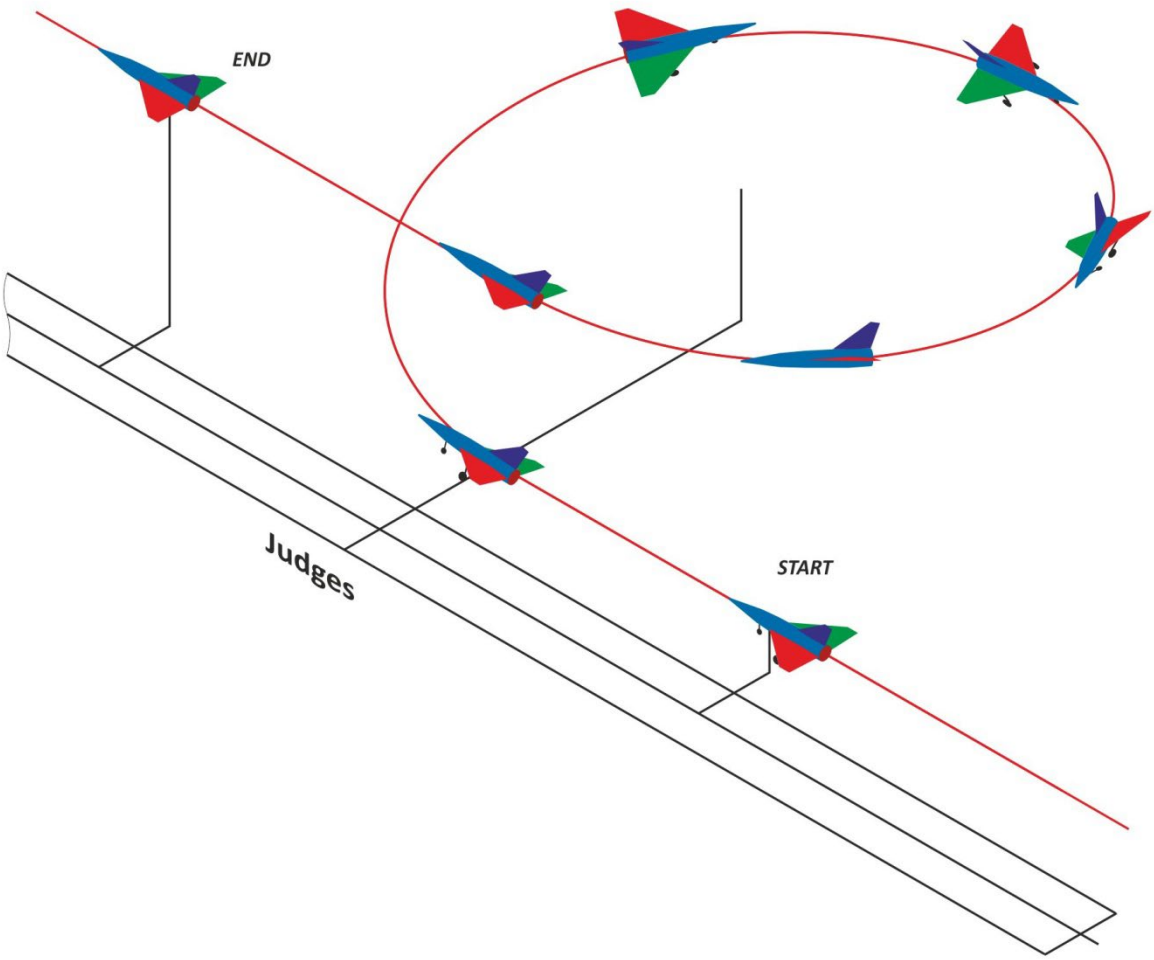
(18) 360° ascending circle (all types) - The model approaches parallel with and beyond the runway in level flight at a minimum height of 5 meters, "Start" is called and at the centre the model pitches up and performs a gentle 360 degree ascending circle, in a direction away from the judges. The manoeuvre terminates on the judge's centreline by resuming straight and level flight on the same track and heading as at the start of the manoeuvre.



Errors:

- *Rate of ascent not constant*
- *Ascent too steep*
- *Circle misshapen*
- *No significant height gain*
- *Model exits at excessive height*
- *Circle not centred on judge's centreline*
- *Entry and exit paths not parallel to the runway*
- *Failure to call Start and/or end*
- *Manoeuvre too far away, too close, too high or too low*

(19) 360° ascending circle with gear retraction (all types) - The model approaches parallel with and beyond the runway in level flight at a minimum height of 5 meters "Start" is called with the undercarriage already deployed, at the centre the model pitches up and performs a gentle 360 degree ascending circle, in a direction away from the judges, during which the gear is retracted. The manoeuvre terminates on the judge's centreline by resuming straight and level flight on the same track and heading as at the start of the manoeuvre.

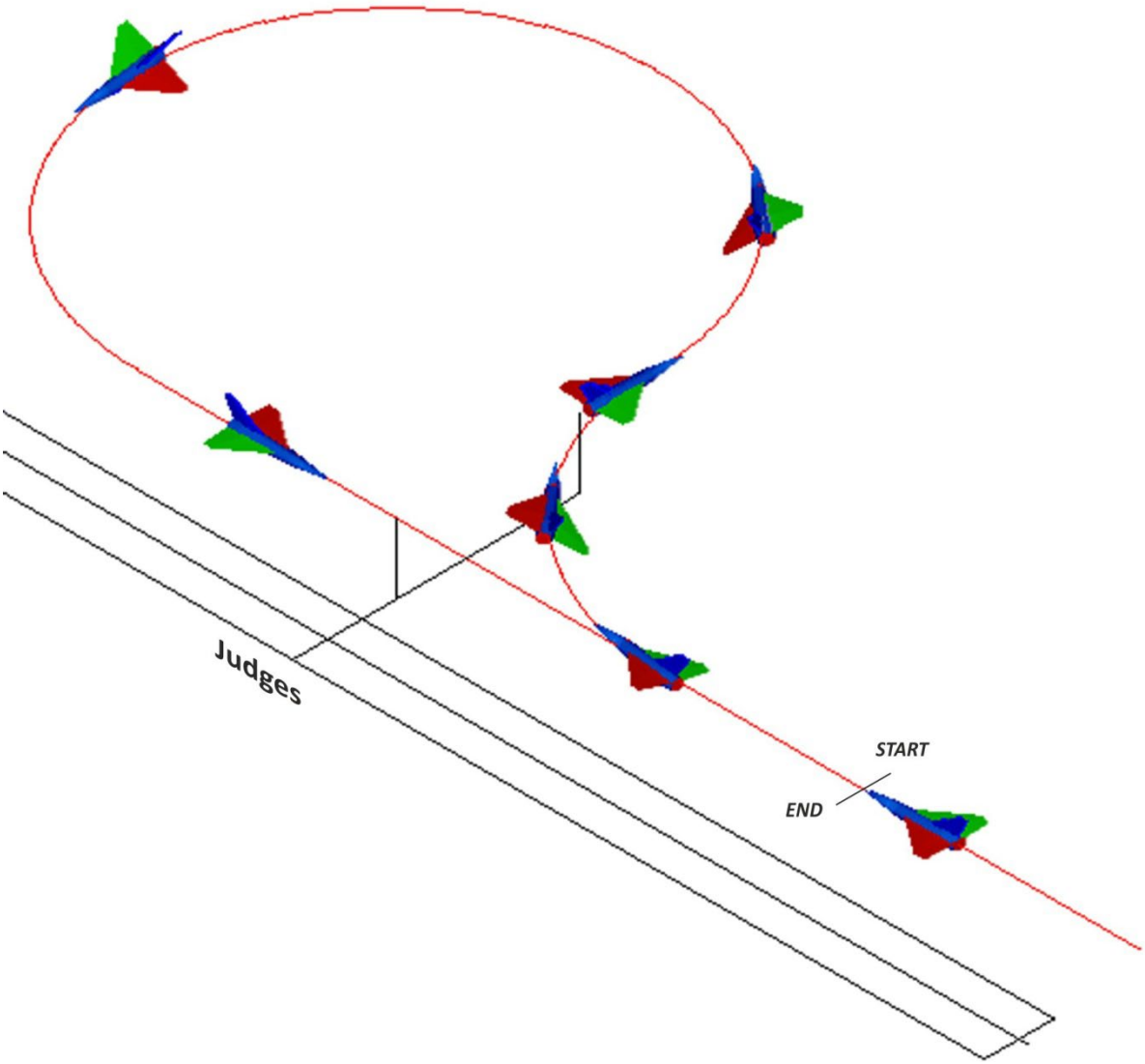


Errors:

- *Gear not fully extended before commencement of manoeuvre is called*
- *Rate of ascent not constant*
- *Ascent too steep*
- *Circle misshapen*
- *No significant height gain*
- *Gear not fully retracted during ascent*
- *Model exits at excessive height*
- *Circle not centred on judge's centreline*
- *Entry and exit paths not parallel to the runway*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

Group 2

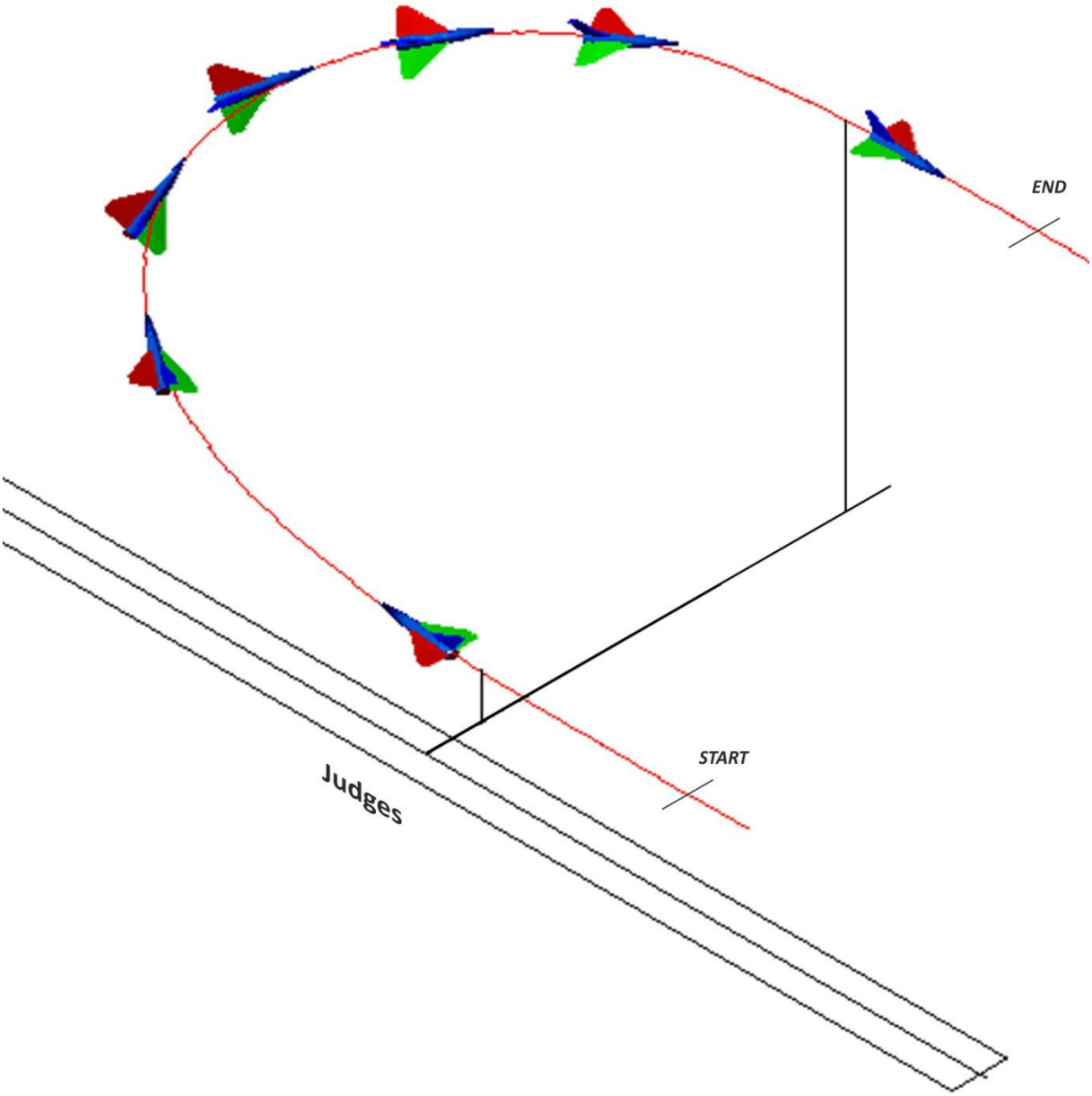
(21) Procedure Turn (non aerobatic option only) - the model approaches parallel to and beyond the runway in straight and level flight at a safe height and "Start" is called well before the judge's centreline, the model then makes a one-quarter circle turn in a direction away from the judges followed by a 270 degree turn in the opposite direction. The manoeuvre ends on the same altitude and on a reciprocal heading to the start. The transition from the one-quarter circle turn to the 270 degree turn should be on the judge's centreline.



Errors:

- *Entry into the 270° turn not at right angles to original flight path*
- *270° turn not at a constant radius*
- *Angle of bank through the turns not appropriate to the prototype aircraft*
- *Constant height not maintained*
- *Transition not centred on judge's centreline*
- *Entry and exit path not contiguous and parallel with runway*
- *Overall size of manoeuvre not realistic for prototype*
- *Model flight path not smooth and steady*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

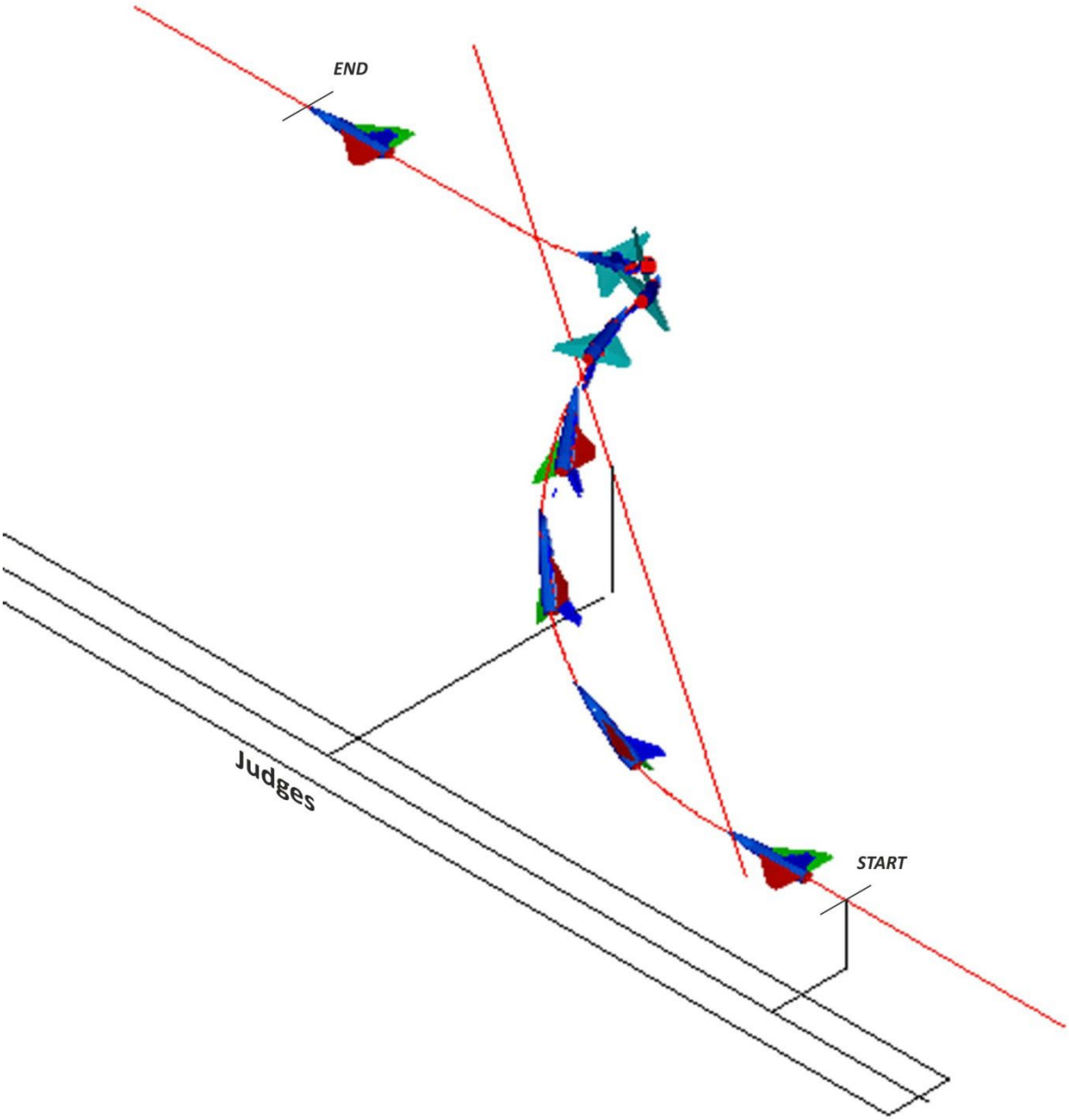
(22) Chandelle (non aerobatic option only) - the model approaches parallel to and beyond the runway in straight and level flight at a safe height, "Start" is called and at the judge's centreline turns away to perform a 180 degree climbing turn in a direction away from the judges. During the first 90 degrees of the turn the model simultaneously climbs and rolls into the turn. During the second 90 degrees the model continues climbing while gradually lowering the nose and rolling away from the turn. At the end of the manoeuvre the model attains a level upright attitude on a reciprocal heading but significantly higher than at the start of the manoeuvre.



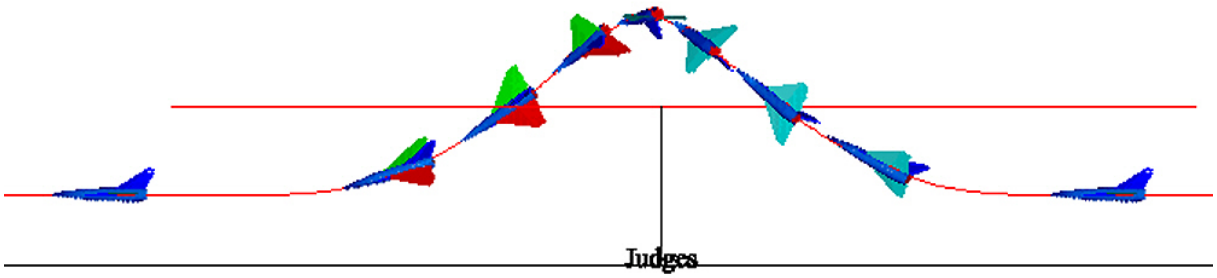
Errors:

- *Approach and departure not parallel to runway*
- *Approach and departure not horizontal*
- *Climb rate not constant*
- *Turn rate not constant*
- *Turn not 180 degrees*
- *Manoeuvre does not start and finish on the judge's centreline*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

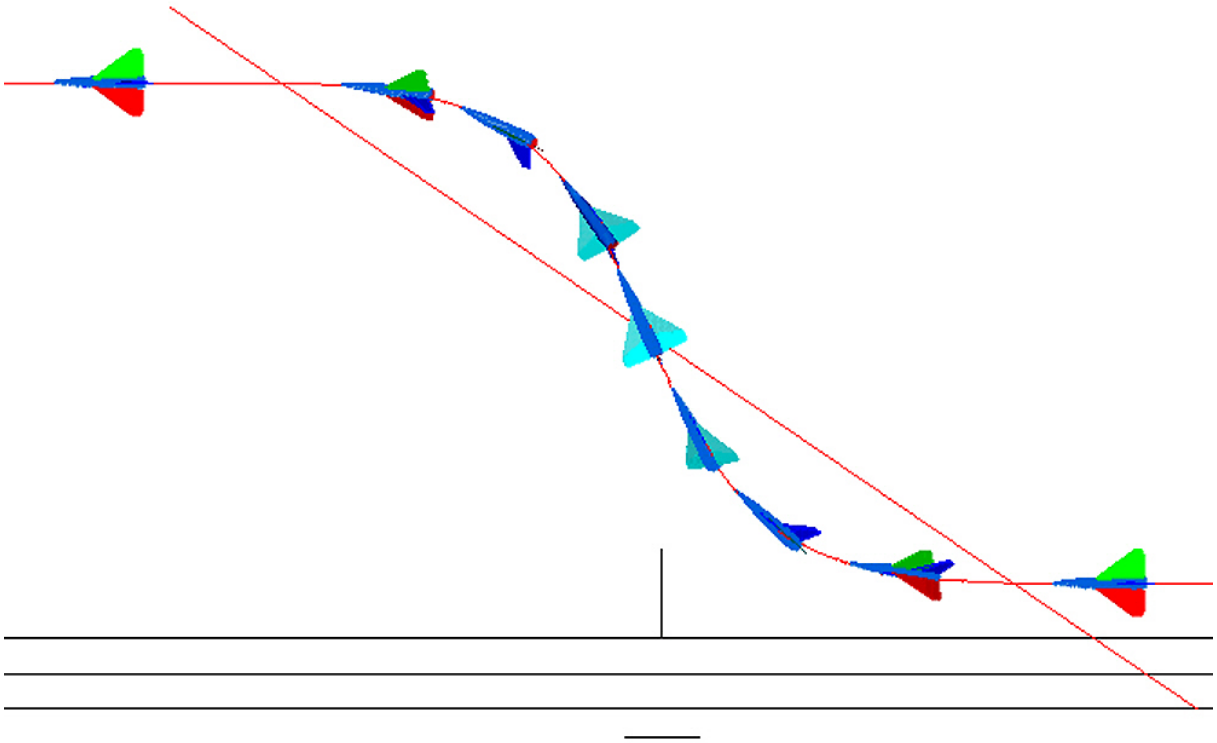
(23) Positive 'G' Roll (aerobatic only) - the model approaches in level flight and parallel to the runway at a safe height, "Start" is called and the model performs a 360 degree roll away from the judges while simultaneously pitching up, describing a gentle helical flight-path reaching inverted flight on the judge's centreline, and resuming level flight, again parallel to the runway but further away than on the entry track and at entry height.



ISOMETRIC VIEW
(front and top views on next page)



FRONT VIEW

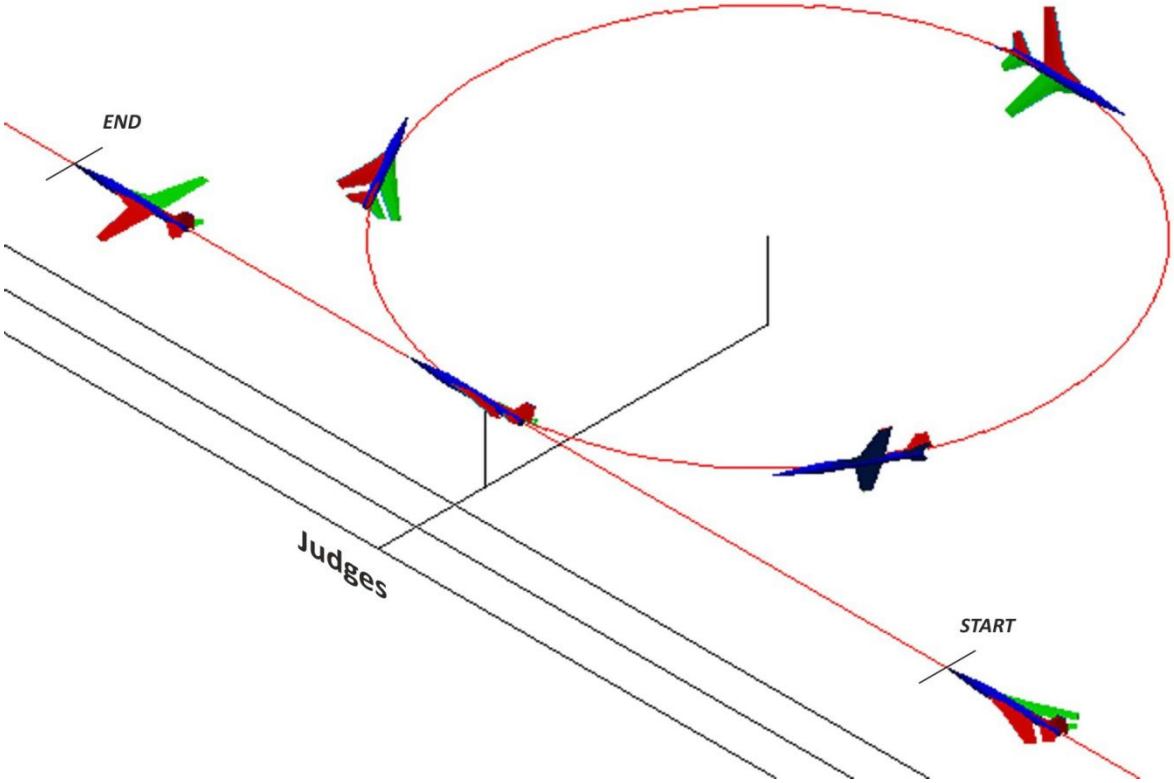


TOP VIEW

Errors:

- *Rate of roll not constant*
- *Rate of pitch not constant*
- *Style of roll not typical of the prototype*
- *Roll not centred on judge's centreline*
- *Entry and exit at different heights or speeds*
- *Entry and exit path not contiguous and parallel with runway*
- *Attitude at exit is not the same as attitude at entry*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

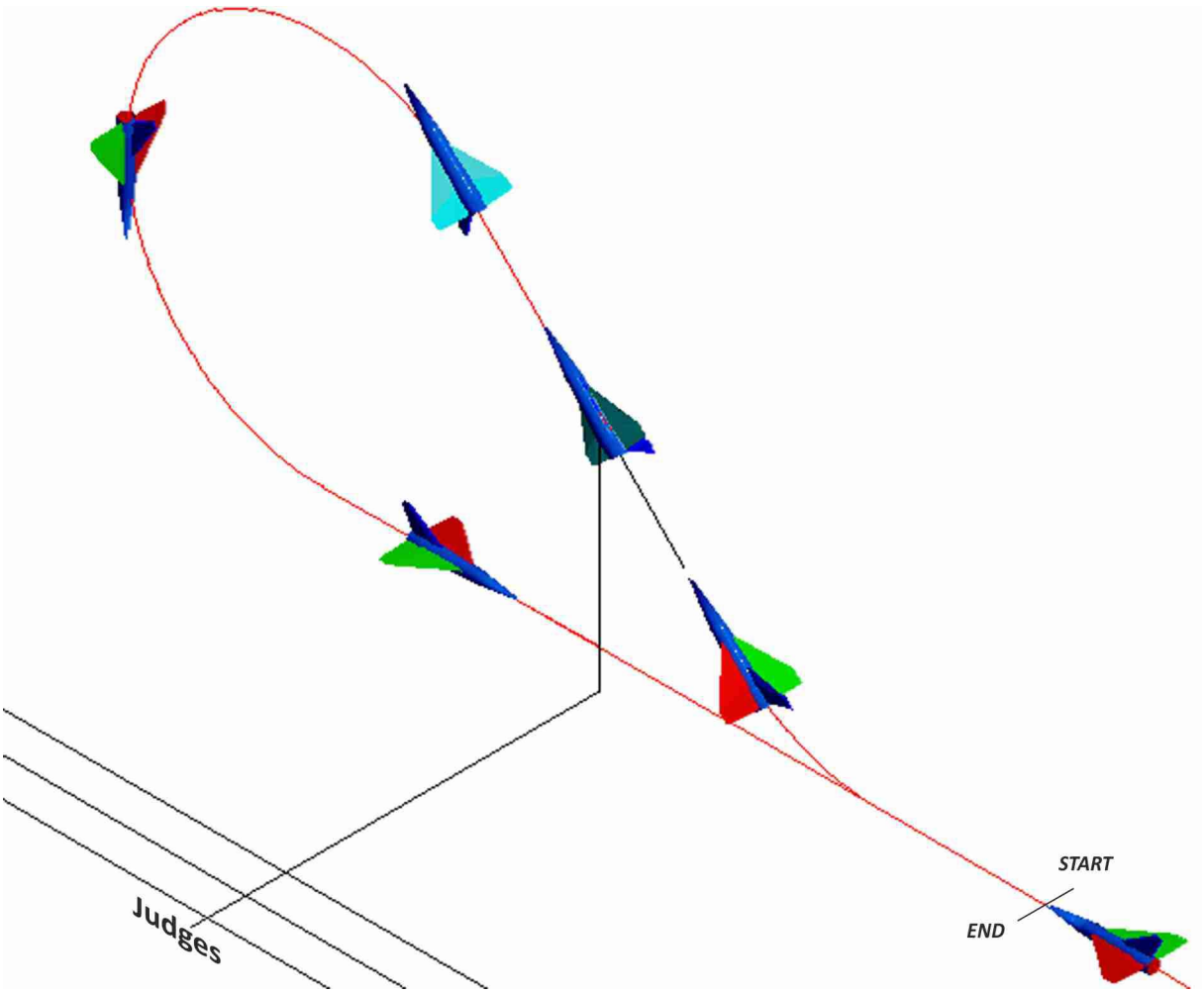
(24) 360 degree Wing-extending Turn – Variable Geometry wing (aerobatic only) - the model approaches parallel to and beyond the runway at a safe height with wings swept back, "Start" is called before it enters a 360 degree circle, commencing by turning away from the judge's on the centreline. The model adopts a rate of bank appropriate to the wing configuration and a constant altitude. While executing the 360 degree circle the wings are extended and the model decelerates to recover to straight and level flight on the same heading and altitude as the start. The rate of turn should be in keeping with the prototype.



Errors:

- *Circle not centred on judge's centreline*
- *Constant height not maintained*
- *Entry and exit paths not contiguous and parallel with runway*
- *Lack of speed reduction during wing extension*
- *Overall size of manoeuvre not realistic for prototype*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

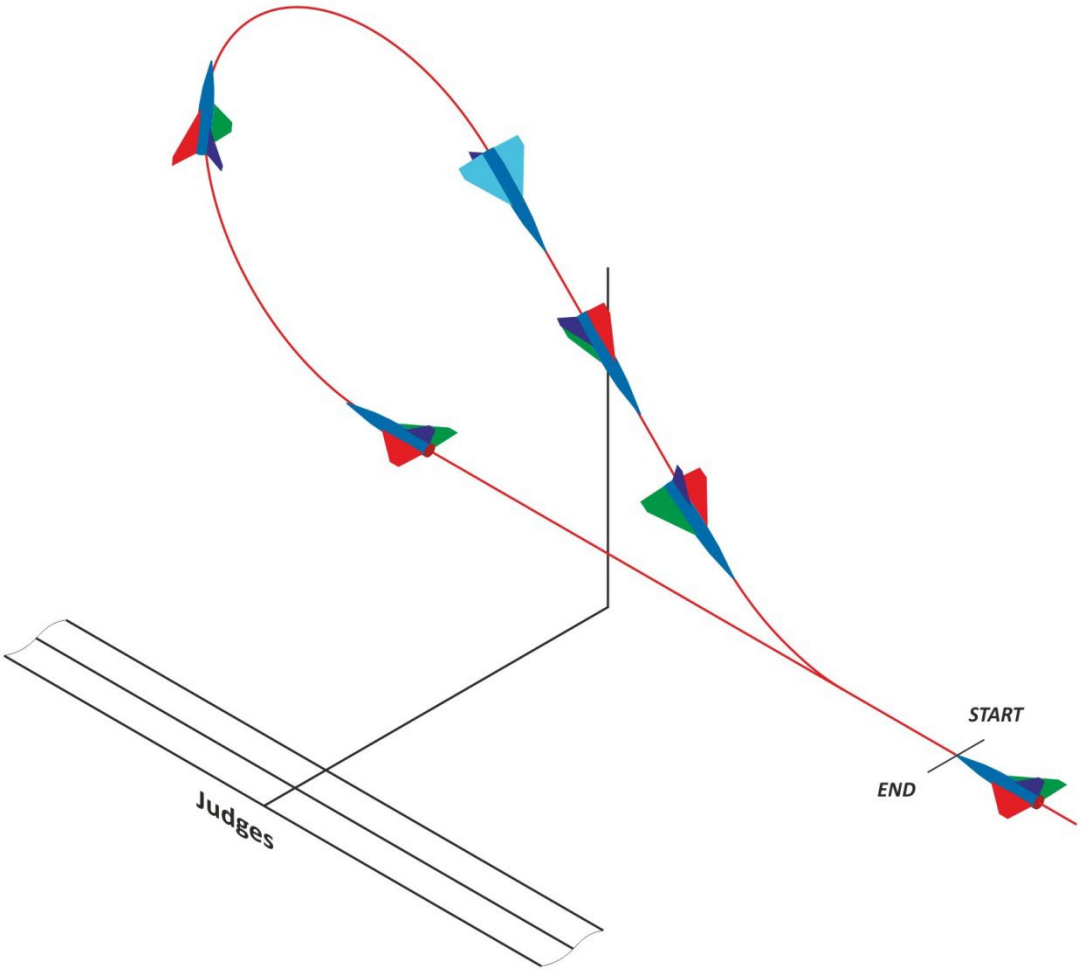
(25) Half Reverse Cuban Eight (aerobatic only) - "Start" is called as the model approaches parallel to and well beyond the runway straight and level at a safe height and pulls to a 45 degree upline, performs a half roll on the judges' centreline then pulls through a 5/8th's inside loop to resume straight and level flight at the entry height on a reciprocal track.



Errors:

- *Manoeuvre not performed in a vertical plane that is parallel with the judge's centreline*
- *Loop portion of the manoeuvre not circular*
- *Half roll not centred on judge's centreline - model should be in knife-edge at this point*
- *45 degree ascent path not achieved*
- *Entry and exit paths not contiguous and parallel with runway*
- *Inappropriate use of throttle*
- *Size and speed of manoeuvre not in the manner of the prototype*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

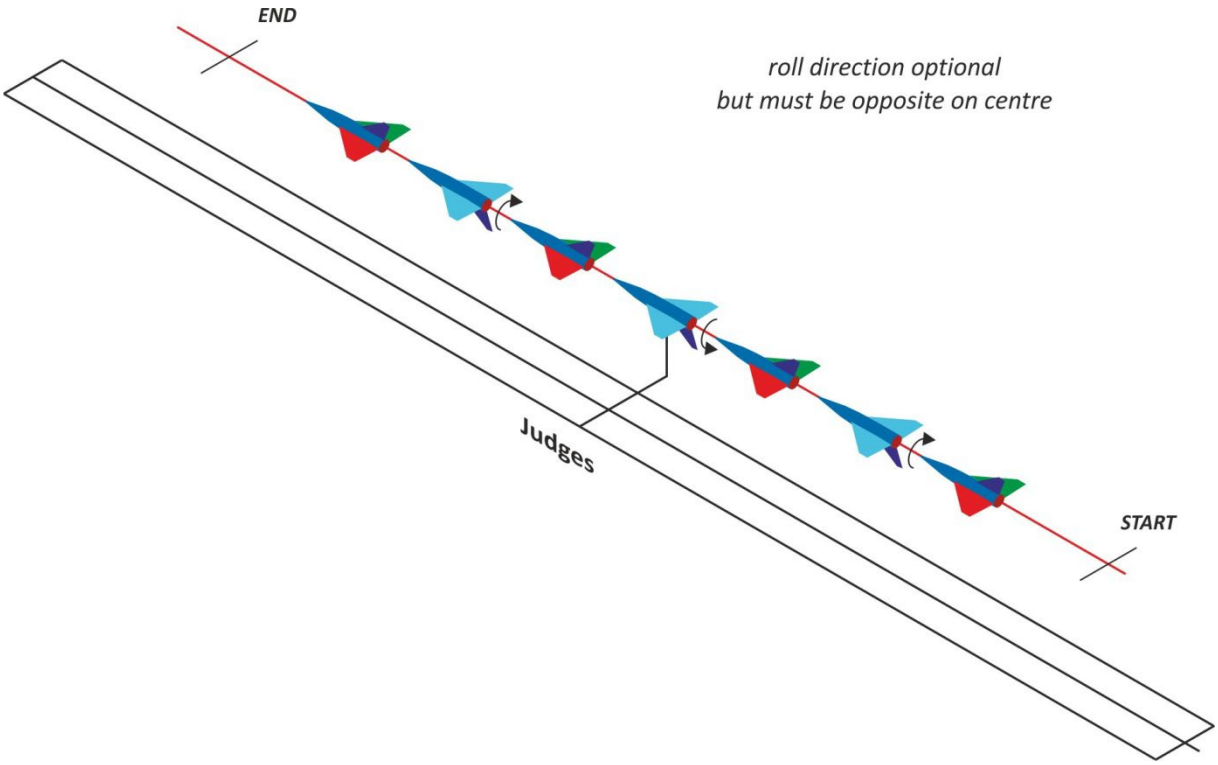
(26) Half Cuban Eight (aerobatic only) - "Start" is called as the model approaches parallel to and well beyond the runway straight and level and at a safe height. After passing the judges' centreline, the model pulls up into a 5/8th's inside loop and continues inverted downward at 45 degrees performing a half roll to upright on the judge's centreline pulling out to resume straight and level flight at the entry height on a reciprocal track.



Errors:

- *Manoeuvre not performed in a vertical plane that is parallel with the judge's centreline*
- *Loop portion of the manoeuvre is not circular*
- *Half roll is not centred on judge's centreline - model should be in knife-edge at this point*
- *45 degree descent path not achieved*
- *Entry and exit paths not contiguous and parallel with runway*
- *Inappropriate use of throttle*
- *Size and speed of manoeuvre not in the manner of the prototype*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

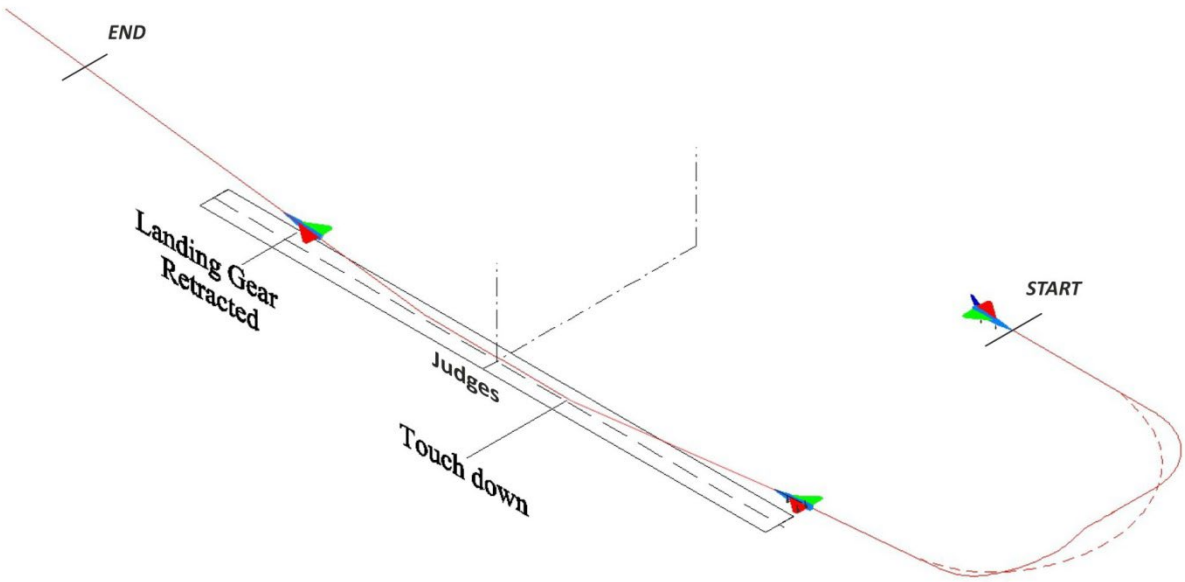
(27) 3 consecutive rolls right–left–right or opposite (aerobatic only) - The model approaches parallel to and beyond the runway at a safe height and at a constant rate performs three consecutive rolls, the second being on the judge's centreline where it will appear inverted and rolling in the opposite direction from the first and third, and resumes straight and level flight on the same track and heading as at the start of the manoeuvre after which "End" is called.



Errors:

- *Rate of rolls not constant*
- *Style of rolls not typical of the prototype*
- *Second roll not inverted as it passes the judge's centreline (i.e. manoeuvre was not centred)*
- *Entry and exit at different heights or speeds*
- *Model does not resume straight and level flight on same track as entry*
- *Rolls not horizontal*
- *Hesitation between each roll*
- *Entry and exit paths not contiguous or parallel with the runway*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

(28) Touch and Go (all types) - With all installed means (landing gear, flaps and drag inducing equipment if fitted) to restrict the speed of the model to a safe minimum, as normally achieved during the landing height reduction turn, already deployed "Start" is called far out on the downwind leg and, the model turns into a landing approach before touching down on the runway centreline shortly before the judge's centreline. After an accelerating run of not less than 5 meters the model accelerates and takes off followed by a climb on the take-off heading and climb angle appropriate to the prototype for a minimum of 5 seconds, during which the landing gear sequence is initiated before calling "End" and entering the circuit. During the climb the "cleaning up" process should be initiated in the style of the prototype aircraft.

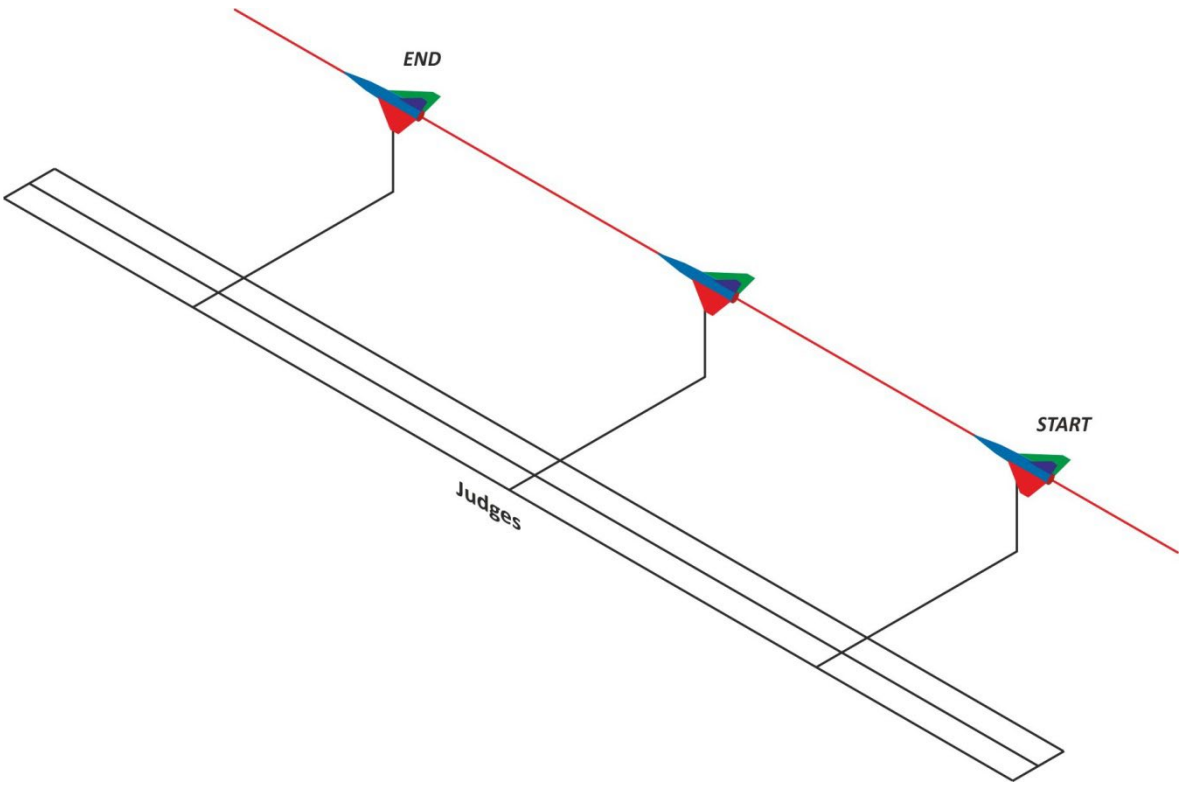


Errors:

- *Landing gear etc. not extended in a manner appropriate to the full-size prototype*
- *Descent not smooth and continuous*
- *Speed too high during descent*
- *Model does not adopt landing attitude appropriate to the prototype*
- *Model bounces on touch down*
- *Touchdown not on runway centreline*
- *Should model be unable to take off manoeuvre and rest of flight to be scored zero*
- *Model veers off runway direction on ground roll*
- *Ground roll too short*
- *Acceleration too rapid*
- *Lift-off not smooth*
- *Climb out too short*
- *Flaps etc. not used if applicable*
- *Nose attitude during climb not in keeping with the prototype*
- *Landing gear sequence not initiated if applicable during climb out*
- *Failure to call Start and/or End*
- *Climb-out track not in line with take-off run*
- *Manoeuvre too far away, too close, too high or too low*

Group 3

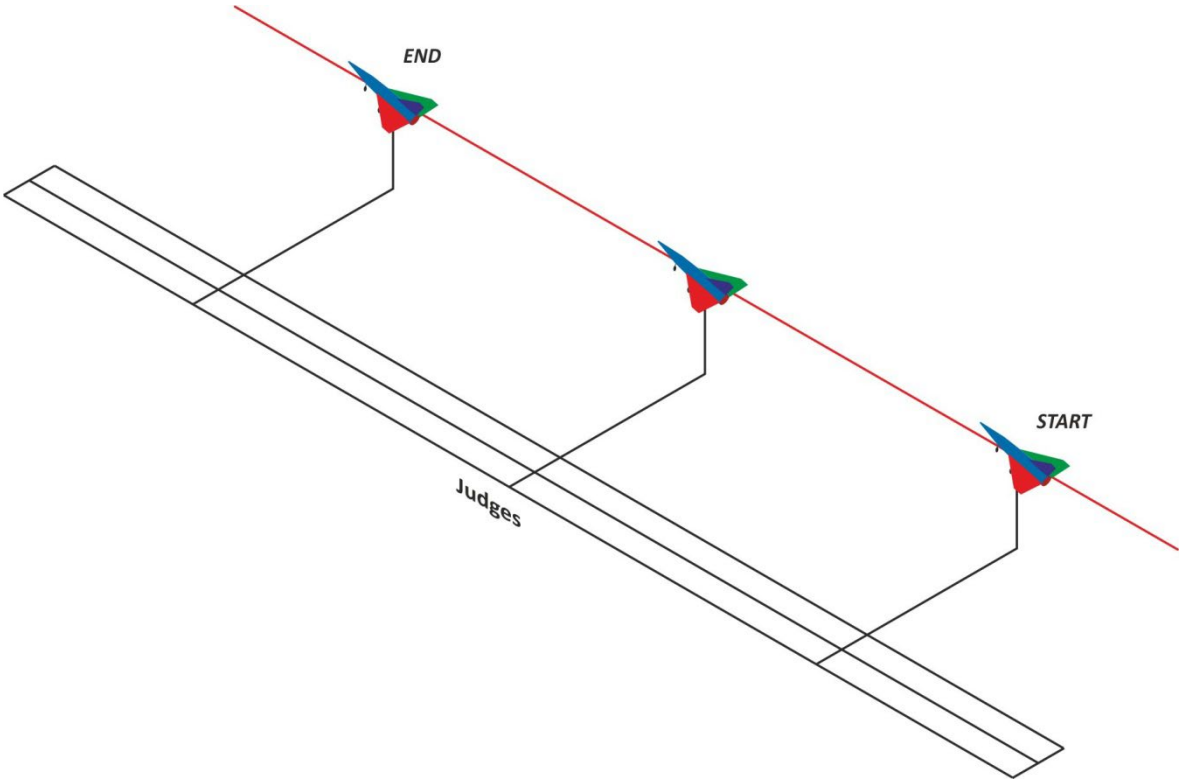
(31) Flight in straight line max 5m (non aerobatic only) - "Start" is called and the model approaches parallel with and beyond the runway in straight flight and makes a low fly-by of 5 - 10 seconds, at a safe height.



Errors:

- *Track not straight*
- *Height not constant*
- *Manoeuvre not centred on judge's centreline*
- *Start and/or end not called in straight and level flight*
- *Manoeuvre too short in time*
- *Model's flight not smooth and steady*
- *Entry and exit paths not contiguous or parallel with the runway*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

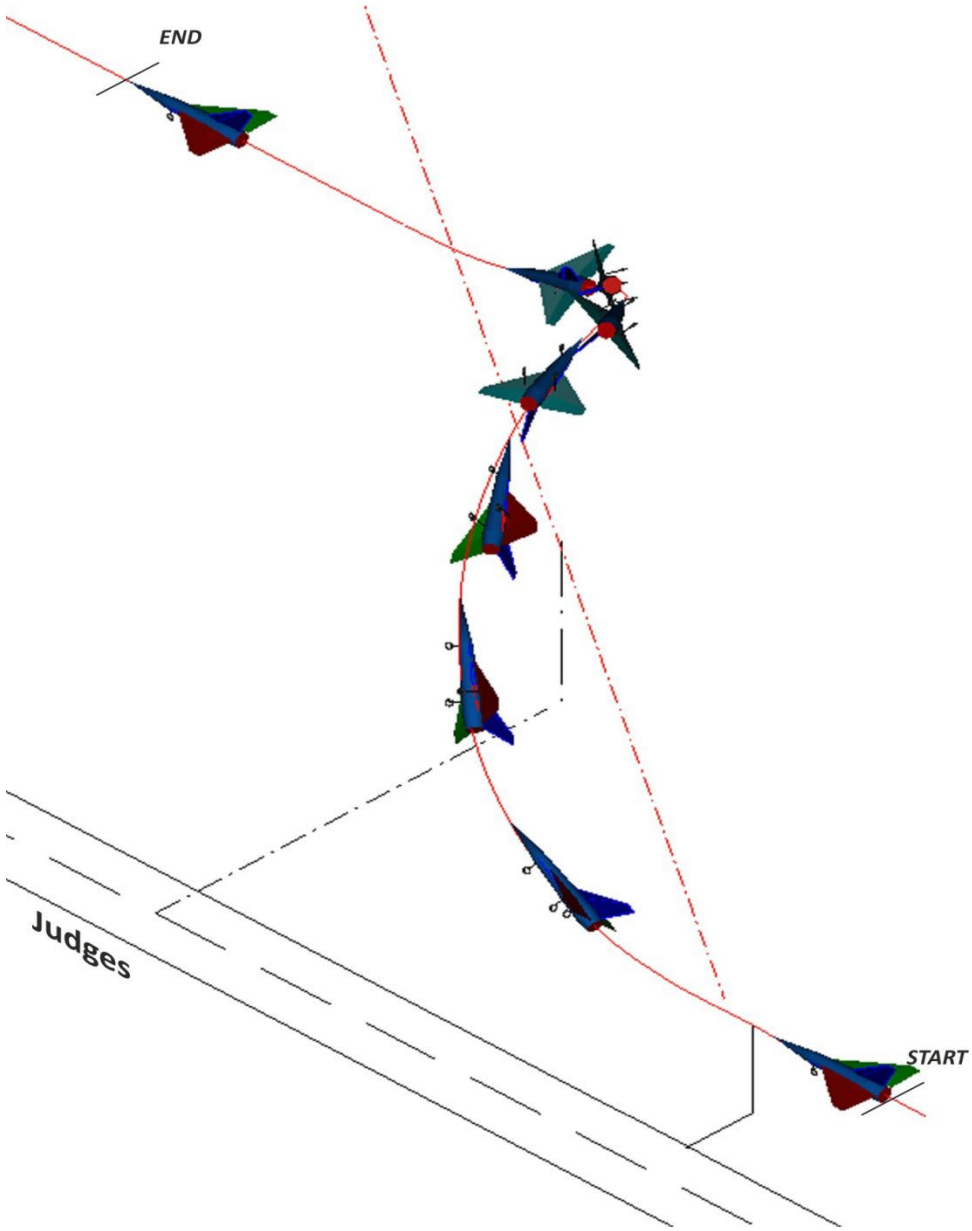
(32) Straight flight at low speed (non aerobatic only) - "Start" is called and the model approaches parallel with and beyond the runway at a safe height in straight flight having previously deployed all installed means (landing gear, flaps and drag inducing equipment if fitted) to restrict the speed to a safe minimum as would be achieved during a landing approach, for a duration of 5 - 10 seconds.



Errors:

- *Installed speed reduction equipment not deployed before start is called*
- *Track not straight*
- *Height not constant*
- *Speed varies during manoeuvre*
- *Start and finish not called in straight and level flight*
- *Manoeuvre not centred on judge's centreline*
- *Entry and exit paths not contiguous and parallel with runway*
- *Manoeuvre too short in time*
- *Model's flight not smooth and steady*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*
- *Installed speed reduction equipment retracted before end is called*

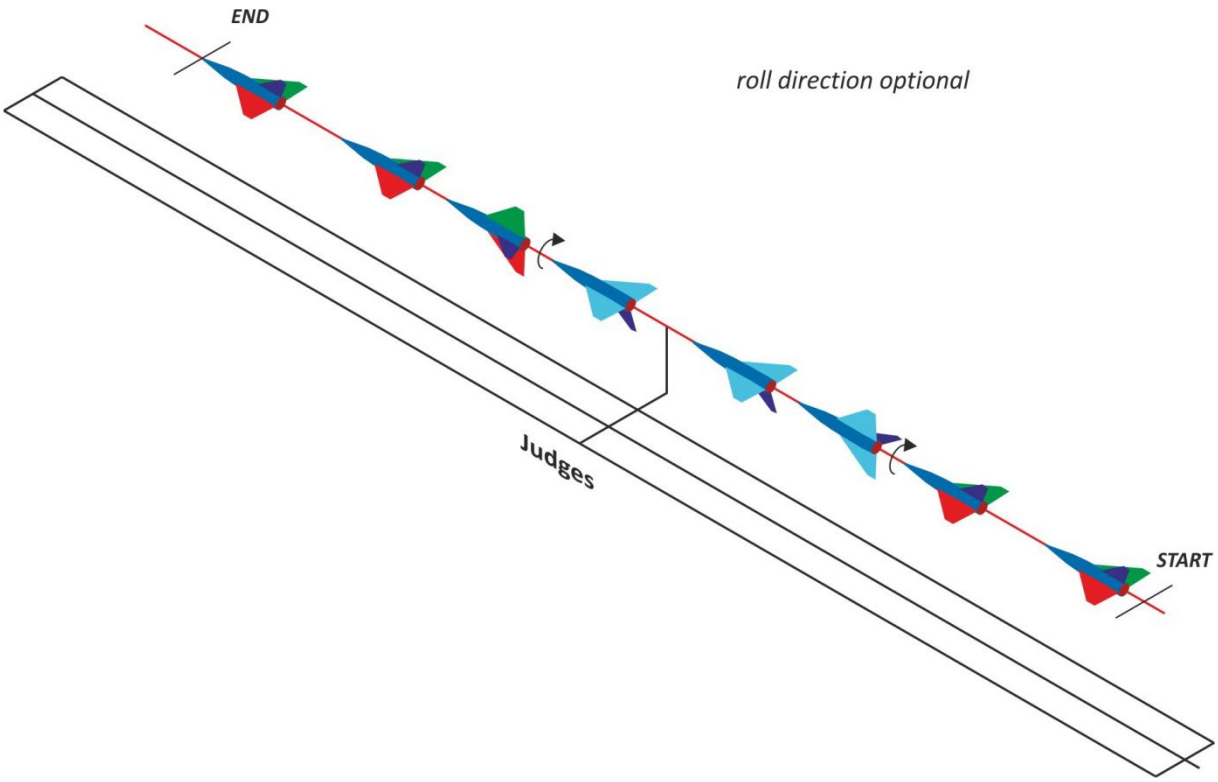
Positive 'G' Roll with landing gear extended (aerobatic only) - nearly identical to the positive 'G' roll but executed at a moderate speed with the landing gear extended. The model approaches in level flight and parallel to the runway at a safe height, with the landing gear already extended before "start" is called and performs a 360 degree roll away from the judges while simultaneously pitching up, describing a gentle helical flight-path reaching inverted flight on the judge's centreline, and resuming level flight, again parallel to the runway at the same height but further away than on the entry track. Gear remains extended until after "end" is called.



Errors:

- *Landing gear not extended prior to start of manoeuvre*
- *Rate of roll not constant*
- *Rate of pitch not constant*
- *Style of roll not typical of the prototype*
- *Speed with landing gear extended too high or not typical of prototype*
- *Roll not centred on judge's centreline*
- *Entry and exit at different heights or speeds*
- *Entry and exit tracks not parallel to each other*
- *Attitude at entry is not the same as attitude at exit*
- *Gear retracted before "End" called*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

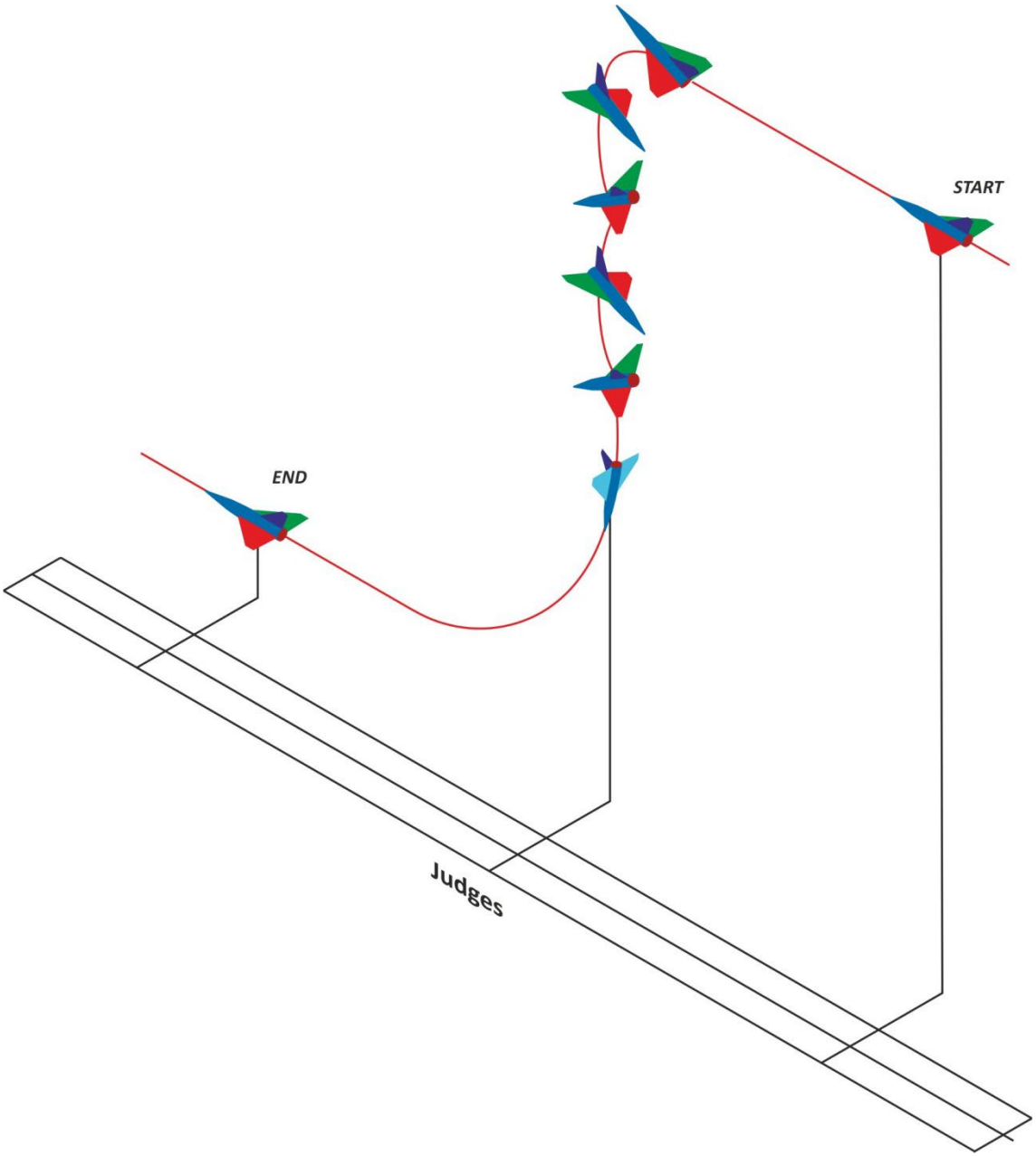
(34) 2 point roll (aerobatic only) - "Start" is called and the model approaches parallel with and beyond the runway in straight and level flight at a safe height at a constant rate and, in the manner of the prototype, performs two half rolls, hesitating at the midpoint then resuming straight and level flight on the same height, heading and altitude.



Errors:

- *Rotation rate of half rolls differ*
- *Style of half rolls not typical of the prototype*
- *Interval between each half roll not centred on judge's centreline*
- *Lack of discernible hesitation between each half roll*
- *Start and finish not called in straight and level flight*
- *Entry and exit at different heights or speeds*
- *Entry, and exit paths and line of half rolls not contiguous or parallel with runway*
- *Style of roll not nominated*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

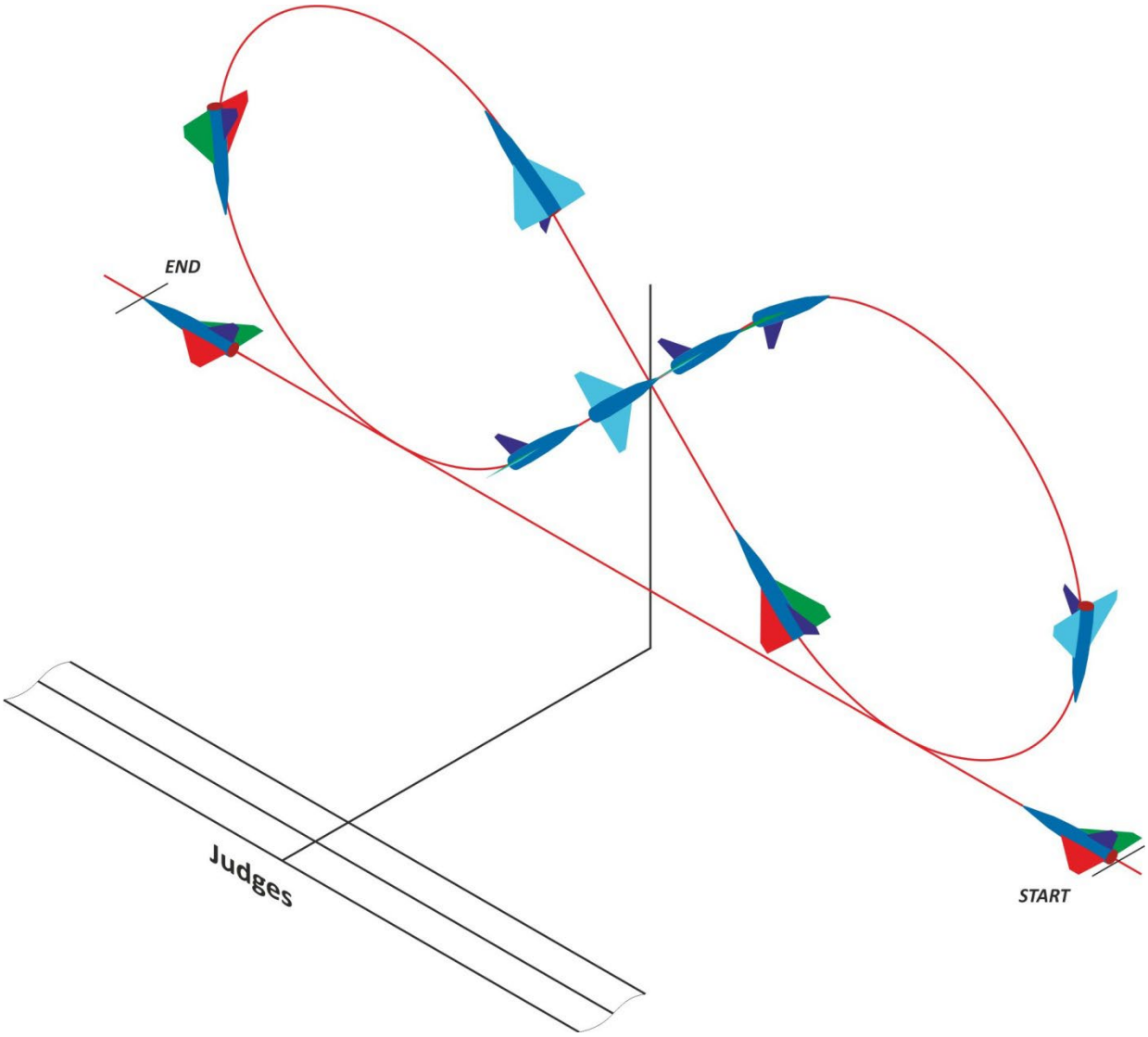
(35) Two turn Spin (aerobatic only) - The model approaches parallel with and well beyond the runway at a suitable height in straight and level flight, reducing power to idle and simultaneously raising the nose, the model decelerates into an upright stall on the judge's centreline, and commences a spin through two turns to recover to level flight on the same track as the initial flight direction after which "End" is called.



Errors

- *Incorrect use of the throttle or flight controls at point of stall.*
- *Forced spin entry, not clean and positive.*
- *Not a true spin but a spiral dive which is a tight vertical barrel roll which would score a zero. In a true spin the descent path will be close to the C of G of the model.*
- *Not two complete turns.*
- *Start of spins not centred on judge's centreline.*
- *Model does not resume straight and level flight on same track as entry.*
- *Entry and exit paths not parallel with the runway.*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

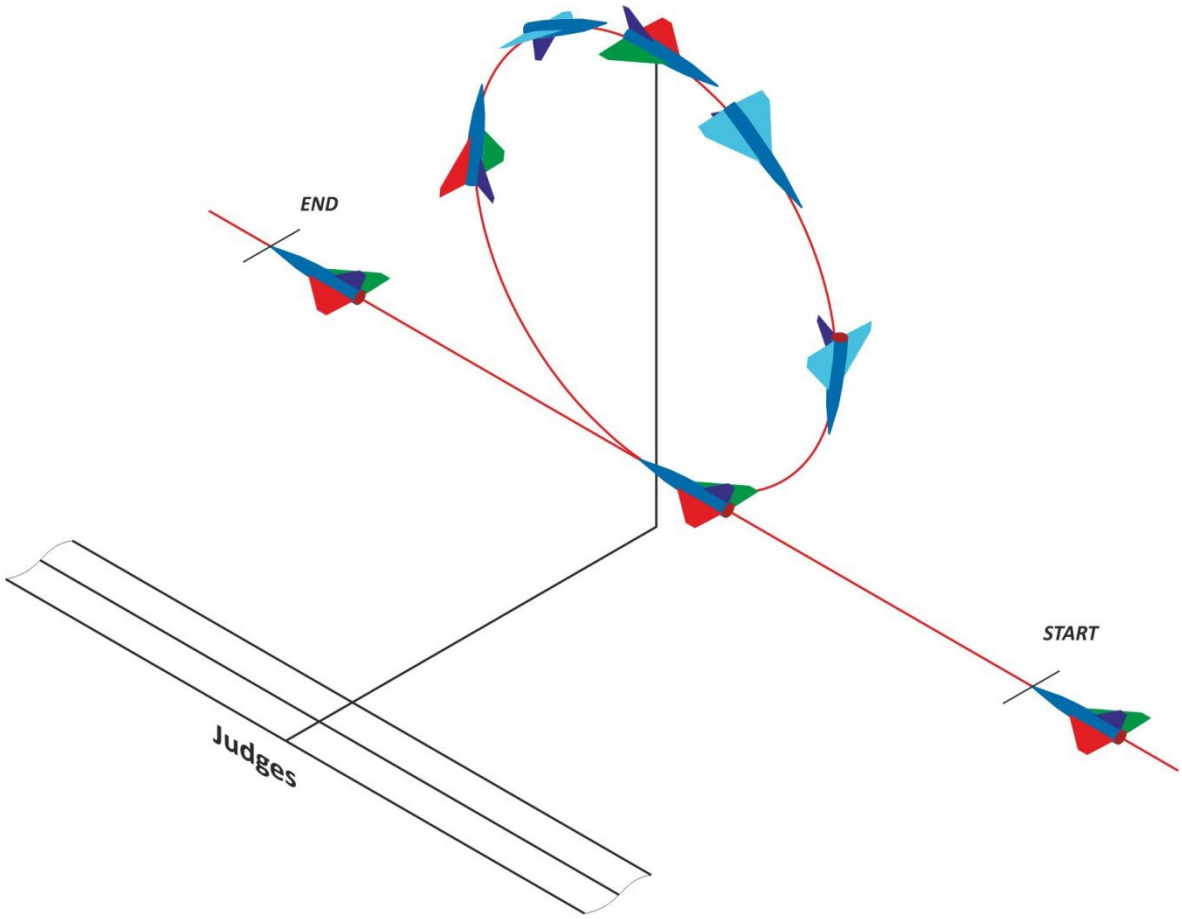
(36) Reverse Cuban Eight (aerobatic only) - "Start" is called and the model approaches parallel with and well beyond the runway at a safe height, straight and level, and pulls up to a 45 degree upline, performs a half roll on the judge's centreline then pulls through a 3/4 inside loop to a 45 degree upline performing a half roll on the judge's centreline followed by a 5/8 inside loop to resume straight and level flight at the entry height and on the original track.



Errors:

- *Manoeuvre not performed in a constant vertical plane that is parallel with the runway*
- *Loops are not in keeping with the prototype*
- *Loops are not the same size*
- *Half rolls not centred on judge's centreline - model should be in knife-edge at crossover point*
- *45 degree ascent paths not achieved*
- *Inappropriate use of throttle*
- *Size and speed of loops not in manner of prototype*
- *Entry and exit paths not contiguous or parallel with the runway*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

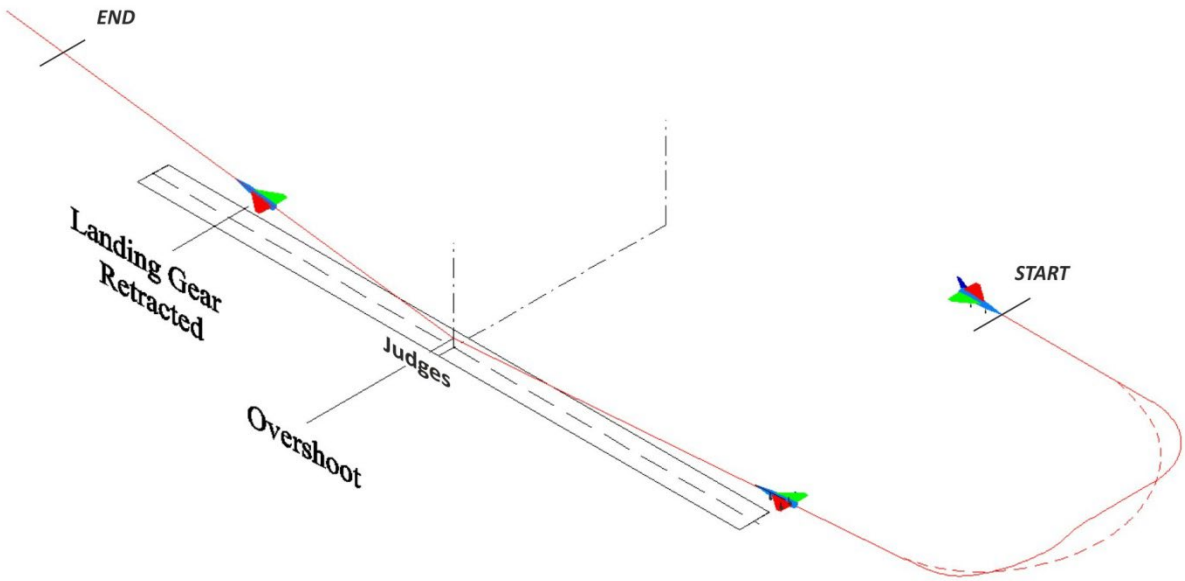
(37) Loop with roll on top (aerobatic only) - "Start" is called and the model approaches upright, parallel with and well beyond the runway. After passing the judge's centreline, the model performs a loop, with one integrated roll over the top 60 degrees exiting to straight and level upright flight on the same track, heading and altitude as at the start of the manoeuvre.



Errors:

- *Plane of loop not vertical and/or parallel with the runway*
- *Loop not in keeping with the prototype*
- *Inappropriate use of throttle*
- *Size and speed of manoeuvre not in the manner of the prototype*
- *Manoeuvre not centred on the judge's centreline with the model upright on the centreline of the loop*
- *Entry and exit paths not contiguous or parallel with the runway*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

(38) Overshoot (all types) - with all installed means (landing gear, flaps and drag inducing equipment if fitted) to restrict the speed of the model to a safe minimum, as normally achieved during the landing height reduction turn, already deployed "Start" is called far out on the downwind leg and, the model turns into a landing approach but before touching down on the runway centreline at a height of approximately 3 meters, aborts the landing and applies full power. The model then accelerates and climbs out on a constant heading and angle appropriate to the prototype for a minimum of 5 seconds during which time the landing gear sequence is initiated before calling "end" and entering the circuit. During the climb the "cleaning up" process should be initiated in the style of the prototype aircraft.

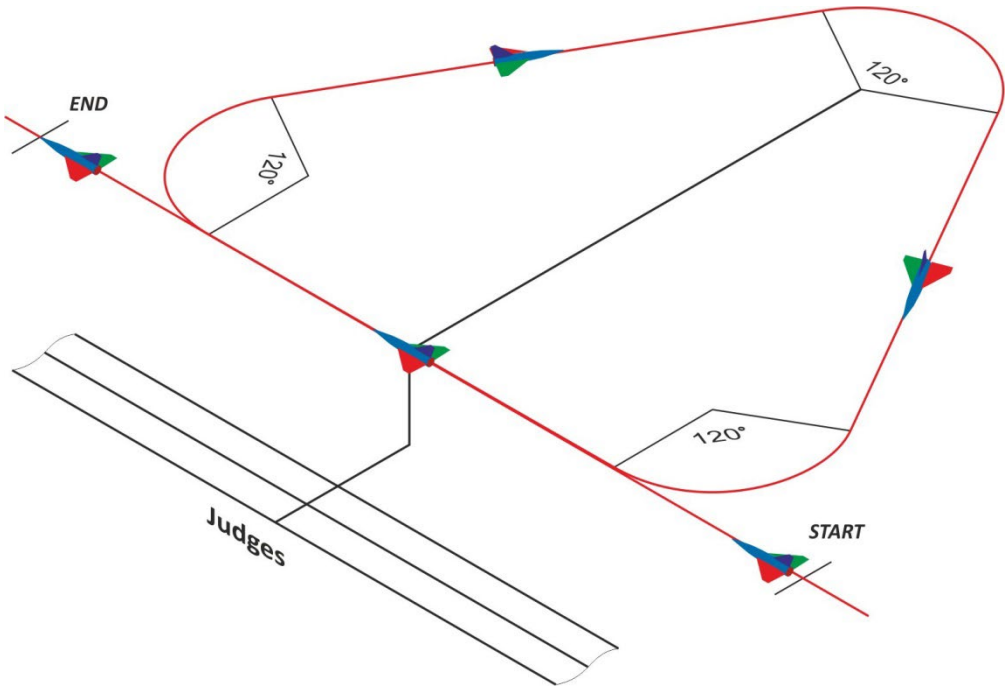


Errors:

- *Landing gear not extended in a manner appropriate to the full-size prototype*
- *Altitude changed before appropriate descent point*
- *Descent not smooth and continuous*
- *Speed too high during descent*
- *Model does not adopt landing attitude appropriate to the prototype*
- *Abort of landing more than 3m above ground*
- *Climb rate incorrect (not appropriate to the prototype)*
- *Nose attitude during climb not in keeping with the prototype*
- *Flaps not used if applicable*
- *Landing gear retraction sequence not initiated if applicable*
- *Exit path not contiguous and parallel with runway*
- *Climb out too short*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

Group 4

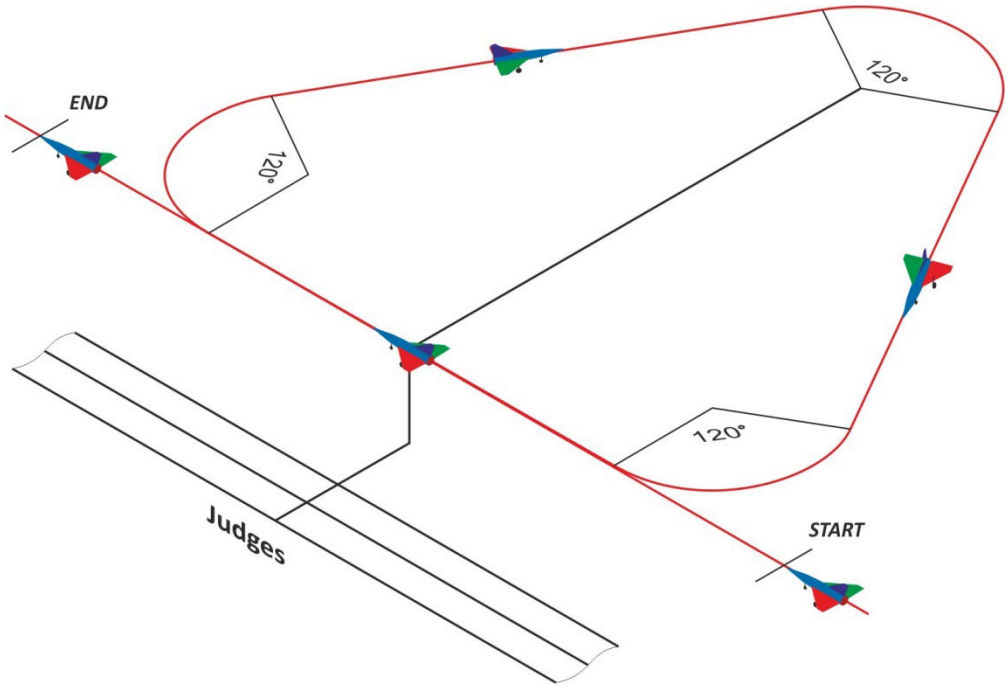
(41) Flight in Triangular Circuit (non aerobatic option only) - The model approaches parallel with and beyond the runway at a safe height in level flight before "Start" has been called. Approximately 100 meters after passing the judge's centreline, the model turns through 120 degrees (away from the judges). It then flies straight and level for approximately 200 meters, turns 120 degrees in the same direction as before, then continues straight and level for a further 200 meters approximately. It then makes a final 120 degree turn in the same direction as before, and flies straight and level (parallel to the runway), completing an equilateral triangle, recovering with the model at the same altitude and heading as at entry. The manoeuvre does not end until the triangle is completed after which "End" is called.



Errors:

- *Model changes height*
- *Rate of turn at corners not constant*
- *Angular differences between the 3 corners*
- *Sides of triangle are not straight*
- *Sides of triangle are not equal in length*
- *Sides of triangle are too short*
- *Correction for drift not properly made*
- *Triangle not centred on judge's centreline*
- *Entry and exit paths not contiguous and parallel with runway*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*
- *Triangle not centred on judges centreline*
- *Manoeuvre too far away, too close, too high or too low*

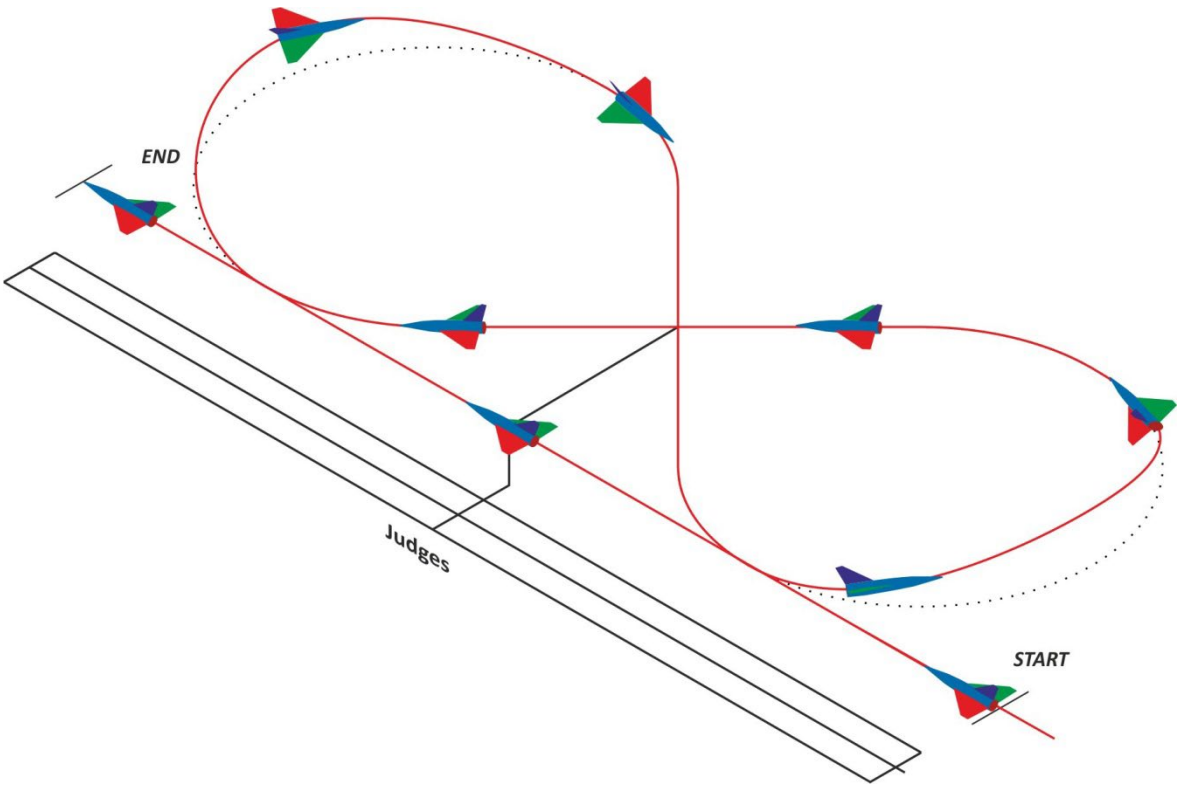
(42) Flight in Triangular Circuit dirty configuration (non aerobatic only) - The model approaches parallel with and beyond the runway at a safe height in level flight with the undercarriage, speed brakes and flaps deployed before "Start" is called. Approximately 100 meters after passing the judge's centreline, the model turns through 120 degrees (away from the judges). It then flies straight and level for approximately 200 meters, turns 120 degrees in the same direction as before, then continues straight and level for a further 200 meters approximately. It then makes another 120 degree turn in the same direction as before, and flies straight and level (parallel to the runway), completing an equilateral triangle, recovering with the model at the same altitude and heading as at entry. The undercarriage etc. must not be retracted until the manoeuvre ends when the triangle is completed and "End" is called.



Errors:

- *Undercarriage not deployed before "Start" is called*
- *Model changes height*
- *Rate of turn at corners not constant*
- *Angular differences between the 3 corners*
- *Sides of triangle are not straight*
- *Sides of triangle are not equal in length*
- *Sides of triangle are too short*
- *Correction for drift not properly made*
- *Triangle not centred on judge's centreline*
- *Entry and exit paths not contiguous or parallel with the runway*
- *Undercarriage retracted before "End" has been called*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

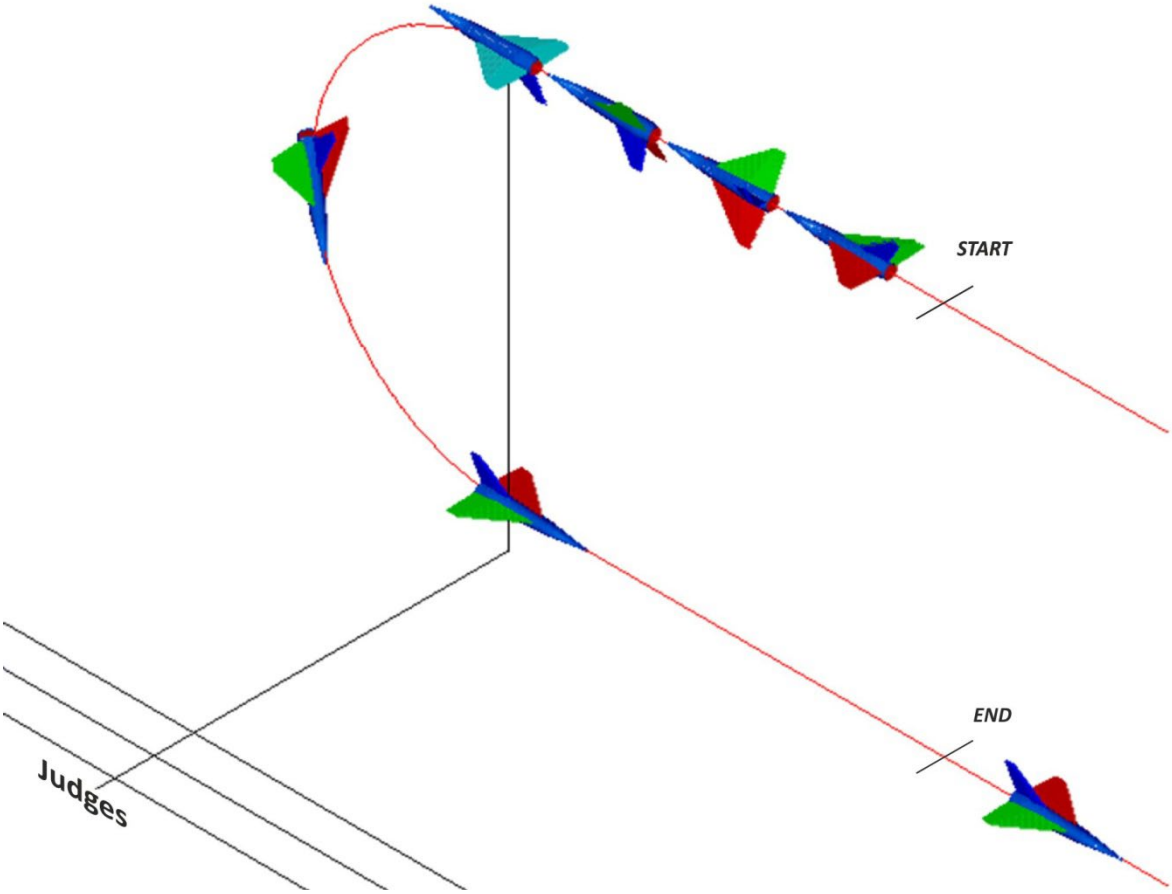
(43) Lazy 8 (non aerobatic only) - The model approaches parallel with and beyond the runway at a safe height in level flight. "Start" is called before it reaches the judges and after passing the centre it starts a smooth curving climbing turn of constant radius away from the judges. At the apex of the turn the bank should not exceed 60º and the model should be on a heading at 90° to the runway. The model then starts a descending turn as the bank comes off and at 225° from the start begins a straight section at the same height as at the entry to cross the centreline at 45° towards the judges to begin a 270° climbing and diving turn away from and then back towards the judges to cross the centreline at 45° with the wings level and at the same height as at the entry. A final turn of 45° exits the manoeuvre parallel to the runway in straight and level flight.



Errors:

- *Insufficient climb achieved*
- *Insufficient bank achieved*
- *Climb and descent curves not equal throughout manoeuvre*
- *Apex of climbing turns not of equal height*
- *Manoeuvre not symmetrical about judges' centreline*
- *Crossover not on judge's centreline*
- *Arcs misshapen*
- *Start and finish positions not as indicated*
- *Overall size of manoeuvre not realistic for subject aircraft*
- *Model flight path not smooth and steady*
- *Apexes of turns not coincident with a model heading of 90 degrees*
- *Wings not level at the crossover*
- *Entry and exit paths not contiguous or parallel with the runway*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*
- *Wings not level at the crossover*

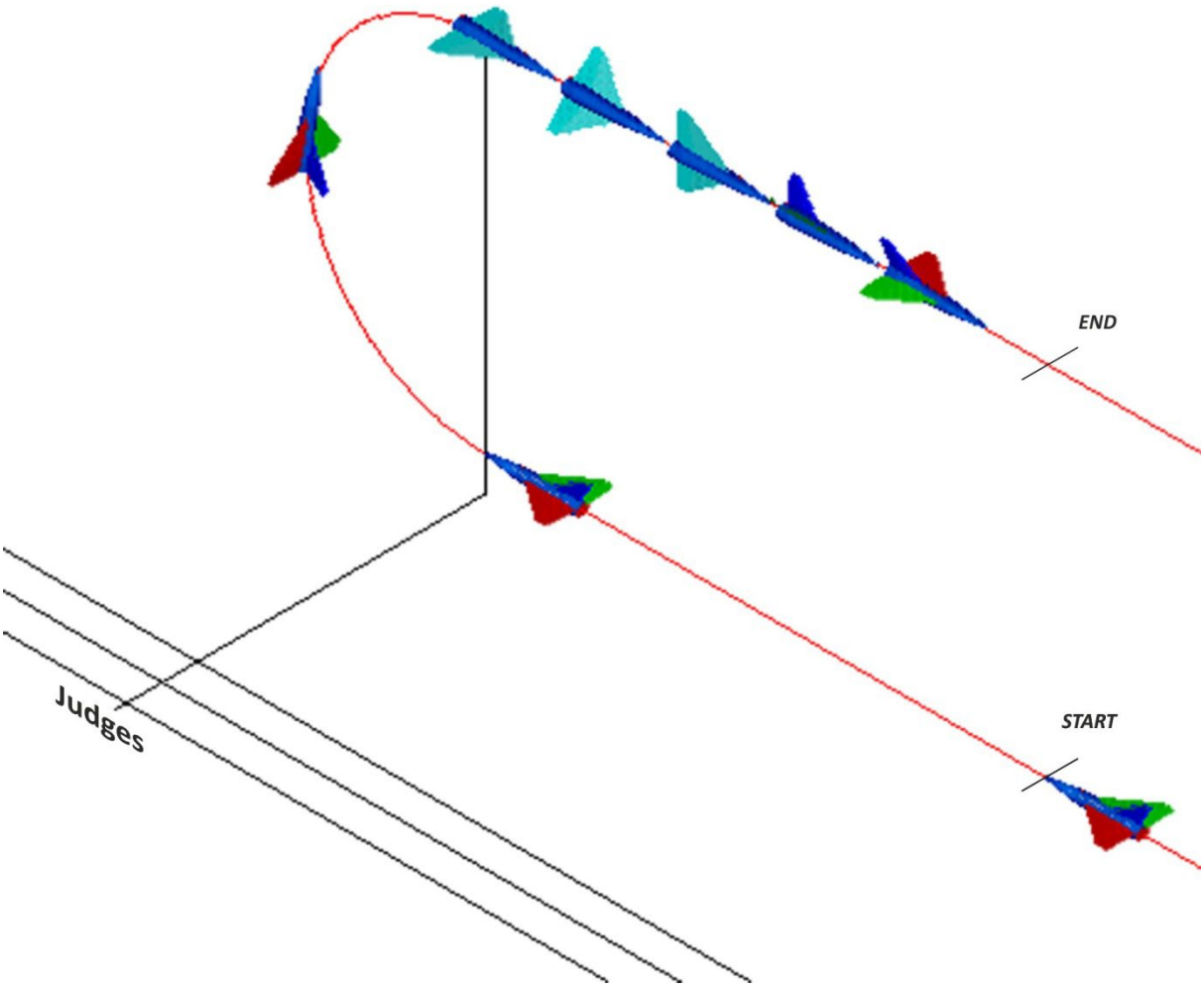
(44) Split "S" (aerobatic only) - after calling "Start" the model approaches parallel with and well beyond the runway at a suitable height in straight and level flight, reducing power, performs a half roll to arrive in the inverted position at the judge's centreline, and then immediately makes a half inside loop downwards, and resumes normal level flight on a reciprocal track to that at the start calling, "End" after passing the judge's centreline and establishing straight and level flight.



Errors:

- *Roll starts too early or too late*
- *Track veers during half roll*
- *Excessive height loss in the roll*
- *Model inverted for too long before commencing half loop*
- *Inappropriate use of throttle*
- *Plane of the half loop not vertical or on line*
- *Half loop not centred on judge's centreline*
- *Half loop is not in keeping with the prototype*
- *Entry and exit paths not parallel with runway*
- *Size of manoeuvre and speed not in manner of the prototype*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

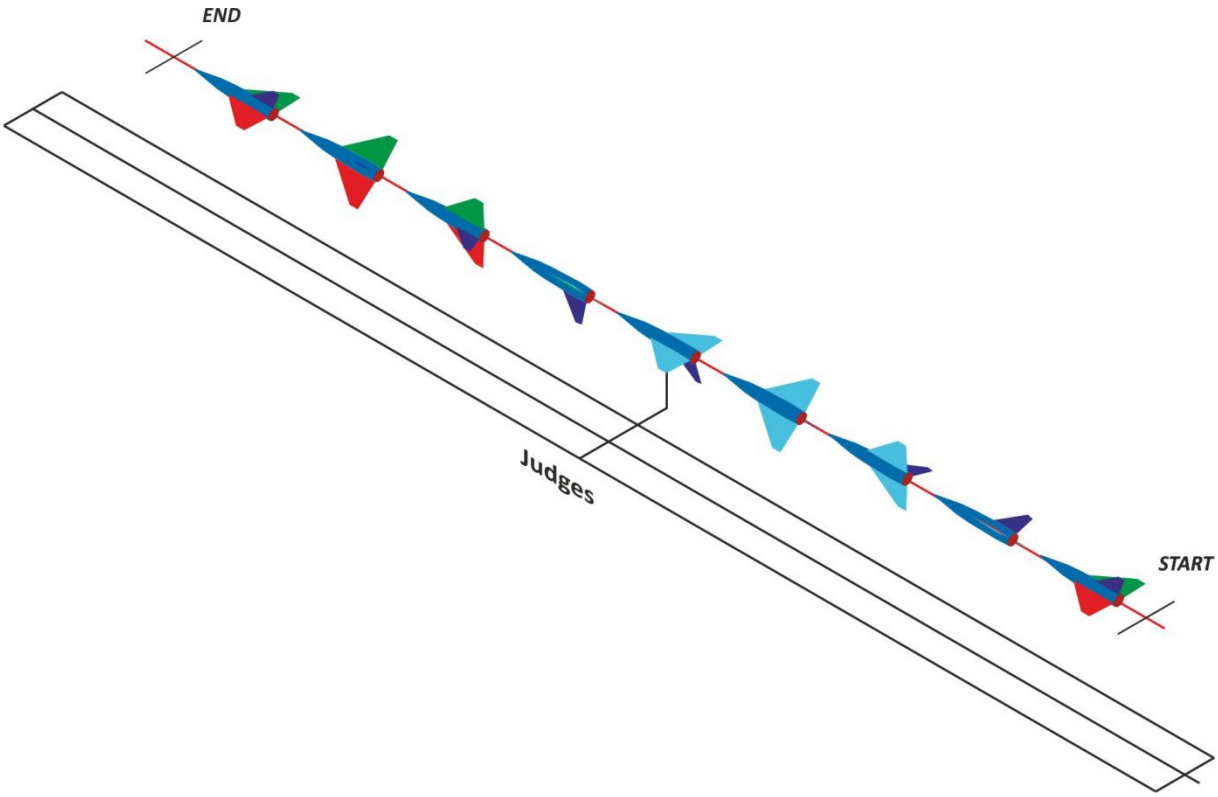
(45) Immelman Turn (aerobatic only) - parallel to and well beyond the runway and at a safe height "Start" is called and the model approaches in straight and level flight, starting at the judge's centreline it pulls up into a half loop immediately executing a half roll at the top to resume level upright flight, on a reciprocal track to that at the start. "End" is called having establishing straight and level flight following completion of the roll.



Errors:

- *Entry not parallel to with runway*
- *Plane of the half loop not vertical or on line*
- *Half loop not centred on judge's centreline*
- *Half loop not in keeping with the prototype*
- *Inappropriate use of throttle*
- *Roll-out not immediate on completion of half loop*
- *Excessive height loss in the roll*
- *Track veers during the roll*
- *Size and speed of manoeuvre not in the manner of the prototype*
- *Entry and exit paths not parallel with runway*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

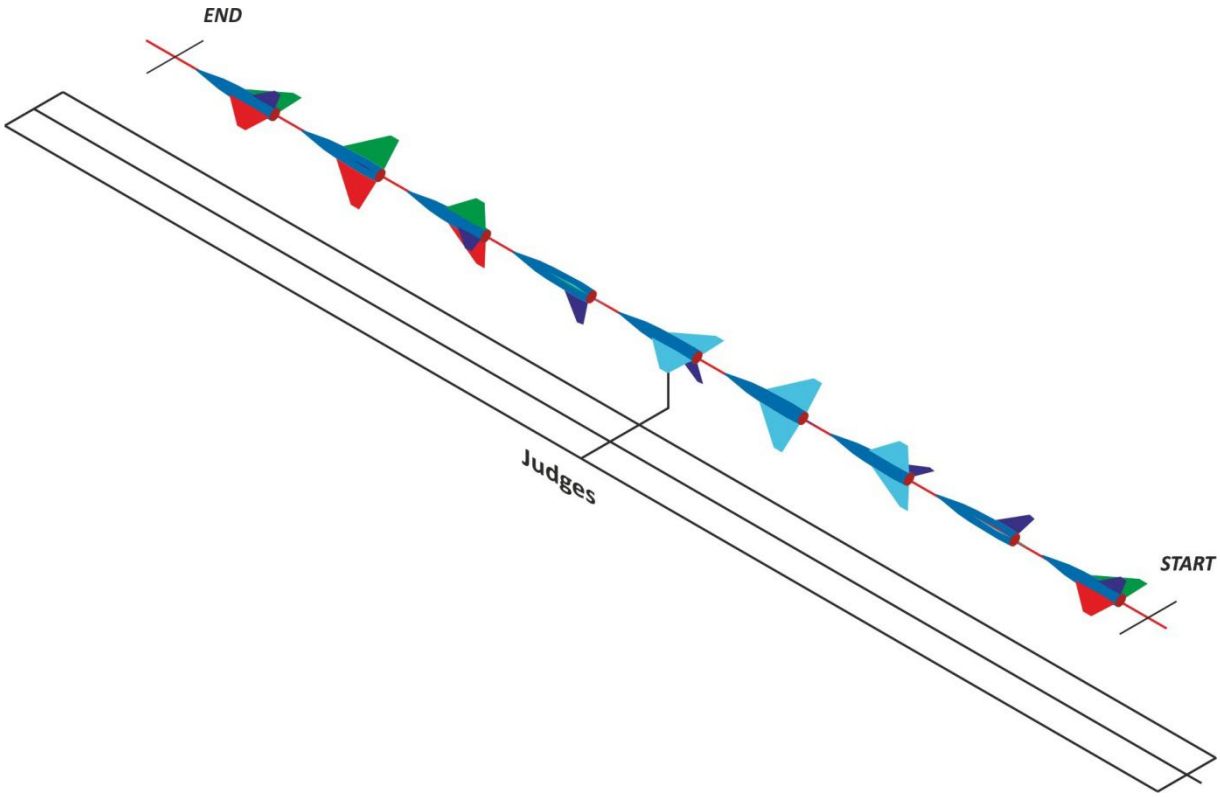
(46) 8 point roll (aerobatic only) - The model approaches parallel with and beyond the runway at a safe height in level flight. After "Start" is called it rolls at a constant rate through eight 45° elements, hesitating at each of the seven equally spaced intervals, passing through inverted on the judge's centreline and resumes straight and level flight on the same heading and altitude before "End" is called.



Errors:

- *Rate of rolls not constant*
- *Style of roll not typical of the prototype*
- *Roll not centred on judge's centreline*
- *Entry and exit at different heights or speeds*
- *Model does not resume straight and level flight on same track as entry*
- *Style of roll not nominated*
- *One or more of the quarter rolls deviate from 90 degrees*
- *Intervals between each part of roll different*
- *Entry and exit paths not contiguous or parallel with the runway*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

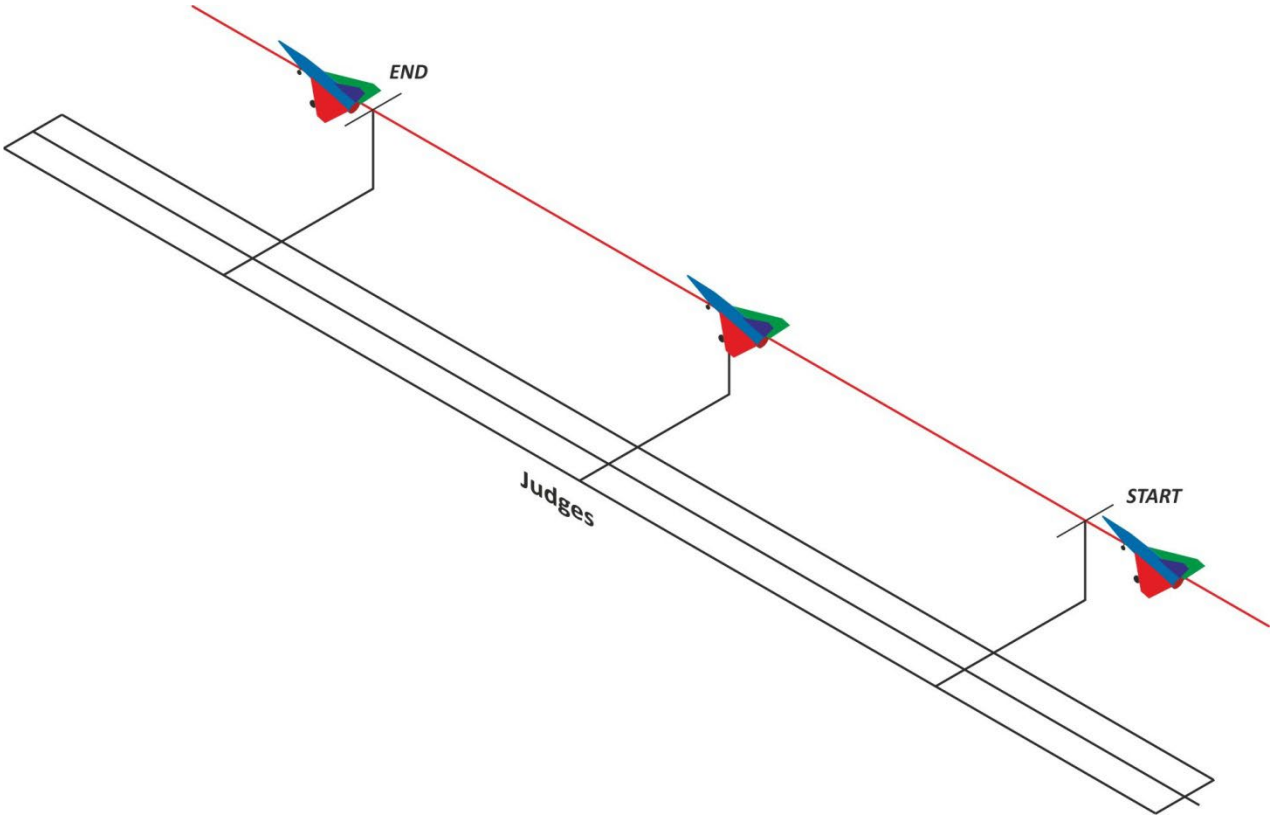
(47) Slow roll (aerobatic only) - parallel to and beyond the runway "Start" is called and the model approaches in straight and level flight and rolls at a constant and slow rate through one complete revolution appearing inverted on the judge's centreline and resumes straight and level flight on the same heading and altitude, taking 3 - 5 seconds to execute the slow roll. This manoeuvre should be performed horizontally. "End" is called having establishing straight and level flight following completion of the roll. Contestants to nominate combat or airshow style.



Errors:

- *Rate of roll not constant*
- *Style of roll not typical of the prototype*
- *Roll not centred on judge's centreline*
- *Entry and exit at different heights or speeds*
- *Entry and exit paths not contiguous and parallel with runway*
- *Style of roll not nominated*
- *Roll rate too fast*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

(48) Slow Flight in "dirty" configuration (all types) - the model approaches in straight and level flight parallel to and beyond the runway at a safe height in a "dirty" configuration with the landing gear and all other drag inducing equipment already deployed. "Start" is called and the model will fly at just above landing speed for a minimum duration of 10 seconds, centred about the judge's centreline after which "End" is called before "cleaning up" the drag inducing equipment.

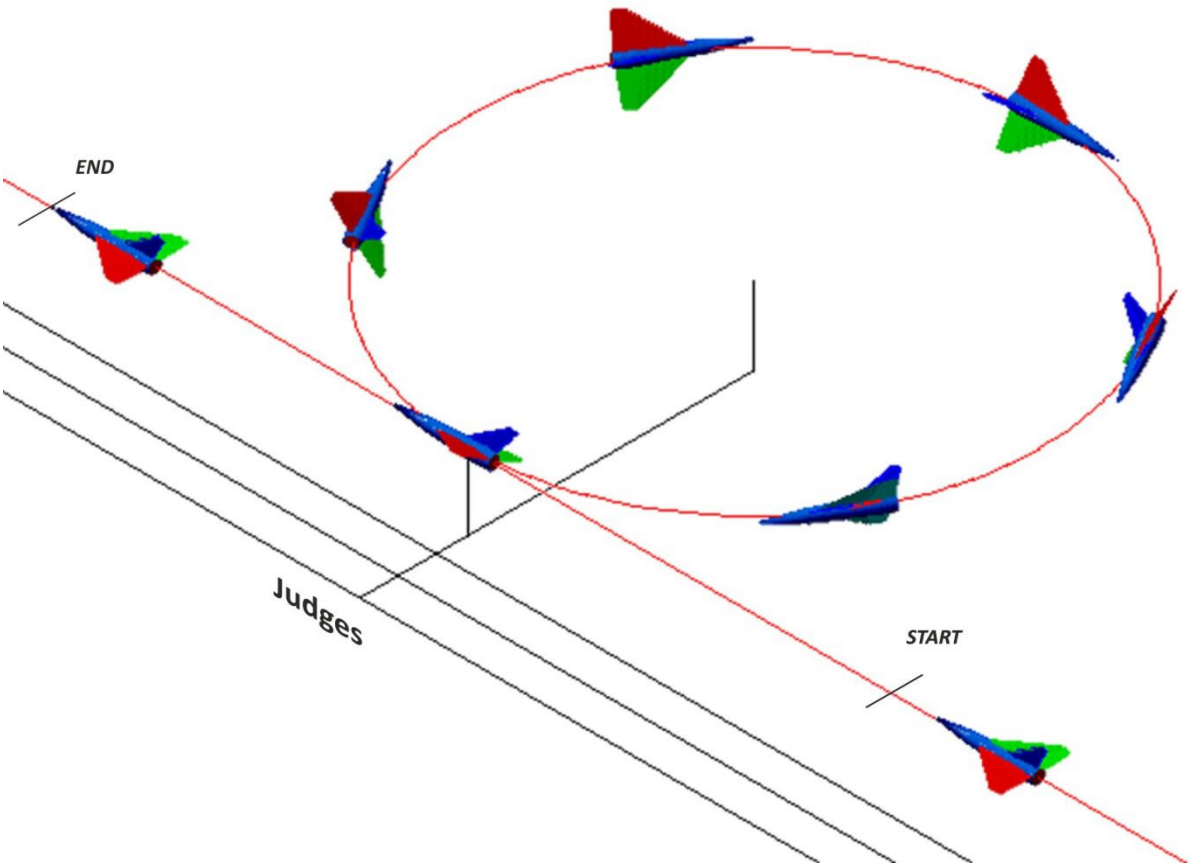


Errors:

- *Landing Gear not extended*
- *Flaps, airbrake(s) and/or spoiler(s) not extended if applicable*
- *Model does not fly a straight course parallel to the runway centreline*
- *Model gains or loses height*
- *Manoeuvre not centred on judge's centreline*
- *Manoeuvre too short in time*
- *Entry and exit paths not contiguous and parallel with runway*
- *Model's flight not smooth and steady*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

Group 5

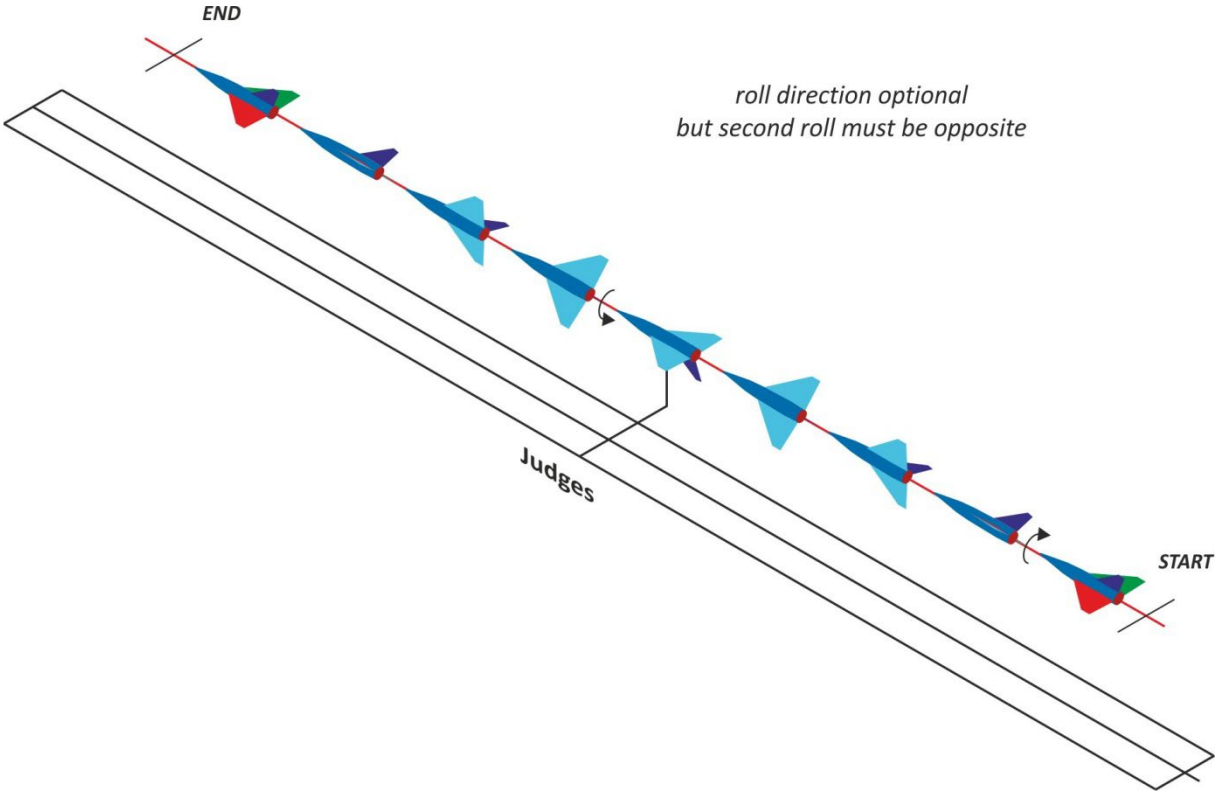
(51) 360 degree Horizontal Circle (non aerobatic option only) - Parallel to and beyond the runway "Start" is called and the model approaches in straight and level flight at a safe height before entering a 360 degree circle, commencing by turning away from the judges on their centreline. The model adopts an angle of bank and rate of turn appropriate to the prototype to recover to straight and level flight on the same heading and altitude as at the start. "End" is called after resuming straight and level flight.



Errors:

- *Circle not centred on judge's centreline*
- *Constant height not maintained*
- *Entry and exit paths not contiguous and parallel with runway*
- *Overall size of manoeuvre not realistic for prototype aircraft*
- *Bank angle and rate of turn not realistic to prototype aircraft*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

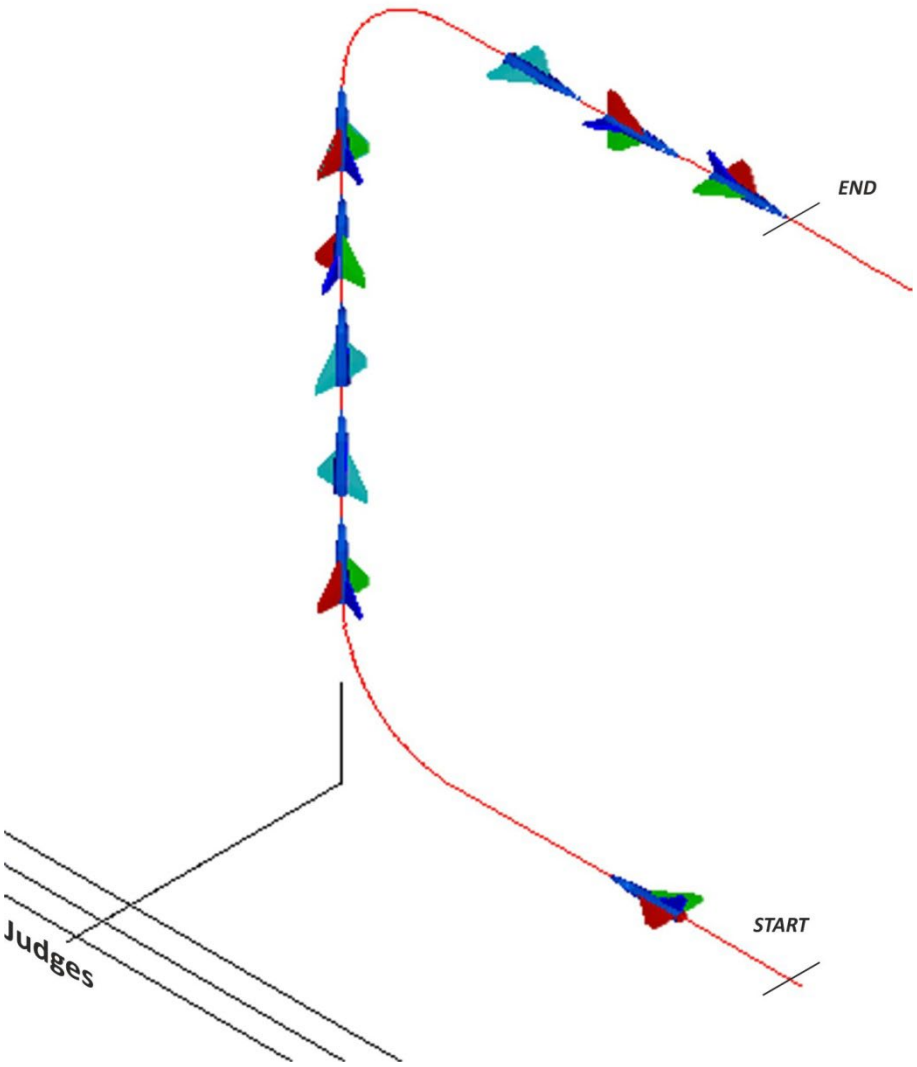
(52) 2 half rolls, one in each direction (aerobatic only) - The model approaches parallel with and beyond the runway at a safe height in level flight, After "Start" is called, it rolls at a constant rate through two half rolls changing direction of rotation between the first and second half rolls hesitating, inverted, at the interval on the judge's centreline and resumes straight and level flight.



Errors:

- *Rate of half rolls differ*
- *Lack of discernible hesitation between each half roll*
- *Style of roll not typical of the prototype*
- *Half rolls not centred on the judge's centreline*
- *Entry and exit at different heights or speeds*
- *Either of the half rolls deviates from 180 degrees of rotation and/or roll rate varies.*
- *Entry and exit paths and line of half rolls not contiguous or parallel with the runway*
- *Style of roll not nominated*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

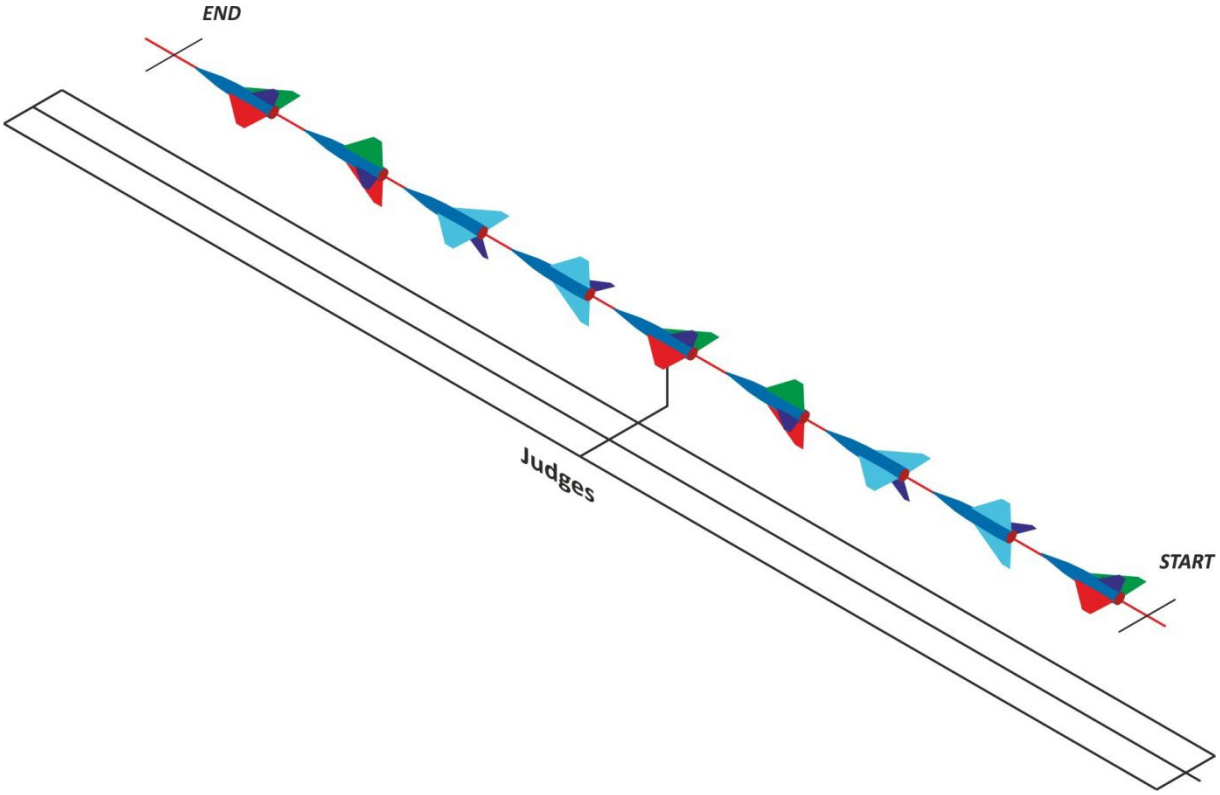
(53) Normal Vertical Roll (aerobatic only) - parallel to and well beyond the runway "Start" is called and the model approaches at a safe height in straight and level flight pulling up into a vertical full roll on the judge's centreline and recovering to level inverted flight on a reciprocal path before half-rolling to upright before "End" is called.



Errors:

- *Rate of roll not constant*
- *Style of roll not typical of the prototype*
- *Vertical Roll not centred on judge's centreline*
- *Vertical Roll more or less than 360 degrees*
- *Roll not vertical*
- *Quarter loops not of equal radius*
- *Entry and exit paths not parallel with runway*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

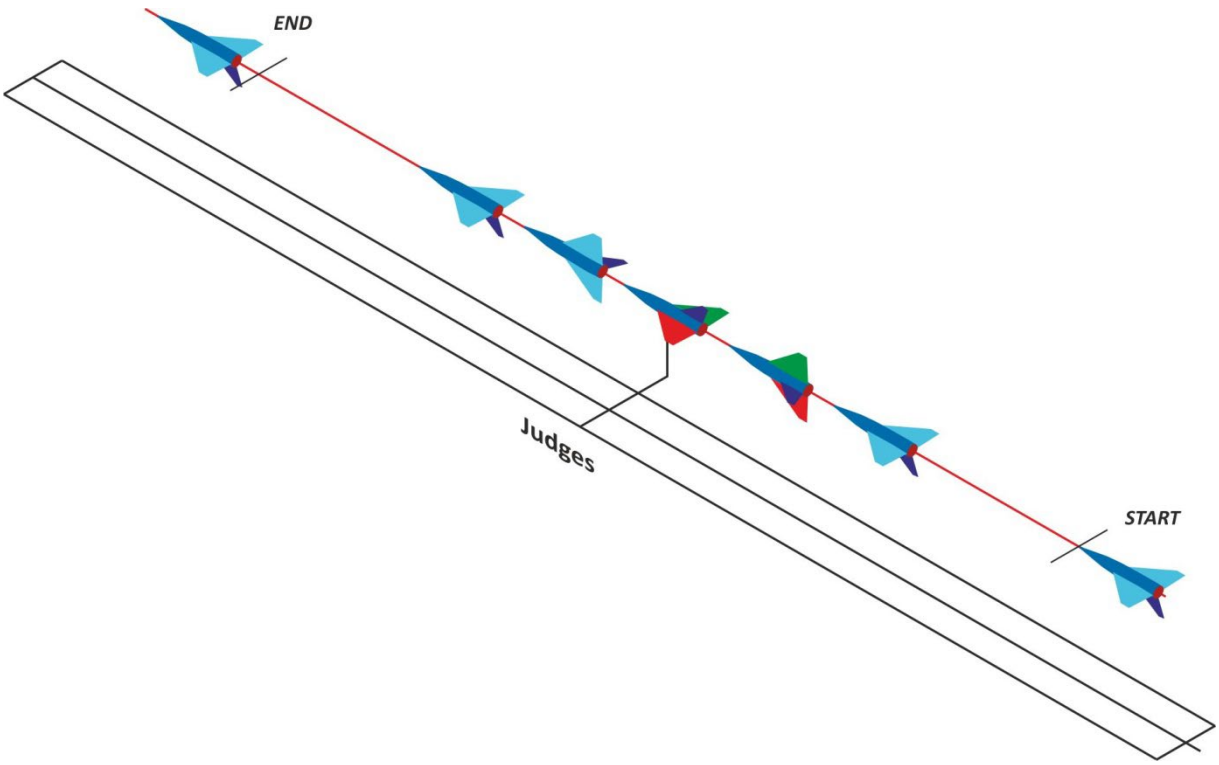
(54) Two (consecutive) Axial Horizontal Rolls in the same direction (aerobatic only) - parallel to and beyond the runway and at a safe height "Start" is called and the model approaches in straight and level flight before it rolls at a constant rate through two complete consecutive rotations disposed symmetrically about judge's centreline resuming straight and level flight on the same heading before "End" is called.



Errors:

- *Rate of rolls not constant*
- *Style of rolls not typical of the prototype*
- *Rolls not level and centred on judge's centreline*
- *Entry and exit at different speeds*
- *Entry and exit paths not contiguous and parallel with runway*
- *Rolls not horizontal*
- *Hesitation between rolls*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

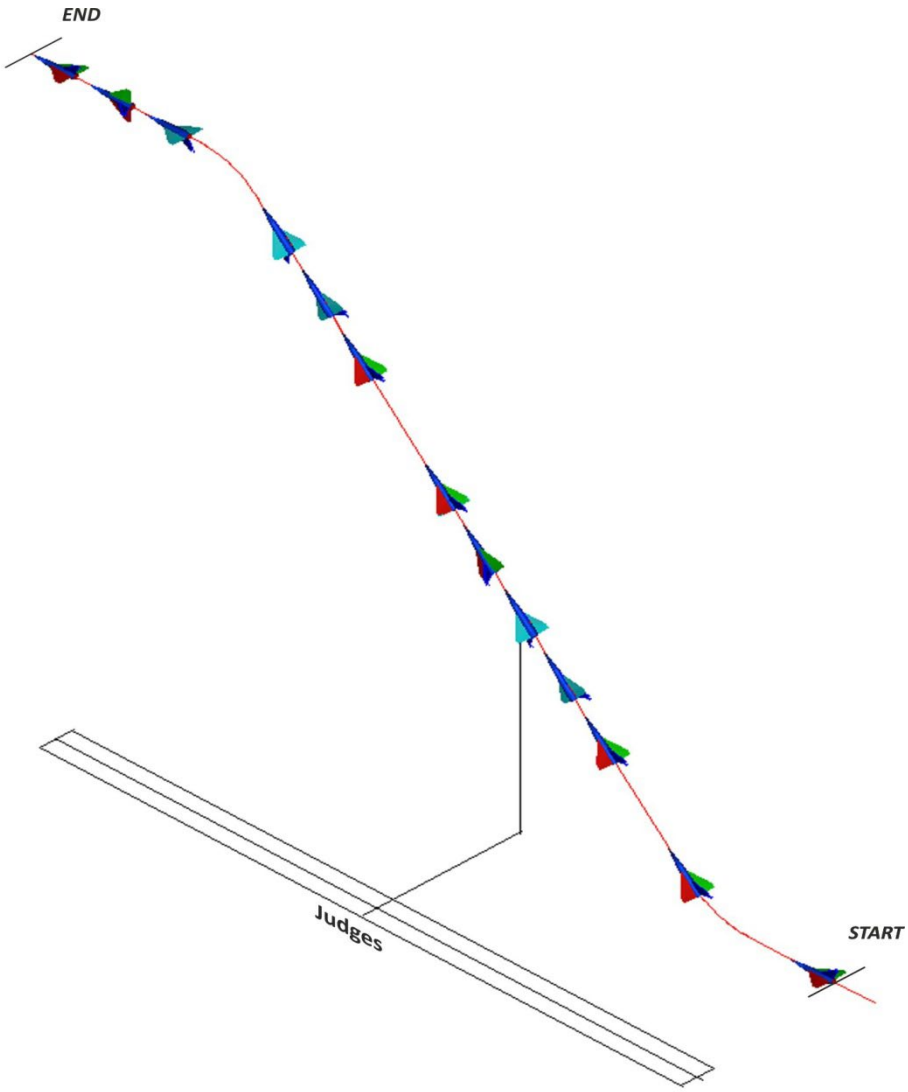
(55) Inverted Normal Axial Horizontal Roll (aerobatic only) - parallel to and beyond the runway the model approaches at a safe height in straight and level inverted flight. “Start” is called and it rolls at a constant rate through one complete rotation appearing upright at the judge’s centreline, and resumes inverted straight and level flight on the same heading not resuming upright flight until after “End” has been called.



Errors:

- *Model not inverted at start of manoeuvre (zero scored)*
- *Rate of roll not constant*
- *Style not typical of the prototype*
- *Roll not centred on judge’s centreline*
- *Entry and exit at different speeds*
- *Entry and exit paths not contiguous and parallel with runway*
- *Roll not horizontal*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

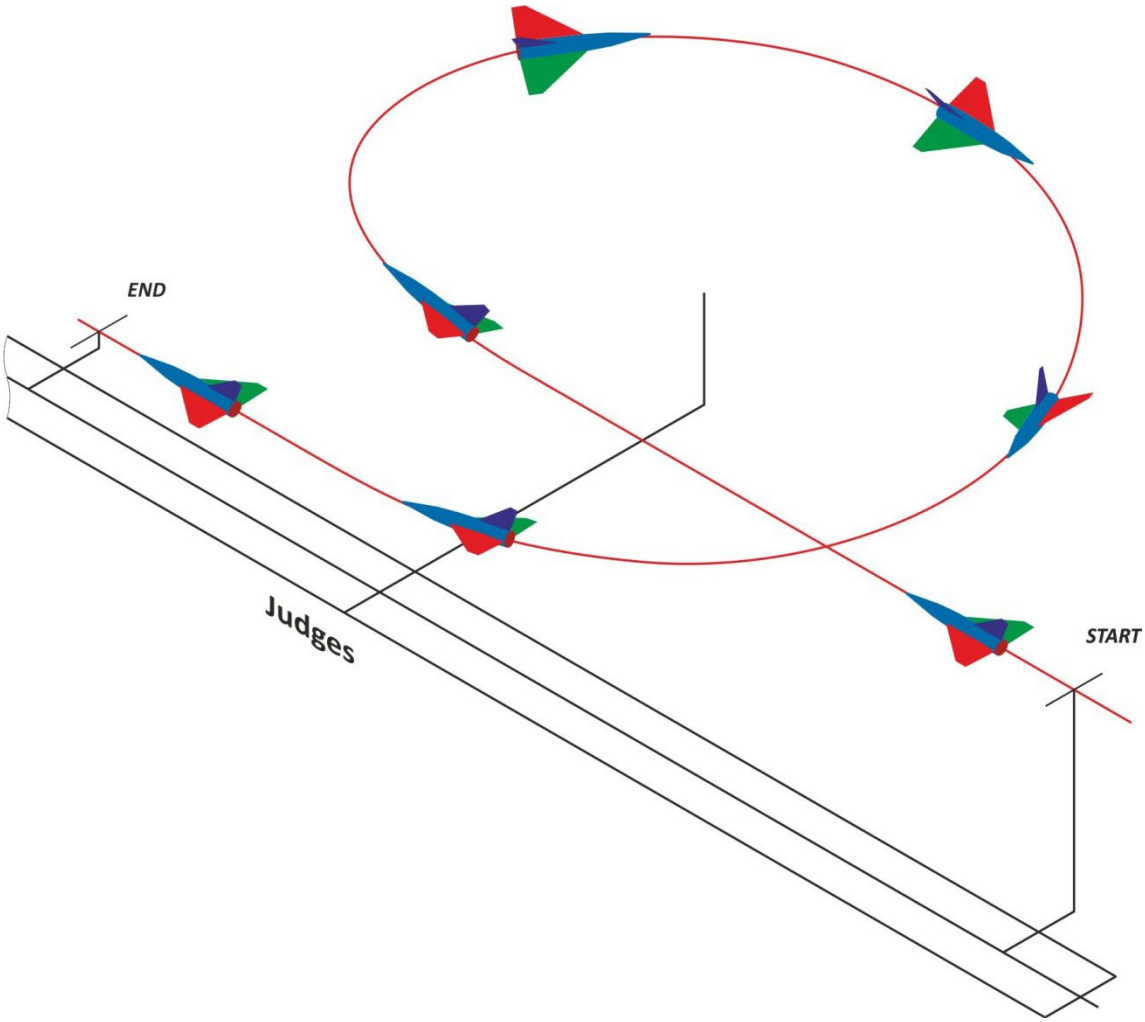
(56) Victory Roll (with rolling exit) (aerobatic only) - parallel to and well beyond the runway and at a safe height "Start" is called and the model approaches in straight and level flight and before reaching the judge's centreline it pulls up to a climbing flight path at approx. 45 degrees for 2-3 seconds, followed by a complete 360 degree roll on the judge's centreline. After another 2 - 3 seconds the model makes a half roll to inverted, pulls to resume inverted level flight followed by a half roll to upright attitude on the same track and heading as entry.



Errors:

- *Manoeuvre not performed in a constant vertical plane that is parallel with the runway*
- *Climb angle not constant*
- *Roll rate is too high*
- *45 degree climb path not achieved*
- *Model rolls by more or less than 360 degrees*
- *360 degree roll not centred on judge's centreline*
- *Climbing half roll omitted (manoeuvre scores zero)*
- *Entry and exit paths not parallel with runway*
- *Exit not as described*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

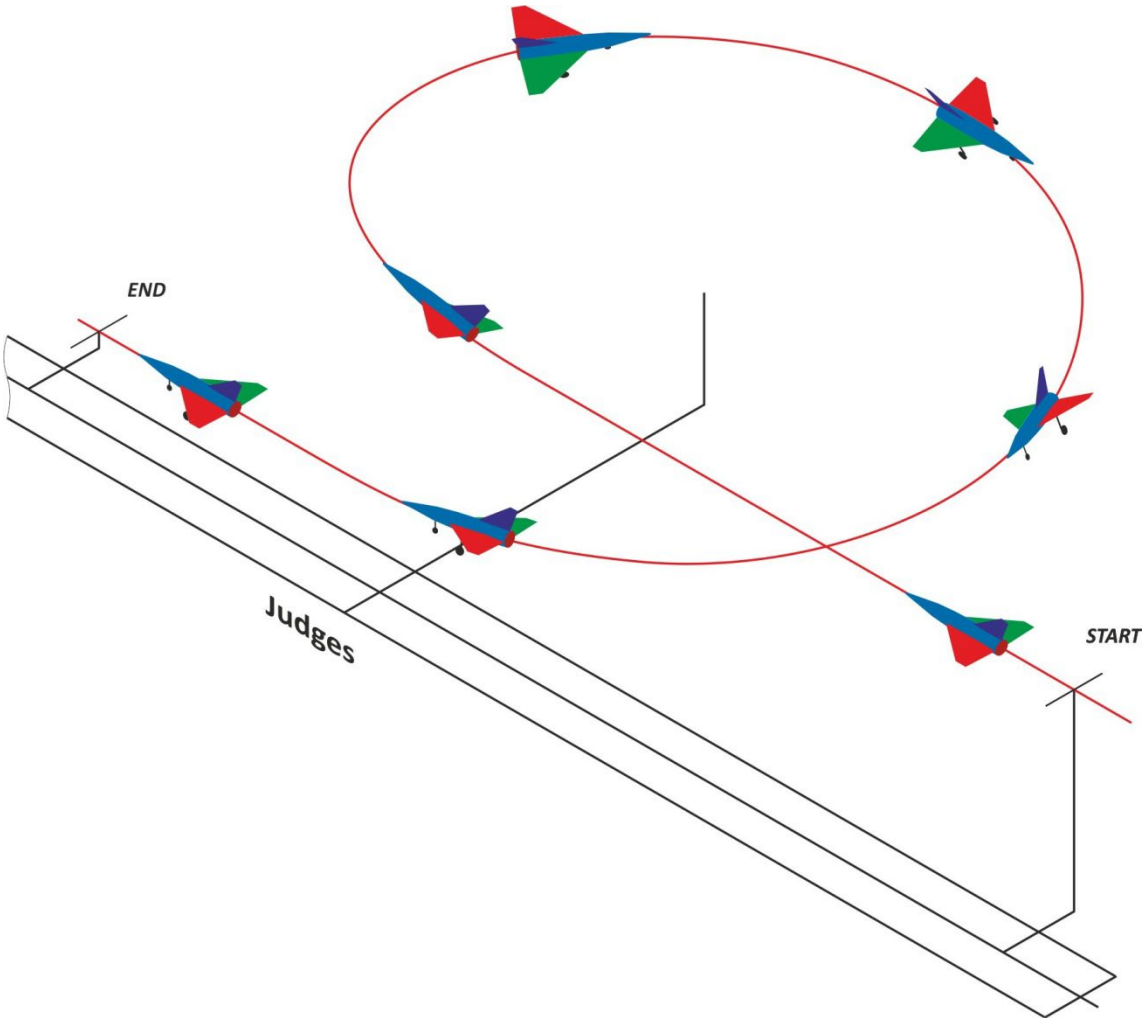
(57) 360 degree descending circle (all types) - Commencing from straight and level flight at height, parallel with and beyond the runway, "Start" is called and from the judge's centreline the model performs a gentle 360 degree descending circle, in a direction away from the judges, at a low throttle setting. The manoeuvre terminates on the judge's centreline at a maximum height of 5 meters, resuming straight and level flight on the same path as entry until after "End" has been called.



Errors:

- *Rate of descent not constant*
- *Descent too steep*
- *Throttle setting not constant or low enough*
- *Circle misshapen*
- *No significant loss of height*
- *Model does not descend to 5 meters or below*
- *Circle not centred on judge's centreline*
- *Entry and exit paths not parallel with the runway*
- *Failure to call Start and/or End on approaching and having completed the circle*
- *Manoeuvre too far away, too close, too high or too low*

(58) 360 degree descending circle with gear extension (all types) - Commencing from straight and level flight at height, parallel with and beyond the runway, "Start" is called and the model performs a gentle 360 degree descending circle, in a direction away from the judges, at a low throttle setting while deploying the undercarriage. The manoeuvre terminates at a maximum height of 5 meters, resuming straight and level flight on the same path as entry with the undercarriage kept fully extended until after "End" is called.

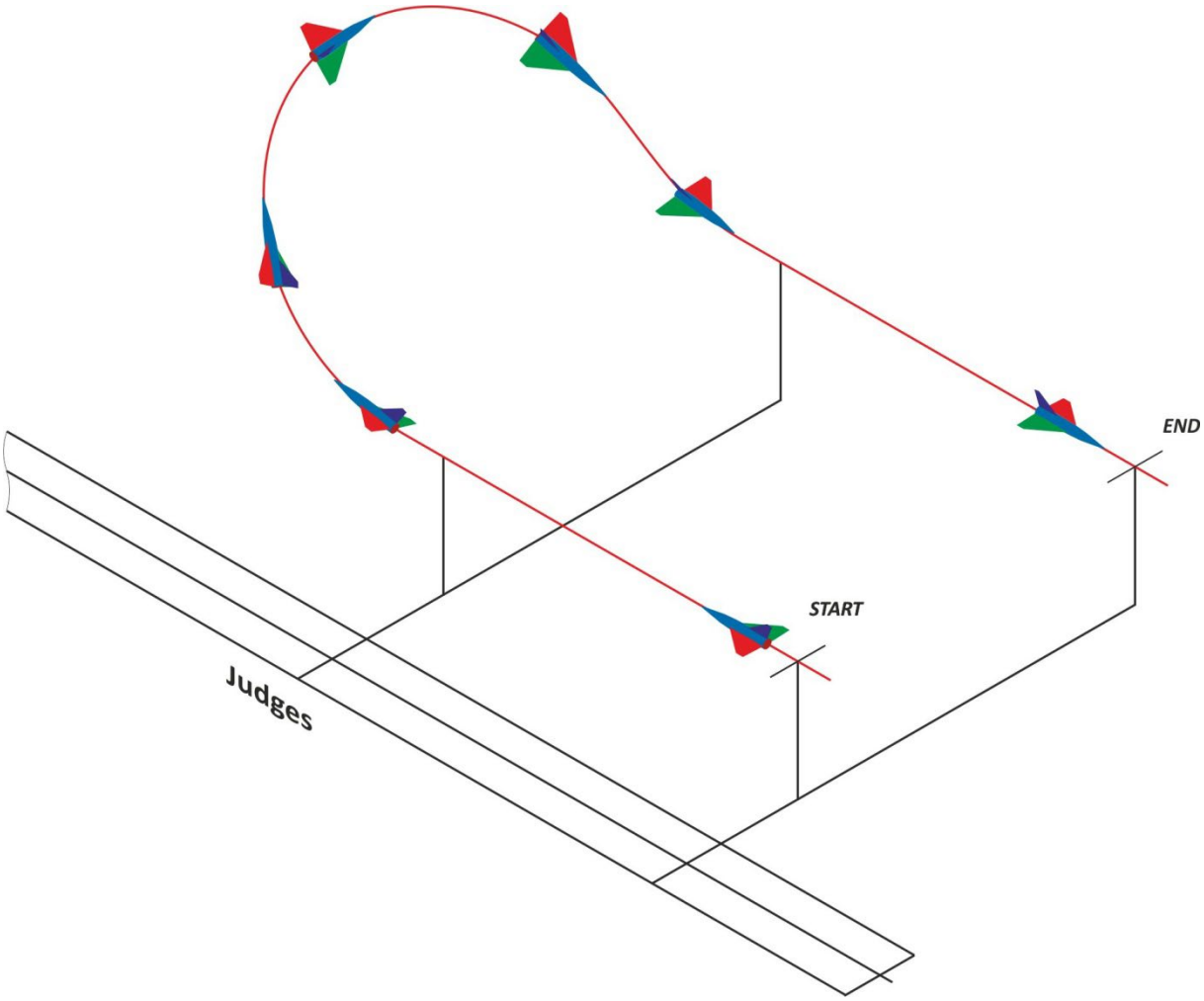


Errors:

- *Rate of descent not constant*
- *Descent too steep*
- *Throttle setting not constant or low enough*
- *Circle misshapen*
- *Undercarriage deployment not as defined*
- *No significant loss of height*
- *Model does not descend to 5 meters or below*
- *Circle not centred on judge's centreline*
- *Entry and exit paths not contiguous or parallel with the runway*
- *Failure to call Start and/or End during straight and level flight*
- *Manoeuvre too far away, too close, too high or too low*

Group 6

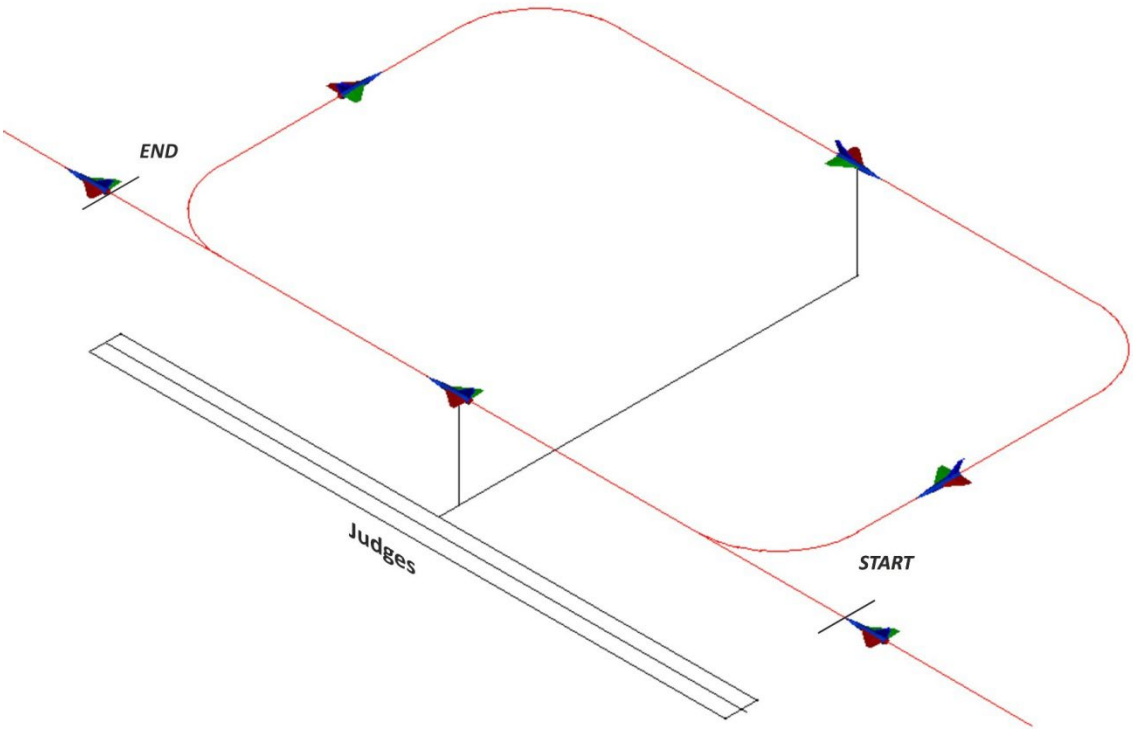
(61) Wing over max 45° bank angle (non aerobatic only) - The model approaches in straight and level flight on a line parallel with and beyond the runway and "Start is called. After passing the judge's centreline the model pitches up into a smooth climbing turn away from the judges. At the apex of the turn, the model should track 90 deg. to the runway and the bank angle should be appropriate for the subject aircraft. The height gain should be appropriate to the capability of the subject aircraft. The model then continues on a mirror image of the entry flight path and recovering to straight and level flight when reaching the judge's centreline at the same height but on the opposite heading to the entry and on a line parallel to the runway but displaced away from the judges and passing the judge's centreline before "End" is called.



Errors:

- *Start and finish positions not as indicated*
- *Insufficient climb achieved*
- *Bank angle exceeds 45° and/or not appropriate for subject aircraft*
- *Climb and descent angles not equal throughout manoeuvre.*
- *Model does not fly a smooth and symmetrical arc.*
- *Entry and exit paths not parallel with runway*
- *Overall size of manoeuvre not realistic for prototype*
- *Model flight path not smooth and steady*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

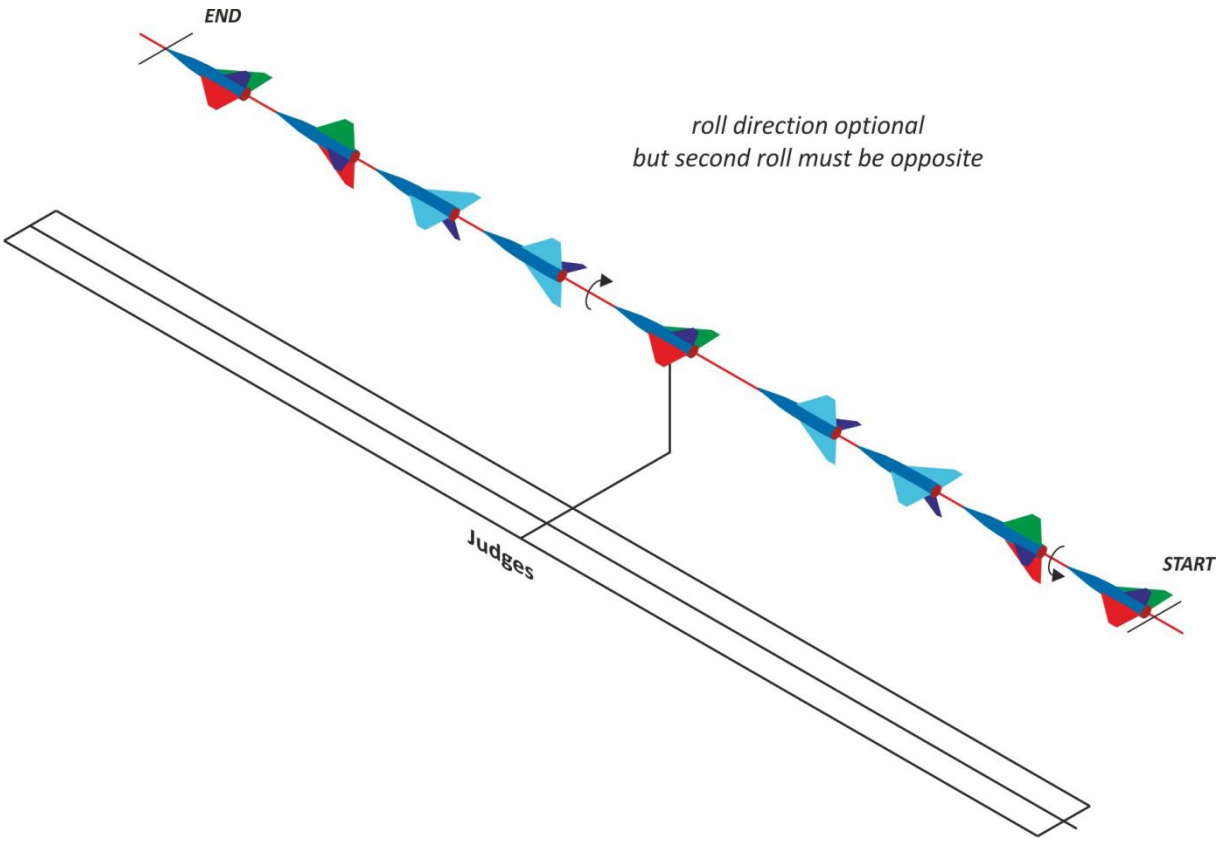
(62) Flight in Rectangular Circuit (non aerobatic option only) - Parallel to and beyond the runway "Start" is called as the model approaches the judge's centreline in straight and level flight at an appropriate height from which point the model flies a rectangular circuit approximately 300 meters long with crosswind legs of approximately 150 meters and 90 decree banked turns at the four corners to resume straight and level flight on the same heading and at the same altitude as entry calling "End" after passing the judge's centreline.



Errors:

- *Model changes height during manoeuvre*
- *Rate of turn at corners not constant and in keeping with prototype aircraft*
- *Angular differences between the 90 degree turns*
- *Sides of rectangular circuit not straight*
- *Opposite sides of rectangular circuit not equal in length*
- *Sides of rectangular circuit are too short*
- *Correction for drift not properly made*
- *Rectangular circuit not centred on judge's centreline*
- *Entry and exit paths not contiguous and parallel with runway*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

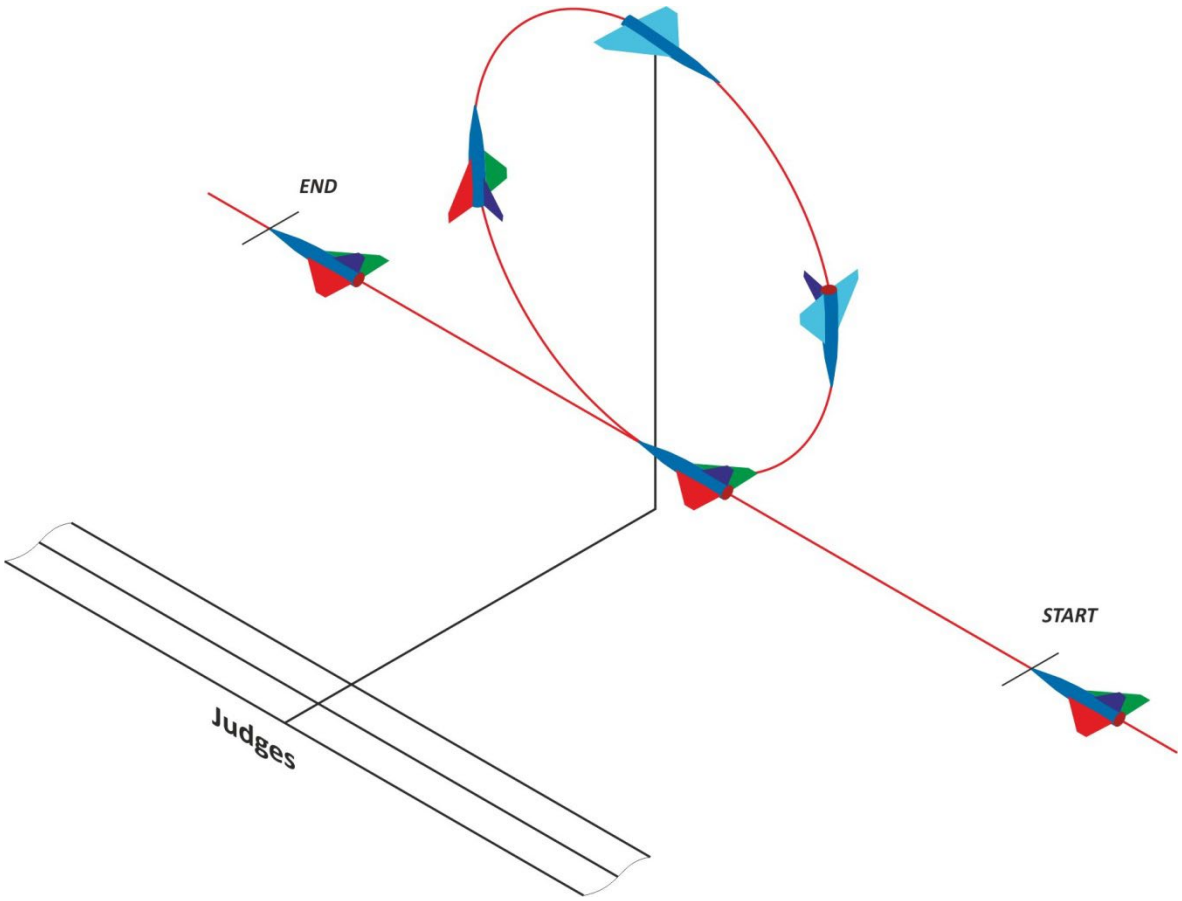
(63) Two Axial Horizontal Rolls, one in each direction (aerobatic only) - commencing from straight and level flight, parallel to and beyond the runway at an appropriate height "Start" is called and the model rolls at a constant rate through one complete rotation and, centred on the judges, immediately rolls in the opposite direction at the same constant rate, resuming straight and level flight on the same heading before calling "End".



Errors:

- *Rate of rolls not constant*
- *Style of rolls not typical of the prototype*
- *Rolls not centred on judge's centreline*
- *Either roll not a complete 360 degrees*
- *Entry and exit at different heights or speeds*
- *Entry and exit paths and line of rolls not contiguous and parallel with runway*
- *Rolls not horizontal*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

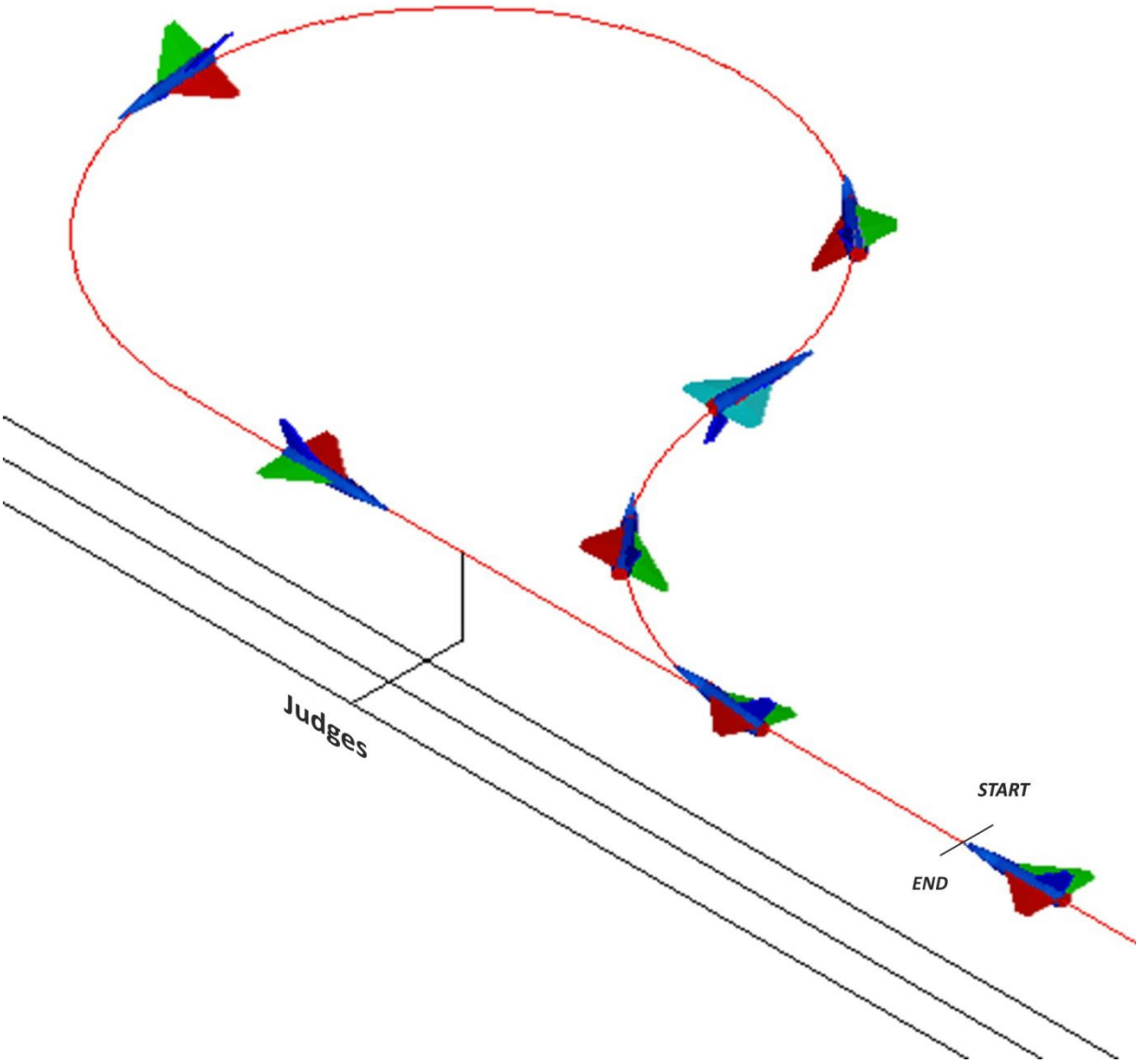
(64) One Inside Loop (aerobatic only) - commencing from straight and level flight at a safe height, parallel to and well beyond the runway the model executes a 360° circle in a vertical plane centred on the judge's centreline, and resumes level flight at the same altitude, and on the same track and heading as it started.



Errors:

- *Plane of loop not vertical*
- *Loop not round or in keeping with the prototype*
- *Inappropriate use of throttle*
- *Size and speed of manoeuvre not in the manner of the prototype*
- *Manoeuvre not centred on the judge's centreline*
- *Entry and exit paths not contiguous and parallel with runway*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

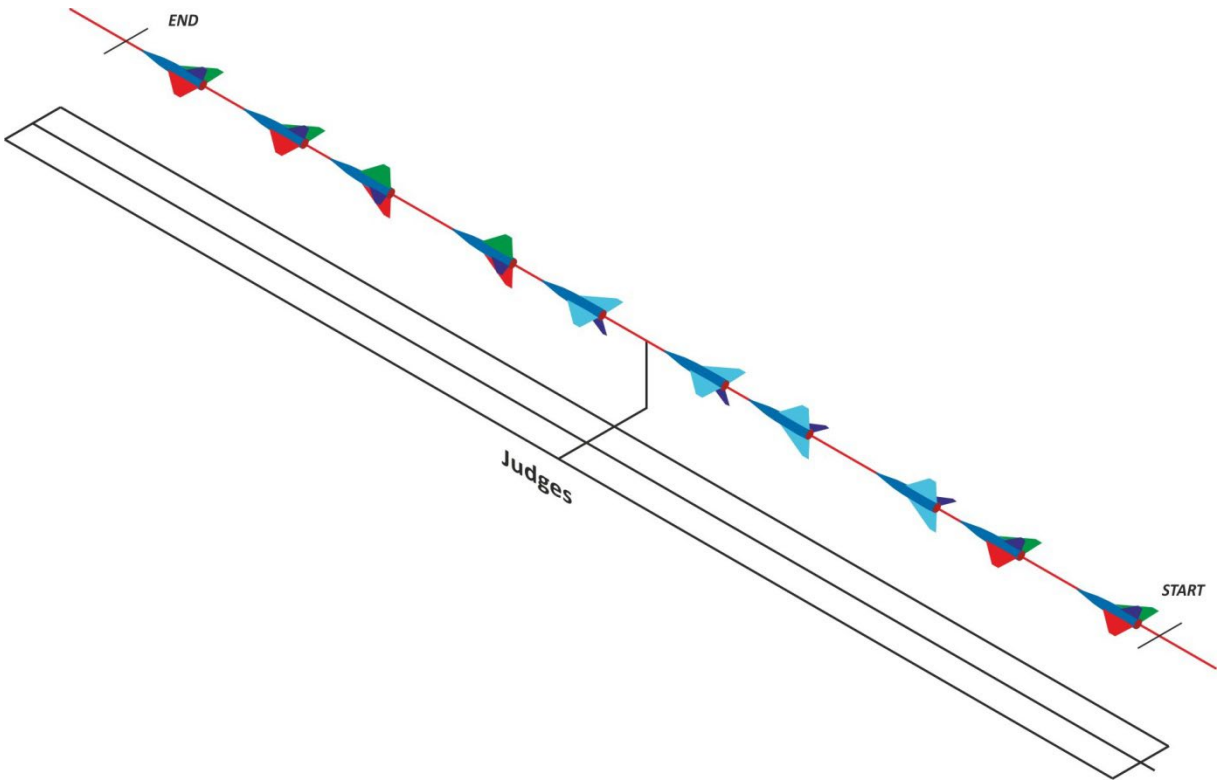
(65) Derry Procedure Turn (aerobatic only) - the model approaches in straight and level flight, parallel to and beyond the runway at a safe height "Start" is called and the model makes a one quarter circle horizontal turn in a direction away from the judges. After the end of this quarter circle immediately turn the model about 3/4 rolls in the direction of the turn. The model continues to enter a 270 degree circle horizontal turn in the opposite direction. The model will stop rolling when upright and banked in the direction of the turn reaching horizontal flight before the judges' centreline after which "End" is called. The manoeuvre ends on the same altitude and on a reciprocal heading to the start.



Errors:

- *Entry into the 270 degree turn not at right angles to original flight path*
- *270 degree turn not at a constant radius*
- *Variations in roll rate*
- *Constant height not maintained*
- *Transition not centred on judges centreline*
- *Entry and exit paths not contiguous and parallel with runway*
- *Overall size of manoeuvre not realistic for prototype*
- *Model flight path not smooth and steady*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

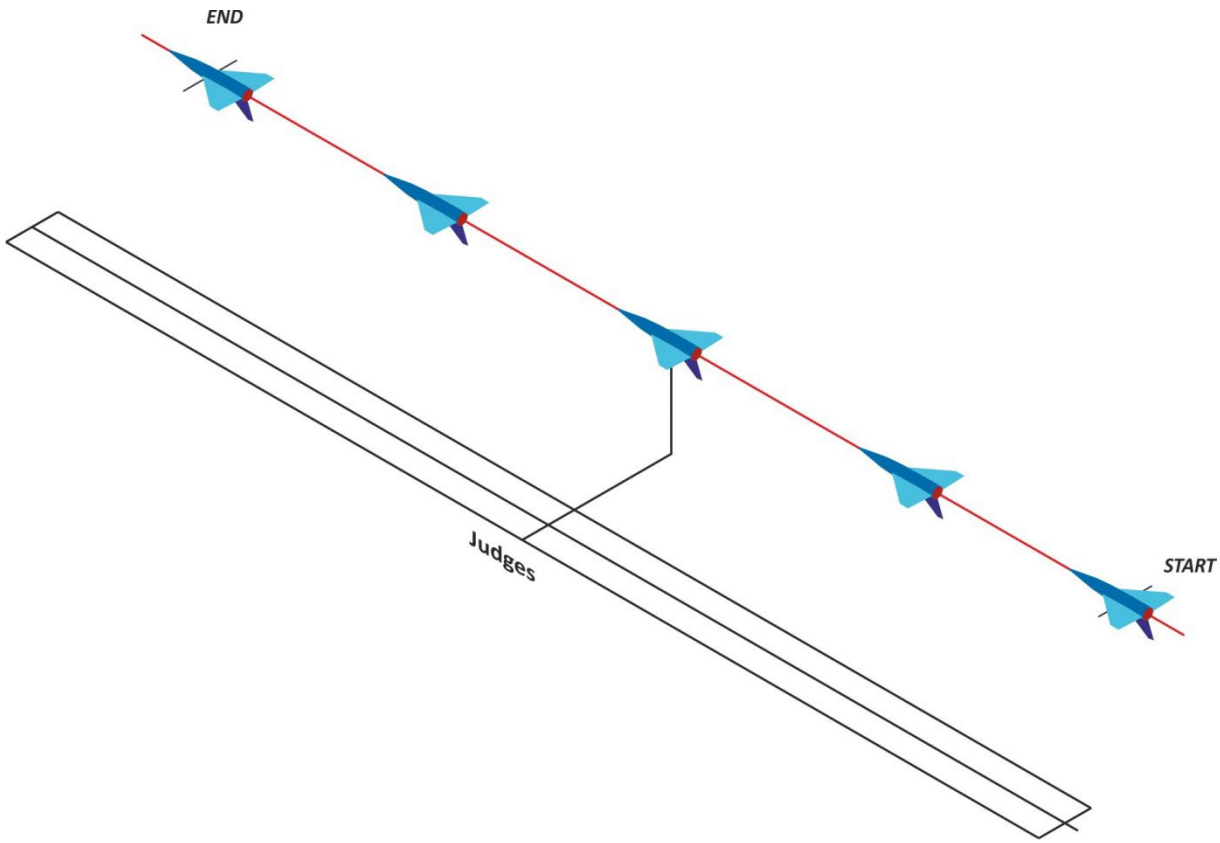
(66) 4-Point Roll (aerobatic only) - commencing from straight and level flight, parallel to and beyond the runway at a safe height "Start" is called and the model rolls at a constant rate through four complete quarter rotations centred on the judges, hesitating at each of three equally spaced intervals, to resume straight and level flight on the same heading and at the same height as entry before "End" is called. This manoeuvre should be performed horizontally.



Errors:

- *Rate of roll not constant*
- *Style of roll not typical of the prototype*
- *Roll not centred on judge's centreline*
- *Entry and exit at different heights or speeds*
- *Entry and exit paths and that of the roll not contiguous and parallel with runway*
- *Style of roll not nominated*
- *One or more of the quarter rolls deviates from 90 degrees*
- *Hesitations between each quarter roll of different lengths*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

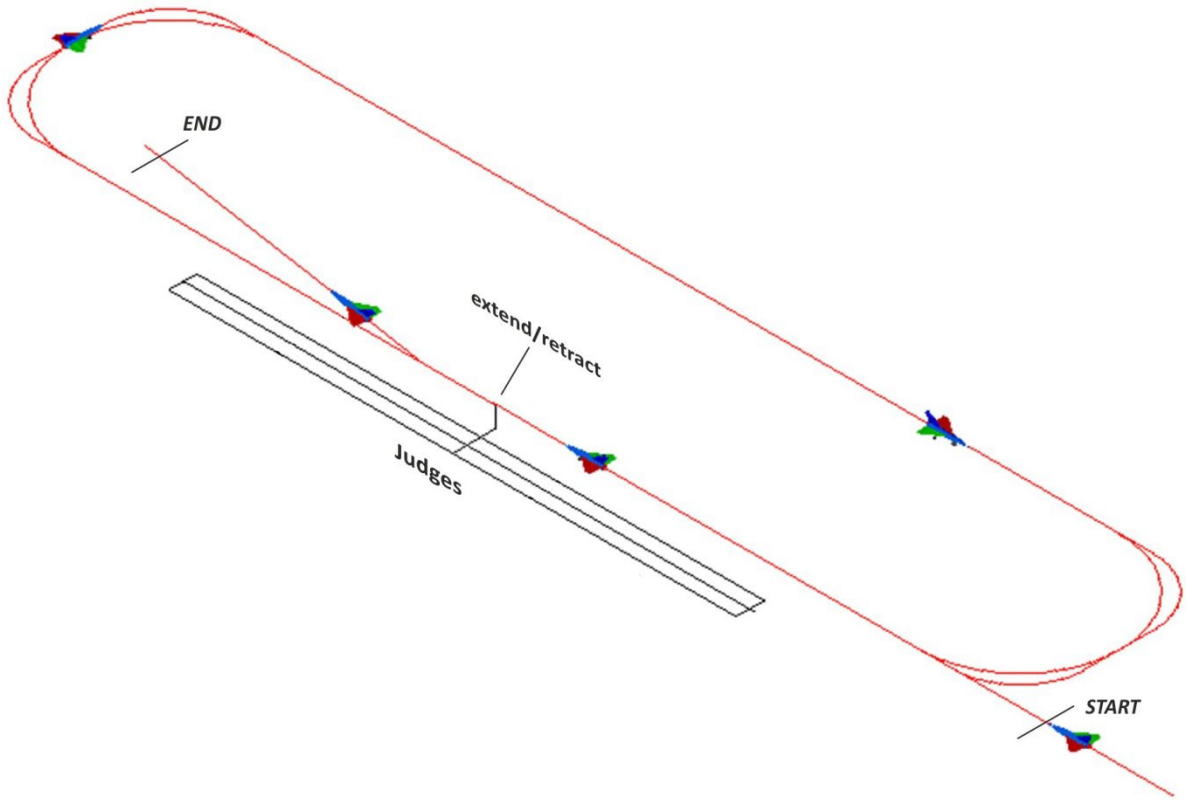
(67) Inverted flight (aerobatic only) - The model approaches parallel with and beyond the runway at a safe height in straight and level inverted flight, "Start" is called before entering a fly-by for a duration of 5-10 seconds. Upright flight is not resumed until "End" has been called.



Errors:

- *Model not fully inverted before "Start" is called and/or rolled to upright before "End"*
- *Track not straight*
- *Height not constant*
- *Start and finish not called in straight and level flight*
- *Manoeuvre not centred on judge's centreline*
- *Manoeuvre too short in time*
- *Model's flight not smooth and steady*
- *Entry and exit paths and line of inverted flight not contiguous or parallel with the runway*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*

(68) Extend and Retract Landing Gear (all types) - commencing from straight and level flight, parallel to and beyond the runway at an appropriate height "start" is called and, at reduced speed in straight and level flight the landing gear is extended in front of the judges. The model then turns away from the judges and completes a circuit at constant height, retracting the landing gear when again on track in front of the judges, soon after which the model climbs away with increased power on a constant track and climb angle for approximately 5 seconds, parallel to the runway.



Errors:

- *Model speed too high for landing gear extended*
- *Landing gear not extended or retracted in full view of the judges*
- *Speed and sequence of extension and retraction not realistic*
- *Model unstable when landing gear is extended and/or retracted*
- *Change in attitude with landing gear extended not in keeping with the prototype*
- *Misshapen circuit or height not constant*
- *Circuit not centred on judge's centreline*
- *Entry and exit paths not contiguous and parallel with runway*
- *Manoeuvre lacks scale realism (e.g. climb-out)*
- *Failure to call Start and/or End*
- *Manoeuvre too far away, too close, too high or too low*