

5. Size and speed of Loop not in manner of prototype.
6. Not centered on judges' position.
7. Does not resume straight and level flight on same track and height as entry.
8. Maneuver not flown parallel with judges' line.

### 3.3 SLOW SPEED "DIRTY" INSPECTION PASS - (optional "maneuver combination"):

The Slow Speed "Dirty" Inspection Pass maneuver is the only maneuver combination permitted where flaps, slats, and retracts shall dilute piloting Placement, Precision, and Realism content in scoring. The pilot must demonstrate the ability to smoothly coordinate the aircraft into and out of this high-drag and reduced-stall-speed configuration employing the applicable "dirty" scale operational features. The maneuver must be remarkably slower than the mandatory fly-by during which time the *minimum scale operation feature of flaps* must be *fully* deployed and (if applicable) slats and retracts must also be deployed for optimum "dirty qualities" in pilot Precision and Realism content. The 300 foot fly-by positioning will be the same as the mandatory fly-by maneuver (including direction) except elevation shall be doubled (20 to 40 feet) for safety purposes. The maneuver will also include a prolonged transition entry for deployment of the "dirty features", and the exit for "clean-up" while speed is again increased. It is the latter clean-up transition that particularly makes this maneuver unique in skill since full flaps are not required on takeoff. For more detailed descriptions of the Slow Speed "Dirty Inspection Pass, see the USSMA Competition Guide, pages 25 and 26, and the AMA Regulation Guide, Para. 4.3.26, "Slow Speed Inspection Pass", page 174.

### 3.4 WINGOVER (Aerobatic):

Model starts in level flight and noses up to the near vertical attitude, at which time it is flown through a 180-degree arc, using rudder to end up on a near vertical dive. Throttle should be closed at this point and the model pulls out of the dive at the same altitude as the entry on a parallel path, but on a 180-degree opposite heading.

### FAULTS

1. Model not level at start
2. Model rolls left or right during pull-up
3. Model tucks under a wing during 180-degree turn
4. Throttle not closed during dive
5. Return path not parallel to entry
6. Recovery not at same altitude as entry

Model does not fly straight and level to complete the maneuver

## *US SCALE MASTERS FLIGHT MANEUVERS*

*Ver.2010.1a*

Compiled by Chuck Maitre



### Flying In A Scale Masters Qualifier

The intent of the flying portion of a Scale Masters qualifier is to determine the pilot's ability to fly the model aircraft in the most realistic manner possible. Scale Masters emphasizes maneuver combinations where mechanical operations (flaps, bomb drop, & retracts) must be combined with a flying maneuver to enhance realism. Scale Masters also recommends that a theme or mission be established in choosing flight maneuvers so the flight routine's order is easier to track by judges and is more pleasing to watch.

The emphasis of the flying portion of a contest is placed on scale realism, so the chosen aircraft type will determine the maneuvers parameters such as speed, geometry, and positioning with respect to the judges centerline, so, contestant beware. Contestants should indicate aircraft type and be designated either Aerobatic capable or Non-Aerobatic by checking the appropriate box on the flight score sheet.

Each maneuver starts with a score of 10 points and the Flight Judge will deduct for errors noted during the execution of the maneuver. Errors include mismatches noticed in Placement, Precision and Realism for each maneuver. The content elements are scored to the nearest 1/2 point.

Maneuver Scoring Content: Maneuvers and "maneuver combinations" with scale operations are scored for three basic content considerations as listed below.

1. Placement Content (2.5 pts.) Most in-flight maneuvers (including those with droppables) will optimally be placed directly in front of the judges (judges centerline) beginning on the far side of the active runway (maneuvering line).

2. Precision Content (5 pts.): The pilot's ability to perform the defined maneuver geometry, and when applicable, the mechanical Precision of scale operation features within a "maneuver combination".

2.1. Maneuvers with horizontal symmetry (Cuban Eight, Loop, Roll, Figure 8, etc.) should have their midpoint on the judges' centerline with equal distance on each side for optimal score.

2.2. Some maneuvers due to their asymmetry are offset from judging center for best viewing, such as a Stall Turn, Chandelle or Wingover.

3. Realism Content (2.5 pts.): The Realism content of the score is based upon the pilot's skill to perform only those maneuvers capable of the full size aircraft in a manner as if watching the prototype in actual flight. The size, shape, and speed of aerobatic maneuvers performed by a contestant should reflect the capabilities of the full size prototype.

### 3.1 TRAFFIC PATTERN APPROACH:

The traffic pattern maneuver may be elected as an option for any aircraft. It may be performed as a standard rectangular pattern as described by the AMA or with other prototypical described Navy methods such as with a semicircular 180 degree pattern replacing the last 90 degree crosswind leg before final approach. The initial part of a traffic pattern entry may also be revised for applicable prototypical tactics to minimize exposure of attack in military aircraft. This may include a low entry approach on the far side of the defined runway and a notably climbing pitch out away from the judges into a 180 degree turn, during which retracts (if applicable) are initiated in extension and continued into the downwind leg. This shall be followed by a rectangle or semicircle entry to final approach. Traffic pattern variations must be briefly described to judges prior to flight. Only one traffic pattern maneuver option variant may be chosen in a flight, *unless further choosing the AMA described "Side Slip" on a separately judged final approach performance.*

If any one of these traffic pattern options is chosen, it will include the final approach to landing in alignment to the runway down to the flare preceding the landing. At this time the landing maneuver content scoring would immediately begin. The descent may initially begin in the final cross wind leg (or semicircle) and shall continue through a straight final approach descending to the runway. This option effectively delays the starting point of the mandatory-landing maneuver to the point at which flare begins.

If flaps, slats, and (or) retracts are prototypical features of the aircraft, they must be timely deployed for optimum Overall Flight Realism scoring. Retracts shall be deployed in the downwind leg for the standard rectangular traffic pattern. Flaps (and slats) shall be deployed initially either in the downwind leg or in the final crosswind (or semicircle) and progressively increased thereafter as may be prototypical to the aircraft. This maneuver shall not be classified as a "maneuver combination" to dilute pilot Placement or Precision with scale operations. The failure of anticipated prototypical scale operation(s) to timely deploy will be downgraded for lack of "OPTION Precision" and "Continuity" for that portion of Overall Flight Realism score.

### 3.2 PROCEDURE TURN:

This individual maneuver may be done by any aircraft similar to that described by the AMA rules. However, it shall not include the straight-flight entry or exit as additional scored options. The Procedure Turn is positioned in the Scale Masters Program where the initial 90 degree turn away from the runway begins *before* reaching judging center, and the remaining 270 degree turn optimally starts at judging center to the left or right. (NOTE: This is identical in desired position as the start of the mandatory figure eight for optimum judging view.)

#### FAULTS:

1. Maneuver does not begin or end in level flight.
2. Wings are not level throughout the maneuver.
3. Loop is not sufficiently circular (or elliptical), commensurate with the aircraft type.
4. Inappropriate use of throttle.

**SNAP ROLL-OUTSIDE:** This maneuver should be performed in a similar manner to the Inside Snap Roll except that, as the break occurs, the nose of the aircraft moves away from the direction of the pilot's cockpit indicating that a stall was induced by the application of down elevator.

**SLOW ROLL – INSIDE:** This type of roll is done for the approximate length of the flight line.

#### **FAULTS:**

##### **Civilian Barrel Roll:**

1. Roll rate is not constant.
2. Aircraft does not finish maneuver on same heading and/or altitude as the entry.
3. Maneuver is not centered on judges' position.
4. The barrel roll orbit is not big and fat like a beer barrel.

##### **Snap Roll – Inside and Outside:**

1. Aircraft does not begin and end in level flight.
2. Wing does not stall during roll.
3. Roll is not terminated precisely after 360 deg. rotation.
4. Aircraft does not exit from the maneuver on the same heading as the entry.
5. Roll not centered on judges' position.

##### **Slow, Axial, Vintage, Etc. Rolls:**

1. Aircraft does not begin and end in level flight.
2. Roll rate is not constant.
3. Roll not centered on judges' position.
4. Aircraft does not finish maneuver on same heading and/or altitude as the entry.
5. Style of roll not as nominated.
6. Inappropriate use of throttle.
7. Too far away/too close/too high/too low.

##### **Military Rolls (Victory, Swing Wing axial rolls, Etc).**

I leave the descriptions and faults of these roll variations to your research and imagination.

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#### **Flight Maneuvers**

A Scalemasters contestant must perform five mandatory maneuvers (includes Overall Flight Realism) and five Optional maneuvers.

##### **1. Mandatory Maneuvers:**

- 1 Takeoff
- 2 Fly Past
- 3 Figure 8
- 4 Landing
- 5 Overall Flight Realism - (An objective summary base on 3 questions):
  - 5.1 Continuity of Flight
  - 5.2 Options Selected or Demonstrated
  - 5.3 Power Management

##### **2. Optional Maneuvers (w/Graphics):**

1. 360 Degree Descending Circle
2. Chandelle
3. Cuban 8
4. Derry Turn
5. Immelman Turn
6. Lazy Eight
7. Missed Approach
8. "N" Turns Spin
9. Side Slip
10. Split "S"
11. Stall Turn
12. Touch and Go
13. Wing Over (Non-Aerobatic)
14. Avalanche
15. Loop Variations
16. Roll Variations

##### **3. Optional Maneuvers (w/o Graphics):**

1. Traffic Pattern Approach
2. Procedure Turn
3. Slow Speed "Dirty" Inspection Pass
4. Wing Over (Aerobatic)

Where deemed applicable, a short description of the AMA maneuver description is appended to a maneuver and is identified as: **AMA xxxxxxxx Maneuver Description Differences:**

The maneuvers so identified are:

1. Take Off
  2. Fly Past
  3. Landing
  4. Touch-and-Go
-

### A Few Words on Judges:

Judges truly understand the physics and/or the mechanics involved with maneuver performance. This point might be more easily appreciated when describing and executing a Reversal or "Split S". The text clearly states "in other words", after the aircraft reduces throttle, it performs a  $\frac{1}{2}$  roll, "then" it pulls through a half loop ending with the airplane in a 180 degree heading from entry to the maneuver. The number one fault and one which is often graced or actually overlooked is pilots that "fall out of" the  $\frac{1}{2}$  roll and execute the  $\frac{1}{2}$  loop to a heading which may or may not be 180 degrees from that of maneuver entry. This with, or without reducing the throttle then resuming proper throttle to resume airspeed at entry to the maneuver. Something as simple to execute as a "Split S" is typically the greatest downgrade from knowledgeable judges. So, don't underestimate flight judges! They know.

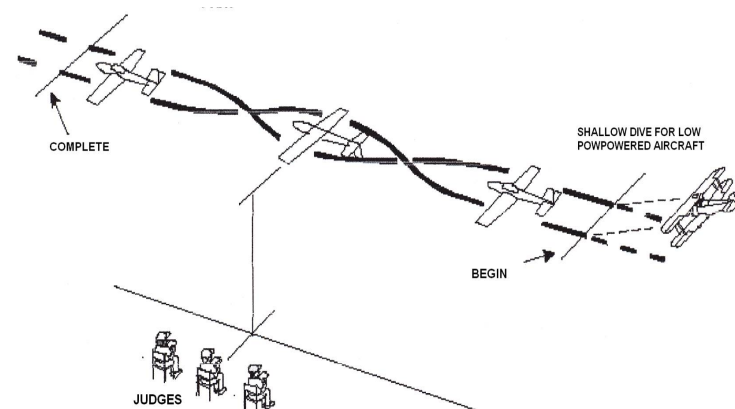
### Maneuvers:

The following pages comprise the scale maneuvers most often executed and are as described in the 2010 USSMA Competition Guide or in the AMA 2009-2010 Regulations Guide. It is recommended that these documents be obtained and thoroughly read. The AMA Regulations Event 512 and 522, and especially the Radio Control Scale Flight Judging Guide section contain the maneuver descriptions. The more advanced maneuver descriptions are to be found in these documents as well.

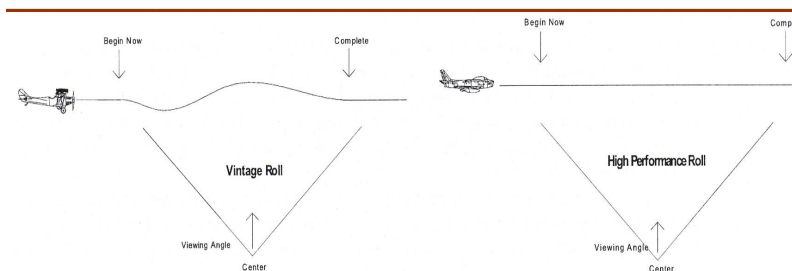
Each maneuver is self-contained and is comprised of a graphic representation, a description of the maneuver and execution faults. Four maneuvers do not contain graphic representations.

SO, get yourself a scale airplane and start practicing the mandatory and some optional scale maneuvers that are representative of your aircraft. Develop a theme or mission and choose flight maneuvers that best present your airplane. Always try to present the airplane to the judges such that it emulates at all times during your flight, the real airplane.

### 2.16 ROLL VARIATIONS



From straight and level flight, the aircraft rolls at a constant rate through one (1) complete rotation and resumes straight and level flight on the same heading. Non aerobatic or low powered aircraft would be expected to execute a shallow dive at full throttle before the maneuver. The contestant should nominate which type of roll that will be performed, e.g. *Slow, Barrel, Axial, Snap, and Vintage*.



**CIVILIAN BARREL ROLL:** The maneuver should begin with a shallow dive at full throttle to pick up speed, the nose should then pull up and the aircraft begins what appears to be a climbing turn. Continued application of ailerons in the turn will roll the aircraft which when inverted, may be as much as 90 deg. off its original heading. No down elevator is applied in the inverted position so the nose will fall as both turn and roll continue until the aircraft returns to the upright position at the same altitude and on the same heading as the entry. The barrel roll orbit should be big and fat like a beer barrel.

**SNAP ROLL-INSIDE:** The maneuver begins in level flight and as the nose is pulled up to the point where the wing will stall, rudder is applied to roll the model in the desired direction. The nose of the aircraft should break the line of flight in a direction towards the pilot's cockpit, indicating that a stall has occurred. *Roll rate should not be a factor in judging.* The roll should stop precisely when the aircraft is again upright and the maneuver should be completed in straight and level flight.

**-OVER-**



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#### INSIDE LOOP:

From straight flight, the aircraft pulls up into a circular loop and resumes straight and level flight on the same heading as the entry. The throttle should be cut back at the top of the loop and opened when normal flight is resumed. Non aerobatic or low powered aircraft types would be expected to execute a shallow dive at full throttle in order to pick up speed before commencing the loop.

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#### OUTSIDE LOOP:

Starting in level flight, the model noses down to perform a smooth, round, outside loop which is completed when the model regains its starting altitude and exits in level flight on the same heading as the entry. The throttle should be closed at entry and should be opened after completion of the first half of the loop when the model is inverted and is at a point closest to the ground.

---

#### VINTAGE LOOP:

The maneuver should begin with a shallow dive at full throttle to pick up speed. The aircraft then pulls up into a smooth elliptical loop and resumes straight and level flight on the same heading as the entry. The throttle should be cut back at the top of the loop and opened when normal flight is resumed.

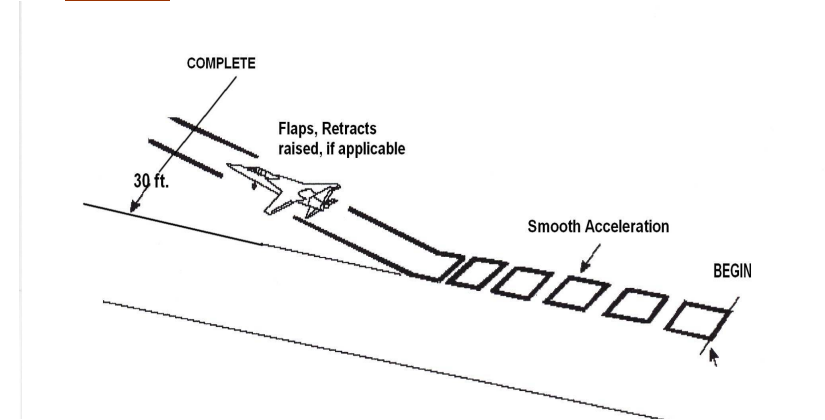
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#### FAULTS:

1. Maneuver does not begin or end in level flight.
  2. Wings are not level throughout the maneuver.
  3. Loop is not sufficiently circular (or elliptical), commensurate with the aircraft type.
  4. Inappropriate use of throttle.
  5. Size and speed of Loop not in manner of prototype.
  6. Not centered on judges' position.
  7. Does not resume straight and level flight on same track and height as entry.
  8. Maneuver not flown parallel with judges' line.
  9. Too far away / too close / too high / too low.
- 

### 1.0 Mandatory Maneuvers:

#### 1.1 TAKE OFF



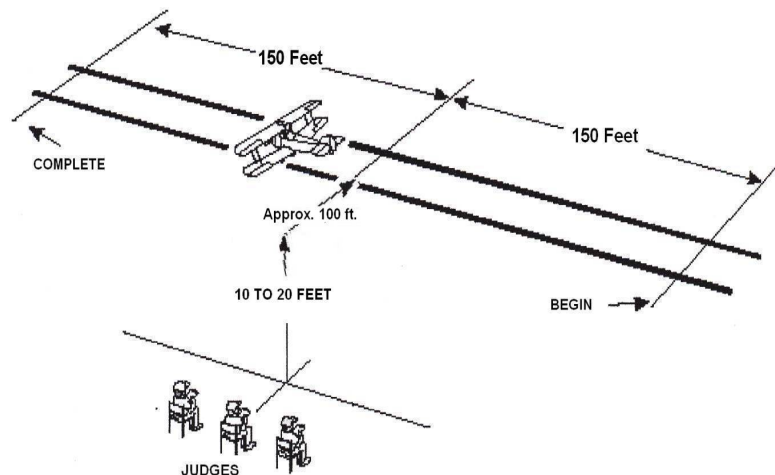
The Take Off maneuver shall be scored after heading position is initially established with a brief hesitation near the centerline of the active runway. A full stop may be made, but is not required between the end of the taxi and the beginning of takeoff. The contestant must announce that "Take Off maneuver is starting now" prior to starting the takeoff roll. For optimum scoring, the roll must be parallel and in close proximity to lengthwise centerline of the runway. The roll distance and tracking prior to lift-off should be realistic in scale to that of the full size aircraft. During climb out, the wings should remain reasonably level with original heading maintained. The takeoff optimum heading and prototypical ascent angle should be maintained to an elevation of at least 30 feet to complete the maneuver prior to making the initial turn away from the flight line. For maximum points, any scale operation that was required by the prototype to perform its normal takeoff should be used by the model but are not required for most available runway lengths.

#### FAULTS:

1. Aircraft swings on takeoff.
  2. Takeoff run too long or too short.
  3. Unrealistic speed / too rapid acceleration.
  4. Not a smooth liftoff
  5. Climb rate wrong (too steep or shallow).
  6. Flaps, gear not used / raised, if applicable.
  7. Significant wing drop.
  8. Climb out track not same as takeoff run
- 

**AMA Take Off Maneuver Description Differences:** Takeoff should be into the wind and should begin with a straight ground run followed by a gentle lift off with a climb angle consistent with that of the prototype. *Takeoff is completed when the model is approximately 10 feet from the ground.* For maximum points, any scale operation that was required by the prototype to perform its normal takeoff should be used by the model.

## 1.2 FLY PAST



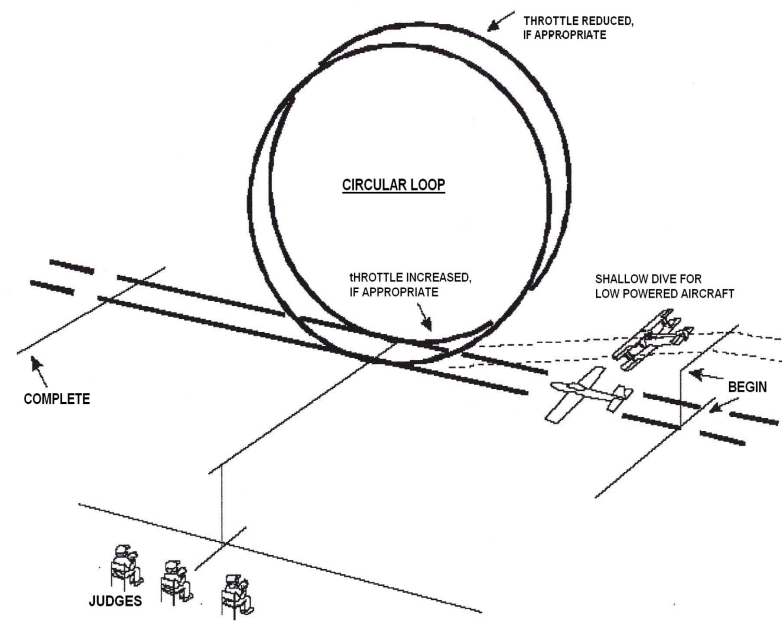
The Fly Past maneuver is flown at a mandatory 10 to 20 foot elevation and will be centered in front of the judges' and located over the maneuvering line, parallel to the "defined runway" width. Direction will be the same as the designated takeoff unless otherwise specified by the CD or Air Boss. Downgrading will also start occurring if the maneuver is too far out beyond the maneuvering line (approx. 100 feet), or in closer than the far side of the defined runway edge. For optimum score, the maneuver should track straight and level over the maneuvering line for at least 300 feet. Elevation and horizontal Placement of this literally "straight forward" maneuver is therefore essential for maximum points.

### FAULTS:

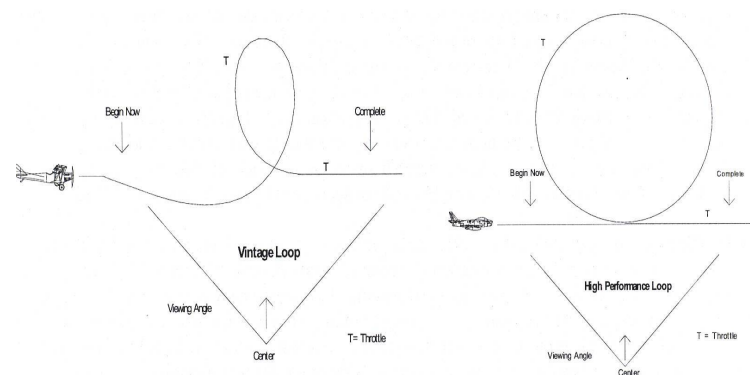
1. Aircraft not flown on a straight course.
2. Aircraft not flown at a constant height.
3. Aircraft not centered on judges' position.
4. Aircraft not flown parallel to the maneuvering (or Judges') line.
5. Aircraft not flown at least 300 feet (over 300 feet not an error).
6. Aircraft flight path not smooth and steady.
7. Aircraft flown too far away, too close, too high, too low.

**AMA Fly Past Maneuver Description Differences:** The midpoint of the maneuver should be opposite the judges. The model shall be flown at the fly-past altitude for at least 5 seconds.

## 2.15 LOOP VARIATIONS

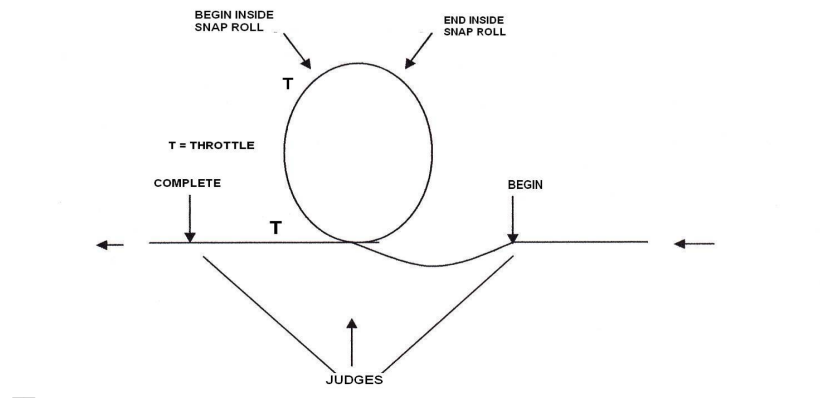


The contestant should nominate which type of loop that will be performed, e.g. Inside, Outside, Vintage, etc. While the loop is intended to be a circular maneuver, the ability of a low powered aircraft to achieve a perfect circle will be less than that of an aerobatic airplane. A slightly elongated loop (a "Vintage loop") by the former would therefore expect to score as well as a circular loop.



**-OVER-**

## 2.14 AVALANCHE



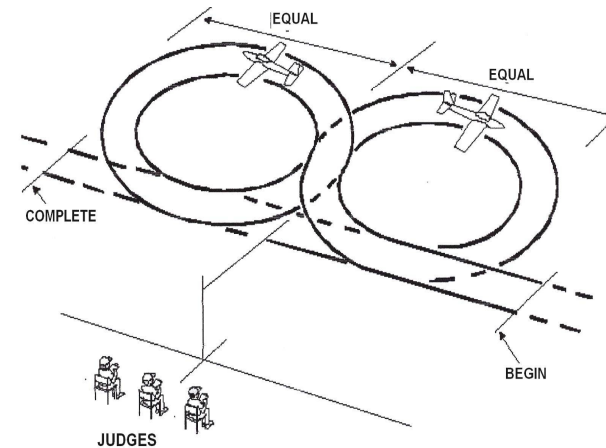
The Avalanche maneuver is basically a Round Loop (or Vintage Loop for low powered aircraft) with an Inside Snap Roll at the top of the loop. *(It's a pretty maneuver to watch).* The maneuver begins with entry from straight and level flight on a line parallel with the judges' line. Low powered aircraft types would be expected to execute a shallow dive at full throttle in order to pick up speed before commencing this maneuver. After passing the judges' position, a loop is commenced and when the aircraft reaches approximately the 11 o'clock position, power is reduced and an Inside Snap Roll is initiated and is completed when the model reaches approximately the 1 o'clock position. The aircraft then completes the loop, and straight and level flight resumes on the heading and altitude as entry. Power is applied during loop completion.

NOTE: One should not attempt this maneuver without first mastering both the Roll and Inside Snap Roll maneuvers.

### FAULTS:

1. Maneuver does not begin or end in level flight.
2. Loop is not sufficiently circular (or elliptical), commensurate with the aircraft type.
3. Throttle not cut just prior to initiation of Inside Snap Roll and opened when normal flight resumes.
4. Size and speed of maneuver not in manner of prototype.
5. Not centered on judges' position.
6. Does not resume straight and level flight on same track and height as entry.
7. Maneuver not flown parallel with judges' line.
8. Inside Snap Roll portion of the maneuver not centered at judges' position.

## 1.3 FIGURE 8

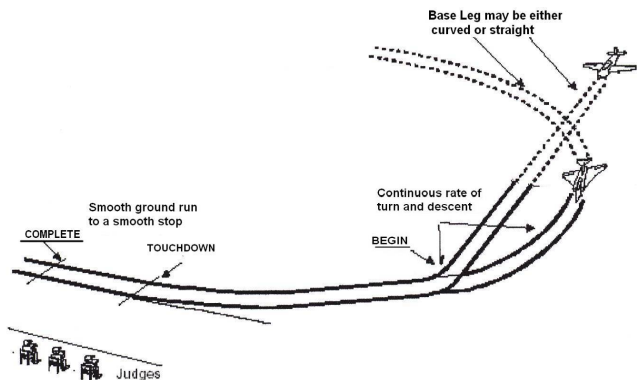


Model approaches in straight & level flight on line parallel with judges' line, & then a 1/4 circle turn is made in a direction away from judges' line. This is followed by a 360-degree turn in the opposite direction, followed by a 270-degree turn in the first direction, completing the maneuver on original approach line. The intersection (mid point) of the maneuver shall be on a line that is at right angles to the direction of entry and passes thru the center of the judges' line.

### FAULTS:

1. Entry into first circle not at right angles to original flight path.
2. Circles of unequal size.
3. Circles misshapen.
4. Constant height not maintained.
5. Intersection not centered on judges' position.
6. Entry and exit paths not on same line.
7. Entry and exit paths not parallel with judges' line.
8. Overall size of maneuver not realistic for prototype.
9. Aircraft flight path not smooth and steady.
10. Too far away/too close/too high/too low.

## 1.4 LANDING



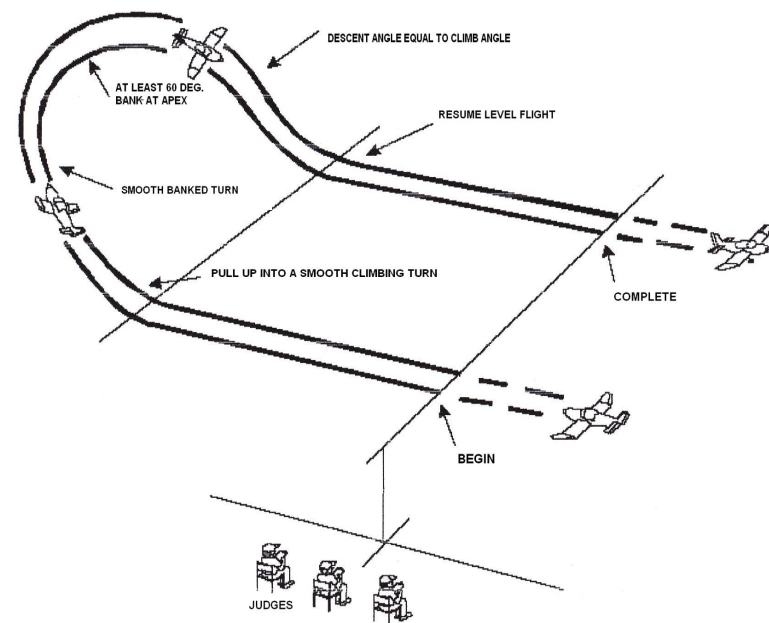
The Landing maneuver will be scored from the time the aircraft enters the final approach to landing, or at the end of an optional Traffic Pattern or Side Slip approach preceding it. In these latter cases, it will start as the model begins to flare. Immediate judging considerations will include optimum alignment to "center line" of the runway and constant rate of descent and flare to touchdown. The optimum point of landing touchdown shall be determined by runway length to permit the necessary safe roll out of the type aircraft flown. Therefore, positioning for touchdown in front of the judges is not required. The judging of roll out and overall landing maneuver is not complete until the aircraft has sufficiently slowed to permit a safe controlled taxi from the active portion of the runway. If flaps, slats, and/or retracts are prototypical features of the aircraft, they must be properly deployed prior to landing for "Overall Flight Realism" qualities.

### FAULTS:

1. Maneuver does not commence when entering final approach, OR
2. At the end of an optional Traffic Pattern or Side Slip approach preceding it.
3. Descent from base leg not smooth and continuous.
4. Aircraft does not maintain a constant rate of descent and flare to touchdown.
5. Aircraft touches down into any area outside of defined runway
6. Aircraft bounces, experiences uncontrollable premature turns after landing.
7. Aircraft noses over or over-turns (a fat zero score! –unless it has a tailskid)
8. Aircraft does not come to a gradual and smooth stop or has not sufficiently slowed after landing to permit a safe, controlled taxi

**AMA Landing Maneuver Description Differences:** The landing maneuver begins either when the model commences to flare at the end of a traffic pattern or, if no traffic pattern is performed, *when the model is at an altitude of 10 feet.* The model should land approximately opposite the judges.

## 2.13 WINGOVER (Non-Aerobatic)

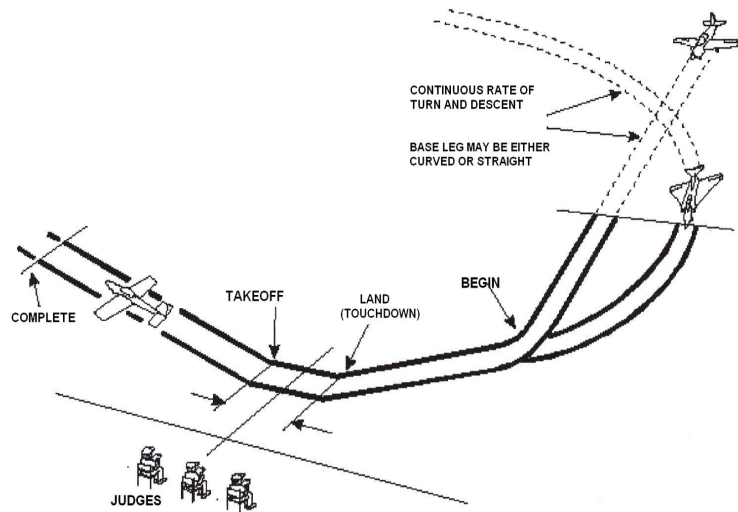


The aircraft approaches in straight and level flight on a line parallel with the judges' line. After passing the judges position, a smooth climbing turn is commenced away from the judges. At the apex of the turn the bank should be at least 60 deg. The nose of the aircraft then lowers and the bank comes off at the same rate as it went on. The turn is continued through 180 deg. to recover straight and level flight at the same height and on a heading opposite to that of the entry. A low powered aircraft would be expected to execute a shallow dive at full throttle to pick up speed before commencing the maneuver. Note also that this is an offset maneuver, providing the judges a clearer view of the maneuver. **NOTE:** This maneuver option may only be nominated for non-aerobatic aircraft. See the Wingover-Aerobatic maneuver for aerobatic aircraft, which is similar to the Stall Turn maneuver.

### FAULTS:

1. Start and finish not centered on judges' position.
2. Insufficient climb achieved.
3. Climb is not smooth and continuous.
4. Insufficient bank achieved.
5. Climb and descent angles not equal throughout maneuver.
6. Aircraft does not fly a smooth and symmetrical arc.
7. Entry and exit paths not in straight and level flight.

## 2.12 TOUCH-AND-GO



The Touch-and-Go option requires the aircraft to slow sufficiently after landing to *below flying speed*, before again accelerating for the "GO" prior to take-off. This does *not* require that the tail wheel or skid settle to the ground for "tail draggers". ALL other qualities expected of landing and takeoff will prevail including the start of this maneuver at the beginning of the final approach. The start of the "GO" maneuver will coincide with the throttle acceleration after previously being slowed. On prototypes so equipped, flaps and retracts would be used on both sides of the maneuver. When coming in, the flaps and gear should be down. When departing, the gear and flaps should be retracted in the same sequential manner as would be expected for a Takeoff (or Slow Speed Dirty Pass). Maneuver should be scored from the time flaps and gear are deployed and finished when gear and flaps are fully retracted again. The maximum score for this maneuver sequence is 20 points (10 points for "TOUCH" and 10 points for "GO"). Each maneuver will be listed on two consecutive lines of the score sheet one as "TOUCH" and the other "GO".

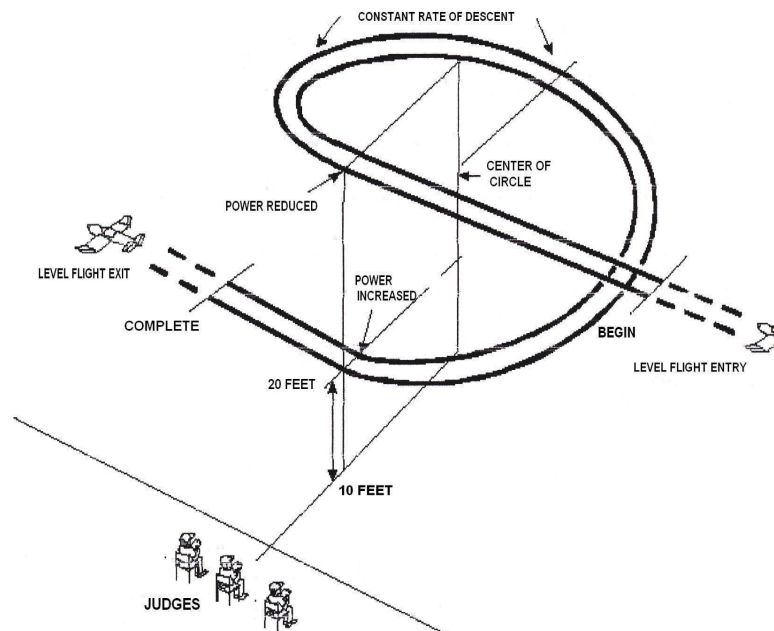
### FAULTS:

1. Maneuver does not commence when entering final approach.
2. Descent from base leg not smooth and continuous.
3. Aircraft does not maintain a constant rate of descent and flare to touchdown.
4. Aircraft impacts or thuds on to ground due to lack of flare out.
5. Aircraft bounces on landing.
6. Aircraft does not slow sufficiently after landing to below flying speed.
7. Take off roll and climb out not smooth and realistic
8. Inappropriate use of flaps and gear.

**AMA TOUCH-and-GO Maneuver Description Differences:** The model makes a landing approach at low throttle to below 10 feet altitude without touching down, followed by a climb out at full throttle to resume level flight. Model should commence by flying a final crosswind leg followed by a turn onto a normal landing approach at low throttle, using flaps if applicable, until it reaches a point immediately opposite the judges at a height of 10 feet or less. At this point, full throttle is applied, and the model climbs out straight ahead to resume level flight.

## 2.0 Optional Maneuvers (w/Graphics):

### 2.1 360 DEG. DESCENDING CIRCLE



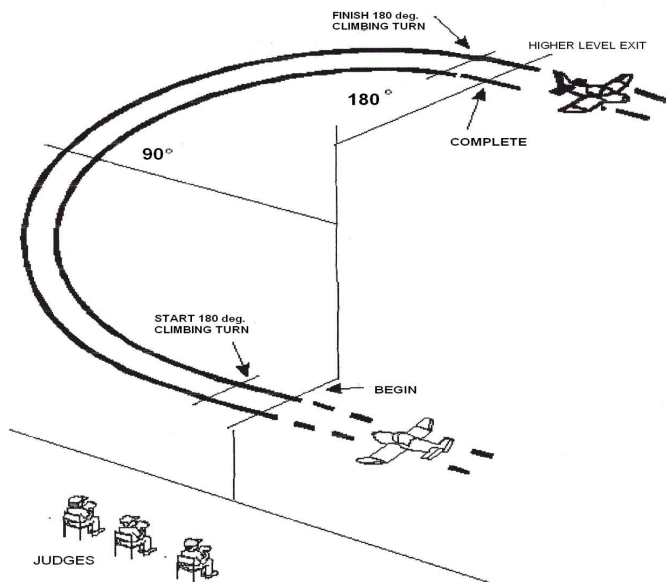
Commencing from straight and level flight, the airplane performs a gentle 360 degree descending circle over the landing area, in a direction away from the judges, at a constant low throttle setting. The maneuver terminates at a height of between 10 and 20 feet resuming straight and level flight on the same path.

### FAULTS:

1. Rate of descent not constant.
2. Descent too steep.
3. Throttle not constant or low enough.
4. Circle misshapen.
5. No significant loss of height.
6. Aircraft does not descend to a height between 10 and 20 feet.
7. Circle not centered on judges' position.
8. Entry and exit paths not parallel with the judges' line.
9. Start and Finish not called in straight and level flight.
10. Too far away, too close.



## 2.2 CHANDELLE

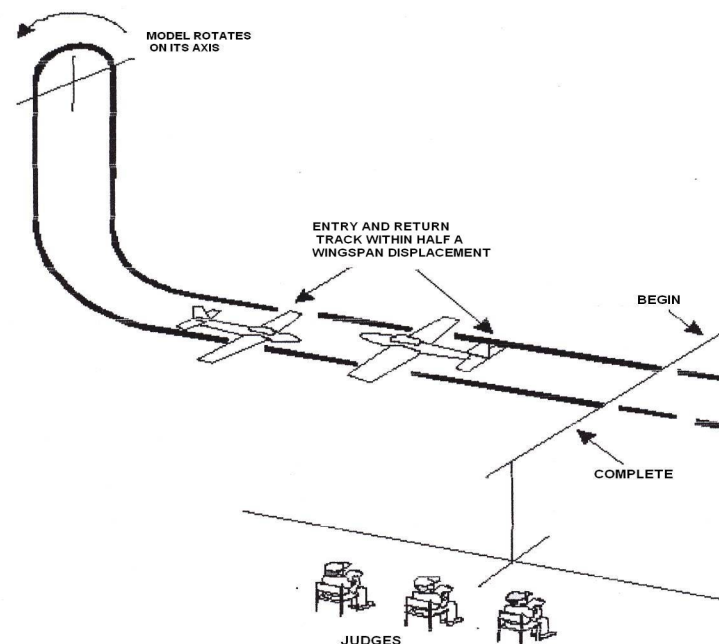


This maneuver is an exaggerated climbing turn in which the airplane changes direction through 180 deg emerging at a higher altitude upon exit. The bank angle, speed, and rate of climb depend on the type of aircraft flown. A non-aerobatic aircraft (vintage for one) may begin with a shallow dive to pick up speed, the nose should then pull up and the model begins a steady climbing turn proceeding away from the flight line. A high performance aircraft would enter the maneuver from straight and level and exhibit a higher bank angle and rate of climb. Entry speed should be sufficient to prevent visible slipping or skidding and maintain the same rate of turn throughout the maneuver. The maximum bank angle may be 45 to 60 deg. for non-aerobatic aircraft and up to 90 deg. for fully aerobatic aircraft. The degree of bank angle and rate of climb are constantly changing and the speed continues to decline throughout the maneuver. When the model has completed the 180 deg. turn, the wings are leveled and the maneuver is called complete.

### FAULTS:

1. Turn not smooth and continuous
2. Climb not smooth and continuous.
3. Bank angle not appropriate for aircraft type.
4. Start and finish not centered on judges' position.
5. Final track not 180 deg. opposite to entry.
6. Wings not level after completion of 180 deg. turn.
7. Entry and exit not in straight and level flight.

## 2.11 STALL TURN

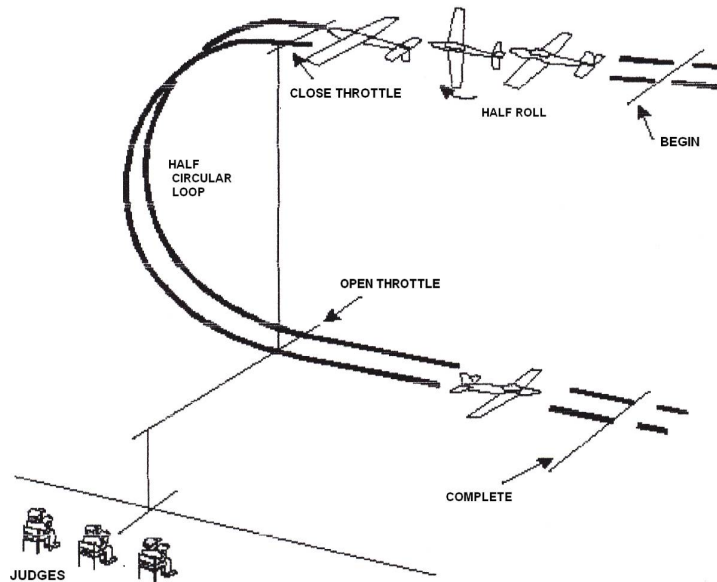


From a straight and level flight the model aircraft noses up to the near vertical attitude, at which point the throttle is closed and the model yaws through 180 deg., then dives and finally recovers straight and level flight on a heading in the opposite direction to the entry. The contestant should specify whether the turn shall be to the left or right.

### FAULTS:

1. Start and finish not parallel with the judges' line.
2. Pull up not positioned (offset) to give best view to the judges.
3. Climb and descent not near vertical.
4. Insufficient height gain.
5. Throttle is not closed.
6. Aircraft does not turn in specified direction.
7. Entry and exit paths are not at the same height.
8. Aircraft does not exit within half span displacement of entry track.

## 2.10 SPLIT "S"



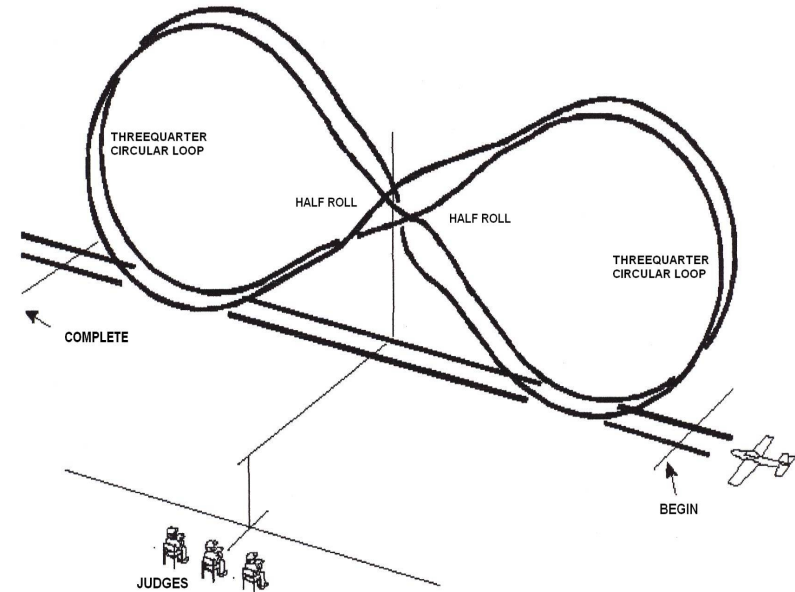
From straight and level flight, the model performs a half roll and when inverted, performs the second half of a loop and resumes straight and level flight on a heading opposite of that of the entry. The throttle should be closed at the inverted position and opened when normal flight is resumed.

### FAULTS:

1. Aircraft changes heading (track) during half roll.
2. Wings not level during half loop.
3. Inappropriate use of throttle.
4. Track of half loop not on line or vertical.
5. Half loop is not sufficiently semicircular.
6. Too fast or tight a half loop.
7. Half loop not centered on judges' position.
8. Does not resume straight and level flight on opposite track to entry.

Note: This maneuver is more difficult to perform correctly than you think....

## 2.3 CUBAN EIGHT

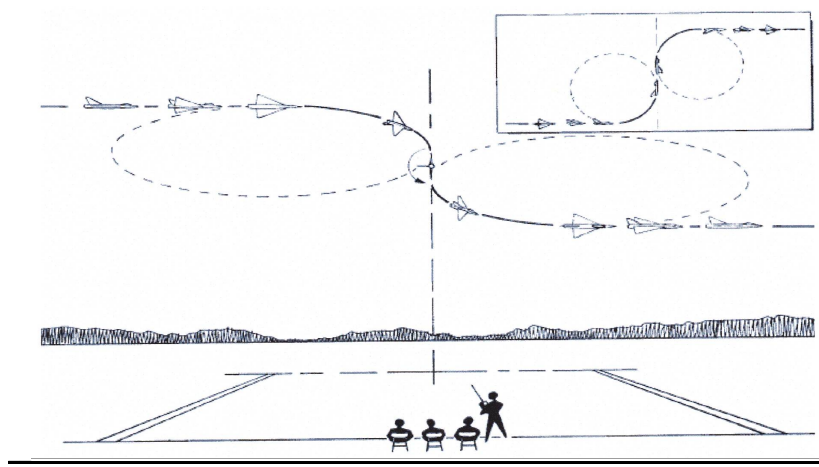


The model approaches in straight and level flight on a line parallel with the judges' line. After passing the judges' position, the model pulls up into a circular inside loop and after completing half the loop, heads inverted downwards at 45 deg. When abeam the judges' position, does a half roll followed by another half inside loop to the inverted downwards 45 deg. heading, then does another half roll and when again abeam the judges' position, pulls out into straight level flight at the same altitude as the entry and on the same heading. A light aircraft type would be expected to execute a shallow dive at full throttle in order to pick up speed before commencing the maneuver. Throttle should be closed at the top of each loop and reopened during each descent.

### FAULTS:

1. Maneuver is not performed in a constant vertical plane that is parallel with the judges' line.
2. Loops are of unequal diameter.
3. Half rolls are not centered on the judges' position.
4. 45 deg. descent paths not achieved.
5. Aircraft does not exit from the maneuver at same height as entry.
6. Aircraft does not resume straight and level flight on same track as entry.
7. Inappropriate use of throttle.
8. Size and speed of loops not in manner of prototype.
9. Too far away/too close/too high/too low.

## 2.4 DERRY TURN

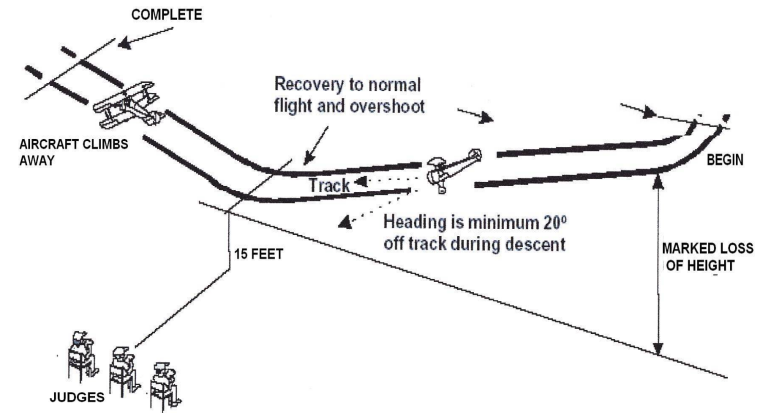


The aircraft approaches at a high speed in straight and level flight on a parallel line with the judges' line. The aircraft then makes a steep bank (in excess of 60 deg.) one quarter ( $\frac{1}{4}$ ) circle turn in a direction away from the judges without losing height. When centered in front of the judges, the aircraft makes a one half ( $\frac{1}{2}$ ) roll in the same rolling direction as the entry, again directly followed by a steep one quarter ( $\frac{1}{4}$ ) circle in the opposite direction, and then flies off straight and level on a line parallel with that of the entry maneuver.

### FAULTS:

1. Entry not parallel with the judges' line.
2. Maneuver not centered in front of judges.
3. The rolling maneuver in front of the judges not axial.
4. The roll in center not in the same roll direction as the entry to the maneuver.
5. Any hesitation between the end of the first  $\frac{1}{4}$  turn, the roll and/or the start of the second turn.
6. Exit not parallel with entry.
7. Significant height difference during the maneuver.
8. The maneuver is misshapen (as seen as part of a figure 8).
9. Maneuver is executed too high or too low to be easily judged.

## 2.9 SIDE SLIP



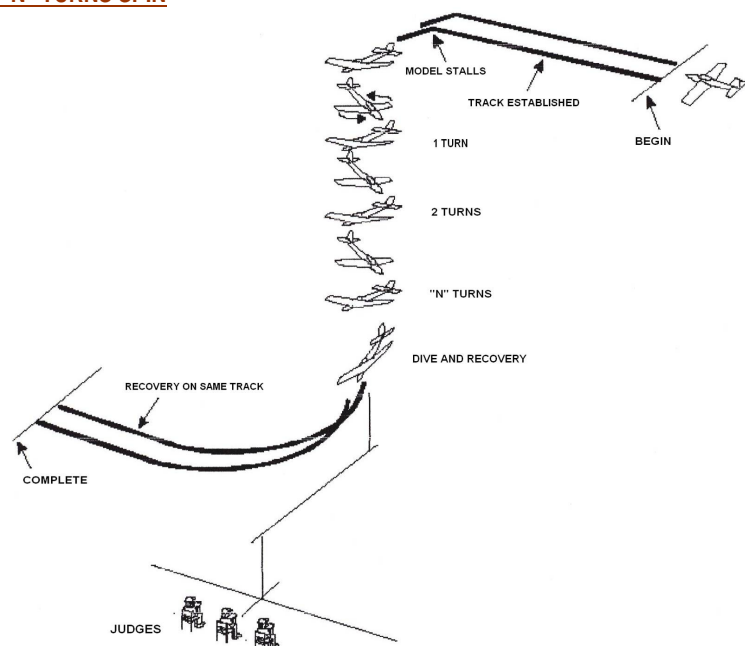
The airplane commences the maneuver in level flight by reducing power on base leg, and turns onto a higher than normal final approach that is parallel with the judges' line. As the aircraft turns final, it starts a Sideslip by the application of opposite rudder to the direction of turn, a yaw of at least 20 deg. off track. A marked loss of height must be apparent while maintaining final approach speed. The aim of the Sideslip, if continued, would be to affect a landing in front of the judges. Before reaching the judges' position however, the Sideslip is corrected, normal flight is resumed and the aircraft carries out an Overshoot from below 15 feet before climbing away.

Also, this maneuver can be performed in a manner as described in the AMA Regulations where the sideslip is describes as follows: The aircraft maintains the same heading while dropping first one wing then the other while yawing at least 20 deg. in each direction. The transition from left to right slip should be smooth. This maneuver may be called as part of the Landing maneuver. *It is suggested that the judges be briefed as to how you will perform the Sideslip.*

### FAULTS:

1. Aircraft does not smoothly enter Sideslip upon turning final approach.
2. Aircraft is not yawed at least 20 deg. off track during Sideslip.
3. Insufficient height loss.
4. Excessive speed is built up during descent.
5. Approach track not maintained or not flown parallel with judges' line.
6. Sideslip is not corrected before passing the judges.
7. Overshoot is not below 15 feet.
8. Transition during return to normal flight and climb out not smooth.
9. If Landing, the slip is not corrected before touchdown.  
(Faults 6, 7 and 8 are not applicable).
10. If the side to side Slip maneuver was elected, transition from left to right slip should be smooth.

## 2.8 "N" TURNS SPIN

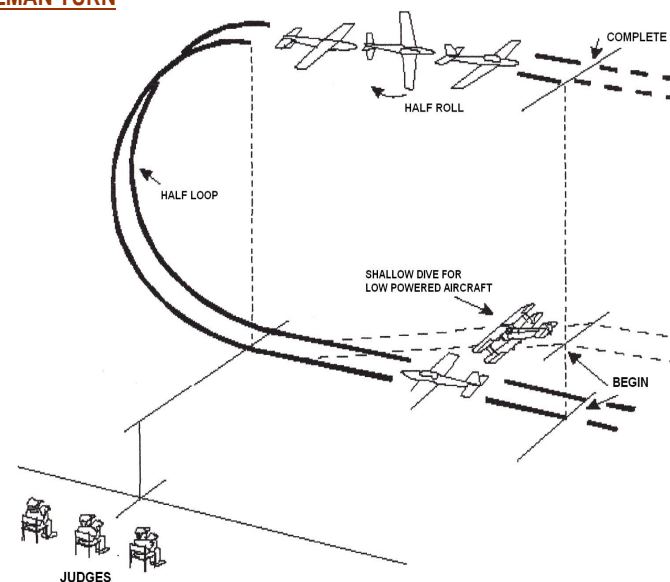


The number of turns to be performed shall be noted on the judges' score sheets. ANY whole number may be chosen. The entry shall be from straight and level flight parallel to the runway. Power shall be reduced and the aircraft should remain on heading in a slightly nose high attitude until it stalls and commences to spin. The model should auto-rotate through the prescribed number of turns and recover on the same heading at a lower altitude.

### FAULTS:

1. Entry not from level flight parallel to runway.
2. Entry into spin not clean and positive.
3. Start of spin not centered at judges' position.
4. Does not perform the prescribed number of complete turns.
5. Does not recover on the same heading as entry.
6. Wings not level on recovery.
7. Not a true spin, but a spiral dive performed.  
(In a true spin, the descent path will be close to the C.G. of the aircraft.)

## 2.5 IMMELMAN TURN

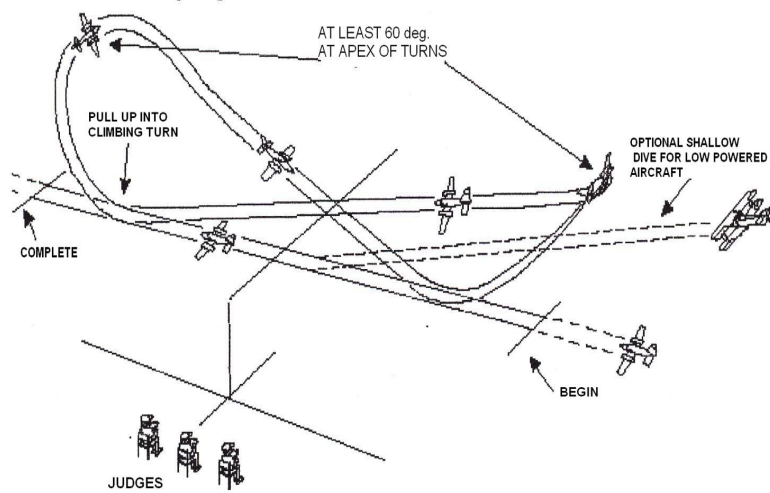


From a straight and level flight the model aircraft pulls up into the first half of a circular loop (commensurate with the performance of the subject type), and when inverted, performs a half roll before resuming straight and level flight on the opposite track. Low powered aircraft types would be expected to commence the maneuver by executing a shallow dive at full throttle in order to pick up the necessary speed.

### FAULTS:

1. Half loop not centered on judges' position.
2. Track of the half loop not vertical.
3. Half loop is not sufficiently semicircular.
4. Roll starts too early or too late.
5. Excessive height loss in the roll.
6. Track veers during the roll.
7. Does not resume straight and level flight on the opposite track to entry.
8. Maneuver not flown parallel with judges' line.
9. Size of maneuver and speed not in manner of the prototype.
10. Too far away/too close/too high/too low.

## 2.6 LAZY EIGHT

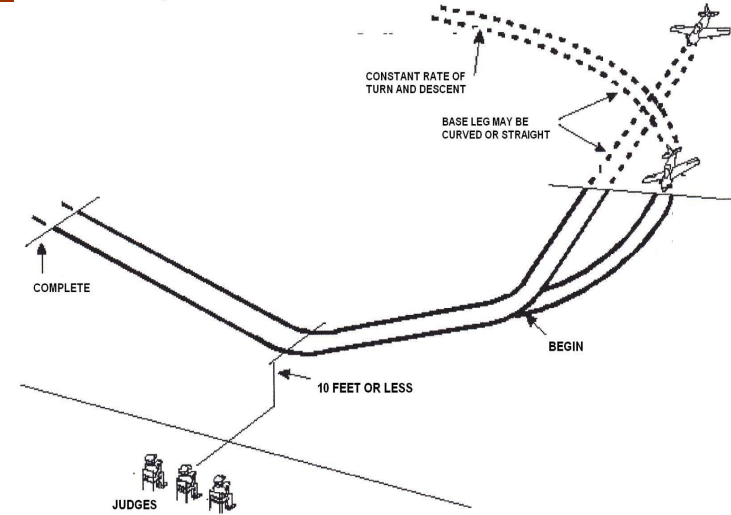


The model approaches in straight and level flight on a line parallel with the judges' line. After passing the judges position, a smooth climbing turn is started away from the judges. At the apex of the turn, the bank should be at least 60 deg. The nose of the model aircraft then lowers and the bank comes off at the same rate as it went on. The turn is continued beyond 180 deg. to cross in front of the judges with wings level before intercepting and turning on to the reciprocal of the original approach track. This completes half of the figure, which is then repeated in the opposite direction to give the full symmetrical maneuver about the judges' position. Intercepting the original approach track parallel with the judges' line completes the maneuver. A low powered aircraft would be expected to execute a shallow dive at full throttle in order to pick up speed before starting the maneuver. The figure should be symmetrical each side of the judges' position. This maneuver is essentially two Wingovers in opposite directions.

### FAULTS:

1. Entry and exit paths not parallel with judges' line.
2. Insufficient climb achieved.
3. Insufficient bank achieved.
4. Climb and descent angles not equal throughout the maneuver.
5. Arcs misshapen.
6. Maneuver not symmetrical about judges' position.
7. Start and finish positions not as indicated.
8. Overall size of maneuver not realistic for prototype.
9. Aircraft flight path not smooth and steady.
10. Too far away/too close/too high/too low.

## 2.7 MISSED APPROACH



The aircraft makes a landing approach at low throttle to below 10 feet altitude without touching down, followed by a climb out at full throttle to resume level flight. All other qualities expected of landing and takeoff will prevail including the start of this maneuver at the beginning of the final approach. The aircraft continues on final until it reaches a point over the center of the runway at a point immediately opposite the judges at a height of 10 feet or less. At this point, full throttle is applied and the aircraft climbs straight ahead to resume level flight. On prototypes so equipped, flaps and retracts would be used on both sides of the maneuver.

### FAULTS:

1. Maneuver does not commence when entering final approach.
2. Descent from base leg not smooth and continuous.
3. Aircraft does not maintain a constant rate of descent until power is applied.
4. Aircraft does not achieve correct high landing approach.
5. Aircraft descends to significantly above or below 10 feet.
6. Lowest point of maneuver not achieved in front of judges.
7. Not smooth transition of speed and altitude from approach through descent to climb out.
8. Inappropriate use of flaps and gear.