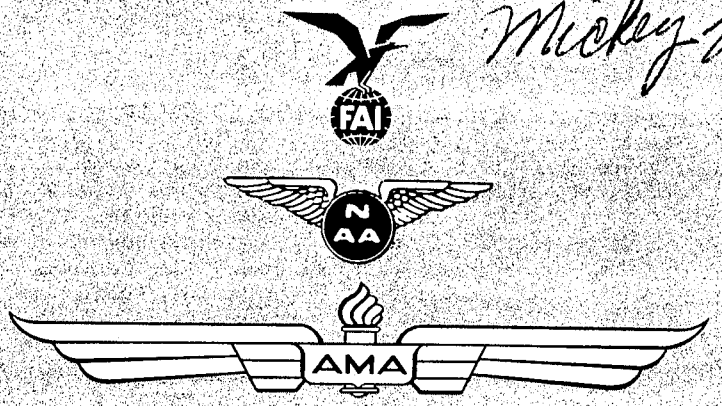
75¢

Mickey Walker



1971

Model Aircraft Regulations

Governing Sporting Model Aviation in America
Issued by the Contest Boards of the

ACADEMY OF MODEL AERONAUTICS

Under the Franchise of

NATIONAL AERONAUTIC ASSOCIATION
and
FEDERATION AERONAUTIQUE INTERNATIONALE

ACADEMY OF MODEL AERONAUTICS
806 Fifteenth St., N.W., Washington, D.C. 20005

.9 TIME LIMITS:

2.9.1 A Class A contestant is allotted a total of eight (8) minutes.

2.9.2 A Class B contestant is allotted a total of ten (10) minutes.

2.9.3 A Class C contestant (Novice or Expert) is allotted a total of ten (10) minutes.

2.9.4 A Class D contestant (Novice or Expert) is allotted a total of ten (10) minutes.

2.9.5 In all AMA classes the contestant must get his engine started and commence his flight within the first two minutes after his time has been started. When he fails to commence within the first two minutes, and is so informed by the timer, he must immediately clear the area for the next contestant.

No engine restarts are allowed after the wheels leave the ground on takeoff. Restarting is permitted within the first two minutes, but only if prior to takeoff.

.9.6 In Class D the contestant must get his engine started and commence his flight within 3 minutes. When he fails to start takeoff within 3 minutes, and is so informed by the timer, he must immediately clear the area for the next contestant.

No engine restarts after the wheels leave the ground on takeoff. Restarting is permitted within the 3 minute starting time, provided wheels have not left ground.

.10 POINT SYSTEM:

.10.1 Class A, B, and C maneuvers shall be judged and scored on a zero to ten basis. Flight score is the sum of the individual maneuver scores.

.10.2 Class D maneuvers shall also be judged and scored on a zero to ten basis. However, each maneuver score shall be multiplied by a "K" factor (See FAI maneuver descriptions). Flight score is the sum of the extended scores for each maneuver, after the K factor is applied.

.11 DETERMINING THE WINNER

.11.1 The highest score for the total of the two best flights in Class A, B, or C shall be the winner. Maneuver points from repeat flights may not be added to earlier flights. Each flight is complete in itself. In case of ties, the third best flight scores of the contestants concerned shall be used to determine the higher place (if only two flights have been scored during the normal contest time, the highest single flight score of the contestants concerned shall determine the higher place). There is no minimum number of flights which must be scored.

.11.2 Determining the winner in Class D shall be the same as for Classes A, B, and C except the total of the best THREE flights shall be used. Unless otherwise designated by the CD, ties will be broken by a single flyoff which must take place within an hour of the normal contest finishing time.

2 FLIGHT PATTERN: The contestant must fly his entire flight according to the established Flight Pattern for his particular class and in the sequence listed. Maneuvers performed out of order will not be judged.

2.1 The contestant must call out each maneuver before he attempts to perform it. Call out should be made just prior to execution. Also, the flier should use the straight flight time at the end of each maneuver to announce, "maneuver complete."

13 CLASS A PATTERN:

The maneuvers are as follows:

1. Takeoff
2. Straight Flight Out
3. Procedure Turn
4. Straight Flight Back
5. Figure Eight
6. Three Rolls*
7. Immelman Turn
8. Three Inside Loops
9. Stall Turn
10. Traffic Pattern Approach
11. Landing Perfection
12. Spot Landing

*Rolls may be Axial or Barrel. Judges are to assume Axial if Barrel is not specified.

22.14 CLASS B PATTERN:

The maneuvers are as follows:

1. Takeoff
2. Straight Flight Out
3. Procedure Turn
4. Straight Flight Back
5. Touch and Go
6. Three Axial Rolls
7. Three Inside Loops
8. Three Turn Spin
9. FAI Rolling Circle
10. FAI Horizontal Eight
11. Three Outside Loops
12. Slow Roll
13. Reverse Cuban Eight
14. Traffic Pattern Approach
15. Landing Perfection
16. Spot Landing

● 22.15 CLASS C PATTERN (NOVICE AND EXPERT):

The maneuvers are as follows:

1. Takeoff
2. Touch and Go
3. Three Horizontal Rolls
4. Three Inside Loops
5. Four Point Roll
6. Figure M
7. Horizontal Eight
8. Double Immelman
9. Three Outside Loops
10. Reverse Cuban Eight
11. Slow Roll
12. 180 Degree Turn
13. Top Hat
14. Three Turn Spin
15. Landing
16. Spot

22.16 CLASS D PATTERN:
The Class D Pattern shall be the current FAI Pattern as described elsewhere in this publication.

22.17 SUGGESTED FIELD PROCEDURE: The procedures listed below are suggestions to Contest Directors for operation of an R/C Pattern event, and may be altered to fit local conditions.

22.17.1 All R/C contestants shall be set up in "pits" at spot assigned by Event Director, so they will be under his immediate control.

22.17.2 There will be no testing of transmitters or receivers during the flying period. Transmitters may be impounded at discretion of Event Director. Any person causing interference will suffer immediate disqualification. The Event Director will provide a monitor receiver to check for interference.

22.17.3 The flight order shall be determined by position of contestants' signatures on a *single Flight List* held by Event Director or his representative. This list shall include all classes and frequencies. Contestant shall have his name on List only once at any one time; names may be moved to bottom of List on request, but trading of positions with other contestants is not allowed. When a contest is to be continued on a following day, the Flight List shall carry over from day to day.

22.17.4 Event Director shall carry out following procedure:

a. Numbers 1, 2, and 3 on Flight List shall be on flight line with their models, equipment, and one helper if desired. No 1 is contestant flying or ready to fly, No. 2 is next man to fly, etc.

b. No. 1 man shall have 3 minutes (4 minutes if FAI Pattern is being used) from completion of preceding flight in which to release model for the start of his flight. False starts are permitted within the 3 or 4 minute limit. Failing to start flight within this limit, contestant must immediately remove his plane and equipment to the pits. It shall be responsibility of Event Director of his representative to notify contestant of start and end of 3 or 4 minute period.

c. Numbers 4, 5, and 6 on the Flight List shall have their planes and equipment in a ready box located near the flight line. As soon as a flight is completed, the No. 4 man becomes No. 3 and shall be requested to move his model and equipment onto the flight line. If he is not on hand to do so, he shall be dropped from the Flight List, and the List advanced to fill his place. The Event Director or his representatives shall be responsible for notifying contestants when they are to move to ready box or flight line.

22.17.5 When technically possible and when judges and space are available, it is strongly recommended that two or more flights be flown simultaneously, under the following conditions:

a. Separate take-off and landing areas sufficiently spaced cross wind from each other to minimize engine noise and flight path interference.

b. Contestants flying simultaneously shall carefully check receiver and transmitter operation before take-off, to be sure no interference between them is possible.

c. Contestants flying simultaneously must be no more than three positions apart on the Flight List. Event Director or representative shall, where possible, select contestants at top of Flight List so that contestants flying on compatible frequencies are on flight line together.

d. Should a contestant oppose flying simultaneously with someone else, he may cancel his turn and re-sign at the bottom of the Flight List.

22.17.6 OFFICIALS. An Event Director, a Dispatcher-Recorder and Judges are the essential officials for an R/C Event. If possible, the Dispatcher-Recorder should have at least two helpers.

22.17.7 Each flight should be judged by at least two Judges, with their scores averaged to give final score for the flight. It is suggested that each maneuver be scored immediately after it is performed. Judges shall score maneuvers individually and without consultation between them. There should be enough judges available to establish a rotational procedure which will average out variations in judging.

22.18 DESCRIPTION OF MANEUVERS: A detailed description of each maneuver specified in the above patterns will be found in the AMA Radio Control Judges Guide, or the FAI Pattern rules.

AMA RADIO CONTROL JUDGES GUIDE

A. PURPOSE: The purpose of the AMA R/C Judges Guide is to furnish an accurate description of each maneuver listed in the three Pattern Event classes, and to provide a reference for use in developing a uniformly high standard of judging in all AMA sanctioned contests.

Study of this guide by the competitor will help him learn exactly what is expected, while study by the judges will help them decide precisely how well the competitor comes up to these expectations.

B. PRINCIPLES: The principles of judging an RC model should be based on the perfection with which the model simulates full scale aircraft performance. The main criteria for perfection in an individual maneuver can be classified as follows:

1. Precision of the maneuver
2. Positioning or display of the maneuver
3. Size or dimensions of the maneuver
4. Smoothness or gracefulness of the maneuver.

All of these requirements must be met in order for a maneuver to be rated perfect. They are discussed below.

a. PRECISION: At the instant the contestant announces his next maneuver, the judge should form an image of the course the airplane should follow during the performance of the maneuver. The precision of the maneuver will then be based on how well the model tracks through this imaginary course.

Competitors will read this statement and exclaim "How am I to know what the judge imagines is a perfect course?" The answer to this is that once the model has locked in on the straight and level entry portion of a maneuver the only real disparity that can exist between the judge's and the competitor's image is the size of the maneuver. The judge will have some preconceived ideas about optimum size as discussed in a later section. However, the judge should modify his image if the first portion of the maneuver clearly demonstrates that the contestant intends to do a maneuver of much smaller or larger dimensions than the judge first imagined.

It will be noted that forming an image of the forthcoming maneuver is based on using the straight and level entry as a reference. If the contestant fails to go through this portion of the maneuver, it will be difficult and perhaps impossible to form an image before the start of the maneuver. The absence of a definite entry into a maneuver therefore increases the difficulty of judging its precision and competitors will recognize this as justification for downgrading.

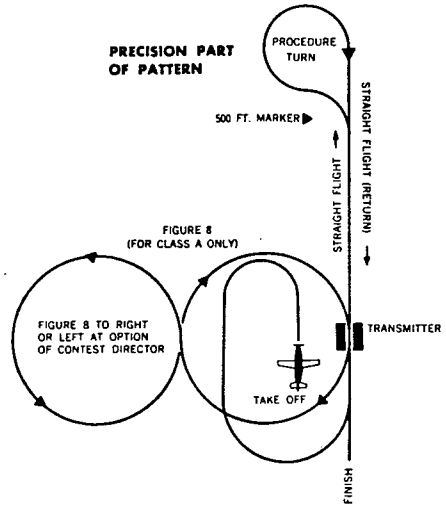
The straight and level exit from a maneuver is one of the more valuable portions of the maneuver in evaluating how well the intended course of the maneuver was followed. The well-polished pilot will use it to announce "Maneuver completed," while the less competent pilot will often skip it in hopes that the judge will not notice that he deviated with respect to his entry heading. The absence of a well defined straight and level exit therefore should also result in downgrading.

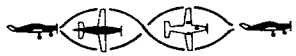
b. POSITIONING: To achieve perfection, the competitor must position his maneuvers in a way that they can be easily judged. The first consideration on position is longitudinal distance from the competitor. It goes without saying that the judges should be located near the competitor so that they obtain identical views of the maneuver. The competitor should center his acrobatic maneuvers at an average distance of less than 300 feet from himself.

In short, the judge should be unmerciful if he gets the impression that the competitor is trying to hide his defects by flying at a great distance.

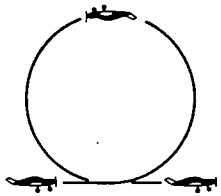
Positioning of maneuvers involves more than mere distance. They should also be presented in a relative direction which displays the most difficult aspects of the maneuver. Specifically, maneuvers which have circular symmetry (such as loops, Immelmans, Cuban

Radio Control Maneuvers

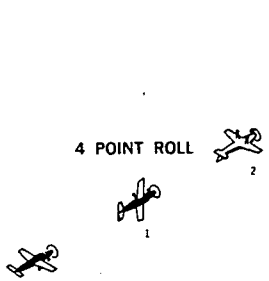




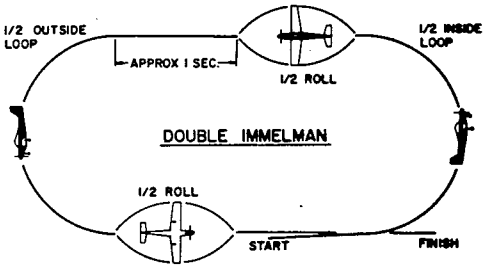
HORIZONTAL ROLL

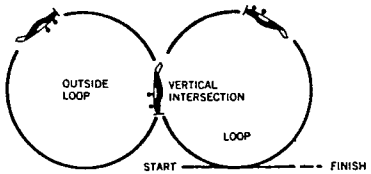


LOOP

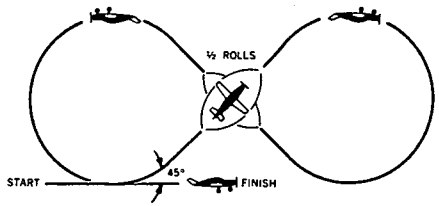


4 POINT ROLL

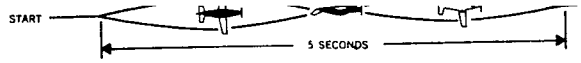




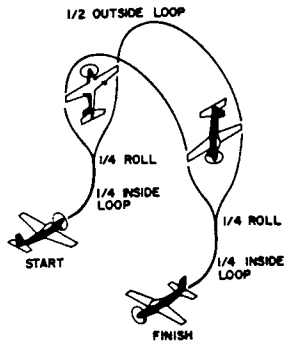
FAI HORIZONTAL 8



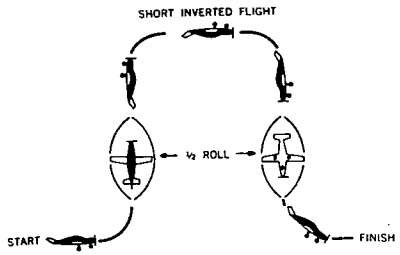
REVERSE CUBAN 8



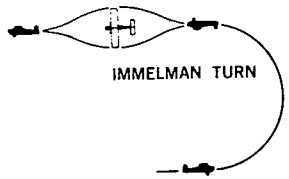
SLOW ROLL

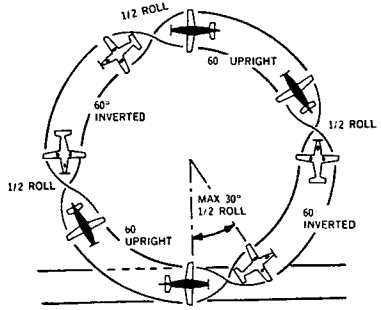


180 DEGREE TURN

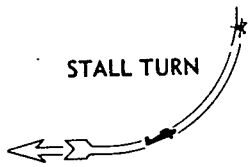


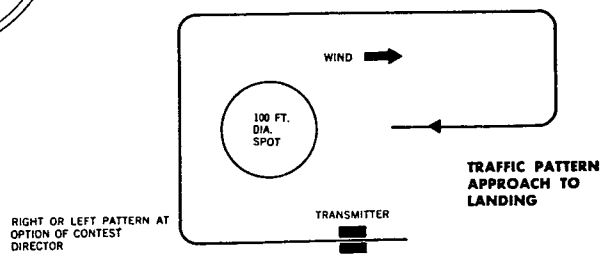
FAI TOP HAT





FAI ROLLING CIRCLE





TRAFFIC PATTERN APPROACH TO LANDING

Maneuver Drawings Courtesy of **MODEL AIRPLANE NEWS**

Eights, and FAI Horizontal Eights) should have the "holes" in their circular path clearly visible, preferably in a plane exactly perpendicular to the line of sight to the model. The same applies to the Square Eight.

The diagrams used to describe these circular maneuvers in the official rule book define the best view to present to the judge. "End on" or "canted" presentation of these should result in downgrading since it increases the difficulty of judging the symmetry of figure 8's and the "tracking" of consecutive loops.

While no special bonus is justified for exceptionally low altitude, excessively high altitude is cause for downgrading. Most maneuvers can be done at less than 300 feet longitudinal distance with altitudes that would not force the judge to look up at more than about a 45 degree angle. If maneuvers are done at high altitudes and close to or above the transmitter in a way that they force the judge to look up vertically or near vertically, they should be downgraded. The main reason for this is that most maneuvers cannot possibly be properly oriented when performed directly overhead. However, a comment to competitors is in order here. This downgrading is almost an automatic reaction after a judge has been on the runway a few hours. He usually has a tired neck from looking at some maneuvers which must be followed overhead, and he is prone to be severe if he is forced to look there unnecessarily.

By the same token, most judges will refuse to even look at the remainder of a maneuver after an aircraft crosses the sun unnecessarily. There are also some places where the sun often cannot be avoided and the judge should follow through to the best of his ability. But he is completely justified in scoring zero if in his opinion the maneuver could have been placed elsewhere.

c. SIZE OF MANEUVERS: In the previous section it was pointed out that most maneuvers could be safely done at an average distance no greater than 300 feet from the competitor and judges, and at altitudes such that the line of sight to the model will seldom exceed a 45° elevation angle. These criteria place an upper limit of about 350 feet for the total vertical size of a maneuver. Most competitors and judges will recognize this as more than ample. It should also be recognized that 300 feet of horizontal distance is a maximum value and not really the optimum. For example, an inside loop of 100 feet diameter at 150 feet longitudinal distance would stay within the 45° angle and a safe altitude and would be more clearly visible to the judge than at 300 feet distance. The competitor who performs loops in the 200 ft. region is therefore allowing the judge to evaluate them more critically and he should suffer no downgrading for positioning. On the other hand, a 100 ft. *diameter* loop at 300 ft. distance might be downgraded.

The optimum size of maneuvers is related to some extent on the size and normal flying speed of the model. For example, loops of 20 to 30 feet diameter done by a 2 ft. wing span airplane would not necessarily look poor or out of scale. However, 20 or 30 ft. diameter loops by a 50 mph multi job give the impression that an imaginary pilot in full scale simulation would be downright uncomfortable if not "blacked out" due to the high "g" forces. Exceedingly small or tight maneuvers with unnecessarily high rates of roll, pitch or yaw do not simulate full scale performance and they should be downgraded accordingly.

d. SMOOTHNESS AND GRACEFULNESS: These two factors are inter-related with size of the maneuver and therefore again are related to normal flying speed of the model. Various judges and competitors will have different opinions of what actually constitutes smoothness and gracefulness. The most general definition must again be related to full scale simulation and the effects of the maneuver on an imaginary pilot or passenger in the plane. On a touch-and-go or landing, for example, the judge might imagine the airplane as a DC-8 in which he is a passenger. Many of the so-called "average" landings by RC models, in this equivalent situation, would result in shearing off of the landing gears and a total loss of the airline company's profits and equipment!

It is recognized that few RC judges have ever been passengers in full scale aerobatic airplanes and therefore have no actual experience with the "g" forces in aerobatic maneuvers. Two to three g's would not be excessive in such performance, particular in violent maneuvers such as a snap roll or spin. However, by comparison, a 30 ft. diameter loop at 50 mph results in about 10 g's, which is close to or excess of the design limits of most full scale aerobatic aircraft. Clearly, such tight maneuvers are not scale-like.

The matter of smoothness is basically related to scale like appearance. For example, a perfect set of consecitive rolls should have a constant roll rate from start to finish. A perfect loop must have a constant radius defining a perfect circle. It cannot be made up of a series of straight flight increments with sudden angular jerks placed between. Such sudden jerks represent high "g" forces well in excess of full scale tolerances and maneuvers should be downgraded for this.

C. ACCURATE AND CONSISTENT JUDGING: The most important aspect of consistent judging is for each judge to establish his standards and then maintain that standard throughout the meet. It is advisable for the contest director or chief judge to hold a briefing prior to the start of the meet in order to make the standards as uniform as possible. This is done best by means of a practice flight which all judges score simultaneously and privately. After the flight, the defects in each maneuver should be discussed by all judges and a semblance of agreement reached about the severity of defects. Once this is done, however, and the contest is started, the individual judge should not alter his standards under any influence.

The contest director should clearly define areas in which it is considered unsafe for competitors to perform, such as above spectators or over buildings, etc. It is highly recommended that the judges agree to register zero points for maneuvers done in these areas. Furthermore, for consistency, judges should exchange a quick nod of agreement to issue zeros immediately following an "over the crowd" maneuver. Nothing can cause more unrest among contestants than a zero and seven score of the same maneuver!

The responsibility for disqualifying pilots who persist in flying unsafely should be assigned to the judges by the C.D. The definition of unsafe areas should be absolutely unambiguous. For example, it should be stated that "maneuvers performed over the spectator area will be scored zero" and not that "maneuvers can be performed over the spectators at a safe altitude". Obeying such safety regulations is just one more of the many pressures associated with winning a competition and the man who overcomes all pressures is more expert than one who does not.

D. JUDGING INDIVIDUAL MANEUVERS: The schedule of maneuvers to be performed is described in Section 22 of the AMA Rule Book. Each maneuver is to be judged individually on a basis of 0 to 10 points according to the degree of excellence.

A common problem in judging is to score the first flights too high and then find there is no margin left to reward a superb flight. When in doubt give the lower score. Remember that perfection is not a relative thing. Perfection is that maneuver in which you see absolutely no flaws. It is not a common occurrence.

In the following section, a description of each maneuver is given and then a number of reasons for downgrading are listed. The maneuver should be downgraded according to (1) the number of defects observed; (2) the severity of the individual defects, and (3) the number of times any one defect occurs.

For example, a small single change in heading during the taxi portion of the touch and go would be considered one defect while two or three distinct turns would be considered two or three defects. It will be noted that for many maneuvers there are more than ten possible kinds of defects and that some of these can be repetitive. It will not be possible to downgrade one point for each defect or indeed we would have many negative scores.

A score of 10 should be given only if the maneuver is well positioned and no defects are observed. One or two minor defects should result in downgrading to at least an 8 while one severe defect should put it down to 6 as should a combination of three or four minor defects. Any demerit in poor positioning should be decided at the start of the maneuver and also fed into the final score for the maneuver.

E. DESCRIPTION OF MANEUVERS:

Note: Precision ground handling of "Proto Taxi" maneuvers at the beginning and end of each flight is not required. However, in the interest of safety and conserving realism, a certain amount of ground control is considered desirable.

In order to discourage the use of competition aircraft without positive means of directional control on the ground, a taxi demonstration is now required as part of the takeoff maneuver. The taxi demonstration will *not* be scored on quality. However, if it is not performed, the takeoff maneuver will automatically lose five (5) points. In other words, if a contestant fails to perform the taxi demonstration and then makes a takeoff worth 5 points or less, his takeoff score will be zero.

TAXI DEMONSTRATION: Prior to takeoff, the plane must be taxied from the Starting Box a distance of approximately 10 feet, including a controlled turn of at least 90 degrees, and come to a complete stop. If there are strong winds, the CD may allow substitution of an 'S' turn, which will serve to demonstrate ground control while avoiding the unnecessary risk of upsetting the model. A flyer not performing this demonstration will automatically lose five (5) takeoff points.

TAKEOFF: The model must start from a standstill following the taxi demonstration. Model shall accelerate gradually and the takeoff run shall be in a straight line. Plane shall lift off gently and climb at a gradual angle, continuing in its straight flight path until at least six feet off the ground. Takeoff is completed when model is turned to circle back over the pilot.

The takeoff should be downgraded for the following reasons (in addition to loss of 5 points for no taxi demonstration):

1. Pushing or assisting the model when released.
2. Changes in heading during the take-off run.
3. "Jumping" from the ground.
4. Retouching the ground after becoming airborne.
5. Too steep a climb angle.
6. Gallops in pitch, roll or yaw during climb.
7. Changes in heading during climb.
8. Dropping a wingtip.
9. Starting turn before reaching six foot altitude.

STRAIGHT FLIGHT OUT: The model must be brought exactly over the transmitter and flown in an absolutely straight path into the wind for a distance of approximately 300 feet before starting the Procedure Turn. (Distance does not have to be accurate, however judges may specify start of turn if they wish). Straight Flight may be downgraded because:

1. Does not fly over transmitter.
2. Plane deviates left or right.
3. Does not hold constant altitude.
4. Turns before permission is given by judge.
5. Gallops in elevation.

PROCEDURE TURN: After the straight flight, the model must turn exactly 90° to the left, then exactly 270° to the right and cross over the point where the first turn commenced. The turn may be downgraded because:

1. Left turn not 90°
2. Right turn to 270°
3. Changes in altitude during turn.
4. Turns not smooth and circular.
5. Does not head back over exact outgoing path.

STRAIGHT FLIGHT BACK: The model should fly back toward the transmitter along the same line as the outgoing path and pass exactly over the transmitter. The Straight Flight Back may be downgraded because:

1. Turns or wiggles during straight flight.
2. Change in altitude.
3. Gallops in pitch, yaw or roll.
4. Flight not along original path.
5. Does not pass over transmitter.

FIGURE EIGHT (Class A only): Directly after the Straight Flight Back and at the instant the plane crosses over the transmitter, the model starts into a horizontal, upright figure 8. The figure shall be perpendicular to the straight flight, and flown away from the spectators, ie, the base of the 8 is over the transmitter and the first turn is made to left or right, depending on spectator location. Crossover of the 8 shall be on the perpendicular line and about 100 feet away from transmitter. Maneuver is finished on same heading as its entry. The Figure Eight should be downgraded for the following:

1. Entry not directly over the transmitter.
2. First half circle not smooth or round.
3. First half circle has gallops in pitch, roll or yaw.
4. First half circle changes altitude.
5 thru 7. Same as 2 thru 4 for second full circle.
8. Model does not complete second full circle at same crossover point as finish of first half circle.
9 thru 11. Same as 2 thru 4 for third half circle.
12. Does not finish on same heading as entry.
13. Does not finish directly over transmitter.
14. Does not finish at same altitude as entry.
15. Does not fly straight and level to complete maneuver.

TOUCH AND GO: After a smooth and gradual descent on a straight line path into the wind, the model lands and slows down to taxi speed (approximately ¼ the normal flight speed) but must not stop. Following this the model must accelerate and take off on the same heading as the entry. The maneuver may be downgraded for the following:

1. Approach during landing is too steep.
2. Gallops in pitch, yaw or roll during approach.
3. Model impacts or thuds onto ground due to lack of flare-out.
4. Model bounces on landing.
5. Model deviates left or right while rolling on ground.
6. Model fails to slow down to distinct taxi or "unairborne" condition.
7. Model stops on ground.
8. Changes in heading during the take-off run.
9. "Jumping" from the ground.
10. Retouching the ground after becoming airborne.
11. Too steep a climb angle.
12. Gallops in pitch, roll or yaw during climb.
13. Changes in heading during climb.
14. Dropping a wingtip.
15. Model is too far away to be seen clearly at any time during the maneuver.

THREE ROLLS: The model enters from a straight and level flight and rolls on its axis to the right or left until three complete rolls are performed. The recovery must be on the same heading and altitude as the entry. The consecutive roll maneuver should be downgraded for the following:

1. Model not level at the start of the rolls.
2. The path traced out by the model is not a straight line (i.e., the plane does barrel rolls or suffers changes in heading).
3. Roll rate not uniform throughout three rolls.
4. Pauses between rolls.
5. Sudden changes in heading between rolls.
6. The axis of the fuselage veers out at an angle to the flight path.
7. Plane changes altitude during rolls.
8. Plane does not do exactly three rolls.
9. Plane is not level at end of rolls.
10. Plane fails to do level flight at end of rolls.

IMMELMAN TURN: The model starts Immelman flying straight and level, pulls up into half loop followed by a half roll and finishes flying straight and level exactly 180° from the heading at entry. The Immelman may be downgraded because:

1. Model not level at start.
2. Model deviates left or right during half-loop.
3. Half-loop not completed exactly above point of commencement of half-loop.
4. Half roll does not commence immediately after half loop.
5. Plane deviates from a straight line during roll.

6. Model does not finish in level flight.
7. Model heading does not finish exactly opposite the direction of entry.

THREE INSIDE LOOPS: The model starts the maneuver flying straight and level, then pulls up into a smooth, round loop, followed by a second and third loop in exactly the same path with a straight and level recovery to finish. The maneuver may be downgraded because:

A. *During the first loop:*
1. Loop not round and smooth.
2. Entry not level.
3. Loop deviates left or right.
4. Finish of loop not at same altitude as entry.
5. Model pauses before start of second loop.

B. *During the second loop:*
1. Not on same heading as first loop.
2. Not the same circular path as first loop.
3. Loop deviates left or right.
4. Finish of loop not at same altitude as entry.
5. Model pauses before start of third loop.

During the third loop:
1. Not on same heading as first loop.
2. Not on same circular path as first loop.
3. Loop deviates left or right.
4. Recovery not at same heading as entry.
5. Recovery not at same altitude as entry.
6. Recovery not level.

Note: Loops must appear rounded and superimposed to the ground-observer even in the presence of the wind.

Stall Turn

The model starts from straight and level flight and noses up to a vertical position, yaws through 180°, then dives along a parallel path and finishes the maneuver with the plane level at the same altitude as the entry. The Stall Turn may be downgraded because:

1. Model not level at start.
2. Does not become exactly vertical.
3. Turns left or right during pull-up.
4. Does not yaw tightly through 180°.
5. Return path more than two wing-spans from entry path.
6. Return path not parallel to entry path.
7. Maneuver not finished at same altitude as entry.
8. Plane not level at finish of maneuver.
9. Model does not fly straight and level to complete maneuver.

Three Turn Spin

The plane establishes a heading by flying straight and level, pulls up into a stall and commences the spin through one, two, three turns and recovers to level flight on the same heading as the initial flight direction. The judge must watch carefully to be sure this is a spin and not a vertical roll or a spiral dive. In the spin, some part of the plane always intersects an imaginary vertical line along the path of descent. In the spiral dive, the plane circles around, but outside of, the imaginary vertical line. The spin may be downgraded because:

1. Initial heading is not level.
2. Commencement of first spin is sloppy or uncertain.
3. Does not do exactly three turns. Less than two or more than four turns should be scored zero.
4. Does not recover on same heading as initial heading.
5. If any of the three turns are spiral dives rather than spins, the score is zero.
6. Rate of rotation in spin is excessively rapid.
7. Does not finish level.
8. Does not fly straight and level for 50 feet.

FOUR POINT ROLL: From a straight and level upright flight path, the model is rolled 90 degrees and holds this attitude, with wings in a vertical position, long enough for it to be clearly defined. The model is then rolled another 90 degrees, in the same direction of rotation, and holds the inverted attitude long enough for it to be clearly defined. This is followed by another 90 degree roll in the same direction, bringing the ship to another knife edge position. Following a similar pause in the roll, the ship is finally rolled another 90 degrees to upright and level flight. The maneuver may be downgraded for the following reasons:

1. Model not level at start of roll.
2. The path traced by the model is not a straight line. (The plane does barrel roll segments or suffers changes in heading.)
3. Sudden corrections in heading between roll segments.
4. The axis of the fuselage veers out at too much of an angle to the flight path.
5. Plane changes altitude during roll.
6. Plane does not pause long enough between each segment of roll.
7. Wings are not exactly vertical at ¼ and ¾ positions.
8. Plane fails to do level flight at end of roll.

REVERSE CUBAN EIGHT: Plane commences in straight and level flight, pulls up into a 45 degree climb, half rolls to inverted and procedes to inside loop until it is again climbing at a 45 degree angle. Plane then does another half roll to inverted that should cross the flight path of the first half roll, then again procedes to inside loop until it has reached straight and level flight on the same heading and altitude as the beginning. Maneuver shall be downgraded for the following:

1. Entry is not straight and level.
2. First roll not on 45 degree line.
3. Loop not round or deviates to left or right.
4. Second roll not on 45 degree line.
5. Middle of second roll does not cross middle point of first roll.

SLOW ROLL: Model commences from straight and level flight and then rolls slowly at a uniform rate through one complete rotation. The approximate time of the roll to be five seconds. Note: No downgrade for slight overtime. Downgrading shall result for any of the following reasons:

1. Model not level at entry.
2. Plane deviates from a straight line during roll.
3. Roll rate not uniform.
4. Plane does not roll through exactly one revolution.
5. Plane changes altitude during roll.
6. Plane changes heading.
7. Roll rate is too rapid resulting in much less than five seconds elapsed during roll.
8. Plane is not level at finish of roll.
9. Plane fails to do level flight at end of maneuver.

FAI TOP HAT: Model starts in straight level flight pulls up into vertical climb and makes a half roll, then levels out inverted on the same heading as entry. After short inverted flight, model dives vertically, performs a half roll and finally recovers in straight level upright flight on same heading and height as entry. The Top Hat should be downgraded if:

1. Model does not start level.
2. Model does not go exactly vertical before starting roll.
3. Roll does not stop at exactly 180° from entry.
4. Model does not climb vertically for a brief period after completing roll.
5. Model does not go on an exactly horizontal inverted position after leveling out.
6. Model does not fly inverted for the same distance as the vertical climb and roll.
7. Model does not dive vertically briefly before starting half roll.
8. Second half roll not started at the same altitude as that where the first half roll was completed.
9. Second half roll not completed at same altitude as that where first roll started.
10. Model does not dive vertically for a brief period after completing second half roll.
11. Model deviates left or right of the entry path at any point in the maneuver.
12. Model does not recover at same altitude and heading as entry.

FAI ROLLING CIRCLE: The model commences in straight level flight, makes half a roll into inverted circular flight, subsequently making a half roll in the same direction of rotation at each quadrant of the circle so that the model flies alternately upright and inverted in consecutive quadrants. The rolling circle shall be flown to the left. The direction of the half rolls is optional. The model recovers in straight level flight on the same heading and height as the entry. Downgrading shall result for any of the following reasons:

1. Plane not level at entry.
2. Half roll does not form an arc of a circle.
3. Model does not recover inverted at the 30° arc point.
4. Model heading is not at about 30° from entry at end of half roll.
5. Model does not fly a smooth circular inverted path from the instant it completes the half roll until reaching the 90° point.
6. Model does not roll upright at the same rate as previous half roll.
7. Model does not complete half roll in the same angular arc as used for the previous half roll.
8. Model heading is not at about 30° from that at entry of the half roll.
9. Model does not fly a smooth circular upright path from the instant it completes the half roll until reaching the 180° point.
10. All items from 1 to 9 apply to second half of the circle in the same way as the first half.
11. The path of the complete maneuver must not deviate from a circle.
12. Model must depart from the maneuver at the same point in space on the same heading and altitude as the entry.

FAI HORIZONTAL EIGHT: The plane commences flying straight and level, pulls up into ¾ of an inside loop, does one full inverted loop starting from straight down, then ¼ of an inside loop finishing in straight and level flight. The Horizontal Eight may be downgraded because:

1. Entry not level.
2. First loop not round.
3. Plane deviates left or right during first loop.
4. Plane not vertical at start of second loop.
5. Second loop not the same diameter as first loop.
6. Second loop not round.
7. Second loop deviates left or right.
8. Does not finish level.
9. Does not finish on same heading as entry.
10. Does not finish at same altitude as entry.

FAI DOUBLE IMMELMAN: Model commences in straight and level flight, pulls up into half an inside loop followed by a half roll to upright, flies straight and level for about one second, pushes down into half an outside loop followed by a half roll to upright, recovering in straight and level flight on the same heading and at the same altitude as the entry. Maneuver shall be downgraded for the following reasons:

1. Entry not straight and level.
2. First half loop not round.
3. Model deviates left or right during half loop.
4. Half loop not completed exactly above starting point.
5. Half roll does not start immediately after half loop.
6. Roll is not on a straight line and on 180 degree heading from entry.
7. Plane goes immediately into outside loop upon completion of half roll.
8. Plane holds straight flight too long before going to outside loop.
9. Half outside loop not round or same size as first half loop.
10. Model deviates left or right during half loop.
11. Half loop not completed exactly below starting point.
12. Final half roll does not start immediately after half outside loop.
13. Final half roll longer or shorter than first half roll.
14. Model does not finish on same heading and at same altitude as entry.
15. Plane fails to do straight and level flight at end of maneuver.

THREE OUTSIDE LOOPS: The model commences the outside loop flying straight and level, then noses down into three outside loops and recovers flying straight and level on the same heading and altitude as the entry. The outside loops are downgraded in the same manner as the inside loops.

180 DEGREE TURN: The plane starts in straight and level flight, pulls up into a vertical climb, rolls 90 degrees, performs half of an outside loop, rolls 90 degrees in the opposite direction to the first quarter roll, and pulls out at the same altitude but with a 180 degree heading change. The maneuver may be downgraded for the following reasons:

1. Entry is not straight and level.
2. Pull up is not to exact vertical climb.
3. Roll is more or less than 90 degrees.
4. Path of roll is not straight vertical line.
5. Half outside loop deviates left or right.
6. Half loop is not smooth and round.
7. Second 90 degree roll path is not straight vertical line.
8. Pull out to level flight is sudden or jerky.
9. Pull out is not to same altitude and 180 degrees opposite heading to entry.
10. Plane fails to perform straight and level flight at end of maneuver.

● FIGURE M: The model starts in straight and level flight, pulls up to a vertical attitude, performs a stall turn (left or right) through 180°, then makes ½ an inverted loop pulling up again to vertical flight, performs a second stall turn in a direction opposite to the first stall turn and then recovers on the same altitude and heading as the entry. When viewed from the side, the model creates the letter "M". The manoeuvre should be down-graded for the following reasons:

1. Model not level at start.
2. Does not become vertical.
3. Turns left or right during pull up.
4. Turn radius at top of stalls is larger than two wingspans.
5. Turns at top of stalls are less than 180°.
6. Diving paths are not parallel to climbing paths.
7. Bottom of inverted portion is at different altitude than entry.
8. Turning point of second stall turn is at different altitude from the first turn.
9. Manoeuvre not finished at same altitude as entry.
10. Plane not level at finish of manoeuvre.

TRAFFIC PATTERN APPROACH: The rectangular approach is commenced with the model flying into the wind above the transmitter, a turn of 90°, a cross-wind leg, a second turn of 90°, a down-wind leg, a third turn of 90°, a cross-wind leg, a fourth turn of 90° and straight flight toward the point of touchdown. The maneuver is finished just prior to the point of touchdown (Six foot altitude).

It is recommended that the descent start at the beginning of the downwind leg. However, wind or airplane conditions may dictate otherwise. Descent should therefore be judged only on smoothness and consistency not on where it actually starts.

Note: The contest director will announce whether the turns should be left or right. The rectangular approach may be downgraded because:

1. Legs of rectangle are not straight and perpendicular to each other.
2. The 90° turns are not smooth, precise, or sharp.
3. Gallops in pitch, yaw or roll during the approach.
4. Attempts to break out of pattern to go around again. Zero points!
5. Model climbs during approach.

● *Note:* Since the Traffic Pattern Approach is not required in Class C, the Landing Perfection maneuver must be called out following completion of the Three Turn Spin. When the contestant has his plane lined up and on heading for the final approach, and not less than six (6) feet off the ground, he must announce the start of the Landing maneuver. From this point on, the Landing will be judged.

LANDING PERFECTION: At the conclusion of the final approach leg, the model continues to descend at a gradual rate and lands on the heading used in the final approach leg. After landing, the model must roll in a straight line and come to a complete stop. The landing should be downgraded if:

1. Approach during landing is too steep.
2. Gallops in pitch, yaw or roll during approach.
3. Model impacts or thuds onto ground due to lack of flare-out.
4. Model bounces on landing.
5. Model turns left or right while rolling to a stop. Turns necessary to avoid running off the runway may be excused if wind direction and spot location are adverse. However, this leniency applies only if the model lands in the spot and should not be employed in cases where the flier accidentally lands near the edge of the runway outside the spot.
6. Landing is dead stick.
7. Model fails to make pronounced stop.
8. Models rolls too far away to accurately judge.
9. Model pitches over and makes ground contact with nose or wingtip.
10. If model flips over on its back or cartwheels on wings—0 points.

SPOT LANDING: Landing within the 100 foot circle results in automatic awarding of the same number of points obtained in landing perfection. All judges should show agreement on their score sheets (Not on the amount of score, just whether or not a spot landing was accomplished) and in the event of disagreement, a majority vote by the judges should dictate.

CONCLUSION OF FLIGHT: The official flight is finished at the moment the plane stops at the end of its landing roll. At this point the contestant announces "flight complete" and immediately taxies his plane off the runway to whatever area the Contest Director designates. If landing was deadstick, pilot or helper shall retrieve plane as soon as permitted by official in charge of flight line.

FAI RADIO CONTROL AEROBATICS WORLD CHAMPIONSHIP REGULATIONS

(AND CLASS D AMA RC AEROBATICS)

These rules do not necessarily apply when FAI Pattern is flown as a Class D event in AMA contests—they are basically World Championship Regulations. They may, however, be used if it is advertised that the event is to be run in accordance with these FAI regulations rather than the AMA Pattern Rules. For either AMA Class D or FAI events, the FAI schedule of maneuvers shall be used (5.13 through 5.13.15).

●5.1 DEFINITION OF A RADIO CONTROLLED MODEL. Model aeroplane in which lift is generated by aerodynamic forces acting on surfaces remaining substantially fixed (except for control surfaces) during flight and which performs maneuvers controlled by the pilot on the ground using radio control connection.

5.2 PREFABRICATION OF THE MODEL: Permitted: a plane which is assembled by the builder from prefabricated parts and in which the builder installs the equipment. Not permitted: models which are completely prefabricated and required only few minutes of unskilled effort for their completion or complete ready-to-fly models which have been built by a person other than the pilot.

5.3 GENERAL CHARACTERISTICS OF RADIO CONTROLLED MODELS: Maximum surface area: 150dm^2 (2325 sq. in.). Maximum total weight: 5 Kg. (11.023 lbs.). Minimum loading: 12gr/dm^2 (3.95 oz. per sq. ft.). Maximum loading: 75gr/dm^2 (24.51 oz. per sq. ft.). Maximum total swept volume of the motor(s): 10 cm^3 (.61 cu. in.). The motor(s) must be equipped with effective silencers.

5.4 NUMBER OF HELPERS: Each pilot is permitted one helper during the competition.

5.5 NUMBER OF FLIGHTS:The competitor has the right to three official flights.

5.6 DEFINITION OF AN ATTEMPT: There is an attempt when:

a) The pilot announces the start of the take-off manoeuvre.
b) The model fails to commence the take-off within the 3 minutes allowed to the competitor.
c) If the motor stops after the pilot has announced the start of take-off and before the model is airborne, it may be restarted (within the 3-minute period). However, no points will be awarded for the subsequent take-off manoeuvre.

5.7 NUMBER OF ATTEMPTS: Each competitor is entitled to one attempt for each official flight.
N.B. An attempt can be repeated at the judges' discretion only when, for any unforseen reason outside the control of the competitor or organizers,the model fails to make a start.

5.8 DEFINITION OF AN OFFICIAL FLIGHT: There is an official flight when an attempt is made whatever the result. Note: When jettisoning occurs the flight is cancelled.

5.9 MARKING: Each manoeuvre may be awarded marks between 0 and 10 by each of the judges during the flight. These marks are multiplied by a coefficient which varies with the difficulty of the manoeuvre. The manoeuvres must be performed in a plane and at a height which will allow them to be seen clearly by the judges. The non-observance of this rule will be penalized by loss of points. There shall be an official at each circle to indicate by a visual and audible signal, if and when the model passes over the spectators. If this happens before a manoeuvre is completed, no points shall be given for this manoeuvre. The official must keep a record over all disqualified manoeuvres.

5.10 CLASSIFICATION: The final classification will be determined by the aggregate sum of three flights. The marks allocated by the judges will be multiplied by their appropriate coefficient, and added together. In case of a tie for the first place, the final result will be established by a fly-off. Any fly-off must take place within one hour of the normal finishing time of the contest. No attempts are permitted. The results of a fly-off shall count only for the establishment of a title (such as World Champion) and any prizes affected.

5.11 JUDGING (for World Championships):

(a) The organizers must appoint a panel of at least 3 judges for each flight. The judges shall preferably be of different nationality and be elected from a list of persons who are approved by the National Aero Clubs and the CIAM. A rotation system may be used provided that each judge will score each contestant an equal number of times. The specific system to be employed at a World Championship must be started in advance by the organizers and must have prior approval by the CIAM or CIAM Bureau.

(b) There shall be training flights for judges with a briefing before and after to be held immediately before every W/C.

5.12 ORGANIZATION FOR RADIO CONTROLLED EVENTS:All transmitters to be used during the contest must be checked and placed in a compound kept under observation. During the contest, a Steward must be in control of the transmitter compound and will issue the transmitter to the competitor only when his name is called for him to stand by to make his flight. As soon as the attempt has ended the competitor must immediately return his transmitter to the Steward at the transmitter compound.

All unauthorized transmission during the contest will result in automatic disqualification of the offender from the entire contest, and render him liable to further penalties.

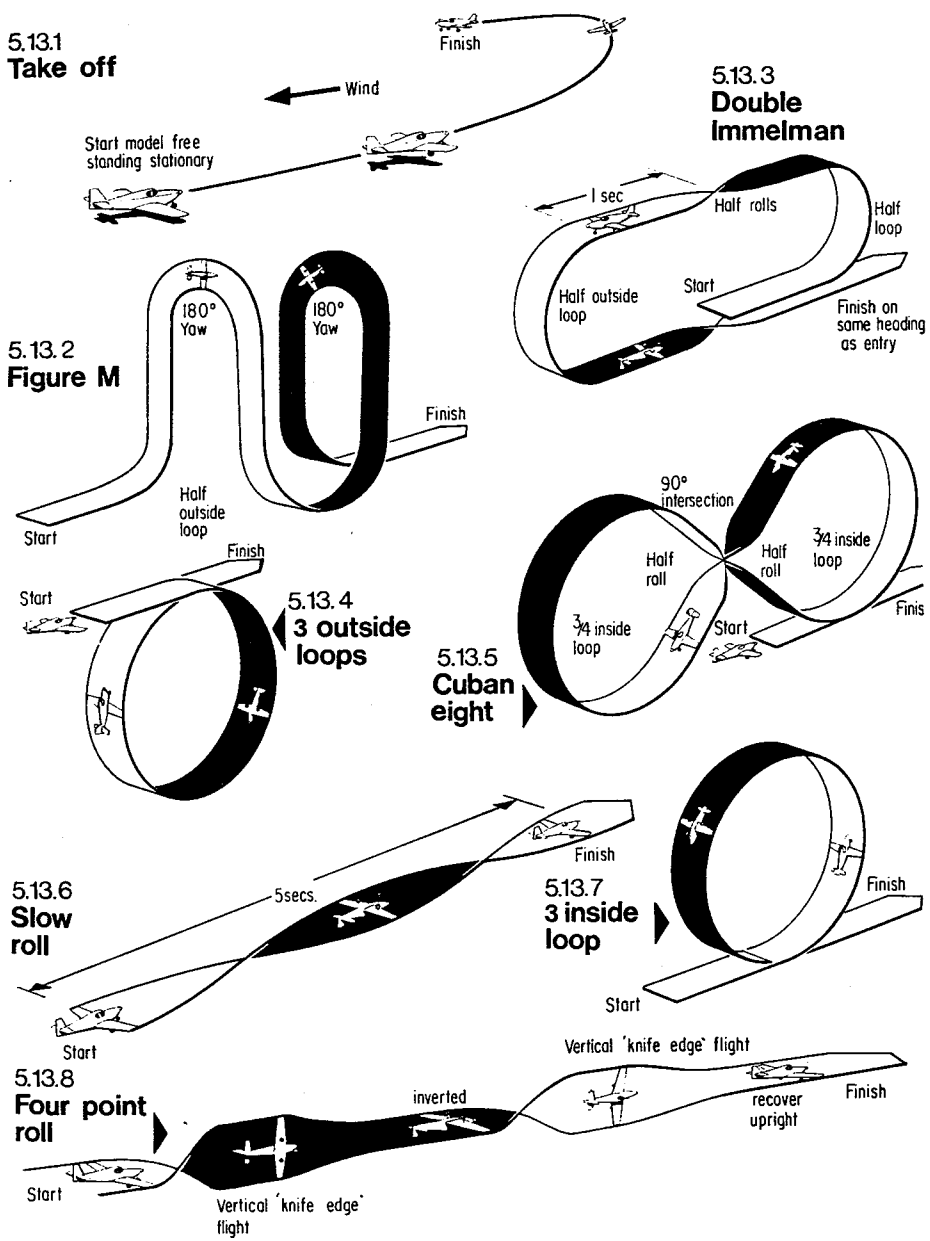
● During the time the flight manoeuvres are being carried out, the pilot, with his transmitter, must stay in the proximity of the 30 meter (98.4 ft.) landing circle and under direct supervision of the course steward.

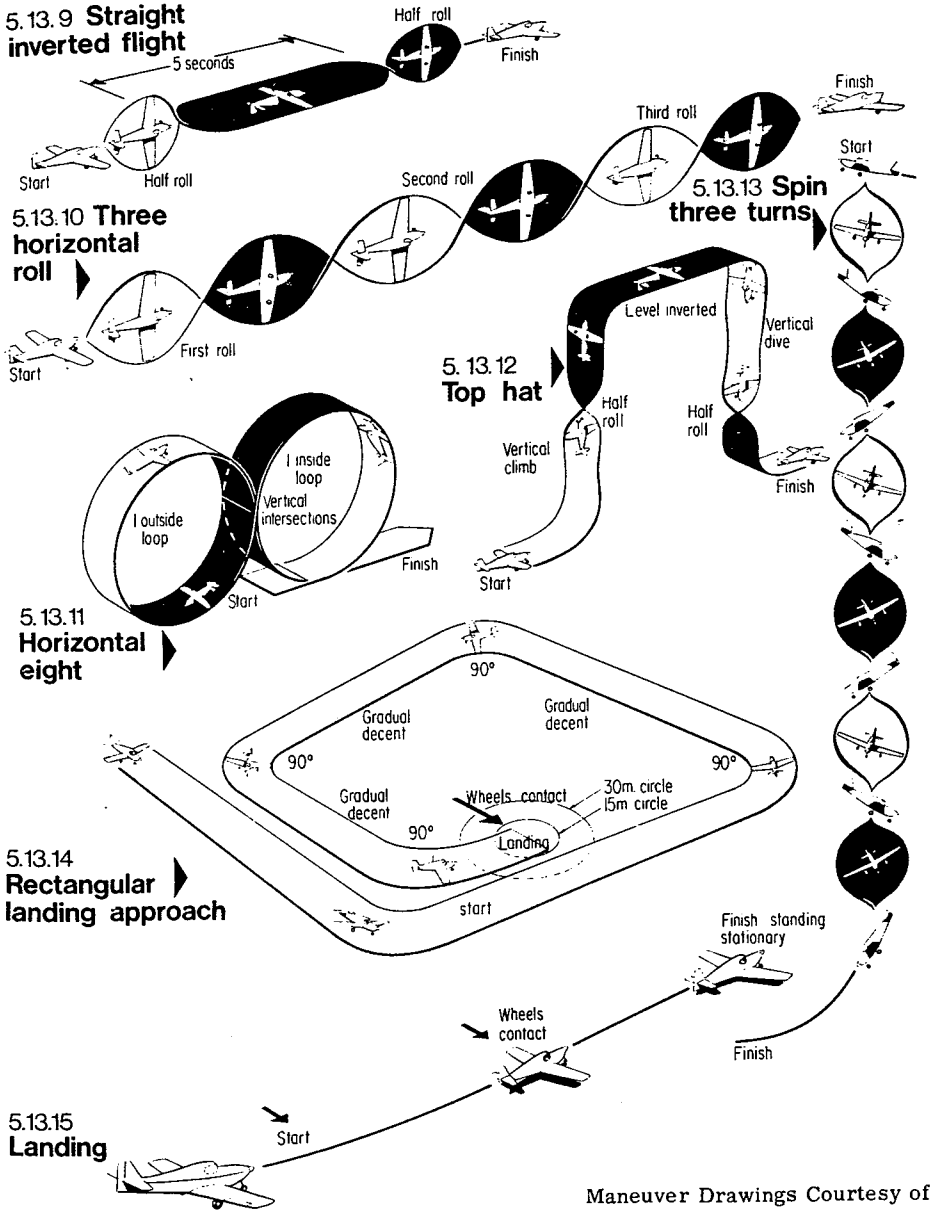
The order of starting of the various countries and the competitors will be established by means of a draw before the start of the contest.

Competitors must be called at least 5 minutes before they are required to occupy the starting area.

The organizer must provide a radio monitor for the purpose of detecting possible interference.

F.A.I.
Radio Control Manouvers





Maneuver Drawings Courtesy of
RADIO CONTROL MODELS & ELECTRONICS

• 5.13 SCHEDULE OF MANOEUVRES:
The maneuvers must be executed during an uninterrupted flight in the order in which they are listed and the competitor must indicate in writing, before the start of the flight, any maneuver he will not execute. The start of each maneuver must be announced by the pilot or his assistant. The landing maneuver need not be announced but must be executed in an uninterrupted manner. The competitor may only make one attempt to execute each figure during any one flight.

The pilot has 10 minutes in which to start his engine and complete the programme of manoeuvres. One motor must be running during execution of the manoeuvres 5.13.1 to 5.13.13 inclusive.

5.13.1 TAKE-OFF: The model must stand still on the ground with the engine running without being held by the pilot or mechanic and must then take off into wind. The taxi-run should be straight and the model should lift gently from the ground and climb at a gradual angle. The Take-off is completed when the model is turned out of the take-off path. The Take-off should be down-graded at least one point for each of the following reasons:

1. Model does not stand still when released.
2. Changes in heading during the run.
3. "Jumping" from the ground.
4. Retouching the ground after becoming airborne.
5. Too steep a climb angle.
6. Gallops in elevation during climb.
7. Changes in heading during climb.
8. Dropping a wingtip K=10

5.13.2. FIGURE M: The model starts in straight and level flight, pulls up to a vertical attitude, performs a stall turn (left or right) through 180°, then makes ½ an inverted loop pulling up again to vertical flight, performs a second stall turn in a direction opposite to the first stall turn and then recovers on the same altitude and heading as the entry. When viewed from the side, the model creates the letter "M". The manoeuvre should be down-graded for the following reasons:

1. Model not level at start.
2. Does not become vertical.
3. Turns left or right during pull up.
4. Turn radius at top of stalls is larger than two wingspans.
5. Turns at top of stalls are less than 180°.
6. Diving paths are not parallel to climbing paths.
7. Bottom of inverted portion is at different altitude than entry.
8. Turning point of second stall turn is at different altitude from the first turn.
9. Manoeuvre not finished at same altitude as entry.
10. Plane not level at finish of manoeuvre. K=15

5.13.3 DOUBLE IMMELMAN: Model starts in level flight, pulls up into a half loop, followed by half a roll, flies straight and level for approximately one second, then makes half an outside loop, followed by half a roll, recovering in straight level flight. The manoeuvre should be down-graded for any of the following reasons:

1. Model not level at start.
2. Model deviates left or right during half-loop.
3. Half-loop not completed exactly above point of commencement of half-loop.
4. Half roll does not commence immediately after half-loop.
5. Plane deviates from a straight line during roll.
6. Model flies longer than one second upright before commencing half outside loop.
7. Model deviates left or right during half outside loop.
8. Half outside loop not completed at same altitude as entry.
9. Half outside loop not completed exactly below point of commencement.
10. Model does not commence half roll immediately at bottom of half loop.
11. Model travels further during second half roll than it did in first half roll.
12. Model does not finish in level flight.
13. Model does not finish on same heading and altitude as entry. K=10

5.13.4 3 OUTSIDE LOOPS: The model commences the Outside Loop flying straight and level, then noses down into three Outside Loops and recovers flying straight and level on the same heading and altitude as the entry. The first loop may be down-graded because:

1. Entry not level.
2. Loop not round.
3. Loop deviates left or right.
4. Finish of loop not at same altitude as entry.
5. Loops displayed endwise rather than with a view of the circular path.

The second Loop may be down-graded because:

1. Not on same heading as first loop.
2. Not the same diameter as first loop.
3. Loop deviates left or right.
4. Finish of loop not at same altitude as entry.

The third Loop may be down-graded because:

1. Not on same heading as first loop.
2. Not the same diameter as first loop.
3. Loop deviates left or right.
4. Recovery not at same altitude as entry.
5. Recovery not on same heading as entry.
6. Recovery not level.

NOTE: Loops must appear round and super-imposed to the ground-observer even in the presence of the wind. K=15

5.13.5 CUBAN EIGHT—SAVOY KNOT: The plane commences flying straight and level, pulls up into an inside loop and continues until heading downward at 45°, does half roll followed by another inside loop at 45°, does half roll followed by straight and level recovery at same altitude of entry. The Cuban Eight may be down-graded because:

1. Entry not level.
2. Loop not round.
3. Loop deviates left or right.
4. Roll not on 45° line.
5. Second loop not same diameter as first loop.
6. Second loop deviates left or right.
7. Second loop not at same altitude as first loop.
8. Second roll not on 45° line.
9. Does not finish level.
10. Does not finish on same heading as entry.
11. Does not finish at same altitude as entry. K=10

5.13.6 SLOW ROLL: Model commences from straight and level flight and then rolls slowly at a uniform rate through one complete rotation. The approximate time of the roll to be five seconds. Down-grading shall result for any of the following reasons:

1. Model not level at entry.
2. Plane deviates from a straight line during roll.
3. Roll rate not uniform.
4. Plane does not roll through exactly one revolution.
5. Plane changes altitude during roll.
6. Plane changes heading.
7. Roll rate is too rapid resulting in much less than five seconds.
8. Plane is not level at finish of roll. K=15

5.13.7 3 INSIDE LOOPS: The model starts the Loops manoeuvre flying straight and level, then pulls up into a smooth, round loop, followed by a second and third loop in exactly the same path with a straight and level recovery to finish. The Inside Loops are down-graded in the same manner as the Loops in 5.13.4. K=10

5.13.8 FOUR POINT ROLL: The model starts in straight and level flight, does ¼ of a horizontal roll till wings are vertical, then hesitates to demonstrate controlled "knife edge" flight. It then continues with a second quarter roll to inverted, hesitates, does another ¼ roll to "knife edge" position again and finally does ¼ roll to upright and level flight at same altitude and heading as entry. The manoeuvre will be down-graded for the following:

1. Not level during entry.
2. Rolls more or less than 90° and does not hesitate with wings vertical.
3. Does not provide angle hesitation to demonstrate controlled "knife edge" flight.
4. Wings not horizontal at end of second quarter of rolls, and
5. Repeat 2, 3 and 4 above for remaining third and fourth quarter rolls. K=15

5.13.9 STRAIGHT INVERTED FLIGHT: The model starts the manoeuvre level and upright, makes a half roll to inverted, flies straight and level inverted for a minimum of five seconds and recovers with a half roll to the upright position. The Straight Inverted Flight may be down-graded because:

1. Not level at entry.
2. Plane deviates left or right.
3. Plane changes altitude or heading.
4. Plane flies inverted for less than five seconds. K=10

5.13.10 3 HORIZONTAL ROLLS: Model commences from straight and level flight then rolls at a uniform rate through three complete rotations and finishes in straight flight, all on the original heading, the time of the three rolls to be approximately four seconds. Down-grading shall result from any of the following reasons:

1. Model not level at entry.
2. Plane deviates from straight line during rolls.
3. Roll rate not uniform.
4. Plane does not roll through exactly three revolutions.
5. Plane changes altitude during rolls.
6. Plane changes heading during rolls.
7. Roll rate is extremely rapid so that rolls are completed in less than three seconds.
8. Plane is not level at the finish of the rolls. K=15

5.13.11 HORIZONTAL EIGHT: The plane commences flying straight and level, pulls up into 3/4 of an inside loop, does one full inverted loop starting from straight down, then ¼ of an inside loop finishing in straight and level flight. The Horizontal Eight may be down-graded because:

1. Entry not level.
2. First loop not round.
3. Plane deviates left or right during first loop.
4. Plane not vertical at start of second loop.
5. Second loop not the same diameter as first loop.
6. Second loop not round.
7. Second loop deviates left or right.
8. Does not finish level.
9. Does not finish on same heading as entry.
10. Does not finish at same altitude as entry. K=10

5.13.12 TOP HAT: Model starts in straight level flight, pulls up into vertical climb and makes a half roll, then levels out inverted on the same heading as entry. After short inverted flight, model dives vertically, performs a half roll and finally recovers in straight level upright flight on same heading and height as entry. The Top Hat should be down-graded if:

1. Model does not start level.
2. Model does not go exactly vertical before starting roll.
3. Roll does not stop at exactly 180° from entry.
4. Model does not climb vertically for a brief period after completing roll.
5. Model does not go to an exactly horizontal inverted position after the ¼ loop.
6. Model does not fly inverted for the same distance as the vertical climb and roll.
7. Model does not dive vertically briefly before starting half roll.
8. Second half roll not started at the same altitude as that where the first half roll was completed.
9. Second half roll not completed at same altitude as that where first roll started.
10. Model does not dive vertically for a brief period after completing second half roll.
11. Model deviates left or right of the entry path at any point in the manoeuvre.
12. Model does not recover at same altitude and heading as entry. K=15

5.13.13 THREE TURN SPIN: The plane establishes a heading direction by flying straight and level, pulls up into a stall and commences the spin through one, two, three turns and recovers to level flight on the same heading as the initial flight direction. The judge must watch carefully to be sure this is a spin and not a vertical roll or a spiral dive. In the Spin, some part of the plane always intersects an imaginary vertical line along the path of descent. In the spiral dive, the plane circles around, but outside of, the imaginary vertical line. The Spin may be down-graded because:

1. Initial heading is not level.
2. Commencement of first spin is sloppy or uncertain.
3. Does not do exactly three turns. Less than two or more than four turns should be scored zero.
4. Does not finish on same heading as initial heading.
5. Does not finish level.
6. If any of the three turns are spiral dives rather than spins, the score is zero. K=10

5.13.14 RECTANGULAR APPROACH: The Rectangular Approach is commenced with the model flying into the wind above the landing circle, a left turn of 90° a crosswind leg, a second left turn of 90° a down-wind leg, a third left turn of 90° a crosswind leg, a fourth left turn of 90° and straight flight toward the point of touch-down. The manoeuvre is finished just prior to the point of touch-down. NOTE: The contest manager may change the left turns to right turns if he wishes. The Rectangular Approach may be down-graded because:

1. Legs of rectangle are not straight.
2. The 90° turns are not smooth or precise.
3. Gallops in elevation.
4. Attempts to break out of pattern or go around again zero points. K=10

• 5.13.15 LANDING: The model flares smoothly to touch the ground with no bouncing or change in heading and rolls to a stop.

K=15 when landing is in 15 m. (49.2 feet) diameter circle.
K=10 when landing is outside 15 m. (49.2 ft.) circle but inside 30 m. (98.4 ft.) diameter circle.
K=5 when landing is outside 30 m. (98.4 feet) diameter circle.

The landing should be down-graded because:

1. Approach to ground is too steep.
2. Model impacts ground due to lack of flare-out.
3. Model bounces on landing.
4. One wing low.
5. Model deviates left or right while rolling to a stop.
6. If the model ends on its nose or back—zero points!