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

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OFFICIAL AMA SAFETY CODE

GENERAL

1. I will not fly my model aircraft in competition or in the presence of spectators until it has been proven to be airworthy by having been previously successfully flight tested.
2. I will not fly my model higher than approximately 400 feet within 3 miles of an airport without notifying the airport operator. I will give right of way to, and avoid flying in the proximity of, full scale aircraft. Where necessary an observer shall be utilized to supervise flying to avoid having models fly in the proximity of full scale aircraft.
3. Where established, I will abide by the safety rules for the flying site I use, and I will not willfully and deliberately fly my models in a careless, reckless, and/or dangerous manner.

RADIO CONTROL

1. I will have completed a successful radio equipment ground range check before the first flight of a new or repaired model.
2. I will not fly my model aircraft in the presence of spectators until I become a qualified flyer, unless assisted by an experienced helper.
3. I will perform my initial turn after takeoff away from the pit, spectator, and parking areas, and I will not thereafter perform maneuvers, flights of any sort, or landing approaches over a pit, spectator, or parking area.

FREE FLIGHT

1. I will not launch my model aircraft unless at least 100 feet downwind of spectators and automobile parking.
2. I will not fly my model unless the launch area is clear of all persons except my mechanic and officials.
3. I will employ the use of an adequate device in flight to extinguish any fuses on the model after it has completed its function.

CONTROL LINE

1. I will subject my complete control line system (including safety thong, where applicable) to an inspection and pull test prior to flying.
2. I will assure that my flying area is safely clear of all utility wires on poles.
3. I will assure that my flying area is safely clear of all non-essentional participants and spectators before permitting my engine to be started.

1974 AMA 1975

OFFICIAL 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

75¢

34. CL DIVE BOMBING AND STRAFING (SUPPLEMENTAL)

1. Applicability. All pertinent AMA regulations (see sections titled Sanctioned Competition, Records, Selection of National Champions, and General) and the General Control Line Rules shall be applicable, except as specified below.

2. Deception. This event simulates the actions of a military combat aircraft on a tactical support mission. Emphasis is placed on the following:

A. Maximum speed over target.
B. Maneuverability (diving over the barrier and breaking the balloons).
C. Pilot skill.

Note: The airplane does not fire any weapons, but through contact with the target balloon(s) the breaking of balloons is accomplished.

3. Field Layout will consist of one 60-foot radius circle, on the downwind side of which the target area shall be placed. The circle is set for counterclockwise direction of flight. *Note: See field layout diagram.*

4. Aircraft Requirements. Any model, be it full bodied or pronle, having a fixed landing gear of no less than two wheels is permitted. Bonus points will be awarded for military-type aircraft of any country; bonus points will be awarded to these types of models on the basis of realism of the aircraft and workmanship. See "scoring" paragraph for the points possible in this regard and the qualification necessary. Balloon breaking devices made of wood and non-pointed, which represent the actual armament used on copied aircraft, are permitted. Such devices shall be permanently affixed to the model. Proof of armament rests with the flyer.

5. Engine(s) shall be of the reciprocating internal combustion type with piston displacement of from .1500 thru .4599 permitted. Sixty percent of the actual piston displacement of four stroke cycle engines shall be taken for compliance with this regulation. Jet assist, catapult or other launching device is not permitted.

6. Duration of Flight. Total elapsed flight time from takeoff to and including landing shall not exceed seven (7) minutes.

7. Control Line Requirements. Sizes and pull test as per chart.

8. Flight. Plane must rise off ground and fly seven (7) laps at maximum altitude of 15 feet for speed timing. Plane shall be timed from instant of release to instant plane passes release point 7th time. Then the pilot must approach targets in upright position flying level, dive over the barrier and knock out targets. Maximum altitude before dive is approximately 20 feet. Pilots are allowed five (5) passes to knock out targets. Pilot must signal when airplane is over target area, prior to each scoring pass by raising arm over head. All balloons broken in any pass will count; however, they must be broken by the plane itself. Balloons knocked over (except by prevailing winds) will not be replaced during flight. Pilots must not:

A. Use two-speed control.
B. Whip or lead model during speed run.
C. Stunt or engage in aerobatic flying except the diving and climbing necessary to engage the targets.
E. Crash
F. Use more than one airplane.

9. Official Flight. Three (3) attempts will be permitted toward two (2) official flights. An official flight is charged if airplane has completed seven (7) laps and the pilot signals for a scoring pass. *Note: Once the pilot has signaled for a scoring pass he will be charged with it the next time the airplane passes over the target area, whether or not he dives and atacks the targets.*

An attempt will be charged if the pilot fails to start engine in three minutes time from signal from the judge. Two additional minutes will be allowed for each additional engine. An attempt will also be charged if pilot waves off flight before signaling for a scoring pass.

10. Scoring. Target balloon nearest the barrier pole is worth ten (10) points, the next is worth eight (8) points, then 6, 4 and 2. *Note: See field layout diagram.*

10.1. To qualify for bonus points planes must:

A. Represent a combat type military plane of some country and have appropriate military markings.

B. Break at least one target balloon according to the rules and comply with the rules of the "flight" paragraph.

10.2. Bonus points are to be awarded on the basis of realism of the airplane and workmanship displayed by the builder.

10.3. Multi-engine airplanes will receive ffve (5) additional bonus points for each additional engine. No points to be awarded for the first engine. All engines of a multi-engine plane must be running until the completion of the scoring passes. No passes will be permitted unless all engines are running. Pilots are not required to make all five scoring passes.

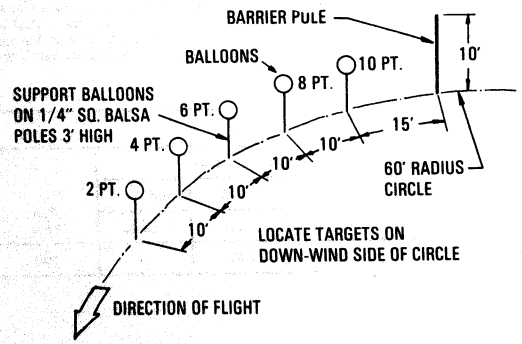
Bonus Breakdown:	**Poor**	**Good**	**Excellent**
Airplane Scale	50	75	100
Airplane Semi-Scale	10	20	30

Note: Semi-scale includes full-bodied and profile types.

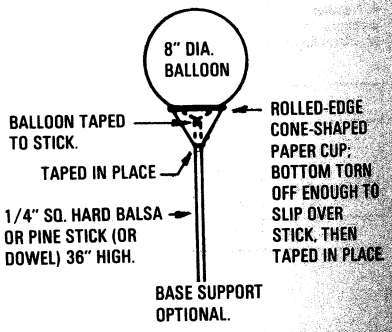
10.4 Final score equals speed in mph times sum of balloons broken plus bonus. *Example: 40 mph × 12 (6.4 & 2 balloons) plus 20 = 500 points. Note: Bonus points are tentatively awarded before flight; if flight qualifies then they are awarded. A crash or failure to break any balloons would result in a zero score.*

CL DIVE BOMBING AND STRAFING

Engine Size (cu. in.)	Max. Model Weight	Required Line Length	Required Minimum Diameter of Each Line: Single Strand 1 Line	Single Strand 2 Lines	Single Strand 3 Lines	Multi-Strand 2 Lines	Multi-Strand 3 Lines	Pull Test
.1500—.4009	4 lbs.	59'9"-60'3"	.018"	.016"	—	.015"	—	10G
.4010—.4599	4 lbs.	59'9"-60'3"	.020"	.018"	—	.018"	—	10G



DIVE BOMBING AND STRAFING FIELD LAYOUT



SUGGESTED BALLOON MOUNTING

35. RC PATTERN

1. Applicability. All pertinent AMA regulations (see sections titled Sanctioned Competition, Records, Selection of National Champions, and General) shall be applicable, except as specified below.

2. Objective. To control by radio a model airplane so that various planned maneuvers may be accomplished. The criterion is the quality of performance, not the mechanism of control. RC competition shall be based on the excellence of performance of the model's maneuvers compared to similar maneuvers performed by a full size plane. Maneuvers shall be judged according to the AMA Radio Control Judges Guide.

3. Licensing Requirements. All radio equipment and operation must conform to the regulations of the F.C.C. AMA membership card and F.C.C. license of each enrant shall be checked a every sanctioned meet.

4. Model Aircraft Requirements.

4.1. Engine(s). Models shall be of the reciprocating internal combustion engine-powered type. Total displacement of the engine(s) shall not exceed .6102 cubic inch (10 cc). Sixty percent of the actual piston displacement (volume swept by the piston) of four stroke cycle engines shall be taken for determining maximum displacement allowed.

4.1.1. Each engine shall be equipped with a muffler.

4.2. Weight. No model may weigh more than 15 lbs. gross, ready for takeoff.

4.3. Controls. There shall be no radio equipment or aircraft control function limitations in any pattern class. *Radio equipment is only limited by F.C.C. regulations.*

4.4. Number of Airplanes. Two airplanes may be entered by a contestant and are to be number "1" and "2". The contestant may choose to enter either plane at the beginning of the meet and shall continue to use such plane unless, and until, said plane shall be damaged to the extent that it cannot be readily repaired. Contestant may then, upon approval of the Contest Director, substitute the second plane for the balance of the meet without penalty. Once this has been done, the contestant may not re-submit the first plane later in the same contest.

4.4.1. Substitution of basic components of the two entered aircraft, i.e., wing(s), fuselage, or tail surfaces, will be considered the same as switching airplanes, and therefore will only be allowed one time. In this connection, each basic, detachable component of each aircraft must be marked as "1" and "2". Substitution rule does **not** apply to radio and engine.

4.5. The Builder of the Model Rule shall not apply to the pattern events.

4.6. Identification. All models shall be identified by the contestant's AMA license number permanently affixed to the upper side of the right-hand lifting surface or to each side of the fuselage or vertical stabilizer. Height of the numberals must be at least one inch. Both stroke and width shall be such to enable ready recognition. It is suggested that the letter N be placed in front of the license number when the number is affixed to the side of the fuselage or vertical stabilizer.

5. Safety Requirements. Considerations of safety for spectators, contest personnel, and other contestants are of the utmost importance in the event, and the following safety provisions **must** be observed.

5.1. All models must pass a general safety inspection by the Event Director or his representatives before they are allowed to compete.

5.2. If any part of a maneuver is performed over a controlled spectator area the contestant shall receive a zero score for that maneuver. Continued flying over controlled spectator areas by any one contestant shall result in disqualification of the contestant by the Event Director.

5.3. Dangerous flying of any sort, or poor sportsmanship of any kind, shall be grounds for disqualification of the contestant involved.

5.4. Pilots shall remain near the judges while flying, and in particular shall stay off the runway and/or landing area during maneuvers which call for flying (or taking off or landing) in line with the center of the runway and/or landing circle.

5.5. All planes entered must have rounded prop spinners, or some sort of safety cover on end of propeller shaft (such as a rounded "acorn nut"). Radius of point shall not be less than ⅛ inch.

5.6. Knife-edge wings are not allowed.

6. Pattern Event Classes. The pattern event shall be divided into four classes. The first three, in order of increasing difficulty, are Classes A, B, and C. These shall be referred to as AMA Pattern classes. The fourth class, Class D, shall be referred to as the FAI Pattern class, and is based on the world championship event.

6.1. Except as noted in the FAI RC Aerobatics section, all rules for the AMA pattern classes shall apply to the FAI pattern class.

6.2. In Classes C and D there shall be a sub-division into Novice and Expert. The methods of determining and controlling the Novice/Expert division are explained elsewhere.

6.3. The Contest Director and/or the sponsors of a sanctioned meet shall determine which of the classes will be flown, and such information must accompany all advance notices pertaining to the contest. Competitors must also be advised prior to start of contest of any planned deviations from standard AMA rules pertaining to the events they have entered. Organizers of a contest may use either Class C or Class D for the top competition category, or, if time and planning permits, both classes may be used.

7. Contestant Classification. At his first pattern contest, a contestant may enter any one pattern class at his own option. (*This decision should be made with care, as no one at any time, will be permitted to change to a lower class.*) Once committed to a certain class, a contestant will be allowed to move only to a higher skill class. This move will come about in one of two ways: (1) voluntary, (2) mandatory.

7.1. A contestant may promote himself voluntarily to a higher class at any time; however, once the move is made, he may not change back to a lower class.

7.1.1 Exception: A contestant may fly in the next higher class at a contest where his class is not being flown without committing himself to a permanent move to the higher class.

7.2. A contestant will be mandatorily advanced through the classes as follows: Upon placing first, second, or third in a sanctioned contest, he will receive 3 points for first place, 2 points for second place, or 1 point for third place. These points will be multiplied by the number of contestants who actually flew officially in the event and class. The resulting Classification Score goes into the contestant's accumulative record. When the accumulated Classification Score meets or exceeds 100 points, the contestant will automatically be advanced to the next competition class **at the end of that calendar year**. Classes, in increasing order of skill, are A, B, C or D Novice, and C or D Expert. Contestants qualified for Class C Novice or Expert are also qualified for Class D Novice or Expert.

7.2.1 A contestant may voluntarily move to the next higher class at the time he accumulates 100 points, but will not be **required** to do so until the end of the calendar year.

7.2.2. Time required to accumulate 100 Classification Points has no limit. A contestant's point accumulation does not start over again at the beginning of each new year, but continues ad infinitum until, if ever, 100 points are accumulated.

Note: A contestant who flies in a higher class under the Exception Rule (7.1.1) above, and who places first, second or third, still acquires Classification Points in accordance with 7.2, above.

Examples

(1) Contestant is one of 8 who flies officially in a given class, and places first. He acquires 3 points times 8 contestants, equaling 24 Classification Points.

(2) Contestant is one of 3, and he places second. He acquires 2 points times 3 contestants, equaling 6 Classification Points.

(3) Contestant accumulates 95 points in 1974, and thus remains in his declared class into 1975. At the first 1975 contest he picks up 12 points. He may fly the rest of 1975 in his declared class, but will be advanced to the next higher class starting January 1, 1976. (He may move up sooner if he so desires.)

7.3. The Contest Director of each AMA sanctioned RC meet having Class A, B, C/N, C/E, D/N, or D/E events is responsible for upkeep of the classification system. He must require that only current AMA members be allowed to fly in the meet and that they all have valid F.C.C. licenses. As soon as the first, second, and third place winners in each class are determined, the Contest Director shall fill out the appropriate spaces of their Classification Forms, indicating the date and location of the meet, event and class, place won, number of contestants who made official flights in that class, and the resulting Classification Score. He will also affix his verifying signature and AMA CD number.

8. Number of Flights. There shall be no limit on the number of flights (other than that imposed by time available). Contest officials shall make every reasonable effort to insure that all contestants receive equal opportunity to fly.

9. Official Flight. A flight is considered official if two maneuvers, other than takeoff and landing, have been judged. An attempted maneuver yielding zero points is still considered "judged."

10. Time Limits.

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

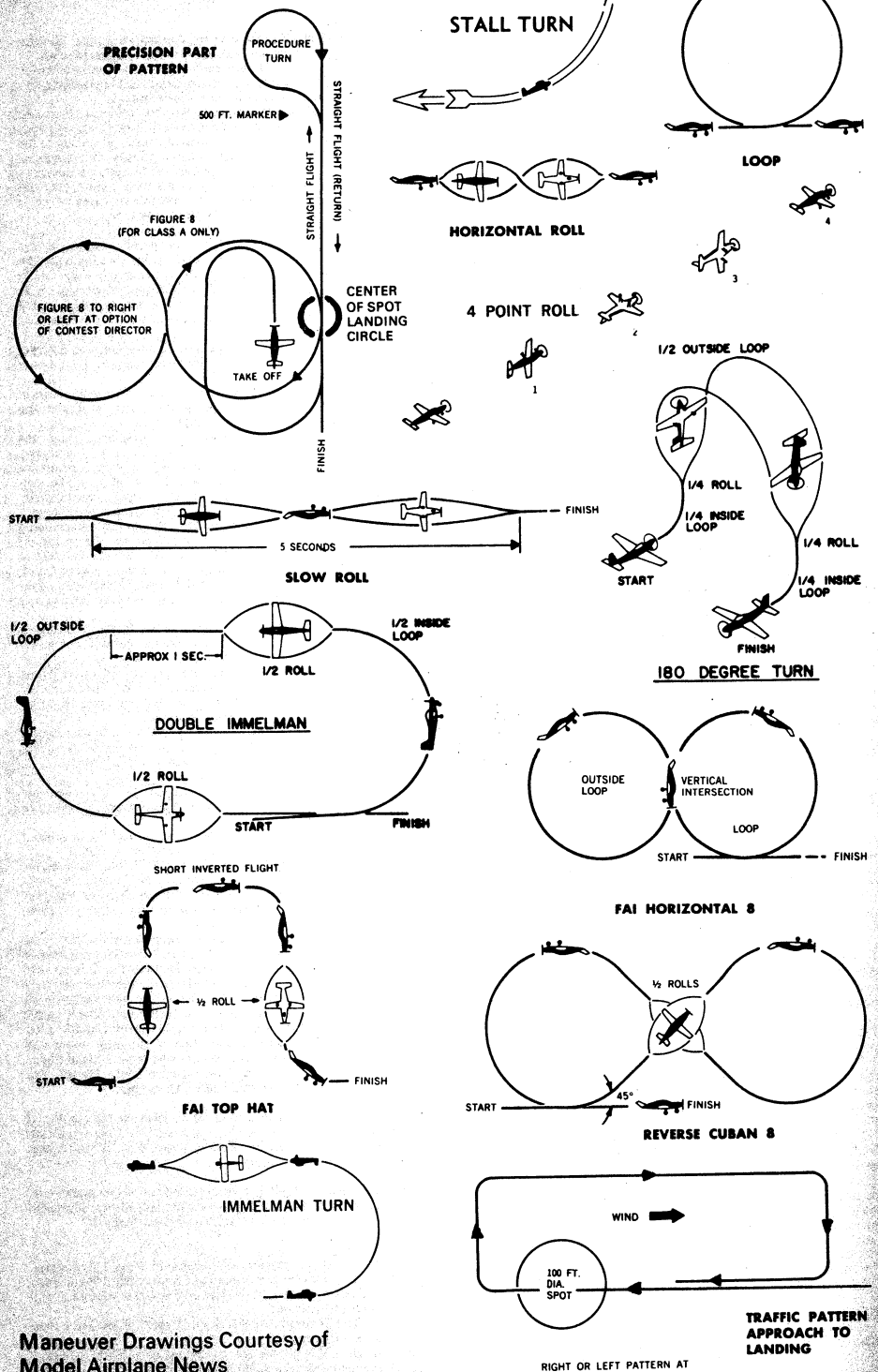
10.2. A Class B contestant is allotted a total of ten (10) minutes.

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

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

10.5. In all AMA classes the contestant must have his engine started and commence his flight within the first two minutes after

AMA RC PATTERN MANEUVERS



Maneuver Drawings Courtesy of
Model Airplane News

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.

10.5.1. 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.

10.6. In Class D the contestant must have 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.

10.6.1. 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.

11. Point System.

11.1. 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.

11.2. 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.

12. Determining the Winner.

12.1. 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.

12.2. 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.

13. 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.

13.1. Contestant (or his helper) may not touch his plane after it has become airborne until completion of flight; i.e., he may not land plane between maneuvers in order to make adjustments to engine, trim, etc.

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

14. Class A Pattern Maneuvers.

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 by contestant.

15. Class B Pattern Maneuvers.

1. Takeoff
2. Touch and Go
3. Three Axial Rolls
4. Three Inside Loops
5. Four Point Roll
6. Three Turn Spin
7. FAI Horizontal Eight
8. Cuban Eight
9. Three Outside Loops
10. Traffic Pattern Approach
11. Landing Perfection
12. Spot Landing

16. Class C Pattern Maneuvers (Novice and Expert).

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.

17. Class D Pattern. The Class D Pattern shall be the current FAI Pattern as described elsewhere in this publication.

18. Suggested Field Procedure. The procedures listed below are suggestions to Contest Directors for operation of an RC Pattern event, and may be altered to fit local conditions.

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

18.2. 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.

18.3. 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.

18.4. Event Director shall carry out following procedure:

18.4.1. 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.

18.4.2. 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 or his representative to notify contestant of start and end of 3 or 4 minute period.

18.4.3. 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.

18.5. 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:

18.5.1. Separate takeoff and landing areas sufficiently spaced cross wind from each other to minimize engine noise and flight path interference.

18.5.2. Contestants flying simultaneously shall carefully check receiver and transmitter operation before takeoff, to be sure no interference between them is possible.

18.5.3. 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.

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

18.6. Officials. An Event Director, a Dispatcher-Recorder and Judges are the essential officials for an RC Event. If possible, the Dispatcher-Recorder should have at least two helpers.

18.7. 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.

19. Description of Maneuvers. A detailed description of each maneuver specified in the above patterns will be found in the AMA RC Pattern Judges Guide, or the FAI RC Aerobatics Rules.

AMA RC PATTERN JUDGES GUIDE

A. Purpose. The purpose of the AMA RC 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 aerobatic 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 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. wingspan 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 interrelated 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 consecutive 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 or maneuvers to be performed is described in the RC Pattern Rules. 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 he 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.

If the engine stops during Taxi Demonstration, the flyer will automatically lose five (5) Takeoff points. The Taxi Demonstration will not be considered finished until the contestant announces the Takeoff. If the engine stops after Takeoff is announced, the Takeoff score is zero. Engine may be restarted, and flight continued, if still within the two minute starting period.

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. Pilot shall call "takeoff" (or "maneuver") complete" when model has gained at least six feet of altitude and is still climbing out in a straight flight path.

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 takeoff 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.

Straight Flight Out. The model must be brought exactly over the center of runway and/or landing circle 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 center of runway and/or landing circle.
2. Plane deviates left or right.
3. Does not hold constant altitude.
4. Turns before permission is given by judge.
5. Gallons in elevation.

Procedure Turn. After the straight flight, the model must turn exactly 90° to the left or right, whichever will take the plane away from the spectator line (direction to be specified by the Contest Director), then exactly 270° to the right (or left) and cross over the point where the first turn commenced. The turn may be downgraded because:

1. Left turn not 90°
2. Right turn not 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 circle along the same line as the outgoing path and pass exactly over the circle. 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 circle.

Figure Eight. (Class A only). Directly after the Straight Flight Back and at the instant the plane crosses over the circle, 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 circle and the first turn is made to left or right, depending on spectator location. Maneuver is finished on same heading as its entry. The Figure Eight should be downgraded for the following.

1. Entry not directly over the circle.
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 cross-over 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 circle.
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 takeoff 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 Axial 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 the 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.

C. 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 shall 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 proceedes 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 proceedes 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.

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 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.

Double Immelman. Model commences in straight and level flight, pulls up into half an inside loop followed by a half roll to upright, outside loop followed by half a 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". First and second stall turns are to be opposite as seen from the ground. (The airplane itself actually turns in the same direction both times.) If both turns are in the same direction, as seen from the ground, the score is zero. The maneuver shall 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. Maneuver not finished at same altitude as entry.
10. Plane not level at finish of maneuver.

Traffic Pattern Approach. The rectangular approach is commenced with the model flying into the wind over the center of the runway and/or landing circle, 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 neccessary 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 flyer accidentally lands near the edge of the runway outside the spot.
6. Model fails to make pronounced stop.
7. Model rolls too far away to accurately judge.
8. Model pitches over and makes ground contact with nose or wingtip.
9. If model flips over on its back or cartwheels on wings—0 points.
10. For a retract gear airplane, any gear-up landing shall be scored zero.
11. Failure of retract gear during landing and before plane completely stops shall result in zero landing score.

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.

RC FREQUENCIES AND FLAGS

The AMA has designated certain colors to be used in the form of a streamer or pennant (flag) as a means of indicating what frequency a transmitter is assigned. It is recommended that 27 MHz flags be triangular. Transmitter antennas in the 50-54 MHz and 72-76 MHz bands will show two flags, each in the form of ribbons approximately 1" × 16"; one ribbon indicates the band while the other ribbon indicates the exact frequency.

The four frequencies indicated by asterisks (*) in the 72-76 MHz band are for model aircraft use only.

27 MHz Band

26.995—Brown	27.095—Orange	27.195—Green
● 27.045—Red	● 27.145—Yellow	27.255—Blue

50-54 MHz Super-Het

53.10—Black & Brown Ribbons	53.30—Black & Orange Ribbons
53.20—Black & Red Ribbons	53.40—Black & Yellow Ribbons

53.50—Black & Green Ribbons

50-54 MHz Super-Regen

51.20—Black & Light Blue	52.04—Black & Violet Ribbons

72-76 MHz Band

72.08*—White & Brown Ribbons	72.32—White & Violet Ribbons
72.16—White & Blue Ribbons	72.40*—White & Orange Ribbons
72.24*—White & Red Ribbons	72.96—White & Yellow Ribbons

75.64*—White & Green Ribbons

the start of each attempt.

6. Number of Models. Each contestant shall be permitted a maximum of 2 models, in each combat period. The streamer must be transferred to the reserve model.

7. Streamer. A crepe, or similar toughened paper streamer measuring 30 millimeters (1⅛ in.) wide and 3 meters (9 ft. 10⅛ in.) long shall be attached by strong thread to the rear of longitudinal center line of the model, with 2 meters (6 ft. 6⅝ in.) free length between rear of model and beginning of streamer. The color of the streamer must be different for each model in the heat.

The point of attachment on the model must be sufficiently strong so the string is not detached under normal flying conditions.

8. Method of Starting.

a) A first signal gives the mechanic(s) or the pilot the opportunity to start, run and adjust the engines.

b) The signal to launch is given (60 seconds after the first signal) by means of both a visual signal (flag) and an audible signal.

c) From the moment the Marshall has given the signal to launch, the round lasts for four minutes.

d) When the Marshall is satisfied that each model has completed 2 level laps, anti-clockwise, separated by at least ¼ of a lap, he will give a prolonged signal that the combat may commence.

e) The Marshall shall give an intermittent signal to terminate the combat either when 4 minutes have elapsed or by disqualification.

f) The engine must be started by flicking the propeller by hand.

9. Termination of Combat. The contest terminates four minutes after the signal to launch, five minutes after the first signal to start the engines.

10. Method of Scoring.

a) Scoring shall commence from the signal to launch and continue for the four minute period.

b) 1 point shall be awarded for each whole second that a model is airborne during the four minutes period.

c) 100 points shall be awarded for each cut off the opponent's streamer by the model.

d) No points shall be awarded for cuts of the thread line.

e) Should the thread become detached from the model, the competitor shall be penalized 100 points.

11. Conduct.

a) The pilot is not permitted to leave the center circle when his model is flying. If he unintentionally does, he shall be penalized 50 points each time. If the pilot wants to leave the center circle (e.g. to start his own engine) he must announce this to opponent and he must wear a head gear as stated in 2, as soon as he leaves the center circle.

b) If a model lands, or is damaged within the five minutes period, the mechanic or pilot may position new lines with the reserve model, or change lines, on the first model.

c) The lines of the second model should be placed just outside the center circle.

d) After a mid-air collision the heat shall continue as if both models had landed, subject to articles 15b, f and i.

e) Every landing model and its crew must be watched by at least one Jury member to assure that the mechanics behave in a fair manner according to the rules.

12. Attempts. A further attempt to complete the combat period shall be permitted at the discretion of the Circle Marshall:

a) Should a streamer or part of a streamer become accidentally detached or fail to unfurl from a rolled state.

13. Classification.

a) The contest shall be run as a knock-out tournament.

b) The entrant who obtains the greater score in points in each heat, will be matched against the winner of another heat in that round.

c) A flyer who has been beaten in his first heat will be matched against another loser from the first round. The winners of these new heats will be regarded as equals to the winners of the first round, and will be drawn together with them for the second round.

d) By process of elimination, each round reduces the number of heats by half so that there are semi-finals and a final.

e) The final placing of the finalists is established solely on the results of their flights in the final. The remaining two semi-finalists will be matched against each other in a deciding flight about the third place.

f) In the event of a tie, the heat shall be re-flown.

14. International Team Classification.

a) Each round will be numbered in reverse numerical sequence, beginning with the final as number 1, the semi-finals as round number 2, etc....

b) Each entrant will adopt a score according to the round in which he was dismissed—e.g. dismissed in the semi-finals the score i.e. 3, etc.

c) The scores so obtained will be added for the three participants of each nation.

d) Nations shall be classified according to the score, the lowest becoming highest in position.

15. Cancellation of the Flight. An entrant will be eliminated from the heat and his opponent proceeds to the next round if:

a) He deliberately attacks the streamer on his opponent's model prior to the Marshall's signal to commence.

b) He deliberately attacks the opponent's model as distinct from the streamer.

c) The model fails to become airborne within 2 minutes of the signal to launch.

d) An attempt is made to fly any model which cannot remain airborne under its own power or under the full control of the pilot.

e) Should an entrant interfere with his opponent, or force his opponent to leave the center circle.

f) Should an entrant deliberately cooperate with his opponent by passive action. Both competitors are to be eliminated from the heat.

g) He deliberately flies in a dangerous manner.

h) If the pilot intentionally leaves the 3 meters (9 ft. 10⅛ in.) circle when his model is flying or if he leaves the center circle without wearing a crash-proof head gear.

i) If a pilot without any doubt is guilty of a mid-air collision, or if he tangles the control lines causing his opponent's model to crash. In these two cases the decision of elimination must be immediate.

j) If a pilot attacks his opponent's model when it is not airborne.

k) A pilot who leaves the lines of any of his models, which at the moment is not airborne, in the center circle should be disqualified.

l) If the model is launched before the signal to launch is given.

16. Judges and Timekeepers. The organizer must appoint a panel of at least three judges, who shall preferably each be of a different nationality. Two timekeepers/score counters are to be allotted to each competitor. They must have at least one language in common.

CONVERSION FACTORS

LENGTH

Multiply	By	To Obtain
centimeters	0.3937	inches
centimeters	0.01	meters
decimeters	0.1	meters
feet	0.3048	meters
inches	25.40	millimeters
kilometers	3281	feet
kilometers	1000	meters
kilometers	0.6214	miles
kilometers	0.53996	nautical miles
meters	3.281	feet
meters	39.37	inches
miles	5280	feet
miles	1609	meters
miles	0.86898	nautical miles

AREA

Multiply	By	To Obtain
square centimeters	0.001076	square feet
square centimeters	0.1550	square inches
square feet	929.0	square centimeters
square feet	144	square inches
square feet	0.09290	square meters
square inches	6.452	square centimeters
square inches	0.006944	square feet
square inches	$6.452/10^4$	square meters
square inches	645.2	square millimeters
square meters	10.76	square feet
square meters	1.196	square yards
square millimeters	0.00155	square inches
square yards	9	square feet
square yards	1296	square inches

FAI RC AEROBATICS (CLASS D AMA RC AEROBATICS)

Rules 1 through 12 and the FAI General 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 (13 through 13.16).

1. Definition of a Radio Controlled Aerobatic Power Model. Model airplane in which lift is generated by aerodynamic forces acting on surfaces remaining fixed during flight (except for control surfaces) and which performs maneuvers controlled by the pilot on the ground using radio control connection.

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 require 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.

3. General Characteristics of Radio Controlled Aerobatic Power Models. Maximum surface area: 150 dm^2 (2325 sq. in.). Maximum total weight: 5 kg. (11.023 lbs.). Minimum loading: 12 gr/dm^2 (3.95 oz. per sq. ft.). Maximum loading: 75 gr/dm^2 (24.51 oz. per sq. ft.). Maximum total swept volume of the engine(s): 10 cm^3 (61. cu. in.). The engine(s) must be fitted with effective silencers.

4. Number of Helpers. Each pilot is permitted one helper during the competition.

5. Number of Flights. The competitor has the right to three official flights.

6. Definition of an Attempt. There is an attempt when:

a) The pilot announces the start of the take-off maneuver.

b) The model fails to commence the take-off maneuver within the 3 minutes allowed to the competitor.

c) If the engine 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 maneuver.

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.

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.

9. Marking. Each maneuver 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 maneuver. Any maneuver not completed shall be scored zero. The maneuvers 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 maneuver is completed, no points shall be given for this maneuver. The official must keep a record of all disqualified maneuvers. The judges shall score all the maneuvers. If an infringement has been made, the scores will be deleted on all cards.

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.

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 or equivalent 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 stated 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.

12. Organization for Radio Controlled Aerobatic Contests. 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 maneuvers 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 five minutes before they are required to occupy the starting area. Once the competitor has been given permission to take off from the runway, he may delay not longer than one minute before flicking his propeller. If he does not flick his propeller within that time, the timer will automatically start the clock measuring his allotted 10 minutes of flight time. The organizer must provide a radio monitor for the purpose of detecting possible interference.

13. Schedule of Maneuvers for Radio-Controlled Aerobatic Power Models. 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 name and start of each maneuver must be announced by the pilot or his assistant. Unannounced maneuvers will not be scored. It is recommended that the end of each maneuver also be announced. The landing maneuver need not be announced but must be executed in an uninterrupted manner.

The competitor may make only one attempt to execute each figure during any one flight.

The pilot has ten minutes in which to start his engine and complete the program of maneuvers.

One engine must be running during execution of the maneuvers 13.1 to 13.14.

The maneuvers must be executed in upwind-downwind sequence as noted for each.

13.1 Takeoff, Upwind. 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. The taxi-run should be straight and the model should lift gently from the ground and climb at a gradual angle. The takeoff is completed when the model is turned approximately 90 degrees out of the takeoff path. The takeoff should be down-graded at least one point for each of the following reasons.

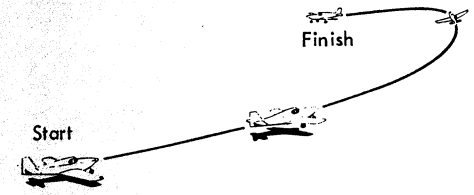
1. Model does not stand still when released.
2. Changes in heading during run.
3. Model "jumps" from ground.
4. Retouching the ground after becoming airborne.
5. Too steep a climb angle.
6. Gallops in elevation during climb.
7. Changes in heading during climb.
8. Dropping a wing tip.
9. Does not turn approximately 90 degrees out of takeoff path. **K=10**

13.2 Figure M, Upwind. The model starts in straight and level flight, pulls up into a vertical attitude, then performs a half roll (left OR right) then a stall turn (left OR right) through 180 degrees, a second half roll in SAME direction as first. The model then makes half an inverted loop pulling up again to vertical flight, performs a third half roll and a second stall turn in the opposite direction to the first stall turn, does fourth half roll and recovers on the same altitude and heading as the entry. When viewed from the side, the model creates the letter 'M.' The maneuver should be down-graded for the following reasons.

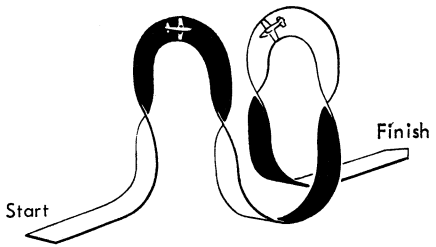
1. Model not level at start.
2. Does not become vertical.
3. Changes heading during half rolls.
4. Turn radius at top of stall turn greater than two wing spans.
5. Turns at top of stall turn are less than 180 degrees.
6. Diving and climbing paths not parallel.
7. Bottom of inverted position at different altitude to entry.
8. Altitude of second stall turn different to that of first stall turn.
9. Maneuver not finished at same altitude as entry.
10. Model not level at finish of maneuver.
11. If any of the stall turns are not completed, or if the second stall turn is in the incorrect direction, or the model rolls in a different direction to the first half roll, then the score is ZERO. **K=15**

13.3 Cuban Eight—Savoy Knot, Downwind. Model starts in straight and level flight, pulls up into an inside loop and continues

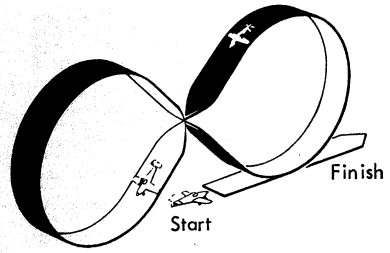
F.A.I.
•Radio Control Maneuvers



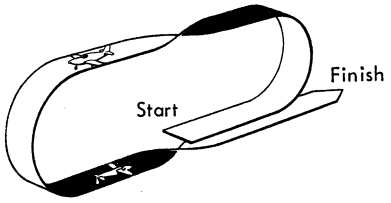
1 Take-off



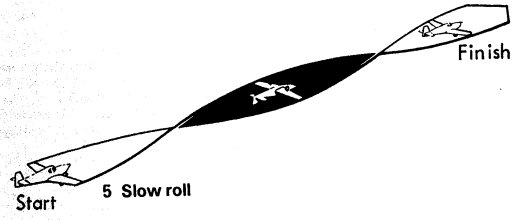
2 Figure M



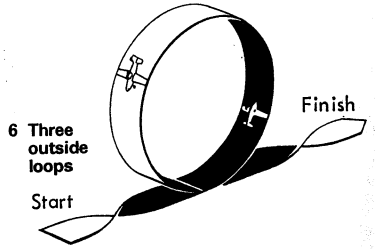
3 Cuban Eight



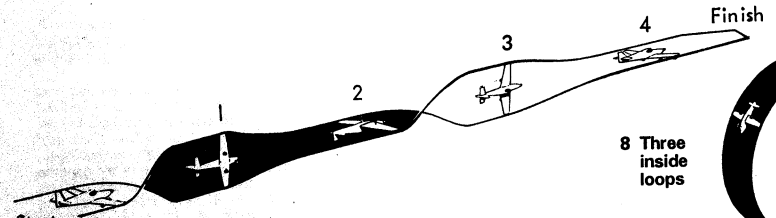
4 Double Immelman



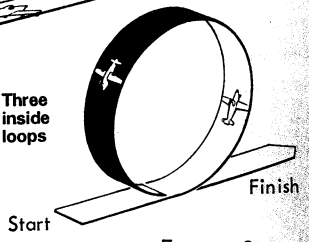
5 Slow roll



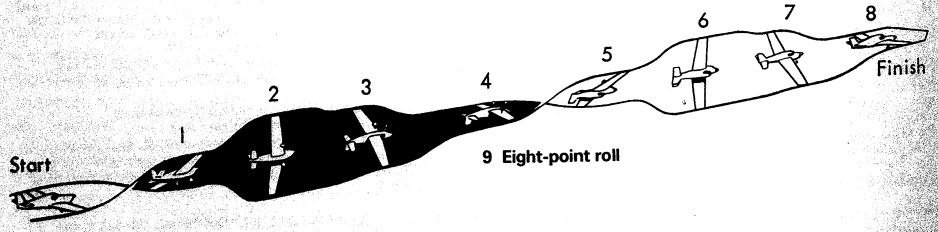
6 Three outside loops



7 Four-point roll

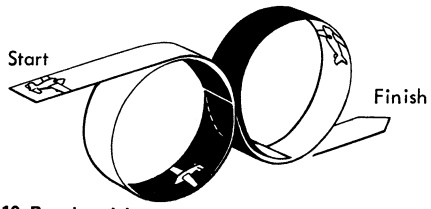


8 Three inside loops

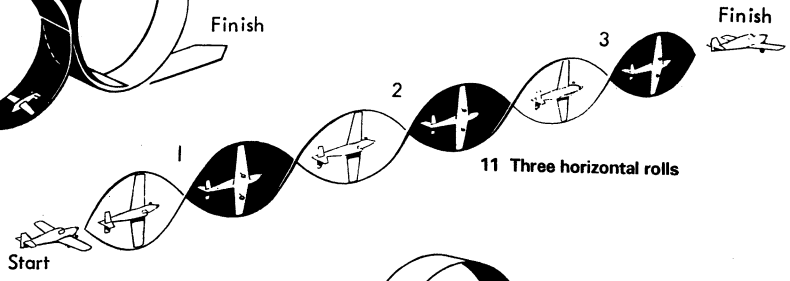


9 Eight-point roll

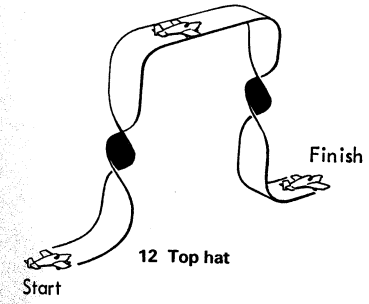
Maneuver Drawings Courtesy of
RADIO CONTROL MODELS & ELECTRONICS



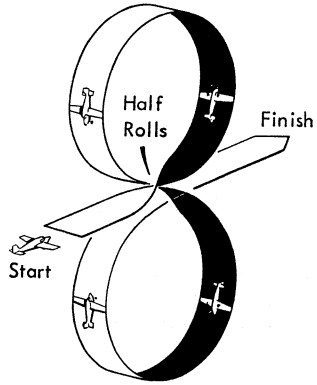
10 Running eight



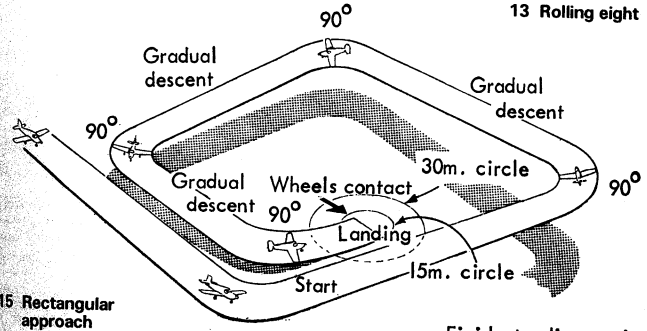
11 Three horizontal rolls



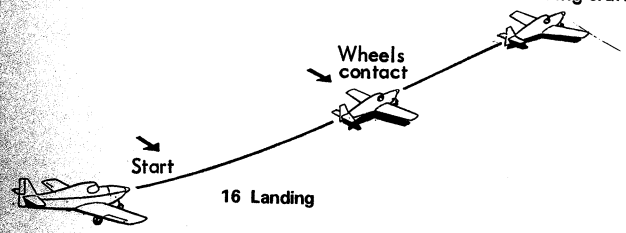
12 Top hat



13 Rolling eight



15 Rectangular approach



16 Landing

14 Spin – three turns

until heading downward at 45 degrees, does half roll (left OR right) followed by another inside loop; at 45 degrees model does another half roll in same direction as first and recovers on the same altitude and heading as entry. The maneuver should be down-graded for the following reasons.

1. Model not level at satrt.
2. Loop not round.
3. Loop deviates left or right.
4. Model not at 45 degrees at commencement of half roll.
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 half roll not on 45-degree line.
9. Model not level at finish of maneuver.
10. Model does not finish on same heading and altitude as entry. **K = 10**

13.4. Double Immelmann, Upwind. Model starts in level flight, pulls up into a half loop, followed by a half roll (left OR right), flies straight and level for 1 second then does a half outside loop, followed by a half roll in same direction as first half roll and recovers on the same heading and altitude as entry. The maneuver should be down-graded for the following reasons.

1. Model not level at start.
2. Half loop deviates left or right.
3. Half roll does not commence immediately after half loop.
4. Half roll deviates left or right.
5. Model flies longer than one second upright before commencing half loop.
6. Second half outside loop deviates left or right.
7. Second half outside loop not at same altitude as first outside loop.
8. Half roll does not commence immediately after half outside loop.
9. Second half roll not in same direction as first half roll.
10. Roll rate not same in both half rolls.
11. Model not level at finish of maneuver.
12. Model does not finish on same heading and altitude as entry. **K = 10**

13.5. Slow Roll, Downwind. Model starts in level flight, then rolls slowly through one complete rotation. Model recovers on the same heading and altitude as entry. Rotation of roll to be in either direction. The approximate time of roll to be 5 seconds. The maneuver should be down-graded for the following reasons.

1. Model not level at start.
2. Model deviates left or right or in altitude during maneuver.
3. Roll rate not constant.
4. Model does not roll through exactly one revolution.
5. Model takes less than 4 seconds or more than 6 seconds to complete roll. Roll is timed from when wings 'break' from level flight until they become level again at end of maneuver.
6. Model not level at finish of maneuver.
7. Model does not finish on same heading and altitude as entry. **K = 15**

13.6. Three Outside Loops, Upwind. Model starts in level flight, then half rolls to inverted position, flies for approximately 1 to 2 seconds, then completes 3 outside loops; model then flies for a further 1 to 2 seconds inverted before half rolling back to level flight, recovering on the same heading and altitude as the entry. The maneuver should be down-graded for the following reasons.

1. Model not level at start.
2. First loop not round.
3. Loop deviates left or right.
4. Wings not level at finish of first loop.
5. Finish not at same altitude as entry.
6. Model drifts or changes heading.
7. Diameter of second loop different from first.
8. Second loop not round.
9. Loop deviates left or right.
10. Wings not level at finish of second loop.
11. Second loop not at same altitude as first loop.
12. Model drifts or changes heading.
13. Diameter of third loop different from first and second loop.
14. Third loop not round.
15. Loop deviates left or right.
16. Wings not level at finish of third loop.
17. Third loop not at same altitude as first and second loop.
18. Model drifts or changes heading.
19. Model changes heading during half rolls.
20. Wings not level before and after half rolls.
21. Model is not level during straight part of inverted flight.
22. Time is taken for the straight inverted section less than 1 second or more than 3 seconds. **K = 15**

13.7. Four-Point Roll, Downwind. Model starts in level flight then rolls one complete rotation hesitating at each quarter revolution. At each hesitation the wings will be parallel with, or, ninety degrees to, the horizon. Model recovers on the same heading and altitude as entry. The maneuver should be down-graded for the following reasons.

1. Model not level at start.
2. Quarter rolls more or less than 90 degrees.
3. Model does not hesitate after each quarter roll.
4. Roll rate not constant during each quarter roll.
5. Model takes less than 4 or more than 6 seconds to complete roll. Roll is timed from when the wings 'break' from level flight until they become level again at end of maneuver.
6. Model not level at finish of maneuver.
7. Model does not finish on same heading and altitude as entry. **K = 15**

13.8. Three Inside Loops, Upwind. Model starts in level flight, pulls up and completes 3 inside loops recovering on the same heading and altitude as the entry. The maneuver should be down-graded for the following reasons.

1. Model not level at start.
2. First loop not round.
3. Loop deviates left or right.
4. Wings not level at finish of first loop.
5. Finish not at same altitude as entry.
6. Model drifts or changes heading.
7. Diameter of second loop different from first.
8. Second loop not round.
9. Loop deviates left or right.
10. Wings not level at finish of second loop.
11. Second loop not at same altitude as first loop.
12. Model drifts or changes heading.
13. Diameter of third loop different from first and second loop.
14. Third loop not round.
15. Loop deviates left or right.
16. Wings not level at finish of third loop.
17. Third loop not at same altitude as first and second loop.
18. Model drifts or changes heading.
19. Finish not on the same heading and altitude as entry. **K = 10**

13.9. Eight-Point Roll, Downwind. Model starts in level flight, then rolls one complete rotation hesitating at each eighth revolution. Each eighth roll to be 45 degrees; at each hesitation the wing will be parallel with, forty-five or ninety degrees to the horizon. Model recovers on same heading and altitude as entry. The maneuver should be down-graded for the following reasons.

1. Model not level at start.
2. Model does not hesitate after each eighth roll.
3. Eighth rolls more or less than 45 degrees.
4. Roll rate not constant during each eighth roll.
5. Model takes less than 4 or more than 6 seconds to complete roll. Roll is timed from when wings 'break' from level flight until they become level again at end of maneuver.
6. Model not level at finish of maneuver.
7. Model does not finish on same heading and altitude as entry. **K = 15**

13.10. Running Eight, Upwind. Model starts in level flight and completes 1¼ outside loops finishing at intersection. Model then does, 1¼ inside loops finishing at bottom of second loop, the model passing the intersection 3 times. Model then recovers on the same heading although at a lower altitude than entry. The maneuver should be down-graded for the following reasons.

1. Model not level at start.
2. First loop not round.
3. First loop deviates left or right.
4. Model does not become vertical at intersection.
5. Second loop not round.
6. Second loop deviates left or right.
7. Does not become vertical at intersection.
8. Second loop not at same altitude as first loop.
9. Second loop not the same diameter as first loop.
10. Second and third intersection do not coincide with first.
11. Model not level at finish of maneuver. **K = 10**

13.11. Three Horizontal Rolls, Downwind. Model starts in level flight, then rolls at a uniform rate through three complete rotations finishing in level flight on the same heading and altitude as entry. The maneuver should be down-graded for the following reasons.

1. Model not level at start.
2. Model changes heading or altitude during rolls.
3. Roll rate not uniform.
4. Does not roll exactly three revolutions.
5. Model takes less than 4 or more than 6 seconds to complete roll. Roll is timed from when wings 'break' from level flight until they become level again at end of maneuver.
6. Model not level at finish of maneuver. **K = 15**

13.12. Top Hat, Upwind. Model starts in level flight, pulls up into a vertical attitude then performs 1 complete roll and regains level flight on the same heading as the entry. After a short upright level flight approximately half the distance of the vertical climb and roll, model dives vertically and does another complete roll, finally recovering in level flight on the same heading and altitude as the entry. The maneuver should be down-graded for the following reasons.

1. Model not level at start.
2. Climb and roll are not vertical.
3. Wings not level before and after rolls.
4. Model does not remain level after regaining level flight after roll.
5. Second roll not vertical.
6. Rolls not of the same length.
7. Model not level at finish of maneuver.
8. Model does not finish on same heading and altitude as entry. **K = 15**

13.13. Rolling Eight. Downwind. Model starts in level flight, then half rolls to inverted and immediately does one complete outside loop; at point of entry model again half rolls to an upright position and does another complete outside loop immediately below the first, recovering on the same heading and altitude as the entry. The maneuver should be down-graded for the following reasons.

1. Model not level at start.
2. Model deviates left or right during the first half roll.
3. Model deviates left or right during first outside loop.
4. Loop not round.
5. Wings not level before and after second half roll.
6. Model deviates left or right during second half roll.
7. Second loop not immediately below first.
8. Model deviates left or right during second loop.
9. Second loop not round.
10. Model not level at finish of maneuver.
11. Model does not finish on same heading and altitude as entry. **K = 10**

13.14. Spin—Three Turns, Upwind. The model 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. The spin may be down-graded for the following reasons.

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**

13.15. Rectangular Approach, Downwind. Model starts in level flight immediately at finish of previous maneuver. Model makes a 90-degree turn cross-wind, turns 90 degrees downwind, turns 90 degrees cross-wind in opposite direction to first cross-wind, and a further 90 degrees turn back into wind towards touch-down point. After each 90-degree turn model must assume straight-and-level flight for a period of time, descending gradually to touch-down point. The direction of turns may be changed from left to right depending on conditions. Maneuver ends just prior to touch-down. The maneuver should be down-graded for the following reasons.

1. Turns are more or less than 90 degrees.
2. Legs of rectangle are not straight.
3. Model gallops in elevation.
4. Wings are not level before or after turns.
5. Turns not smooth and precise.
6. Attempts to break out of pattern or go round again, ZERO POINTS. **K = 10**

13.16. Landing, Upwind. Model flares to touch-down within the landing circle, on the same heading but at a different altitude to entry. The maneuver should be down-graded for the following reasons.

1. Lack of flare at touch-down resulting in bounce.
2. Model becomes airborne again after touch-down.
3. Model does not run in straight-line after touch-down.
4. Model touches ground with airframe other than under-carriage.
5. Model contacts objects or persons causing it to break landing run.
6. Model does not roll to stop in straight line.
7. If model ends on its back, ZERO POINTS.

K = 15, Landing within 15m (49'2") circle.
K = 10, Landing within 30m (98'5") circle.
K = 5, Landing outside 30m (98'5") circle.

FAI RC AEROBATICS JUDGES' GUIDE

Purpose. The purpose of the FAI RC Judges' Guide is to furnish an accurate description of each maneuver and to provide a reference for use in developing a uniformly high standard of judging.

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.

Precision. At the instant the contestant announces his next maneuver, the judge should form an image of the course the model airplane should follow.

The judge should adjust 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 anticipated.

It will be noted that forming on image of the forthcoming maneuver is based on using the straight and level entry as a reference. The absence of a definite entry into a maneuver 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 for evaluation of how well the intended course of the maneuver was followed. The pilot will use it to announce "maneuver completed". The absence of a well defined straight and level exit should also result in downgrading.

Positioning. To achieve perfection, the competitor must position his maneuvers in such a way that they can be easily judged. The first consideration on position is longitudinal distance from the competitor. All the judges should be located near the competitor so that they obtain identical views of the maneuver. The competitor should center his aerobatic maneuvers in such a way that they can be easily judged. The first consideration on position is longitudinal distance from the competitor. All the judges should be located near the competitor so that they obtain identical views of the maneuver. The competitor should center his aerobatic maneuvers at an average distance of less than 100 meters (328 feet) from himself.

The judge should observe if the competitor is trying to hide his defects by flying at a distance.

Positioning of maneuvers involves more than 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 Eights and Horizontal eights) should execute their circular path in a plane perpendicular to the line of sight to the model.

"End on" or "canted" presentation of the circular maneuvers 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 100 meters (328 feet) longitudinal distance at altitudes that would not force the judge to look up at more than about 45 degree angle. If maneuvers are executed 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.

Size of Maneuvers. The established criteria places an upper limit of about 100 meters 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 100 meters of horizontal distance is a maximum value and not really the optimum. For example, on inside loop of 30 meters (98') diameter at 45 meter (148') longitudinal distance would stay within the 45 degree angle and a safe altitude and would be more clearly visible to the judge than at 100 meters distance. The competitor who performs loops in the 45 meters region is, therefore, allowing the judge to evaluate them more critically and he should suffer no downgrading for positioning. On the other hand, a 30 meters diameter loop at 100 meters distance should be down-graded.

The optimum size of maneuvers is governed to some extent by the size and normal flying speed of the model. 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.

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 a full scale aircraft.

A 10 meters (33') diameter loop at 80 km/h (50 m.p.h.) results in about 10 g's, which is close to or in excess of the design limits of most full scale aerobatic aircraft.

The matter of smoothness is basically related to scale-like appearance. For example, a perfect set of consecutive 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 should be downgraded.

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 contest. It is advisable for the contest director or the chief judge to hold a conference prior to the start in order to discuss judging and make the standards as uniform as possible. This is effected by means of practice flights which all judges score simultaneously and privately. After these flights, the defects in each maneuver should be discussed by all judges and agreement reached about the severity of defects. Once the contest is started, the individual judge should not alter his standard 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. The definition of unsafe areas should be absolutely unambiguous.

Judging Individual Maneuvers. When in doubt, give the lower score. Perfection is not a common occurrence.

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.
3) the number of times any one defect occurs.
4) the positioning of the maneuver.
5) the size of the maneuver.

For example, a small single change in heading during the take-off would be considered one defect, while two or three distinct turns would be considered two or three defects. It should be noted that for many maneuvers there are more than ten possible kinds of defects and that some of these can be repetitive.

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. Bad position should be considered as equal to as many as 3 or 4 small defects. Improper size observed during or at the end of a maneuver might also result in as many as 3 to 4 demerits.

FAI RC PYLON RACING

Note: The FAI General Rules also apply.

1. Definition of Radio Control Pylon Racing Models. Model airplane in which the propulsion energy is provided by a piston type engine and in which the lift is obtained by aerodynamic forces acting on the supporting surfaces which, except for control areas, must remain fixed in flight. The models must be of the semi-scale type and their general lines must be in accordance with those of full-sized aircraft. Competitors may be required to justify any unusual or unconventional features of their model design with documentary evidence of similar full-sized aircraft.

2. Engine(s). Engine(s) must be of the reciprocating piston type with a maximum total swept volume of 6.6 cm^3 (.4028 cu. in.).

3. Shut-Off. The engine shall be equipped with a positive radio controlled engine shut-off. The pilot must be able to shut off his engine by radio control on the ground or in the air within five seconds of command irrespective of aircraft attitude. A competitor will be disqualified from the heat if unable to land his model promptly on instruction from a properly designated official.

● 3.1. The engine shall be fitted with an effective silencer. The use of tuned exhaust systems is prohibited. The contest director (Jury at World Championships) has discretion to disqualify any model considered excessively noisy. *Beginning in 1975 this rule is changed as follows. The engine must be fitted with an effective muffler which must extend from the center line of the cylinder not less than 100mm (3.94") and not more than 200mm (7.87"). The expansion chamber must be not less than 25mm (.984") diameter. The muffler, fitted to the engine, must be gas tight, except for a single orifice, maximum diameter 15mm (.590").*

4. Propeller. Only wooden, fixed pitch, two-blade propellers shall be permitted.

5. Spinner. A round spinner is required on all prototype aircraft and models of real aircraft. Models of real aircraft using radial engines and ring type cowls are not required to use such a spinner.

6. Fuselage.

6.1. Cross-Section. The fuselage shall have a minimum height of 175 millimeters (6-29/32") and a minimum width of 85 millimeters (3-11/32"). Both minimum dimensions must occur at the same cross-section location. Fillets are not considered part of the fuselage or lifting surfaces.

6.2. Cowls. The engine or engines must be enclosed with the exception of the silencer, cylinder head and controls which must be manipulated during operation of the engine. The cylinder head for this purpose is defined as the top (or outer) 1 centimeter (⅜") of the engine excluding ignition plug or compression screw.

6.3. Landing Gear. At least two wheels with a minimum diameter of 57 millimeters (2¼") will be used. Where applicable, a third wheel, of any size, may be used. A positive means of steering on the ground shall be provided. The landing gear must be attached in a permanent manner to the model, so as to permit a normal take-off and landing.

7. Lifting Surfaces.

7.1. Area. Total projected area of the lifting surfaces (wing and horizontal stabilizer combined) shall be a minimum of 45 square decimeters (697 sq. ins.). On biplanes with different size wings, the smaller wing shall be at least two-thirds of the larger wing. Flying wings and Deltas will not be allowed in this event.

7.2. Wing Span. Minimum wing span shall be 1250 millimeters (4'1-3/16") for a monoplane and 750 millimeters (2'5½") for the largest wing of a biplane.

7.3. Chord Thickness. Wing thickness at the root shall be at least 38 millimeters (1½") for a monoplane and 25 millimeters (1") for a biplane. On a biplane with different size wings, the smaller wing must be at least 19 millimeters (¾") thick at the root. Wing thickness may decrease in a straight line taper from root to tip as viewed from the leading or trailing edge.

Note: "Root" shall be defined as the innermost wing section, not counting fillets, that may be measured without removing wing from the fuselage. On a completely exposed wing, such as on a parasol monoplane or the top wing of most biplanes, the root is that section of the wing that is intersected by a projection of the outline of the fuselage as seen in the top view, i.e., the root section would be 50 millimeters (2") from the centerline of an exposed wing on a model with a 100 millimeter (4") wide fuselage.

8. Weight. Weight, less fuel but including all equipment necessary for flight shall be at least 2200 grams (77.6 ozs.) and not more than 3000 grams (105.8 ozs.).

● **9. Fuel** to a standard formula for glow plug and spark ignition engines will be supplied by the organizers. Its composition shall be 80% methanol, 20% castor oil or equivalent. (Fuel for compression ignition is not restricted.)

10. Racing Course Specifications. The triangular course will be laid out as follows: the course is 10 laps with individual lap length of 400 meters. Total distance travelled is 4 kilometers. The race starts at the start—finish line. All takeoffs will be ROG; no mechanical device will be used to assist the aircraft, but hand pushing is permitted. The race is terminated at the start—finish line 10 full laps later. The race course specifications may be modified in the interest of safety or to suit existing field conditions if safety is not compromised. The pylons should have a minimum height of 4 meters (13 ft. 1.5 ins.) and should not exceed 5 meters (16 ft. 4.75 ins.) height.

11. Organization for Radio-Controlled Pylon Racing Contests. 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 officials on the race course and all competitors must wear a crash helmet with a chin strap. The helmet must be able to withstand the impact of a flying Pylon model.

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

Heats shall be arranged in accordance with the radio frequencies in use to permit simultaneous flights.

12.1 Operation of the Race.

At the number 1 pylon there will be one pylon judge and an official flagman for each contestant in the heat. The pylon judge will stand in close proximity to the pylon. The flagmen will stand perpendicular to the direction of the course on the right hand side of the pylon, as seen by the contestants, no more than 5 meters (16'5") away from the pylon.

Each flagman will have a flag of distinctive color and the contest director will arrange for each model to be identified by one flagman before the start of every heat.

12.2. The flagmen will have their flags in a ready position above their heads as the aircraft reach midcourse between No. 3 and No. 1 pylons. At the instant the model draws level with the No. 1 pylon on the correct side the flagman will briskly lower his flag. If a model fails to round the pylon or passes back on the same side of the pylon, the flagman will signal a cut by waving his flag from side to side above his head. There will be no flagging at the No. 2 or No. 3 pylons unless a pylon is cut. There will be no pilot's helpers at any of the pylons.

12.3. At the No. 2 and No. 3 pylons the official pylon judge will stand in close proximity to the pylon they are judging.

12.4. A sideline judge will be posted in front of the pit area on the spectator side of the racing course. The sideline judge will signal any overflight of the pit or spectator areas by waving a flag. The judges at the No. 2 and 3 pylons will signal a cut pylon by waving a flag or by sounding an audible signal. The timekeeper will inform the competitor when an infringement or cut at any pylon is signalled.

12.5. A maximum of 4 models per heat will be allowed.

12.6. A maximum of 2 minutes will be allowed for starting and adjusting the engine(s). After the two-minute period, no one may restart his engine or make a pit stop.

12.7. All laps are to be flown counter-clockwise with turns to the left.

12.8. No minimum altitude is required for racing.

12.9. The lap will not be counted if the contestant cuts a pylon or flies outside the sideline judge. Two infractions constitutes disqualification for that flight.

12.10. Starting positions in all races will be determined by draw, with the No. 1 position being closest to the No. 2 pylon. If there is sufficient runway width to provide a 6-meter (19'8") space between all contestants and still provide a clear takeoff path for all models, all models will be flagged off simultaneously. If the runway width is inadequate, models will be flagged off at one-second intervals. All contestants must be given an equal number of opportunities to race.

12.11. The contest director has the right to request any competitor to make a flight to demonstrate the airworthiness of his model and/or his ability to fly the airplane around the course. If, during a race, the contest director considers any model to be flying erratically, dangerously, or so low as to endanger course officials he may disqualify the competitor from that heat or from all heats and require the model to be landed immediately. Persistent flight below the top of the pylons may be considered dangerous to the course officials.

12.12. Each competitor may have only one helper in each race and the helper may release the model at the start and give the pilot verbal information regarding the flying course of his model and the official flag signals. The designation "competitor" may refer to an individual or team entry of no more than two persons. Any award will be made jointly to team members.

12.13. In the event of a collision or contact between two airborne models, both models must be landed immediately even though they are able to continue flying. No score will be awarded for the colliding models in that heat, and the race will not be rescheduled. Models involved in a collision must be inspected by the contest director and approved as airworthy before being flown in subsequent heats. A reserve model is permitted. Competitors may use either model in a heat.

13. Scoring.

● 13.1. The flight of each model shall be timed with a stopwatch. Timing shall be commenced when the starting signal is given to each individual competitor and finish when his model crosses the finishing line. The winner of each heat will be the pilot of the aircraft which crosses the finish line first. Times will not be used to determine the winner of a heat. The winner shall be flagged with a checkered flag. The results of a heat will be decided prior to the start of the following heat or within 5 minutes after the winner has been flagged, whichever is sooner.

13.2. Points shall be awarded after each race as follows: 4 points for first, 3 points for second, 2 points for third and 1 point for fourth. No points will be awarded if a model fails to complete the 10 laps or if the flight is disqualified.

13.3. The winner of the event is the contestant who has accumulated the most points after the conclusion of all heats.

13.4. If time permits, and there is no frequency conflict, ties shall be broken by a fly-off race. Otherwise, the best single race time shall be considered in determing final placings.