

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.
4. I will not knowingly operate my radio control transmitter (with antenna extended) within 5 miles of other RC model flying activity.

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 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 or poles.
3. I will assure that my flying area is safely clear of all non-essential participants and spectators before permitting my engine to be started.

Academy of Model Aeronautics

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1976

Governing
Sporting
Model
Aviation
in America

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OFFICIAL
MODEL
AIRCRAFT
REGULATIONS

37. 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 mechanics 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 entrant shall be checked at every sanctioned meet.

4. Model Aircraft Requirements.

4.1. Power. Models shall be powered by reciprocating or rotary piston internal combustion engine(s) or electric motor(s). Total displacement of reciprocating engine(s) shall not exceed 6102 cubic centimeters (371 cubic inch). Total displacement of rotary piston engine(s) shall not exceed 6102 cubic centimeters (371 cubic inch). 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 reciprocating or rotary piston internal combustion 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 numbered "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 seek 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. wings, fuselage, or tail surfaces, will be considered the same as switching airplanes, and therefore will only be allowed one time. In this section, 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 wing surface or to each side of the fuselage or vertical stabilizer. Height of the numerals 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. The "Flight Line" shall be defined as a straight line, minimally long in both directions, in front of which all flying is done, and in back of which, all judges, officials, contestants, and spectators are positioned. If at any time during a flight, including takeoff and landing, the plane goes behind the flight line, the maneuver being executed, or about to be executed (i.e., between maneuvers), shall be scored zero. Two infractions during the same flight shall cause the remainder of the flight to be scored zero.

5.3. Contested flying behind the flight line shall result in disqualification of the contestant by the Contest Director.

5.3.1. 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 on 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 1/8 inch.

5.6. Knife-edge wings are not allowed.

6. Pattern Event Classes. The pattern event shall be divided into four classes: Novice, Advanced, Expert, and Master.

6.1. The Expert and Master Classes may use the current AMA Pattern (Expert) or the current FAI Pattern (Master).

6.2. Competitors must also be advised prior to the start of the contest of any planned deviations from standard AMA or FAI patterns pertaining to the events they have entered. Organizers of a contest may use either AMA or FAI patterns for the Expert and Master classes or 11 time and planning permits, both patterns may be used.

6.3. Any reference made to Class A, Class B, Class D/N, or Class D/E shall be construed to mean Novice, Advanced, Expert or Master, respectively.

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.

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 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, equating 24 Classification Points.

(2) Contestant is one of 3, and he places second. He acquires 2 points times 3 contestants, equating 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 Novice, Advanced, Expert or Master Class 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. Novice and Advanced contestants are allotted a total of nine (9) minutes.

10.2. Expert and Master contestants are allotted a total of ten

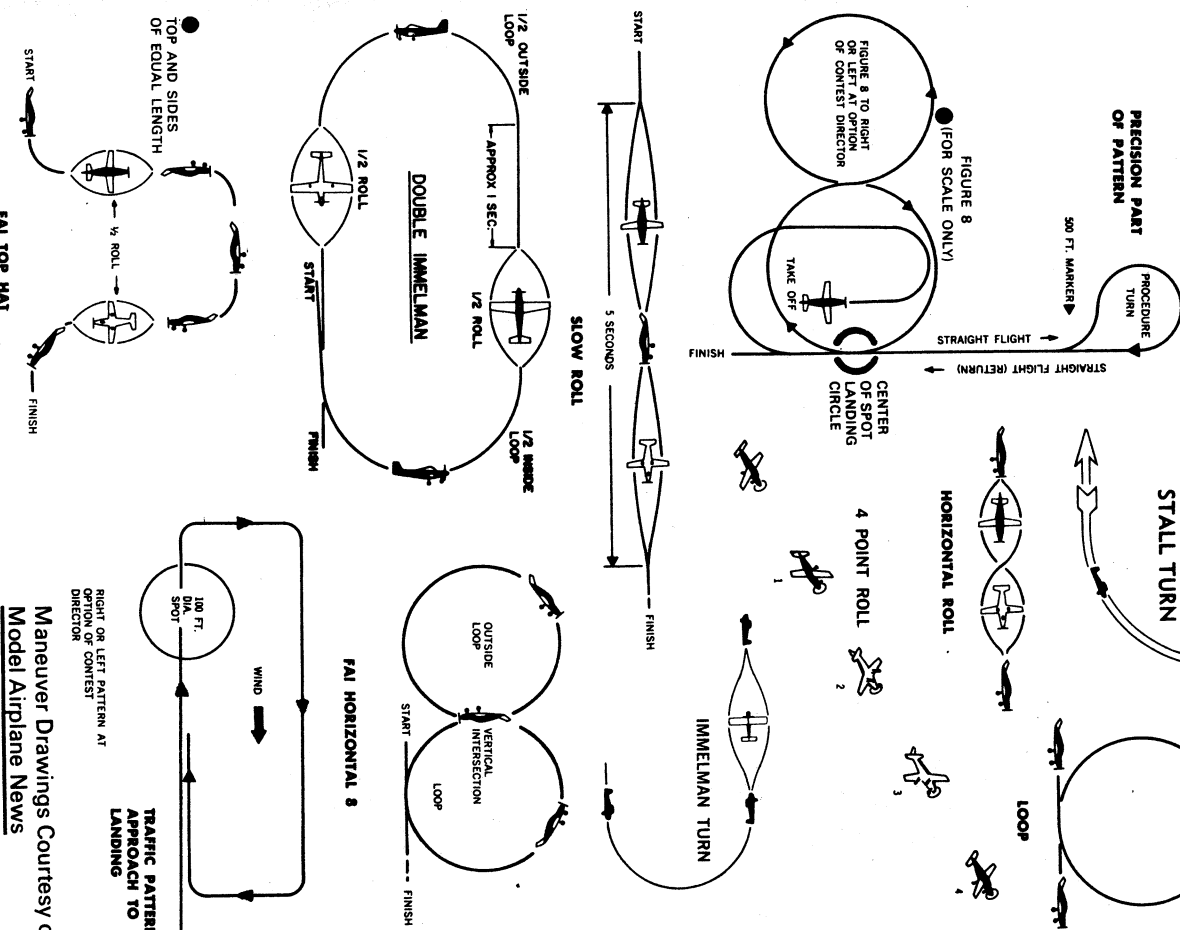
(10) minutes.

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

10.3.1. No Refuel. Refuels are allowed after the wheels leave the ground, but not before. Refueling is permitted within the first two minutes, but not before the wheels leave the ground.

10.4. In Master 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 clean the area for the next contestant.

AMA RC PATTERN MANEUVERS



10.4.1. 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. Novice, Advanced, and Expert maneuvers shall be judged and scored on a zero to ten basis. Flight score is the sum of the individual maneuver scores.

11.2. Master 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.

Maneuver Drawings Courtesy of Model Airplane News

AMA RC PATTERN JUDGES GUIDE

12. Determining the Winner:

12.1. The highest score for the total of the two best flights in Novice, Advanced, or Expert shall be the winner. Maneuver points are computed in itself. In case of ties, the third best flight score 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 to be scored.

12.2. Determining the winner in Master shall be the same as for Novice, Advanced, and Expert except the total of the best three flights shall be used. Unless otherwise designated by the CD, ties will be broken by a single flight 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 or touch the ground in order to make adjustments to engine, fuel, etc.

13.2. The contestant must call out each maneuver before he attempts to perform it. Call out shall be made just prior to the execution of each maneuver to announce, "maneuver complete." If a contestant fails to call a maneuver before its execution, the contestant shall be scored zero.

14. Novice Pattern Maneuvers:

1. Takeoff (U)
2. Straight Flight Out (U)
3. Straight Flight Turn
4. Straight Flight Back (D)
5. Stall Turn (U)
6. Single Immelman (U)
7. 3 Inside Loops (U)
8. Two Point Loop (D)
9. One Outside Loop (U)
10. 3 Horizontal Rolls (D)
11. Rectangular Approach (U)
12. Landing and Spot (U)

Note: (U) means upwind; (D) means downwind.

15. Advanced Pattern Maneuvers:

1. Takeoff (U)
2. Non-rolling Figure M (U)
3. Cuban 8 (D)
4. Double Immelman (U)
5. Two Point Roll (D) or Straight Inverted Flight
6. 3 Outside Loops (U)
7. Slow Roll (D)
8. 3 Inside Loops (U)
9. 3 Horizontal Rolls (D)
10. Spin (U)
11. Rectangular Approach (U)
12. Landing and Spot (U)

Note: (U) means upwind; (D) means downwind.

16. Expert Pattern Maneuvers:

1. Takeoff (U)
2. Non-rolling Figure M (U)
3. Cuban 8 (D)
4. Double Immelman (U)
5. Slow Roll (D)
6. 3 Outside Loops (U)
7. Four Point Roll (D)
8. 3 Inside Loops (U)
9. 3 Horizontal Rolls (D)
10. FAI Top Hat (D)
11. Rolling 8 (D)
12. Spin (U)
13. Rectangular Approach (U)
14. Landing and Spot (U)

Note: (U) means upwind; (D) means downwind.

Note: For Novice, Advanced and Expert, first contact with ground within the 100-foot circle results in automatic awarding of the same number of points for Spot as obtained in the landing.

17. Master Pattern. The Master 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 spots 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 reading 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. 4 from List shall have 5 minutes (4 minutes if FAI Pattern is being used) from start of preceding flight in which to release model for the start of flight. False starts are permitted within the 3 or 4 minute limit. Failing to start flight within this limit, contestant must immediately inform of 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, hot, cooled 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 set it on only the flight line. If he is not on hand to do so, he shall be dropped. The Event Director, and the List advanced to fill his place. The Event Director or his representative 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.

Contestant Classification Forms as per Sec. 7 are available upon request from AMA HQ; please include a pre-addressed and stamped return envelope. Contest Directors of meets having RC Pattern events are also provided with a small supply of such forms.

A. Purpose. The purpose of the AMA RC Judges Guide is to furnish an accurate description of each maneuver listed in the 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. Perfection 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 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 as stern and exclaim: "How am I to know what the judge means in 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 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 tends 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 a 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 the intended course of the maneuver was followed. If well used, the pilot will use it to announce "Maneuver completed," while the competent pilot will often skip it in hopes that the judge will not notice that he defined with respect to his entry heading. The absence of a well defined straight and level exit therefore should also result in downgrading.

The judging of the precision of a maneuver shall not be dependent on the throttle setting or speed of the engine. Aircraft speed, which could affect the quality of the maneuver, is not to be confused with engine speed.

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 unimpaired 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 Eight, and FAI Horizontal Eight) 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 Squares 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 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 than about a 45 degree angle. If maneuvers are done at more altitudes and close to or above the transmitter in a way that they force the judge to look up 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 unimpaired. 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 obscures the sun 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 should be safely done at an average distance no greater than 300 feet from the competitor and judges, and at a 45 degree angle. These maneuvers 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 maneuver. It should also be not really the optimum. For example, a 150 foot loop of 100 feet diameter at 150 feet longitudinal distance is a maximum value angle and a safe altitude and would be more clearly visible to the judge than a 300 feet distance. The competitor who performs loops 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 jet give the impression that an imaginary pilot in full scale simulation would be downright uncomfortable if not "blacked out" due to the high "g" forces. Exceedingly small or tight maneuvers with unnecessarily high rates of roll, pitch or yaw do not simulate full scale performance and they should be downgraded accordingly.

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

It is recognized that few RC judges have ever been passengers in a full scale aerobatic airplane and therefore have no actual experience with the "g" forces in aerobatic maneuvers. Two to violent "g" forces are not excessive in such performance. Particular in comparison, a 30 ft. diameter loop at 50 mph results in about 10 "g's" which is close to or over 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 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.

e. Accurate and Consistent Judging. The most important aspect of consistent judging is for each judge to establish his standards and then maintain them steadily throughout the meet. It is advisable for the contest director to standardize the 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 privately. After the flight, the judges score in each maneuver should be discussed by all judges and a semblance of agreement reached. The severity of defects and the degree of downgrading should be discussed and agreed upon.

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 encourage a quick nod of agreement to issue zeros immediately following a "over the crowd" maneuver. Nothing can cause more unrest among contestants than a zero and severe 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 design and go would be considered one defect. Three defects of this kind would be considered 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. The description of maneuvers in the FAI RC Aerobatics section applies to the Novice, Advanced and Expert Classes, except when the named maneuver is not contained in the FAI Schedule of Maneuvers, in which case the descriptions follow. Definitions of abbreviated FAI maneuvers used in Novice, Advanced and Expert classes (Two Point Roll, One Outside Loop, and Non-Rolling Figure M) can be taken from the full description simply by deleting the portion not used.

Takeoff. See FAI section.

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 parallel with the flight line 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. Gallows 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. Right turn not 90°.
2. Left 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. Gallows in pitch, yaw or roll.
4. Flight not along original path.
5. Does not pass over circle.

Figure Eight. (Scale 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, i.e., 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 gallows in pitch, roll or yaw.
4. First half circle changes altitude.
5. Turn 7. Same as 2 thru 4 for second full circle.
6. Model does not complete second full circle at same cross-over point as finish of first half circle.
7. Turn 11. Same as 2 thru 4 for third half circle.
8. Does not finish on same heading as entry.
9. Does not finish directly over circle.
10. Does not fly straight and level to complete maneuver.
11. Does not fly straight and level to complete maneuver.

Touch and Go. (Scale only). After a smooth and gradual descent on a straight line path into the wind, the model lands and slows down to taxi speed (approximately 1/4 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. Gallows 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. Gallows 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.

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 wingspans 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.

Figure M. See FAI section.

Cuban Eight. See FAI section.

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.

Double Immelman. See FAI section.

Slow Roll. See FAI section.

Three Outside Loops. See FAI section.

Two Point Roll. Model starts in level flight, then rolls one complete rotation, hesitating at the inverted position. During hesitation, wings shall be parallel to the horizon. Model shall finish the maneuver in level upright flight. Approximate time of the roll shall be 2 seconds.

Basically, maneuver could be described as straight, inverted flight, with half rolls into and out of the inverted portion being performed in the same direction of rotation. Maneuver should be downgraded for the following reasons:

1. Model not level at start.
2. Half rolls more or less than 180°.
3. Model does not hesitate after first half roll.
4. Roll rate not constant during or more than 0 seconds to complete.
5. Model takes less than 4 or more than 6 seconds to complete roll.
6. Model not level at finish of maneuver.
7. Model does not finish on same heading and altitude as entry.

Four Point Roll. See FAI section.

Three Inside Loops. See FAI section.

Eight Point Roll. See FAI section.

Running Eight. See FAI section.

Three Horizontal Rolls. See FAI section.

Top Hat. See FAI section.

Rolling Eight. See FAI section.

Spin. See FAI section.

Rectangular Approach. See FAI section.

Landing. See FAI section.

Spot Landing. For Novice, Advanced and Expert, a landing with first contact with the ground within the 100-foot circle results in alternate awarding of the same number of points for Spot as obtained in landing perfection. All judges should show agreement.

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" x 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	27.195—Green
27.045—Red	27.145—Yellow
27.045—Red	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	53.60—Black & Blue Ribbons

50-54 MHz Super-Regen	
51.20—Black & Light Blue	52.04—Black & Violet Ribbons

72-76 MHz Band	
72.06*—White & Brown Ribbons	72.32—White & Violet Ribbons
72.10—White & Blue Ribbons	72.40—White & Orange Ribbons
72.24*—White & Red Ribbons	72.36—White & Yellow Ribbons
75.64*—White & Green Ribbons	

38. RC SPORT BIPLANES (PROVISIONAL)

1. Objective. To duplicate full-scale aerobatics with miniature radio-controlled aircraft in a realistic manner that is challenging for the contestants as well as interesting for the spectators.

2. General. All AMA regulations and FCC regulations covering the RC flyer, his plane and equipment, shall be applicable to this event, except as noted herein. There shall be no limitation to the type of equipment fitted to the aircraft, nor the number of controls. The contestant shall be allowed two entries in this event. He can only use his alternate model if the first model is not flyable.

2.1. Consideration of safety for spectators, contest personnel, and other contestants is of the utmost importance in this event. Any unsportsmanlike conduct or hazardous flying over a controlled spectator area will be cause for immediate disqualification of that flight.

3. Model Aircraft Specifications.

3.1. Model must be of a realistic replica typical of the biplanes that have been built and flown. The bottom wing shall be at least 30% of the total wing area. Fixed landing gear only.

3.1.1. Model aircraft need not be of a scale type; however, the non-scale model aircraft shall resemble the "style" of biplane as specified in 3.1.

3.1.2. It will be the contestant's responsibility to show proof, if required by contest officials, that the bottom wing is of sufficient size.

3.2. Only one engine of the reciprocating internal combustion type with a total displacement not exceeding .0102 cubic inches (1cc) shall be used.

3.3. An effective silencer shall be used in accordance with AMA standards of noise reduction.

3.4. Maximum weight less fuel is 11 pounds.

3.5. Builder of the model rule shall not apply in this event.

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 taxis 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.

4. Optional Scale Bonus. Contest Director has the option to award a 10% flight score bonus to any entry meeting the standards required of a scale aircraft. The decision of the bonus point system will be made prior to the starting of the first official flight of the competition. It is recommended that if the bonus system is used, it be so noted in all publicity prior to the contest.

5. Proof of Scale.

5.1. To prove that the model resembles a particular aircraft, some proof of scale is required.

5.2. Proof of scale is the responsibility of the contestant.

5.3. The general outlines of the model shall approximate the full size outlines of the subject aircraft. Exact scale is not required nor intended. The model shall be judged for likeness at a distance of approximately 10 feet.

5.4. If no proof of scale material is presented with the model by the contestant and the Contest Director can determine himself that the aircraft is a replica of a full-size aircraft, then the contestant will be allowed to have his entry to be considered for scale entry.

5.5. If the scale model is not considered a scale replica, the aircraft will be allowed to compete as a non-scale aircraft without the scale bonus.

6. Registration Numbers.

6.1. Registration numbers are the entrant's AMA number. If the entrant desires to try out the last one or two numbers of his AMA number, the initials of his name, such as NSJN.

6.2. If the aircraft has been built to conform to the scale regulations of the AMA or FAI, then registration requirements of that event will apply.

6.3. The registration number shall be displayed in a realistic manner typical of full-scale aircraft.

7. Material and Workmanship. Workmanship must be of satisfactory standards. Contest committees are empowered to refuse permission to fly or to disqualify any aircraft which, in their opinion, is not up to reasonably safe standards in materials, workmanship, detail design, radio installation or condition as a result of damage.

8. Pattern Event Classes.
8.1. The event shall be divided into three classes: in order of increasing difficulty, the classes are Sportsman, Advanced, and Unlimited.

8.2. Contest Directors and/or the sponsors of a sanctioned meet shall determine which of the classes will be flown. Such information must accompany all advance notices pertaining to the contest. Competitors may also be advised prior to the start of the contest of any planned deviations from standard rules.

9. Contestant Classification.

9.1. A contestant may enter any one pattern class at his own option. Advancement from the Sportsman Class to the Advanced Class is mandatory. Advancement from the Advanced Class to Unlimited Class is optional at any time. Contestant may return to Advanced class in future competitions when he so desires.

9.2. Advancement from the Sportsman Class to the Advanced Class occurs after winning first place in the Sportsman Class three times. There shall be at least five entries and at least five contestants making official flights before the first place victory is counted towards advancement to the Advanced Class. If the Sportsman Class is not offered at a competition, then the contestant can enter any class and then compete in the Sportsman Class in future contests until three first place wins are accumulated.

10. Official Flight. A flight is considered official if two maneuvers have been judged. An attempted maneuver yielding zero points is considered judged.

11. 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.

12. Aerobatic Zone.

12.1. All maneuvers shall be flown in an area in front of the judges, 45° on either side and no higher than 400 feet. Minimum altitude unless landing or taking off shall be 20 feet.

12.2. Aircraft will rock its wings back and forth prior to entering and just after leaving the aerobatic zone thus showing the judges the beginning and end of the aerobatic sequence.

13. Start Limits.

13.1. Start engine and become airborne—two minutes.
13.2. To enter the aerobatic zone upon command of appropriate official—one minute.
13.3. No time limit while in the aerobatic zone.
13.4. Upon leaving the aerobatic zone and touchdown for landing—two minutes unless required to hold upon command of appropriate official.

14. Point System.

14.1. All classes shall have the scheduled maneuvers scored on a scale of 0-10.
14.2. Free style maneuvers and presentation portion will be scored on a scale of 0-10.

1. Objective.

To run multiple plane races that will recreate the spirit and thrills of the great air races of the past and present, and that will be interesting for spectators as well as challenging for the contestants.

2. General. All AMA regulations (See sections titled Sanctioned Competition, Records, Selection of National Champions, and General and R/C regulations covering the RC flyer, his plans and equipment, shall be applicable to this event, except as noted herein. There shall be no limitation on the type of equipment fitted to the plane, or the number of controls. The contestant shall be allowed two entries in this event. He can only use his alternate model if the first model is not flyable. The contestant may have someone else fly his model in competition if he desires to do so; however, if this is done they shall be entered as a team. Both the owner and the pilot shall have current AMA sporting licenses.

2.1. Consideration of safety for spectators, contest personnel, and other contestants are of the utmost importance in this event. Any unsportsmanlike conduct or hazardous flying over a controlled spectator area will be cause for immediate disqualification of that flight.

14.3. Individual maneuvers are not scored separately in the free style portion. The total sequence is to be judged as one maneuver.

15. Determining the Winner. The highest score for the total of the best two flights shall be the winner.

16. Flight Pattern.

16.1. The contestant must fly his entire flight according to the established flight schedule for his particular class and in the sequence listed. Maneuvers performed out of order will be scored 0.

16.2. Contestant or anyone else may not touch his aircraft after it has become airborne until completion of flight. He may not land aircraft between maneuvers in order to make adjustments to engine, aircraft trim, etc.

16.3. Contestant or helper will not call out each maneuver to the judges except during the free style portion where the calling is optional.

16.4. Landing and taking off are not to be considered judged maneuvers. It is not necessary for the judges to see the aircraft take off or land. The aircraft can be carried to the take-off point and carried from the landing area if so desired.

16.5. No flybys are allowed during the aerobatic sequence. If a flyby is performed then the next maneuver shall receive zero points (i.e. each upwind and downwind leg will consist of a maneuver). Flybys can be performed in the free style portion only.

16.6. Presentation is kept within the boundaries of the aerobatic zone during the presentation of the aerobatic sequence.

17. Maneuvers.

17.1. Sportsman class sequence is:
1. Inside Loop
2. One Roll
3. Half Cuban Eight
4. Half Reverse Cuban Eight
5. One Inside Snap Roll
6. Square Inside Loop
9. Presentation

17.2. Advanced class sequence is:
1. 45° Climbing Snap Roll
2. Hammerhead
3. Reverse Spin—One Turn Each
4. Outside Loop
5. Slow Roll
6. Tail Slide
7. Knife-Edge Flight
8. 4-Point Roll
9. Two Free-Style Maneuvers

17.3. Unlimited class sequence is:
1. 45° Diving Snap Roll
2. Horizontal Eight (FAI)
3. Inverted Spin
4. Square Outside Loop
5. Loop with Snap at Top
6. Inverted Snap Roll
7. Inverted Hammerhead
8. 360° Rolling Circle
9. One-Minute Free-Style
10. Presentation.

39. RC PYLON RACING—FORMULA I AND II

3. Model Aircraft Requirements.

3.1. Formula I: Models must be a replica of the 190 cubic inch class 2. Formula II: Original prototypes, or models resembling known full scale aircraft that have raced or were designed for racing on a closed course. For the latter, contestant must provide exact officials with proof of the plane's identity and its connection with 3.3. The builder of the Model rule shall not apply to the Formula I and II events.

4. Model Aircraft Specifications.

4.1. Engine(s). Maximum total nominal displacement shall be 4030 cubic inch (66.60 cu. cm.). Engines must be production units assembled from factory available production parts. Engines and parts must have been produced in quantities greater than 1,000, and all must be available through normal retail outlets in the U.S.A. Alterations shall be limited to catalog listed parts commercially to anyone from the manufacturer of the engine being al-

tered. Engines may only be altered by removing parts or material from parts, no material or parts may be added, except as noted in the following paragraphs under this section.

4.1.1. The engine is defined as the complete unit, ready to run, including only prop, fuel, and starting voltage, except that the glow plug, carburetor, shut-off, exhaust extension, propshaft, head and crankcase bolts, drive washer, front washer, and prop nut need not be considered part of the production unit. These parts are not to be removed or replaced. No engine or motor because engine manufacturers may designate any of these parts which help make up the complete production engine.

4.1.2. An exhaust extension may be used, provided its help purpose is to carry exhaust fumes and residue out of the cowling.

4.1.2.1. Rear exhaust engines may use an adaptor not over 1/2 inches long (measured along centerline and from face of piston) followed by a constant inside diameter pipe which increases the total length of the complete extension to not over five inches as measured from face of piston to extreme exhaust end.

4.1.2.2. Side exhaust engines may use a curved adaptor not over 2 1/2 inches long (measured along centerline and from face of piston) followed by a constant inside diameter pipe which increases the total length of the complete extension to not over five inches, as measured from face of piston to extreme exhaust end.

4.1.2.3. Any part of the exhaust extension may continue outside of the cowling.

4.1.2.4. If a Contest Director feels that a particular exhaust extension does not meet the above physical specifications, he may require a test run of the engine with and without the extension. The extension shall be declared illegal if the engine's speed is increased by more than 200 RPM. Test runs with and without extension must take place within a 15-minute time period, and with all other conditions constant. Note: Contest Directors are cautioned that requiring the above test must come only as a result of suspecting that the extension is causing an excessive increase in RPM. In other words, certain engines on occasion may pick up more than 200 RPM with a legal extension, but this alone is not a satisfactory reason for requiring the test.

4.2. Engine Inspection. Any competitor at a contest may have another competitor's engine inspected for compliance with the rules by posting \$25.00. The engine will be inspected by the C.D. and someone selected by the C.D. If declared legal, the owner is not disqualified and gets the \$25.00 for his trouble. If declared illegal, the owner is disqualified and the protestor gets his \$25.00 back.

4.2.1. The C.D. may at his discretion request an engine inspection prior to the trophy or award presentation without the \$25.00 fee above.

4.3. Engine Shut-Off. Pilot must be able to shut off his engine by radio control with plane in upright position, on ground or in the air, without affecting flight path in any direction, upon official command. Engine must stop within five (5) seconds of command.

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

4.5. Spinner. A rounded spinner of at least 2 inches diameter is required on all Formula I aircraft and on prototype Formula II aircraft.

4.5.1. Formula II models of real aircraft need not use a 2 inch spinner, where such a spinner is inappropriate, but must at least meet the AMA prop nut rule.

4.6. Fuselage.

4.6.1. Formula I: At the pilot's cockpit, a minimum depth of 7 inches and a minimum width of 3 1/2 inches is required.

4.6.2. Formula II: A minimum depth of 7 inches and a minimum width of 3 1/2 inches is required. Both minimum dimensions must occur at the same cross section location.

4.6.3. Note: Flaps are not considered part of the fuselage.

4.6.4. Formula II prototype aircraft must have check covs and the cross section at the engine shall be an oval at least 5 inches wide and 2 inches high overall.

4.6.5. For both Formula I and II the engine shall be cowled at least to the extent that no more than the cylinder and head are exposed beyond the fuselage outline. The exhaust side of cowling may be shaped to clear exhaust exit.

4.7. Landing Gear. At least two wheels of 7/8 inch diameter or larger may be used. Where applicable, a third wheel, of any size, may be used. A positive means of steering on the ground shall be provided. (A movable rudder fulfills this requirement.) The landing gear of any landing gear, even on scale ships in Formula II, shall not be permitted.

4.8. Wings.

4.8.1. The minimum area specified below must be used, including that area displaced by the fuselage but not including fillets or stall strips. Flaps are permitted but wing area is to be figured with flaps retracted.

4.8.1.1. Area.
4.8.1.1.1. Formula I: Minimum area shall be 450 square inches.
4.8.1.2. Formula II: Total minimum area shall be 600 square inches. On biplanes with different size wings, the area of the

smaller wing shall be at least 1/2 the area of the larger wing.

4.8.2. Span.

4.8.2.1. Formula I: No restrictions.
4.8.2.2. Formula II: Minimum wing span shall be 50 inches for a monoplane and 30 inches for the largest wing of a biplane.

4.8.3. Chord Thickness.

4.8.3.1. Formula I: Wing shall be at least one inch thick at the centerline. Thickness may be decreased with wing on or off the aircraft. If wing is not tapered for thickness, a 1/8 inch gap is set at 1/2 of an inch shall not be "top" less than 3 cent. A 1/8 inch gap centerline. The wing from centerline (and/or outside of fillet) to tip, must have a straight line taper on both top and bottom surfaces. (However, the wing may have a convex taper.)

4.8.3.2. Formula II: Wing thickness at the root shall be at least 1 1/2 inches for a monoplane and 1 inch for a biplane. On a biplane with different size wings, the smaller wing must be at least 1/2 inches thick at the root. Thickness of wings may taper in any straight line proportion to taper of chord length.

Note: In the Formula II specifications, "root" shall be defined as the innermost wing section, not counting fillets, that may be exposed without removing wing from 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 two inches from the centerline of an exposed wing on a plane with a 4 inch wide fuselage.

4.8.3.3. Weight. Planes shall be weighed immediately after an official flight, with whatever amount of the fuel remains and before being returned to the pit or ready area. Weight at this time shall be not less than 5 pounds nor more than 6 1/2 pounds.

4.8.3.4. Racing Numbers. Racing numbers may be obtained from the National Miniature Pylon Racing Association secretary. The use of these numbers is highly recommended, but not mandatory. The numbers are located on the upper left and lower right hand wing panel facing toward the left side. The number will be right side up with the model in a left bank. The numbers will be at least 3" on the wings. Area letters will be 1/2 inch high.

4.8.3.5. Registration Numbers. Registration numbers are the entrants' AMA numbers. If the entrant desires he may use the last two or three numbers and the initial of his last name, such as N204D, instead of 262604.

4.8.3.6. Registration. A registration number is required on the upper right and lower left wing panel. The minimum height of the numbers on the wing will be 2 inches. The letter "N" will precede the registration numbers.

4.8.3.7. An alternate method will be placing a minimum of 1 inch registration numbers, preceded by the letter "N", along each side of the fuselage behind the trailing edge of the wing.

4.8.3.8. Materials and Workmanship. Workmanship must be of satisfactory standards. Contest committees are empowered to refuse permission to fly, or to disqualify any ship which, in their opinion, is not up to reasonably safe standards in either materials, workmanship, detail design, radio installation or condition as a result of damage.

4.8.3.9. Flight Requirements. The following is required for Formula I, and when practical, should be applied to Formula II.

4.8.3.9.1. Before attempting to enter a competition, the pilot must have flown the ship before two witnesses who are members of the AMA and demonstrated the following maneuvers before them:

4.8.3.9.1.1. Take-off at full throttle without veering more than 10 feet from either side of a straight line on the ground directly into the wind.

4.8.3.9.1.2. Pull-up from straight and level flight at maximum air speed and RPM into a full up elevator loop.

4.8.3.9.1.3. Make a dive at a 30 degree angle for at least a length of 500 feet.

4.8.3.9.1.4. Make a 180 degree turn at full air speed and maximum RPM without any appreciable loss of altitude or control.

4.8.3.9.1.5. Make three laps of a simulated race course at normal racing altitudes, making the turns at full speed as in a race.

4.8.3.9.2. The starter is empowered to black flag any pilot whose flying is erratic and dangerous, in the judgment of the starter. This decision is entirely at the discretion of the starter, and it is not subject to protest. Upon receiving the black flag, a flyer must land his aircraft immediately.

10. Handicap System—Formula I Only.

Order of takeoff shall be determined by handicap judging as described below. Aircraft shall be flagged off the line at an interval of approximately 10 seconds, as rapidly as the starter can drop the flag (in a succession), with the aircraft closest to the starter taking off first.

10.1. Handicap judging shall be conducted as follows: all the aircraft are lined up, including backup aircraft, in the same line. An experienced team of up to three judges then rearranges the aircraft in the line in such a way that the aircraft which in their judgment should rank highest with respect to scale fidelity, workmanship, and excellence of appearance is at one end of the line and the

FAI RC AEROBATICS (F3A) (MASTER CLASS 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 aircraft which is aerodynamically maneuvered by control surfaces in attitude, direction and altitude by a pilot on the ground using radio control, but not a Helicopter.

2. Preparation 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 a person other 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 Model. Maximum surface area: 150 dm² (2325 sq. in.). Maximum total weight: 5 kg (11.023 lbs.). Minimum loading: 12 gr/dm (3.95 oz. per sq. ft.). Maximum loading: 75 gr/dm (24.51 oz. per sq. ft.). Maximum total swept volume of the engine(s): 10 cm³ (.61 cu. in.). The engine(s) must be fitted with effective silencers. The maximum noise level must be no greater than 84dBA at 10 meters (322 ft.) distance.

Noise Measurement Details. The model is placed on a rotatable platform 1.2m (4') above the ground. With the engine running at full power the table is rotated through 360° stopping at each 45° position for a measurement to be made. The average of these eight readings will be considered the noise level.

No measurement should be made in wind speeds over 3m/sec. (11.2 mph).

Measurements should be made over short grass. No noise reflecting objects should be nearer than 30m (98.4') to the model or microphone.

The equipment used for measurement should comply with International Electronic Commission document No. 179, *Precision Noise Level Instruments*.

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

5. Number of Flights. The competitor has the right to four 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.

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 judge's discretion only when, for any unforeseen reason outside the control of the competitor, 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.

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 (approximately 60 degrees vertically and 90 degrees horizontally). The non-observance of this rule will be heavily penalized by loss of points. If the majority of judges agree, a competitor may be told to land his model if the model is considered unsafe for any reason, or is being flown in an unsafe manner.

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. Alternatively, the individual classification may be

determined by selecting the top five, or 10%, whichever is larger, from the three best flights which will determine the team classification, allow these competitors a further two flights the best of which will be added to the other three flights to determine the individual winner.

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 nationalities 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 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 a transmitter has ended the competitor must immediately return his transmitter to the Steward at the transmitter compound. A compound during the contest at the discretion of the Contest Manager or Jury, will be allowed to remove his transmitter from the compound during the contest at the discretion of the Contest Manager or Jury.

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 meters (98.4 ft.) handling 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, the may delay no 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 when he will not execute a maneuver or when he must make a start on each pass in front of the judges. One maneuver must be made on each pass in front of the judges, except after Take-off and before the Approach where in each case a choice may be made without a maneuver being performed. The name of each maneuver must be announced by the pilot. 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.

13.1. Takeoff (K = 5). The model must stand still on the ground with the engine running, without being held by the pilot or the mechanic and must then take off. The takeoff run must 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 downgraded for the following reasons:
1. Model does not stand still when released.
2. Changes in heading during the run.
3. Model jumps from the ground.
4. Reaching the ground after becoming airborne.
5. Too steep a climb angle.
6. Gallons in heading during climb.
7. Changes in heading during climb.
8. Drooping a wing.
9. Does not turn approximately 90 degrees out of takeoff path.

13.2. Figure "W" (K = 15). 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 followed the stall turn, the model then executes a half inverted loop, followed by a third half roll, a stall turn, in the opposite direction to the first stall turn, a fourth half roll after the stall turn and recovers in level flight on the same heading and attitude as the entry. When viewed from the side the model creates a figure "W". The maneuver should be downgraded for the following reasons:
1. Model not level at start.
2. Does not become vertical.
3. Changes in heading during half rolls.
4. Turn radius at top of stall turns greater than two wing spans.
5. Turns at top of stall turns less than 180 degrees.

13.3. Cuban Eight (K = 10). Model starts in straight and level flight, pulls up to an inside loop, rolls over until heading downwards at 45 degrees, does a half roll followed by another inside loop, at 45 degrees, model does another half roll and recovers on the same attitude and heading as entry. The maneuver should be downgraded for the following reasons:
1. Model not level at start.
2. Loop not round.
3. Loop deviates left or right.
4. Model not at 45 degrees at commencement of roll.
5. Second loop not at same altitude as first loop.
6. Second loop deviates left or right.
7. Second loop not same diameter 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 attitude as entry.
11. Rolls not centered on cross over point.

13.4. Double Immelmanman (K = 10). Model starts in level flight, pulls up into a half inside loop, followed by a half roll, flies straight and level for one second, then does a half outside loop, followed by a half roll and recovers on the same heading and attitude as entry. The maneuver should be downgraded for the following reasons:
1. Model not level at start.
2. Half inside loop deviates left or right.
3. Half roll does not commence immediately after half inside loop.
4. Half roll deviates left or right.
5. Model flies longer than one second upright before commencing half outside loop.
6. Half outside loop deviates left or right.
7. Half outside loop not at same altitude as inside loop.
8. Half roll does not commence immediately after half outside loop.
9. Roll rate not same in both half rolls.
10. Model not level at finish of maneuver.
11. Model does not finish on same heading and attitude as entry.

13.5. Slow Roll (K = 15). Model starts in level flight, then rolls slowly through one complete rotation. Model recovers on same heading and attitude as entry. The approximate time of the roll to be the seconds. The maneuver should be downgraded for the following reasons:
1. Model not level at start.
2. Model deviates left or right or in attitude during maneuver.
3. Roll rate not constant.
4. Model does not roll through exactly one revolution.
5. Model takes less than 4 or more than 6 seconds to complete roll.
6. Model not level at finish of maneuver.
7. Model does not finish on same heading and attitude as entry.

13.6. Three Outside Loops (K = 15). Model starts in level flight, then half rolls to inverted, flies for approximately 1 second, then performs three outside loops upwards, flies for a further 1 second inverted and half rolls to level flight, recovering on the same heading and attitude as entry. The maneuver should be downgraded 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 end of third loop.
5. Finish not at same altitude as entry.
6. Model drifts or changes in 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. Model not level at same altitude as first loop.
12. Model drifts or changes in heading.
13. Diameter of third loop different from first and second loop.
14. Third loop not round.
15. Loop deviates left or right.

13.7. Four Point Roll (K = 15). Model starts in level flight, then rolls one complete rotation hesitating at each quarter revolution. At each hesitation the wings will be parallel to the horizon and altitude as entry. The approximate time of the roll to be the seconds. The maneuver should be downgraded 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.
6. Model does not finish on same heading and attitude as entry.

13.8. Three Inside Loops (K = 10). Model starts in level flight, pulls up and completes three inside loops, recovering on the same attitude and heading as entry. The maneuver should be downgraded 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 right or left.
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 in second loop.
13. Diameter of third loop different from first and second.
14. Third loop not round.
15. Loop deviates left or right.

13.9. Eight Point Roll (K = 15). Model starts in level flight, then rolls one complete rotation hesitating at each eighth revolution (45 degrees). At each hesitation the wing will be parallel with 45 degrees to the horizon. Model recovers on same heading and altitude as entry. The approximate time of the roll to be the five seconds. The maneuver should be downgraded 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 for the roll.
6. Model not level at finish of maneuver.
7. Model does not finish on same heading and attitude as entry.

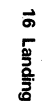
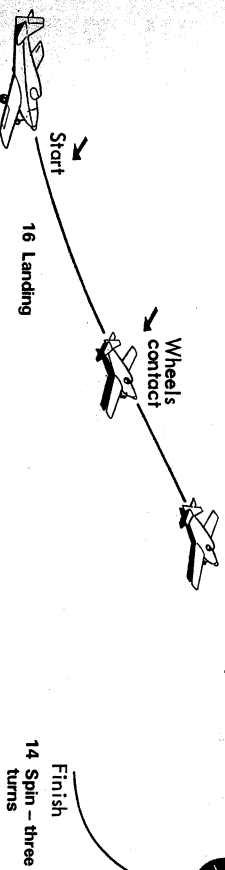
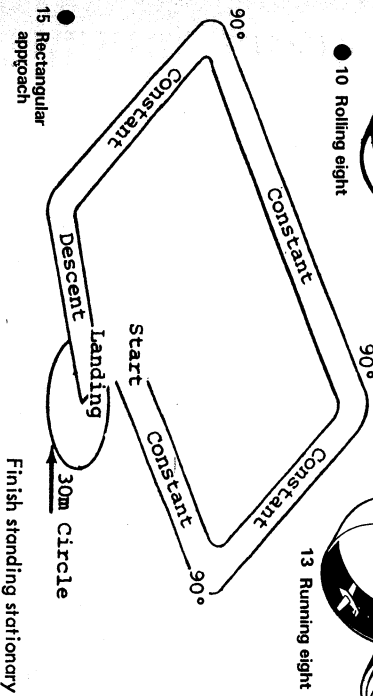
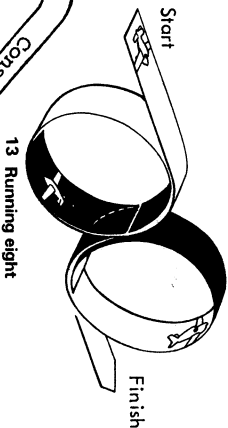
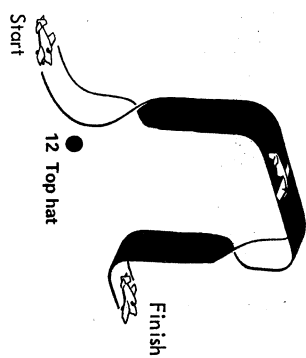
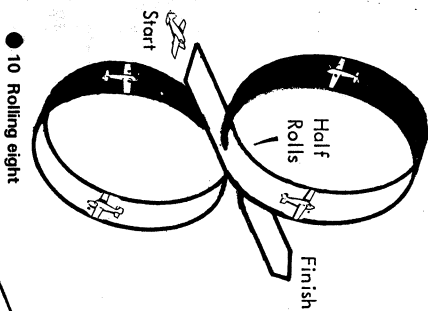
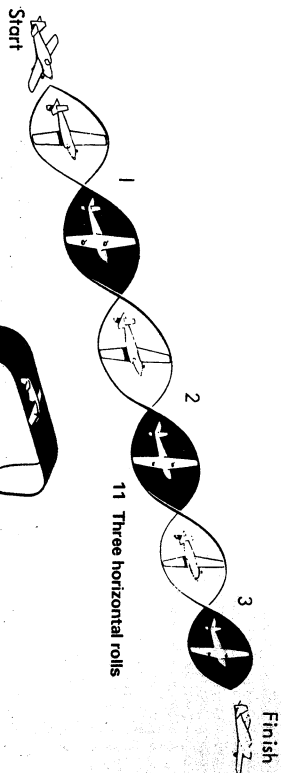
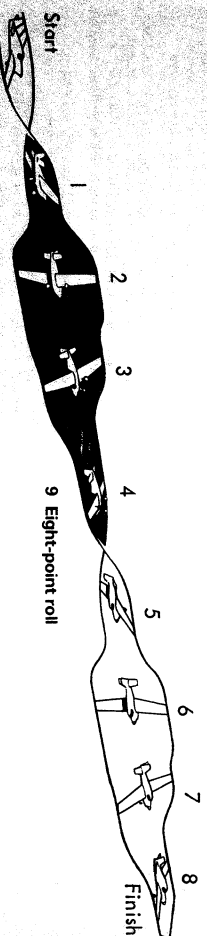
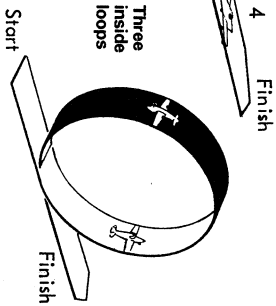
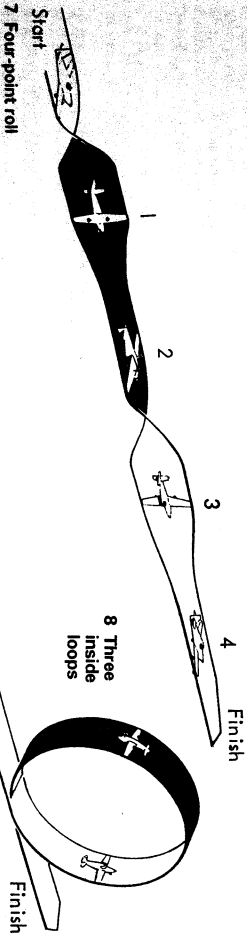
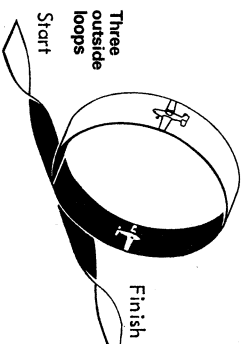
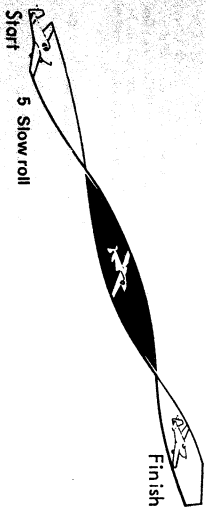
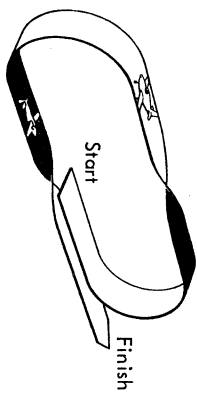
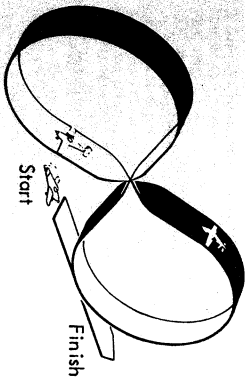
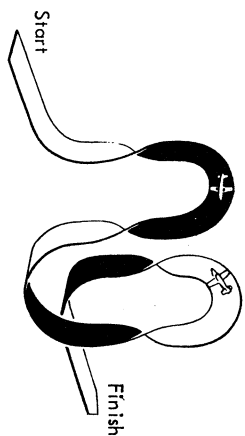
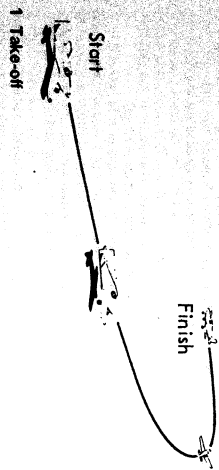
13.10. Rolling Eight (K = 10). Model starts in level flight, pulls up into an inside loop, at the bottom of the loop, at the point of entry, rolls through 180 degrees recovers another inside loop downwards, at the top rolls through 180 degrees and recovers on same heading and attitude as entry. The maneuver should be downgraded for the following reasons:
1. Model not level at start.
2. Loop not round.
3. Wings not level before and after first half roll.
4. Second loop not round.
5. Second loop not immediately under first loop.
6. Model deviates left or right during loops.
7. Model does not level at finish.
8. Model does not finish on same heading and attitude as entry.

13.11. Three Horizontal Rolls (K = 15). Model starts in level flight, then rolls at a uniform rate through three complete rotations finishing in level flight on the same heading and attitude as entry. The approximate time of the roll to be the five seconds. The maneuver should be downgraded for the following reasons:
1. Model not level at start.
2. Model changes heading or attitude during rolls.
3. Model not level uniformly.
4. Does not roll exactly three revolutions.
5. Model takes less than 4 or more than 6 seconds to complete rolls.
6. Model not level at finish of maneuver.

13.12. Top Hat (K = 15). Model starts in level flight, pulls up into a vertical attitude, then performs a half roll, pulls over into inverted flight for a short period, pulls down into a vertical dive, performs a half roll, and recovers in level flight in an upright position on the same heading and attitude as entry. The maneuver should be downgraded 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.
6. Model does not finish on same heading and attitude as entry.

13.13. Four Point Roll (K = 15). Model starts in level flight, then rolls one complete rotation hesitating at each quarter revolution. At each hesitation the wings will be parallel to the horizon and altitude as entry. The approximate time of the roll to be the seconds. The maneuver should be downgraded 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.
6. Model does not finish on same heading and attitude as entry.

F.A.I. Radio Control Maneuvers



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 performance 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 an 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 to be judged. 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 maneuver on such a way that it can be easily judged. From the first consideration, a position is important 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 enter 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

4. Not level at finish.

5. If maneuver is spiral dive score zero.

Note: If initial entry to spin is not smooth, or the spin itself is jerky and uncertain this is not a reason for downgrading, it is an indication that the spin is a true spin. A spiral dive is indicated by its smoothness and increasing airspeed during a spin the airspeed does not increase appreciably.

13.15. Rectangular Approach (K = 10): The maneuver is completed with the model flying into wind over the landing circle, a left turn of 90 degrees, a crosswind leg, a second turn of 90 degrees, a downwind leg, a third left turn of 90 degrees, a crosswind leg, a fourth 90 degree turn and straight flight towards the point of touchdown. *The first three legs will be at constant altitude, the descent to touchdown will commence after the second crosswind leg.* The maneuver is finished just prior to touchdown. The circuit may be to the right if the Contest Director states so before the flight. The maneuver should be downgraded for the following reasons:

1. Legs of rectangle are not straight.
2. 90-degree turns not smooth and precise.
3. Turns more or less than 90 degrees.
4. Gallops in elevation.
5. If model does not land after approach, zero points.

13.16. Landing: The model flares smoothly to touch the ground within the landing circles with no bouncing or changes in heading and rolls to a stop. The maneuver should be downgraded for the following reasons:

1. Model impacts ground due to lack of flare.
2. Model bounces after touchdown.
3. Wings not level at touchdown or during landing roll.
4. Model deviates left or right during landing roll.
5. If model ends on its back, zero points.
6. If any wheel is retracted during landing maneuver, zero points.

Note: Landing maneuver commences when aircraft is approximately 1 meter above ground.

K = 5 within 50m (98.5') circle.
K = 1 outside 50m (98.5') circle.

most difficult aspects of the maneuver. Specifically, maneuvers which have vertical symmetry (such as Loops, Immelmans, Cuban Eight and Horizontal Eight) should execute their circular path in a plane perpendicular to the line of sight to the model.

Each one of these maneuvers is downgraded since it increases the difficulty of judging the symmetry of figure 8's and the "tracking" of consecutive loops. It is justified for exceptionally low altitude, while the 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 from 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, 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 and agreement reached about the severity of defects, once the contest is started, the individual judge should not alter his standard of judgement.

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.

FAI RC PYLON RACING (F3D)

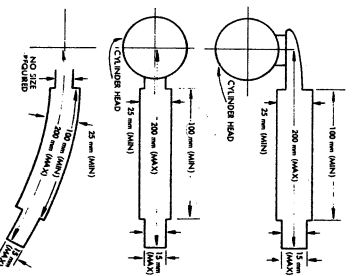
Note: The FAI General Rules also apply.

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 cm³ (.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 must be fitted with an effective silencer, maximum length 200mm (7.87") measured along its centerline from a point on, or at right angles to, the cylinder centerline. Within this length there shall be an expansion chamber not less than 100mm (3.94") long and 25mm (.984") diameter. The silencer must be gas tight, with a single orifice, maximum diameter 15mm (.590"). Diagrams illustrate examples of approved arrangements.



Judging Individual Maneuvers: When in doubt, give the lower score. Precision is not a common occurrence, 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 simple change in heading during the take-off would be considered one defect, while two or three distinct turns 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 element in poor positioning should be deducted at the start of the maneuver and also fed into the final score for the maneuver. Bad position: Improper size observed during or as many as 3 or 4 small defects. Improper size observed during or as the end of a maneuver might also result in as many as 3 to 4 elements.

6.3. Landing Gear: At least two wheels with a minimum diameter of 57 millimeters (2 1/4") and a minimum width of 18mm (.7") for at least 1/2 of their diameter will be used. The wheels will have a minimum track, measured laterally, of 300mm (11.8 ins.).

6.4. A cockpit will be provided of a size to allow for a scale pilot head, size 5cm (1.97") from chin to top of head. There will be a fixed forward and side vision from the pilot, when sitting in a normal upright position. A pilot need not be fitted.

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 Delta's will not be allowed in this event.

7.2. Wing Span: Minimum wing span shall be 1250 millimeters (41 1/3"/16") for a monoplane and 750 millimeters (23 1/4") for the largest chord of a biplane.

7.3. Chord Thickness: Wing thickness at the root shall be at least 38 millimeters (1 1/4") 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 (3/4") 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 30 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 legs with intermediate lap length of 400 meters. The course is travelled in 4 kilometers. The race starts at the start finish line. All takeoffs will be from a mechanical device. This race is terminated at the start finish line. Full flag is permitted. 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