

**OFFICIAL MODEL
AIRCRAFT ☆ 1980-81
REGULATIONS** □□□

Governing Sporting



Model Aviation in

America □□□□□□□□□□

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\$1.00

Academy of Model Aeronautics

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36. CL DIVE BOMBING & STRAFING (SUPPLEMENTAL)

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

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

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

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

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

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

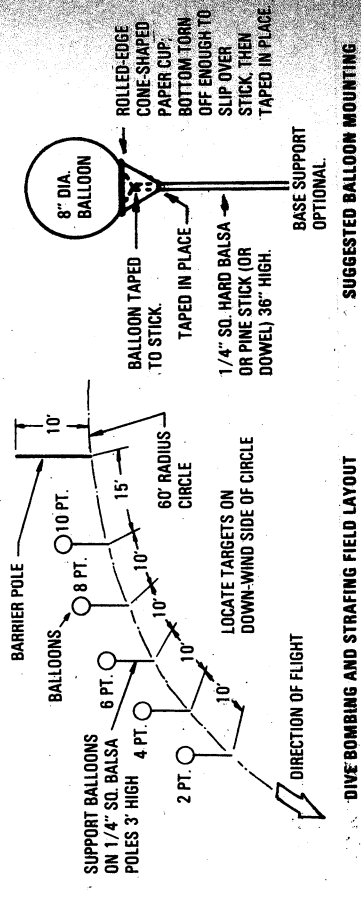
5. **Engine(s)** shall be of the reciprocating internal combustion type with piston displacement of from 1500 thru 4599 permitted. Sixty percent of the actual piston displacement of four stroke cycle engines shall be taken for compliance with this regulation. Jet assist, catapult or other launching device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

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

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

8. **Flight.** Plane must rise off ground and fly seven (7) laps at maximum altitude of 15 feet for speed timing. Plane shall be timed from instant of release to instant plane passes release point 7th time. Then the pilot must approach target in upright position flying level, dive over the barrier and knock out targets. Maximum altitude before dive is approximately 20 feet. Pilots are allowed to break any balloons would result in a zero score.

Engine Size (cu. in.)	Max. Model Weight (lbs.)	Required Minimum Diameter of Each Line				Pull Test
		1 Line	2 Lines	3 Lines	Multi-Strand	
1500-4009	4 lbs.	59"-.603"	.018"	.015"	3 Lines	10G
4010-4599	4 lbs.	59"-.603"	.018"	.018"	3 Lines	10G



DIVE BOMBING AND STRAFING FIELD LAYOUT

37. RADIO CONTROL, GENERAL (FOR NON-SCALE EVENTS)

1. **Control Rules.** In addition to the following General Radio Control Rules and the specific rules for each model control event, also controlled model aircraft construction, flying and competition are also governed by the rules of the following sections: Sanctioned Competition, Records, and General. Although the following general and specific rules primarily govern competitive activity in AMA events, it is strongly recommended that, in the interests of safety and consistency, they be followed in all radio control activity.

2. **Objective.** To control by radio a model airplane so that various planned maneuvers may be accomplished. The criterion is the quality of execution of the maneuvers. The model is to 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 FCC. AMA membership card and FCC 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 a reciprocating or rotary piston internal combustion engine in a single engine model shall not exceed 6102 cubic cent (cc). In a model powered by two or more reciprocating or rotary piston internal combustion engines, the total displacement shall not exceed 8060 cubic inch (13.20cc) and none of these individual engines shall exceed 6102 cubic inch (10cc). 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.

4.2. Muffler(s). Each reciprocating or rotary piston internal combustion engine shall be equipped with an effective muffler.

4.3. Weight. No model may weigh more than 5kg (11 lbs.) gross, 4kg (8 lbs.) net.

4.4. Controls. There shall be no radio equipment or aircraft control function limitations in any Pattern class except Pre-Novice Radio Control.

4.4.1. In the Pre-Novice class, aircraft must be of the fixed gear type, or if the aircraft is of the retractable landing gear, the aircraft must be flown with the gear down. No tuned pipe (i.e., muffler device which increases engine rpm) may be used by each contestant.

4.5. Number of Airplanes. Two models may be entered by each contestant. A contestant may interchange the aircraft and/or various parts as he wishes provided the resulting complete model conforms to the rules and that the parts have been checked before flight.

4.6. The Builder of the Model Rule shall not apply to the Pattern events.

4.7. Identification. All models shall be identified by the contestant's AMA license number permanently affixed to the upper side of the right-hand lifting surface or to each side of the fuselage or vertical stabilizer. Height of the numerals must be at least one inch. Both stroke and width shall be such as to enable ready recognition.

4.8. Number of Helpers. Each pilot is permitted one helper during the flight. Two helpers may be present during the starting of the engine(s).

4.9. 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.

4.10. All models must pass a general safety inspection by the Event Director or his representative before they are allowed to fly.

4.11. The "flight line" shall be defined as a straight line, infinitely long in both directions, in front of which all flying is done and in back of which all spectators and operators are positioned. The judges shall be positioned along the flight line, and their flight shall be established by the judges' position. If at any time during a flight, including the takeoff and landing, the plane goes behind the flight line, the flight is terminated.

38. 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 execution of the maneuvers. The model is to 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 FCC. AMA membership card and FCC license of each entrant shall be checked at every sanctioned meet.

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4.8. Number of Helpers. Each pilot is permitted one helper during the flight. Two helpers may be present during the starting of the engine(s).

4.9. 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.

4.10. All models must pass a general safety inspection by the Event Director or his representative before they are allowed to fly.

4.11. The "flight line" shall be defined as a straight line, infinitely long in both directions, in front of which all flying is done and in back of which all spectators and operators are positioned. The judges shall be positioned along the flight line, and their flight shall be established by the judges' position. If at any time during a flight, including the takeoff and landing, the plane goes behind the flight line, the flight is terminated.

2. **Safety Declaration.** At all sanctioned contests, each contestant shall sign an AMA Flight Safety Declaration (perhaps as part of an entry form), attesting to the fact that he or she has previously read and understands the safety regulations of the AMA and is aware of the responsibilities of a pilot of a model aircraft. Furthermore, the contestant shall also sign a declaration that he or she is at least 14 years of age and is qualified to fly a model aircraft. The safety regulations of the AMA shall apply to all participants in the presence of fellow contestants, contest officials, and all others who may be in the flight area during the competition period.

3. **Pattern Declaration.** The Pattern event shall be divided into five classes. They shall (in order of increasing difficulty) be referred to as Pre-Novice, Novice, Advanced, Expert and Master. The Pre-Novice class is supplemental (see Supplemental and Provisional Rules, p. 2). Competitors must be advised prior to the start of the contest of any planned deviations from standard AMA rules pertaining to the events they have entered.

4. **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, except as noted in 8.1.2., 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 class. This move will come about in one of two ways: (1) voluntary, (2) mandatory.

8.1. 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.

8.1.1. 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 a higher class. He may not fly in a class lower than the one to which he is committed.

8.1.2. Exception: For a flier to be reclassified to a lower rank, that person must make an application (using a form supplied by AMA HQ) to be approved by a Contest Director and forwarded to the Contest Board member and Vice-President for their approval.

8.2. A contestant will be mandatorily advanced through the classes as follows: A flier who moves out of the Pre-Novice class if he places first, second or third above all other fliers other than (having recorded an official flight) in a sanctioned Pattern class contest. For Novice, Advanced and Expert classes, advancement takes place through the accumulation of points. In any of these three classes contestants receive points according to their finishing place in every contest they compete in. For fliers finishing third or below in a given contest they will receive points equal to the number of official (having recorded an official flight) fliers they beat. The second place winner will receive points equal to twice the number of official fliers he beats, and the first place winner will receive points equal to three times the number of official fliers he beats. The points each contestant receives goes into his cumulative record.

8.2.1. A flier accumulating or exceeding 100 points will automatically be advanced to the next higher competition class at the end of that calendar year.

8.2.2. 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.

8.2.3. Time required to acquire 100 points has no limit. A contestant's point accumulation does not start over again at the beginning of each new year, but continues until, if ever, 100 points is reached.

8.2.4. When a contestant enters a new class, either higher or lower, as permitted by 8.1.7, he begins with zero points.

Note: A contestant who flies in a higher class under the Exception Rule (8.1.1) above still acquires classification points in accordance with 8.2. above.

Example:

(1) Contestant is one of 8 who flies officially in a given class under Pre-Novice rules for 5 flights. He requires 3 times 7 (the number of Pre-Novice flights) = 21 classification points.

(2) Contestant is one of 16 and places fifth. He receives 11 points.

(3) Contestant accumulates 95 points in 1980 and thus remains in his declared class into 1981. At the first 1981 contest, he picks up 12 points. He may fly the rest of 1981 in his declared class but will be advanced to the next higher class starting January 1, 1982. (He may move up sooner if he so desires.)

8.3. Each Pattern contestant is responsible for maintaining an accurate record of his own classification points. Handy wallet-size Classification Advancement Record forms 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.

9. 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.

10. Official Flight. There is an official flight when an attempt is made whatever the result.

10.1. There is an attempt when:

a) the pilot announces the start of the takeoff maneuver or

b) the model fails to commence the takeoff maneuver within the 3 minutes allowed to each competitor.

If the engine stops after the pilot has announced the start of takeoff and before the model is airborne, it may be restarted within the 3-minute period. However, no points will be awarded for the subsequent takeoff maneuver.

10.2. Each competitor is entitled to one attempt for each official flight. An attempt can be repeated at the judges' discretion only when, for any unforeseen reason outside the control of the competitor, the model fails to make a start (i.e., radio interference or a safety relay due to other aircraft traffic).

10.3. In the case of a tie on timing a Pattern flight the contestant immediately fly on the timing. They may assume their flight with the same effort if they are judged to be worthy by a back-up aircraft beginning with the maneuver that was in progress or with the next scheduled maneuver if collision occurred between the contestants. The previously defined starting times will apply and the contestant will be allowed no more than two passes in front of the judges for the purpose of trimming the plane. Scores of previous maneuvers will be added to the scores of subsequent maneuvers in resumed flight.

11. Time Limits. All contestants are allotted a total time of 10 minutes in which to complete a flight. The engine must be started and the takeoff maneuver commenced within the first 3 minutes. When the contestant fails to commence within the first 3 minutes and is so informed by the timer, he must immediately clear the area and the contest. No engine restarts are allowed after the wheels leave the ground on takeoff. Restarting is permitted within the first 3 minutes but only if prior to takeoff (also see Para. 10).

12. Point System.

12.1. Pre-Novice, Novice and Advanced maneuvers shall be judged and scored on a zero to ten basis to the nearest 1/2 point. Flight score is the sum of the individual maneuver scores.

12.2. Expert and Master maneuvers shall also be judged on a zero to ten basis to the nearest 1/2 point. However, each maneuver score shall be multiplied by a "K" factor (see Paragraphs 18 & 19). Flight score is the sum of the "K" multiplied maneuver scores.

13. Determining the Winner. In all classes, the winner shall be the highest score if only one flight is completed; the highest single flight score if two flights are completed; the highest total of the best two flights if four or more are completed. Maneuver points from repeat flights may not be added to earlier flights. Each flight is complete in itself. In case of ties, the best non-scored flight of the contestant shall be used to determine the higher place.

14. Flight Pattern. The maneuvers in all classes must be executed during an uninterrupted flight in the order in which they are listed. Each time the model passes in front of the judges a maneuver must be executed except after takeoff and before landing, where in each case a pass may be made without a maneuver being performed. In Pre-Novice a free pass is allowed after takeoff and following Three Inside Loops but not before Landing.

14.1. In the maneuver lists that follow, (U) and (D) denote preferred upwind or downwind maneuver orientation, but are a matter of choice to the individual contestant without penalty. However, sequence of maneuvers is mandatory and must be

followed regardless of actual wind direction.

14.2. If a maneuver is done out of order it shall be scored zero.

14.3. If an illegal pass (crossing a line perpendicular to and centered on the judges) is made the maneuver which should have been executed shall be scored zero.

14.4. After a contestant performs a wrong maneuver or makes an illegal pass, he shall then be judged on the remaining maneuvers in the schedule provided they are executed in proper sequence, regardless of the order in which they are scheduled.

14.5. The following is the scoring method for a missed approach for Pre-Novice. If on an aborted landing (missed approach), the plane did not descend below two meters but went once around the field and then landed, the traffic pattern maneuver shall be scored zero and the landing awarded appropriate points. If the plane did descend below two meters the landing pattern shall be given appropriate points and the landing scored zero. If a second missed approach is executed with the plane passing in front of the judges, the landing must be scored zero as well as the traffic pattern irrespective of any previous minimum altitude.

14.6. A missed approach or aborted landing in Novice, Advanced, Expert and Master yields zero points for the landing.

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

14.8. It is recommended that the pilot or helper vocally indicate to the judges that the pilot is about to execute a maneuver. The competitor may make only one attempt at each maneuver during the flight.

15. Pre-Novice Pattern Maneuvers.

- 1. Takeoff (U)
- 2. Straight Flight Out (U)
- 3. Procedure Turn
- 4. Straight Flight Back (D)
- 5. Stall Turn (U)
- 6. Immelmann Turn (U)
- 7. 3 Inside Loops (U)
- 8. Traffic Pattern (U)
- 9. Landing (U)

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

16. Novice Pattern Maneuvers.

- 1. Takeoff (U)
- 2. Straight Flight Out (U)
- 3. Procedure Turn
- 4. Straight Flight Back (D)
- 5. Stall Turn (U)
- 6. Immelmann Turn (U)
- 7. 3 Inside Loops (U)
- 8. Straight Inverted Flight (D)
- 9. Reverse Outside Loop (U)
- 10. 3 Horizontal Rolls (D)
- 11. Landing (U)

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

17. Advanced Pattern Maneuvers.

- 1. Takeoff (U)
- 2. Double Stall Turn (U)
- 3. Cuban 8 (D)
- 4. Double Immelmann (U)
- 5. Four Point Roll (D)
- 6. 3 Reverse Outside Loops (U)
- 7. Slow Roll (D)
- 8. 3 Inside Loops (U)
- 9. 3 Horizontal Rolls (D)
- 10. 3 Turn Spin (U)
- 11. Landing (U)

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

18. Expert Pattern Maneuvers.

- 1. Takeoff (U)
- 2. Figure M with 1/2 Rolls (U)
- 3. Cuban 8 (D)
- 4. Double Immelmann (U)
- 5. Slow Roll (D)
- 6. Four Point Roll (D)
- 7. Reverse Outside Loops (U)
- 8. 3 Inside Loops (U)
- 9. Eight Figure 8 (D)
- 10. Right Eight (U)
- 11. 3 Horizontal Rolls (D)
- 12. Top Hat (U)
- 13. Running Eight (D)
- 14. Three Turn Spin (U)
- 15. Landing (U)

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

19. Master Pattern Maneuvers. The Master maneuver sequence is made up by the individual competitor from a list of 36 possible maneuvers. The sequence starts with takeoff and ends with landing. Any maneuver can be used only once, and only one Figure M may be used. Only 14 different maneuvers may be selected including takeoff and landing to give a maximum total score of 450 points. A

contestant's maneuver schedule may be changed from flight to flight but it must still conform to the aforementioned limitations. The Master maneuvers shall be chosen from the following list:

- 1. Take-off
- 2. 3 Inside Loops
- 3. Outside Loops
- 4. Cuban Eight
- 5. Reverse Cuban Eight
- 6. Horizontal Eight
- 7. Vertical Eight
- 8. Rolling Eight
- 9. Reverse Double Immelmann
- 10. Double Immelmann
- 11. Straight Inverted
- 12. Cobra Roll
- 13. Turn Spin
- 14. Reverse Inside Loops
- 15. Reverse Outside Loops
- 16. Avalanche
- 17. Slow Roll
- 18. 3 Horizontal Rolls
- 19. 2 Rolls in Opposite Direction
- 20. Vertical Roll
- 21. Aileron Turn
- 22. Top Hat
- 23. Inverted Spin
- 24. Square Horizontal Eight
- 25. Triangle Rolling Loop
- 26. Reverse Knife Edge
- 27. Reverse Point Roll
- 28. Point Roll
- 29. Reverse Point Roll
- 30. Reverse Top Hat
- 31. Square Rolls in Opposite Direction
- 32. Figure M with 1/2 Rolls
- 33. Figure M with 1/4 Rolls
- 34. Landing

The contestant's flight must conform to the flight plan submitted to the judge prior to the flight and in all other ways adhere to the specifications of Paragraph 14, Flight Pattern.

Note: A detailed description of each maneuver for all classes and reasons for downgrading when scoring will be found in the AMA RC Pattern Judges' Guide.

20. Suggested Field Procedure. The procedures listed below are suggestions to Contest Directors for the execution of an RC Pattern event, and they are intended for local conditions.

20.1. All RC contests shall be set up in "pits" at spot assigned by the Contest Director so they will be under his immediate control.

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

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

20.4. Event Director shall carry out the following procedure:

20.4.1. 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.

20.4.2. No. 1 may fly have 3 minutes from completion of preceding flight in which to release model for the start of his flight. False starts are permitted within the 3 minute limit. Failing to start flight within this limit, contestant must immediately remove his plane and equipment to the pits. It shall be the responsibility of the Event Director or his representative to notify contestant of start and end of the 3 minute period.

20.4.3. Numbers 4, 5, and 6 on the Flight List shall have their planes and equipment in a ready box located near the flight line. As soon as a flight is completed by No. 4, he becomes No. 3 and shall be requested to open his model and equipment onto the flight line. If he is not ready to do so, he shall be dropped from the Flight List, 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 the ready box or flight line.

20.5. 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:

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

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

20.5.3. 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.

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

20.6. 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.

20.7. 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 without consultation. Judges shall score maneuvers individually without consultation between them. There should be enough judges available to establish a rotational procedure which will average out variations in judging.

RC FREQUENCIES AND FLAGS

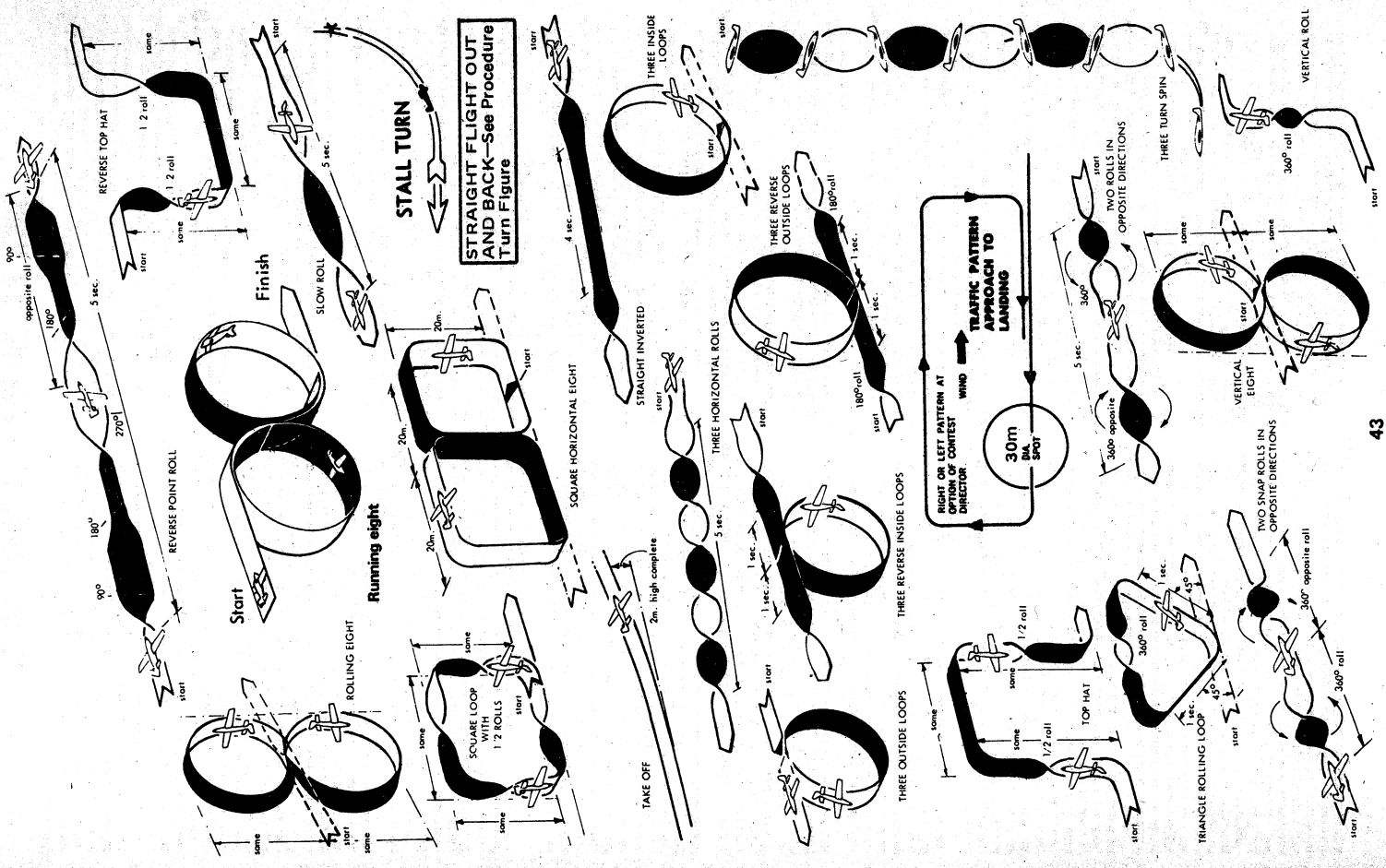
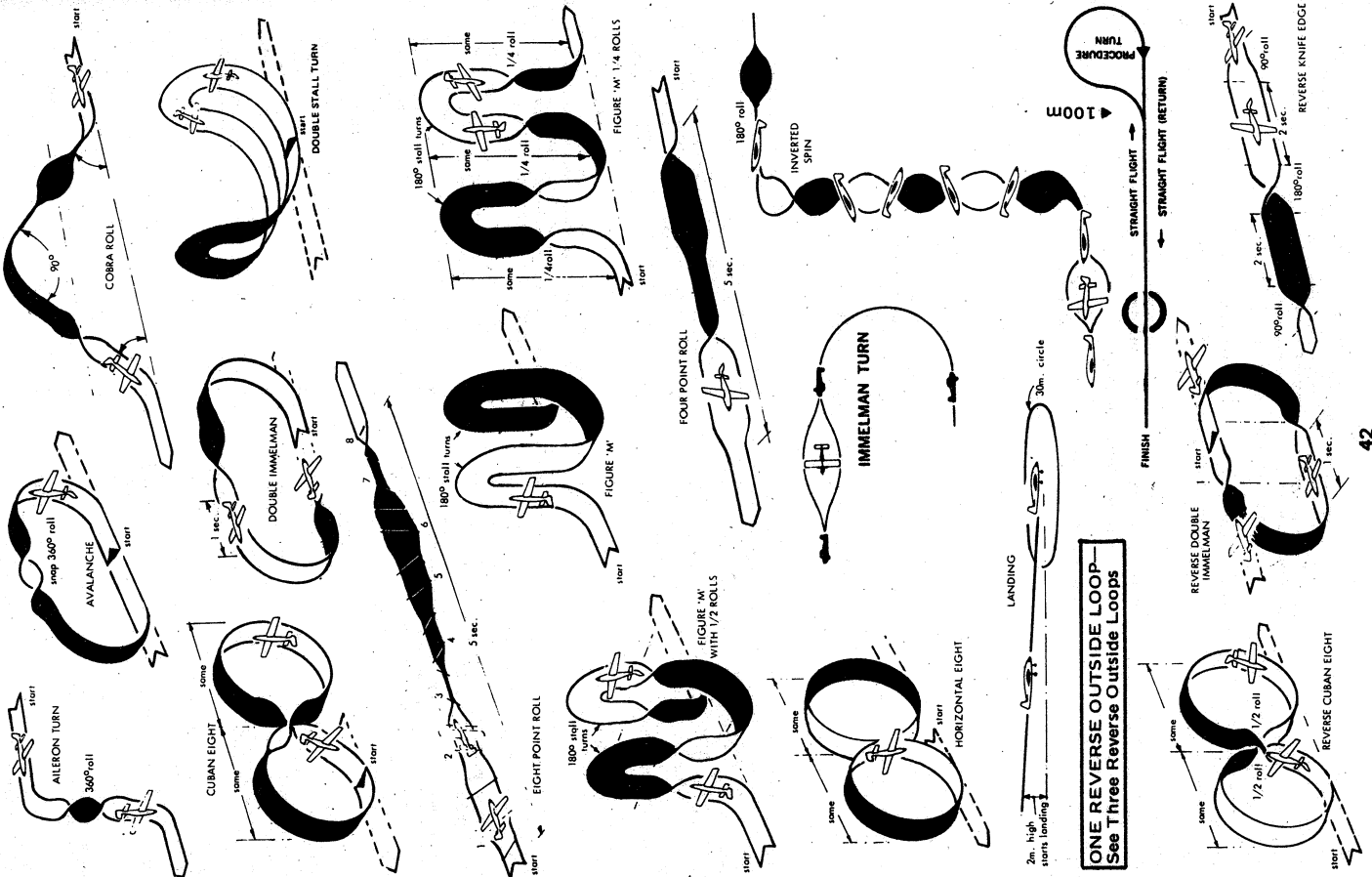
The AMA has designated certain colors to be used in the form of a streamer or pennant (flag) as a means of indicating what frequency a transmitter is assigned. It is recommended that 27 MHz flags be triangular. Transmitter antennas in the 50-54 MHz and 72-76 MHz bands will show two flags, each in the 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
27,046—Red	27,255—Blue
27,085—Orange	27,145—Yellow
50-54 MHz Super-Het	
53.10—Black & Brown Ribbons	53.30—Black & Orange Ribbons
53.20—Black & Red Ribbons	53.40—Black & Yellow Ribbons
53.50—Black & Green Ribbons	
50-54 MHz Super-Regen.	
51.20—Black & Light Blue	52.04—Black & Violet Ribbons
72-76 MHz Band	
72.08*—White & Brown Ribbons	72.32—White & Violet Ribbons
72.16—White & Blue Ribbons	72.40*—White & Orange Ribbons
72.24*—White & Red Ribbons	72.98*—White & Yellow Ribbons
75.94*—White & Green Ribbons	

AMA RC PATTERN MANEUVERS

(in alphabetical order)



AMA RC PATTERN JUDGES' GUIDE

A. Purpose. The purpose of the AMA RC Pattern Judges' Guide is to furnish an accurate description of each maneuver used in Pattern competition 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 shall be based on the perfection with which the model executes the geometric patterns. The main criteria for perfection in an individual maneuver can be classified as follows:

1. Precision of the maneuver.
 2. Positioning or display of the maneuver.
 3. Size or dimensions of the maneuver.
 4. Smoothness or gracefulness of the maneuver.
- All of these requirements must be met in order for a maneuver to be rated perfect. They are discussed below.

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

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

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

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

The judging of the precision of a maneuver shall not be dependent on the throttle setting or speed of the engine. Aircraft speed, which can 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 100m from himself.

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

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

The diagrams used to describe these circular maneuvers in the book are taken from the best view to present the judge. "End on" or "tailed" presentation of these should result in downgrading since it increases the difficulty of judging the symmetry of figure 8's.

When the altitude of a maneuver is exceptionally low, all maneuvers except Straight Flight Out, Downgrade Turn and Straight Flight Back should be executed within a judging frame defined by 60° left and right from center and 60° up from horizontal. Maneuvers not properly centered within this frame should be downgraded. A comment to competitors is in order here. This downgrading is almost an automatic reaction after a judge has been on the runway a few hours. He usually has a tired neck from looking at some maneuvers which must be followed overhead, and he is prone to be severe if he is forced to look there unnecessarily.

competition and the man who overcomes all pressures is more expert than one who does not.

D. Judging Individual Maneuvers. The schedule of maneuvers to be judged is described in the RC Pattern Rules. Each maneuver is to be judged individually on a basis of 0 to 10 points according to a degree of excellence.

A common problem with inexperienced judges is to score the first flight too high and then find there is no margin left to reward superb flight. When in doubt, give the lower score. Remember that perfection is not a relative thing. Perfection is the 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 defects 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 slow roll would be considered one defect while two or three distinct turns would be considered two or three defects. It will be noted that many maneuvers there are more than six 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.

The following is a collation of all mandatory zero scores applicable to all Pattern classes. Judges must agree unanimously on any zero scores.

1. Flying behind Flight Line during or between maneuvers
2. Maneuver performed out of sequence (see 14.1.1)
3. Execution of an illegal pass, etc. (see 14.2.1, 4.3, 14.4, and 14.5)
4. Maneuver not completed
5. Less than 2 or more than 4 spins in 3 Turn Spin maneuver (upright and inverted)
6. Spiral dive in any spin maneuver
7. Model ends up on back when landing
8. Any gear retracts or collapses during landing
9. Time runs out prior to completion of a maneuver, zero maneuver and subsequent maneuvers

E. Description of Maneuvers (in alphabetical order).

Aleron Turn. Model pushes over and executes a 360-degree roll vertically downward and recovers to finish in level flight.

Downgrades:

1. Model not vertical at start and finish of roll
2. Roll not exactly 360 degrees
3. Roll rate not constant
4. Roll not snap roll

Avalanche. Model pulls up and completes a half loop, at the top it executes a complete snap roll, recovers and does another half loop to finish in level flight.

Downgrades:

1. Loop not round
2. Changes in heading during loop
3. Wings not level during loop
4. Snap roll not 360 degrees
5. Roll not snap roll

Cobra Roll. Model pulls up to a 45-degree angle, half-rolls to inverted attitude, executes a one-quarter loop, half-rolls to upright attitude and recovers in level flight.

Downgrades:

1. Initial climb not 45 degrees
2. Rolls not 180 degrees
3. One-quarter loop not 90 degrees
4. Descent not at 45 degrees
5. Changes in heading during rolls and one-quarter loop

Cuban Eight. Model pulls up and executes an inside loop, when at 45 degrees inverted model does a half roll, followed by another inside loop, again when 45 degrees inverted the model does another half roll and recovers to level flight.

Downgrades:

1. Loops not round and same size
2. Model not at 45 degrees before commencement of rolls
3. Changes in heading in loops or rolls
4. Rolls do not cross over at same point

Double Immelman. Model pulls up into a half inside loop, half-rolls to upright, flies straight and level for approximately one second, does a half outside loop and half-rolls to level flight.

Downgrades:

1. Half loops deviate left or right
2. Half rolls not immediately after half loops
3. Half rolls deviate left or right
4. Model pauses more than one second before half outside loop

Double Immelman Turn. The model starts the Immelman flying straight and level, pulls up into a half loop followed by a half roll and finishes flying straight and level exactly 180 degrees 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

5. Half loops not at same altitude

Double Stall Turn. The model begins by performing a Stall Turn. At the bottom of the pull-out, the plane pulls up, thus completing half of an inside loop, at which point a second Stall Turn is executed, followed by a opposite-loop pull-out. The two Stall Turns shall be performed in opposite directions with respect to the ground. The maneuver may be downgraded because:

1. Model not flying straight and level at beginning and end of maneuver
2. Model does not become exactly vertical at points of turn
3. Half inside-loop not present in heading
4. Bottom of half-loop not at same altitude as entry and finish
5. Model turns left or right during pull-ups
6. Does not yaw tightly through 160 degrees
7. Return paths more than two wingspans from entry path
8. Return paths not parallel to entry path
9. Maneuver not finished at same altitude as entry

Eight-Point Roll. Model rolls through 360 degrees hesitating at each 45-degree point; the wings should be parallel, vertical to or 45 degrees to the horizon; maneuver to take approximately 5 seconds.

Downgrades:

1. One-eighth rolls more or less than 45 degrees
2. Model does not hesitate after each 45 degrees
3. Roll rate not constant
4. Roll takes less than 4 or more than 6 seconds

Figure M. Model pulls up into a vertical attitude and executes a 180-degree stall turn, in either direction, does a one-half outside loop, again executes a stall turn, in the opposite direction, and recovers in level flight.

Downgrades:

1. Model not vertical before and after stall turns
2. Stall turns not 180 degrees
3. Slumping and diving paths not parallel
4. Bottom of outside-loop at different altitude to entry
5. Altitude of second stall turn different to first

Figure M with One-quarter Rolls. Model pulls up into a vertical attitude, executes a one-quarter roll, stall turns through 180 degrees, one-quarter rolls in the opposite direction as the first roll, does a one-half outside loop to a vertical attitude, again, one-quarter rolls in the same direction as the first two, does a half one-quarter roll, one-quarter rolls in the same direction as the other three and recovers to level flight. Viewed from the side the model executes a figure M. Downgrades:

1. Model not vertical at start and finish of rolls and stall turns
2. Stall turns not 180 degrees
3. One-quarter rolls not exactly 90 degrees
4. Bottom of outside loop not level with entry
5. Changes in heading during one-half outside loop or rolls
6. Stall turns not at same altitude

Figure M with One-half Rolls. Model pulls up into a vertical attitude, performs a one-half roll, a stall turn through 180 degrees, another one-half roll, then executes a half inverted loop, followed by a third one-half roll, a second stall turn and a fourth one-half roll, recovering into level flight. The rolls may be in any direction, but the stall turns must be in opposite directions. Viewed from the side, the model executes a figure M. Downgrades:

1. Model not vertical at start and finish of rolls and stall turns
2. Stall turns not exactly 180 degrees
3. One-half rolls not exactly 180 degrees
4. Bottom of outside loop not level with entry
5. Changes in heading during one-half outside loop and rolls.

Four-Point Roll. Model rolls through 360 degrees, hesitating at each 90-degree point; at each hesitation wings are parallel or vertical to the horizon; maneuver takes approximately five seconds.

Downgrades:

1. One-quarter rolls less than 90 degrees
2. Model does not hesitate after each one-quarter roll
3. Roll rate not constant
4. Roll takes less than 4 or more than 6 seconds
5. Changes in altitude

Horizontal Eight. Model pulls up and completes three-quarters of an inside loop to a vertical position, then does a complete outside loop to a vertical position again and recovers by doing a one-quarter inside loop. Downgrades:

1. Loops not round
2. Model not vertical at crossover point
3. Changes in heading during loops
4. Loops not same diameter
5. Loops not at same altitude
6. Model does not cross over at same point

Immelmann Turn. The model starts the Immelman flying straight and level, pulls up into a half loop followed by a half roll and finishes flying straight and level exactly 180 degrees 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

ment 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

Inverted Spin* Model establishes a heading, half-rolls to inverted, power is reduced, the model is held in a nose-high attitude until it stalls and commences to spin. The model will autorotate through three complete turns and recover on the same heading at a different altitude, then half-rolls to an upright position. Downgrades:
1. One-half rolls not level
2. One-half rolls not 180 degrees
3. Model does not level during entry and exit
4. Spins during entry and exit
5. Does not finish in same heading
6. Does not make three turns; less than 2 or more than 4 score zero

Landing. The model flares smoothly to touch the ground within the landing circle with no bouncing or changes in heading. Landing maneuver will start two meters (6½ feet) from the ground. Landing maneuver shall be considered complete once the plane has slowed below flying speed and has rolled straight for 15 meters. Landing will not be downgraded if plane rolls straight to a controlled stop in less than 15 meters. Downgrades:
1. Model impacts the ground due to lack of flare
2. Model bounces after touchdown
3. Wings not level
4. Changes in heading
5. If model ends on its back, zero points
6. If model lands outside 30-meter circle
7. If any undercarriage leg retracts on landing, zero points

Reverse Outside Loop. Maneuver executed similar to Three Reverse Outside Loops except for number of loops.

Procedure Turn. Immediately after the Straight-Flight Out the model must turn exactly 90 degrees 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 degrees to the right (or left) and cross over the point where the first turn commenced. The turn may be downgraded because:
1. First turn not 90 degrees
2. Second turn not 270 degrees
3. Changes in attitude during turn
4. Wings not smooth and circular
5. Does not finish back over exact outgoing path

This maneuver will not be downgraded for not staying within the 120 degree aerobatic frame.

Reverse Cuban Eight. Model pulls up into 45-degree climb, half-rolls, executes a three-quarter loop, half-rolls to inverted and loops back to level flight at the same point as entry. Downgrades:
1. Loops not round and same size
2. Model not at 45 degrees at commencement of rolls
3. Changes in heading during loops and rolls

Reverse Double Immelman. Model pushes over and executes one-half outside loop followed immediately by a one-half roll, pauses for approximately one second, does a one-half inside loop and immediately one-half rolls to level flight. Downgrades:
1. Changes to heading during one-half loops and one-half rolls
2. One-half rolls not immediately after one-half loops
3. Model pauses more than one second before one-half inside loop
4. One-half loops not at same altitude

Reverse Knife Edge. Model rolls 90 degrees and hesitates, then half-rolls 180 degrees in opposite direction and hesitates, then rolls 90 degrees to finish in level flight. Maneuver takes approximately 5 seconds. Downgrades:
1. One-quarter rolls more or less than 90 degrees
2. Model does not hesitate in the two knife-edge positions
3. Roll rate not constant
4. Maneuver takes less than 4 or more than 6 seconds

Reverse Point Roll. Model rolls through 270 degrees, hesitating at each 90-degree roll, then rolls 270 degrees in opposite direction, hesitating at each 90-degree roll, then finishes in level flight. Maneuver takes approximately 5 seconds. Downgrades:
1. One-quarter rolls more or less than 90 degrees
2. Model does not hesitate at each 90 degree point
3. Roll rate not constant
4. Roll takes less than 4 or more than 6 seconds

Reverse Top Hat. Model pushes into vertical downward attitude, distance as the downward path, loops upward to vertical attitude, half-rolls and pushes over to level flight. Downgrades:
1. Model not vertical at start and finish of half rolls
2. Rolls not exactly 180 degrees
3. Model does not fly straight and level inverted

4. Vertical and horizontal legs not approximately the same length
5. Rolls not the same length and rate
6. Changes in heading during maneuver

Rolling Eight. Model pulls up from level flight, completes an inside loop, at the bottom executes a half roll, makes a second inside loop, directly under the first, and half-rolls back to level flight. Downgrades:
1. Loops not round
2. Second loop not directly under first
3. Model not at start and finish of half rolls
4. Changes in heading during loops and rolls
5. Wings not level during loops

Running Eight. Model starts in level flight and completes 1¼ outside loops. Model then does 1¼ inside loops, finishing at the bottom. The model passes through the intersection three times, then recovers on the same heading but at a lower altitude than entry. The maneuver should be downgraded for the following reasons:
1. Model not level at start
2. First loop not round
3. First loop deviates left or right
4. Model does not become vertical at intersection
5. Second loop not round
6. Second loop deviates left or right
7. Does not become vertical at intersection
8. Second loop not at same altitude as first loop
9. Second loop not same diameter as first loop
10. Second and third intersections do not coincide with first
11. Model not level at finish of maneuver

Slow Roll. Model rolls slowly through one complete revolution, in either direction; maneuver takes approximately five seconds. Downgrades:
1. Changes in heading
2. Changes in attitude
3. Roll rate not constant
4. Model does not roll exactly 360 degrees
5. Roll takes less than 4 or more than 6 seconds

Square Loop with One-half Roll. Model pulls up and completes a square loop, in each side the model executes a one-half roll. Downgrades:
1. Loop not square
2. Rolls not 180 degrees
3. Wings not level during one-quarter loops
4. Changes in heading during rolls and loops
5. Sides of square not of equal length

Square Horizontal Eight. Model pulls up and executes a square loop, when at the bottom of the third leg it does a complete square outside loop behind the inside loop; the model should rotate sharply at each corner, and the straight paths should be at least 20 meters (65½ feet) long. Downgrades:
1. Loops not square
2. Vertical downward paths do not coincide
3. Loops not same size
4. Changes in heading
5. Wings not level
6. Loops not at same altitude
7. Sides of squares not same size

Stall Turn. The model starts from straight and level flight and noses up to a vertical position, yaws through 180 degrees 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 degrees
5. Return path not parallel to entry path
6. Maneuver not finished at same altitude as entry
7. Plane not level at finish of maneuver
8. Model does not fly straight and level to complete maneuver

Straight Flight Back. Immediately after the Procedure Turn the model shall fly back over the circle along the same line as the incoming path, finish exactly the circle. The Straight Flight Back may be downgraded because:
1. Turns or wiggles during straight flight
2. Change in altitude
3. Gallops in pitch, yaw or roll
4. Flight not along straight flight out path
5. Does not pass over circle

This maneuver shall not be downgraded for not staying within the 120 degree aerobatic frame.

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 100 meters 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 does not level or right
3. Wings not held constant altitude
4. Turns before permission is given by judge
5. Gallops in pitch, yaw or roll
This maneuver shall not be downgraded for not staying within the 120 degree aerobatic frame.

Straight Inverted Flight. Model, half-rolls to inverted, and flies straight and level inverted for a minimum of four seconds, then half-rolls back to level flight. Half rolls may be in either direction. Downgrades:
1. Half roll not level
2. Inverted flight not straight and level
3. Changes in heading during rolls and inverted flight
4. Inverted flight; less than 3 or more than 5 seconds

Takoff. The model must stand still on the ground with the engine running, without being held, and must then take off. The takeoff run should be straight. The model should lift gently from the ground and climb at a gradual angle. The takeoff is completed when the model is approximately two meters (6½ feet) from the ground. Downgrades:
1. Model does not stand still when released
2. Changes heading during takeoff and climb
3. Model jumps from the ground
4. Retouches ground after becoming airborne
5. Too steep a climb angle
6. Gallops in elevation during climb
7. Wings not level at any time

Three Horizontal Rolls. Model rolls at a uniform rate through three complete revolutions in either direction; maneuver takes approximately five seconds. Downgrades:
1. Changes in heading during rolls
2. Changes in attitude during rolls
3. Model does not do exactly three rolls
4. Maneuver takes less than 4 or more than 6 seconds

Three Inside Loops. Model pulls up and executes three consecutive loops, all loops shall be round and superimposed. Downgrades:
1. Loops not superimposed
2. Wings not level during loops
3. Changes in heading during loops

Three Outside Loops. Model pushes over and executes three consecutive outside loops. All loops should be round and superimposed. Downgrades:
1. Loops not round
2. Wings not level during loops
3. Changes in heading during loops

Three Reverse Inside Loops. Model half-rolls from level flight, pauses for approximately one second, then does three consecutive inside loops downward, flies for approximately one second inverted then half-rolls upright. All loops should be round and superimposed. Downgrades:
1. Changes in heading during half rolls
2. Loops not round
3. Loops not superimposed
4. Wings not level during loops
5. Changes in heading during loops

Three Reverse Outside Loops. Model half-rolls to inverted, pauses for approximately one second and pushes up to execute three consecutive outside loops, pauses for approximately one second then half-rolls to level flight; all loops to be round and superimposed. Downgrades:
1. Loops not round
2. Wings not level during loops
3. Changes in heading during loops

Three-Turn Spin* The model establishes a heading, power is reduced, the model is held in a slightly nose-high attitude until it stalls and commences to spin. The model will autorotate through three complete turns and recover on the same heading at a different altitude. Downgrades:
1. Entry not level
2. Does not make three turns; less than two or more than four, score zero

3. Does not finish in same heading
4. Wings not level during recovery
5. Spiral dive scores zero

Top Hat. Model pulls up into a vertical attitude, pauses, makes a half roll, pauses, makes a half roll, pauses and recovers in level flight. Downgrades:
1. Model does not fly vertically before starting and finishing rolls
2. Rolls not exactly 180 degrees
3. Model does not fly straight and level inverted
4. Rolls not the same length
5. Changes in heading during maneuver

Traffic Pattern. The maneuver is commenced with the model flying into the 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, and fourth 90 degree turn and straight flight towards the point of touchdown. The first three legs will be at constant altitude; the touchdown to touch-down will commence after the downwind leg. The maneuver is finished at 2 meters altitude. The circuit may be to the right if the contestant wishes. The maneuver shall 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. Wings not level in each leg
6. Aborted approach (see 14.5.)

Triangle Rolling Loop. Model pulls up into 45-degree climb, holds the attitude for approximately one second, loops through 135 degrees, does one complete roll, loops through 135 degrees, holds the attitude for approximately one second and recovers to level flight at the same point that the maneuver started. The climbing and descending portions should be the same length. Downgrades:
1. Climbing and descending paths not same length
2. Climbing and descending paths not smooth and precise
3. Roll not 360 degrees
4. Model changes heading during loops and roll
5. Model does not start and finish maneuver at same point

Two Rolls in Opposite Directions. Model rolls 360 degrees in either direction, then immediately after rolls 360 degrees in opposite direction, then rolls approximately 5 seconds. Downgrades:
1. Changes in heading
2. Changes in attitude
3. Roll rate not constant
4. Rolls not exactly 360 degrees
5. Second roll does not start immediately after first roll
6. Rolls take less than 4 or more than 6 seconds

Two Snap Rolls in Opposite Directions. Model snap-rolls** through 360 degrees, recovers and immediately snap-rolls in the opposite direction, and recovers in level flight. Downgrades:
1. Rolls not 360 degrees
2. Rolls not snap rolls**
3. Changes in heading
4. Changes in attitude

Vertical Flight. Model pulls up and executes a complete inside loop, at the bottom pushes over and completes an outside loop directly under the inside loop. Downgrades:
1. Loops not round and same diameter
2. Changes in heading during loops
3. Wings not level during loops
4. Outside loop not directly under inside loop

Vertical Loop. Model pulls up and executes a 360-degree roll vertically upward and pushes over to finish in level flight. Downgrades:
1. Model not vertical at start and finish of roll
2. Roll not exactly 360 degrees
3. Roll not vertical
4. Roll rate not constant

**Final entry to a spin is not smooth, or the spin itself is jerky and erratic; this is not a reason for downgrading; it is a matter of opinion. The spin is a true spin. A spiral dive is indicated by its smooth, and increasing airspeed, during a spin the airspeed does not increase appreciably.*

***A snap roll is autorotation in the horizontal axis; the plane rolls very rapidly with a nose-high attitude; if the plane rolls along its axis, it is not a snap roll.*

39. RC SPORT AEROBATICS

1. Objective. To duplicate full-scale sport aerobatics with miniaturized 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 pilot, his plane and equipment, shall be applicable to this event, except as noted herein. There shall be no limitation on the type or equipment of the aircraft, nor on the number of contestants, nor on the number of entries in the contest.

3.1. The contestant shall be allowed two entries in this event. He can only use his alternate model if the first model is not flyable.

3.2. 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 cause for immediate disqualification of that pilot.

3.3. The skill classes and maneuver schedules shall be the same for both the biplane and monoplane events. Biplanes may be allowed to compete with monoplanes in the monoplane event, however, monoplanes are not allowed to compete in the biplane event.

3.4. A separate event for aerobatics monoplanes accommodates models which are replicas of types actually flown in International Aerobatic Club (IAC) competition.

3.5. The skill classes and maneuver schedules shall be the same for both the biplane and monoplane events. Biplanes may be allowed to compete with monoplanes in the monoplane event, however, monoplanes are not allowed to compete in the biplane event.

4. Model Aircraft Specifications.

4.1. Only one engine of the reciprocating internal combustion type with a total displacement not exceeding 1.25 cu. in. shall be used.

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

4.3. Maximum weight less fuel shall be 15 pounds.

4.4. The builder of the model shall not apply.

5. Optional Scale Bonus. Contest Director has the option to award a 10% light score bonus to any entry meeting the standards required of a scale aircraft. The decision of the contest judge will be made prior to the beginning of the first official flight; the competitor must be notified if the bonus system is used, it will be so noted in all publicity prior to the contest.

6. Proof of Scale.

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

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

6.3. 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.

6.4. 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.

6.5. 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.

7. Registration Numbers.

7.1. Registration numbers are the entrant's AMA number. If the entrant desires he may use the last one or two numbers of his AMA number and the initials of his name, such as NSJN.

7.2. 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.

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

8. 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.

9. Pattern Event Classes.

9.1. The events shall be divided into three classes; in order of increasing difficulty, the classes are Sportsman, Advanced, and Unlimited.

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

18. Maneuvers.

- 18.1. Sportsman
 - 1. Loop option
 - 2. Roll option
 - 3. Turn option
 - 4. Spin option
 - 5. Snap option
 - 6. Unknown*
 - 7. Free-style (3 maneuvers plus turns, one minute maximum)
 - 8. Presentation
 - 18.2. Advanced
 - 1-5. Same as above
 - 6. Unknown*
 - 7. Free-style (5 maneuvers plus turns, two minutes maximum)
 - 8. Presentation
 - 18.3. Unlimited
 - 1-8. Same as Advanced except that 2 inverted snap rolls are required in the free-style sequence.
- *Unknown maneuver to be announced the day of the contest.

The following is an example flight plan for each class. This is a guide only, and individuals may create their own sequences by substitution, as they develop them.

EXAMPLE FLIGHT PLANS

Options		Sportsman		Advanced		Unlimited	
1. LOOP	Inside Loop	Loop with snap	Square Outside Loop	Loop with snap	Square Outside Loop	Loop with snap	Square Outside Loop
2. ROLL	Roll	Roll	Roll	Roll	Roll	Roll	Roll
3. TURN	Turn	Turn	Turn	Turn	Turn	Turn	Turn
4. SPIN	Spin	Spin	Spin	Spin	Spin	Spin	Spin
5. SNAP	Snap	Snap	Snap	Snap	Snap	Snap	Snap
6. Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
7. Free-Style	Free-Style (3)	Free-Style (5)	Free-Style (5)	Free-Style (5)	Free-Style (5)	Free-Style (5)	Free-Style (5)
8. Presentation	Presentation	Presentation	Presentation	Presentation	Presentation	Presentation	Presentation

Typical FREE-STYLE: (K-3)

Cuban Eight
180° Turn 1/4 Ris.
Invert
Horizontal Eight
Half Loop
Reverse Knife Edge
Split-S
Circus Eight
Triangular Loop & Roll

Loop with 2 Snaps @ Top
Loop with 2 Snaps @ Bottom
Square Outside Loop
Square Inside Loop
Rolling Loop

Vertical Qtr. Rolls
Cuban 8 with Half Snaps
3-Turn Inverted Spin
2- or 3-Turn Reversing
Inverted Spin
45° Diving Snap
1 1/2 or 2 Inverted Snaps
2 or 3 Consecutive Snaps
1/2 Snaps (45° climbing)
Reverse Top Hat
Tail Slide
(upright or inverted)
Torque Roll
(roll side rolling)
Lone Star
Recognized Aerobatics Combinations

3-point Roll
Slow Roll
Figure "M" (no rolls)
Top Hat
3-Turn Inverted Spin
Reversing 3-Turn Spin
45° Climbing Snap
1 1/2 Snaps
Reversing Top Hat
(12, 3, 2, 1) Edge
Square Slow Roll (9 sec.)
Rolling Circle
(4 continuous rolls)
Rolling Circle
(3 continuous rolls)

4-point Roll
Slow Roll
Figure "M" (no rolls)
Top Hat
3-Turn Inverted Spin
Reversing 3-Turn Spin
45° Climbing Snap
1 1/2 Snaps
Reversing Top Hat
(12, 3, 2, 1) Edge
Square Slow Roll (9 sec.)
Rolling Circle
(4 continuous rolls)
Rolling Circle
(3 continuous rolls)

MANEUVER OPTIONS

- 1. Loop
- 2. Roll
- 3. Turn
- 4. Spin
- 5. Snap
- 6. Unknown
- 7. Free-Style (3)
- 8. Presentation

SPORT AEROBATICS CD GUIDE

Some basic details are available on page 21 of this guide. The following information is compiled to help clubs and CD's plan contests.

The Number of Events and classes in Sport Aerobatics may be varied according to anticipated attendance. Large regional contests can offer three classes: Sportsman, Advanced and Unlimited, in both Biplane and Monoplane (2) events. A small club contest can simply offer one Biplane event, the classes combined.

When Combining Classes, it should be required that each competitor fly maneuvers from his own class. The maneuvers are progressively harder in each class. Thus, a well flown Sportsman sequence could out-point the Advanced and Unlimited entrants and win all the marbles!

Classes. Sportsman: Beginners and non-winners of AMA or Open contests. Winners move up to "Advanced."
Advanced: Advanced fliers and experienced competitors. Those who have won an AMA or Open contest.

Maneuver Sequences. All substitutions must be cleared with the chief judge. It is his responsibility to be certain his judges know the correct line and track of each maneuver. A pilot and judges briefing followed by a demonstration flight is recommended. Unknowns

40. RC PYLON RACING—FORMULA I

- 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.
- 4.6. **Fuselage.**
 - 4.6.1. 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. Note: Fillers are not considered.
 - 4.6.3. The engine shall be cowled to the extent that no more than the cylinder and head fins project 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 2 1/2 inch diameter or larger, must 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.) Retracting of any landing gear shall not be permitted.
- 4.8. **Wings.** 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. There is no restriction on span.
 - 4.8.1. **Area.**
 - 4.8.1.1. Minimum area shall be 450 square inches.
 - 4.8.2. **Chord Thickness.**
 - 4.8.2.1. Wing shall be at least one inch thick at the centerline. Thickness may be measured with wing on or off the aircraft. If wing is removed, the measurement is "no-go" gauge reading. The wing must not "go" less than 3 inches from leading edge. The wing must be tapered on both top and bottom surfaces. (However, the wing may have a convex taper.)
5. **Weight.** Planes shall be weighed immediately after an official flight, with whatever amount of 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.
6. **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 numbers 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.
7. **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 20204.
- 7.1. The registration number is required on the upper right and lower left wing panel. The maximum height of the numbers on the wings will be 2 inches. The letter 'N' will precede the registration numbers.
- 7.2. 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.
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.
9. **Flight Requirements.**
 - 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:
 - 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.
 - 9.1.2. Pull-up from straight and level flight at maximum air speed into a full up elevator loop.
 - 9.1.3. Make a dive at a 30 degree angle for at least a length of 500 feet.
 - 9.1.4. Make a 180 degree turn at full air speed and maximum RPM without loss of altitude.
 - 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.
 - 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 flier must land his aircraft immediately.

1. **Objective.** To pit multiple plane races that will recapture 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 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 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 unsafe flying practices which could create a spectator area will be cause for immediate disqualification of that flight.

3. **Model Aircraft Requirements.**

- 3.1. Formula I Models must be a replica of the 190 cubic inch class.
- 3.2. The Builder of the Model rule shall not apply to the Formula I event.

4. **Model Aircraft Specifications.**

4.1. **Engine(s).** Maximum total nominal displacement shall be .4030 cubic inch (6.60 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 produced in quantities greater than 1,000 units and available commercially to anyone from the manufacturer of the engine being altered. 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 "prop" is defined as the complete unit, ready to run, needing only prop, fuel, and starting voltage, except that the glow plug, carburetor, air washer, front washer, and prop nut need not be included as part of the production unit. These parts are not subject to the rules regarding quantity or source because engine manufacturers may or may not produce these parts which help make up the complete production engine.

4.1.2. An exhaust extension may be used, provided its sole purpose is to carry exhaust fumes and residue out of the cowling. 1 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 constant extension to not over five inches as measured from face of piston to extreme exhaust end.

4.1.2.1. Side exhaust engines may use a curved adapter 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 constant 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 stalls or is created by more than 200 RPM, ten minute time period, and without extension must be placed in the above test. *Note: Contest Directors are cautioned that requiring the above test must only be as a result of suspecting the physical appearance of the extension, and not 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.*

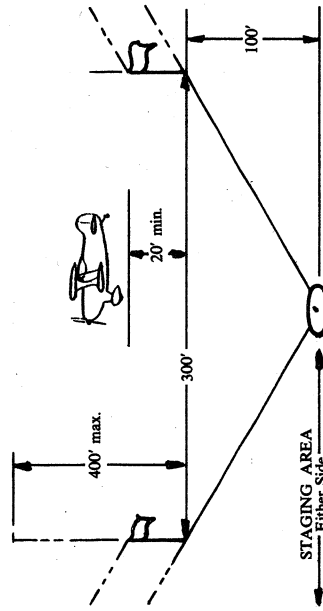
4.2. **Engine Inspection.** Any competitor at a contest may have another competitor's engine inspected for compliance with the rules by posting \$25.00. The engine will be inspected by the C.D. and someone selected by the C.D. If declared legal, the owner is not disqualified and gets the \$25.00 for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

The entire program may be flown within the box with turn-arounds between each maneuver. Each judge must then have a recorder (assistant) to write down the scores and call the maneuvers within the box for the entire sequence. Normally just the Free-Style sequence remains entirely within the box (3 to 10 consecutive maneuvers) while the first six permit turn-arounds outside the box like Sport Scale and Pattern.

The "Box" will measure 112'—300' X 100'. Floor is 20' and ceiling 400'. Delimitate with tall flagpoles.



GUIDELINES FOR CONTEST COORDINATORS

Conflicts of Contests in Different Categories. Contests in different categories (FF, CL, RC, Ind.) should not be considered to be in conflict in the protected drawing area concept. Sanction issuance to several contests which are restricted on a category basis in a small area is encouraged.

Acceptance of Sanction Applications. Sanction applications may not be honored if submitted more than one year or less than thirty days prior to the proposed date of the contest, except that Record Trials, Class A and Class B contest applications may be submitted no less than twenty days prior to the proposed date.

Order of Acceptance. All correctly completed sanction applications accompanied with correct fees will be honored in the order received after consideration of the conditions mentioned above. In all cases of conflicting requests which arrive simultaneously, larger meets will take precedence over smaller meets. Unrestricted meets will take precedence over restricted meets unless the restrictions nullify possible conflicts as outlined in the rule book instructions.

Correct Sanction Applications. Sanction applications are correct if they meet all the requirements outlined in the front of the rule book. Applications for contests in the next calendar year must include proof that the CD has paid his license fees for that year, or those fees.

Communications between Contest Coordinators in Adjacent Districts. It is absolutely imperative that Coordinators in adjacent districts cooperate in the issuance of sanctions where the guidelines indicate that a contest will draw participants from a district adjacent to that in which the application is made. In case of possible interference of this type, the Coordinator is responsible for communicating with the Coordinator of the adjacent district at the earliest possible time so that interference will be minimized.

In cases where this cooperation is non-existent, or where a Coordinator feels that he is not operating at maximum efficiency because of lack of cooperation of a Coordinator in an adjacent district, it is his responsibility to bring this to the attention of his district VP who will resolve the problem through the VP of the adjacent district.

Appeal. If an individual club is unhappy with their approved date, or feels that the date of another club is a result of a procedural error, the affected club officers may appeal to the respective district vice-president. The vice-president, in making his decision, should also contact the vice-president and/or coordinator of any other district involved. Decision of the vice-president is final.

may be changed each day or every other round in Advanced and Unlimited.

Judging. The criteria by which we judge aerobatic maneuvers is relative to full-scale, realistic performance and speed. The actual line and track of the aircraft are what count, not the attitude which may be necessary to achieve it. Example: The yaw in knife-edge flight or nose-high in inverted flight are acceptable attitudes. Boundary infringements may be noted by the regular judges or by an individual designated as a boundary judge, seated with the flight judges. If experienced judges are not available, the maneuvers may be required to be flown as listed without substitutions.

Protected Drawing Area. The base on which the system is built is that of protected drawing area. Actually, this should be interpreted as broader population, but this is very difficult to use even in the most general sense. Only after years of experience in a certain district can a Coordinator develop a feel for who flies what and lives where. It is hoped that those Coordinators who have developed this information will use it rather than coarse area measure which we propose here.

In general, on the same date, there should be at least the following distance separating contests:

- Class A 100 miles
- Class AA or AAA 400 miles
- Class AAA or AAAA 600 miles

(These distances should be scaled down in high population density areas and should be scaled up in low population density areas.)

Class AAA or AAAA meets are not to be allowed to conflict with an AMA-Sponsored National or International Contest anywhere in the country, but Class A and AA meets may be allowed provided that they are at least 1,000 miles away. FAI semi-finals or finals are not considered to be in conflict with other meets which do not offer the same events. Traditional Class AAA or AAAA meets may be scheduled in conflict with FAI semi-finals or finals if the CD of the Class AAA or AAAA meet is informed of the conflict and does not choose to change dates. This concession is due to the fact that both types of meets are generally scheduled on three-day week-ends, and these are in very short supply.

Traditional Contests. Any Class AA, AAA, or AAAA contest which has been held annually on the same date or week-end for the last three years shall be considered a traditional contest and shall be allowed first choice of that usual date, provided that the sanction application and fee are submitted by March 15 for the year concerned. Such dates may be re-confirmed if no request is received 115 days prior to the date of the traditional contest. The Contest Coordinator will inform other applicants for these traditional dates of the policy regarding their use and give those applicants the option of waiting to see if there will be a conflict or of possibly applying for an alternate date.

FAI RC AEROBATICS (F3A)

gine. The timer will notify the competitor when the minute is finished and immediately start timing the 3-minute starting time. The organizer must provide an adequate radio monitor for the purpose of detecting radio interference and a means of communicating this information to the pilot.

13. **Schedule of Maneuvers for RC Aerobatic Power Models.** The maneuvers must be executed during an uninterrupted flight in the order in which they are listed. Each time the model passes in front of the judges a maneuver must be executed, except after take-off and before landing where in each case a pass may be made without a maneuver being performed. It is recommended that the pilot or helper should vocally indicate to the judges that the pilot is about to execute a maneuver. The competitor may make only one attempt at each maneuver during the flight. The pilot has three minutes to start his engine and 10 minutes to complete his flight, his 10 minutes to start when the competitor attempts to start his engine. N.B. A pass is made when the model flies over a line perpendicular to the center of the judges. The schedule of maneuvers is given in Annex B and the descriptions of maneuvers in Annex C.

3. **Noise Measurement.** The maximum noise level will be 84dB measured at 10 meters distance. The noise level will be measured in the following manner:
The model is placed on a rotatable platform 1.2m above the ground, and the microphone is placed 10m downwind from the model 1.2 m above the ground. With the engine running at full power, measurement shall be taken at one position, 90° to the flight path, on the engine exhaust side of the model.
Measurements should be made over short grass.
No noise reflecting objects should be nearer than 30m to the model or microphone.
The equipment used for measurement should comply with International Electronic Commission Document No. 179, "Precision-Noise Level Instruments."

10. **Classification.** Each competitor will have four flights, two from Schedule A and two from Schedule B; the best scores from each schedule will be added together to determine the team placings; the top 10%, or first five, of the competitors will then compete in a final to determine the individual winner. The final will consist of two flights for each competitor, the best of which will be added to the previous score to determine the winner. The final schedule will be chosen by each competitor from the complete list of maneuvers. Only 14 different maneuvers may be selected including take-off and landing, to give a maximum total score of 450 points. Only one Figure M may be included.
Before the final the competitor must submit the list of maneuvers he will fly to the Contest Director; maneuvers to be indicated by the numbers shown in Annex B.

ANNEX A

1. **Definition of a Radio Controlled Aerobatic Power Model.** Model aircraft which is aerodynamically maneuvered by control surfaces(s) in attitude, direction and altitude by a pilot on the ground using radio control, but not a Helicopter.

2. **Prefabrication of the Model.** Permitted: a plane which is assembled by the competitor from prefabricated parts and in which the competitor installs the equipment. Not permitted: models which are completely prefabricated and require only few minutes of unskilled effort for their completion or complete ready-to-fly models which have been built by a person other than the pilot.

3. **General Characteristics of Radio Controlled Aerobatic Power Models.** Maximum surface area: 150 dm² (2325 sq. in.). Maximum total weight, without fuel: 5 kg. (11.023 lbs.). Maximum engine swept volume of the engine(s): 10 cm³ (.61 cu. in.). The maximum engine(s) must be fitted with effective silencer(s). The maximum noise level and method of measuring it is stated in Annex A.

4. **Number of Helpers.** Each pilot is permitted one helper during the flight. Two helpers may be present during the starting of the engine.

5. **Number of Flights.** See Annex A.

6. **Definition of an Attempt.** There is an attempt when:
a) The pilot announces the start of the take-off maneuver.
b) The model fails to commence the take-off maneuver within the 3 minutes allowed to the competitor.
c) If the engine stops after the pilot has announced the start of take-off and before the model is airborne, it may be restarted (within the 3-minute period). However, no points will be awarded for the subsequent take-off maneuver.

7. **Number of Attempts.** Each competitor is entitled to one attempt for each official flight.
When, for any unforeseen reason outside the control of the competitor, the model fails to make a start (i.e. there is radio interference),

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 0. 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 a model is, in the opinion of the judges, unsafe or being flown in an unsafe manner, they may instruct the pilot to land.

10. **Classification.** See Annex A.

11. **Judging (for World Championships)**
a) The organizer must appoint a panel of at least three judges for each flight. The judges shall preferably be of different nationalities and be selected from a list of persons who are approved by the National Aero Club of the CIAM. The specific system to be employed at a World Championship must be stated in advance by the CIAM Bureau and must have prior approval by the CIAM or CMAA Bureau.
b) There shall be a judges' briefing with training flights before every WC.

12. **Organization for RC Aerobatic Contests.** All transmitters at the contest site must be checked and placed in a compound kept under observation. During the contest a Steward(s) must be in control of the transmitter compound(s) and will issue the transmitter to the competitor only when his name is called for him to make his flight. As soon as the attempt has ended the competitor must immediately return his transmitter to the Steward at the transmitter compound.
Any unauthorized transmissions during the period of the contest will result in automatic exclusion of the offender from the entire contest and render him liable to further penalties. During the flight the competitor must stay in the proximity of the judges and under the supervision of the Course Steward.
The order of starting of the various countries will be established by means of a draw before the start of the contest, compatible with transmitter frequencies.
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 start, he may delay no longer than one minute before attempting to start his en-

List of Extra Maneuvers for Finals	K Factor
13. Avalanché	3
14. Inverted Spin	3
15. Square Horizontal Roll	4
16. Eight-Point Roll	4
17. Vertical Roll	4
18. Vertical Turn	3
19. Figure M	3
20. Square Loop with Four 1/2 Rolls	5
21. Two Sharp Rolls in Opposite Directions	5
22. Reverse Turn Edge	4
23. Reverse Turn Head	4
24. Reverse Point Roll	4
25. Reverse Point Roll	4
26. Triangle Rolling Loop	4

ANNEX C

Description of Maneuvers. All maneuvers will start and finish in straight and level flight, and have the same altitude and heading for entry and exit unless otherwise stated.
All maneuvers will be downgraded if the start and finish are not straight and level and the altitude and heading are not the same for exit and entry.

All maneuvers which have more than one loop shall have the loops the same diameter; similarly all maneuvers which have more than one roll shall have the same roll rate. All consecutive rolls shall be at the same altitude.

● **Take-Off.** The model must stand still on the ground with the engine running, without being held, and must then take off. The take-off run should be straight, the model lift gently from the ground and climb at a gradual angle. The take-off is completed when the model is approximately two meters (6½ feet) from the ground. The take-off is not judged, and it receives no score.

● **Double Immelmann.** Model pulls up into a half inside loop, half rolls to upright, flies straight and level for approximately one second, does a half outside loop and half rolls to level flight. Downgrades:
1. Half rolls deviate left or right.
2. Half rolls not immediately after half loops.
3. Model pauses more than one second before half outside loop.
5. Half loops not at same altitude.

● **Three Reverse Inside Loops.** Model half rolls from level flight, pauses for approximately one second, then does three consecutive inside loops downgraded, flies for approximately one second inverted then half rolls flight. All loops should be round and superimposed. Downgrades:
1. Changes in heading during half rolls.
2. Loops not superimposed.
3. Loops not round.
4. Wings not level during loops.
5. Changes in heading during loops.

● **Rolling Eight.** Model pulls up from level flight, completes an inside loop, at the bottom executes a half roll, makes a second inside loop, directly under the first, and half rolls back to level flight. Downgrades:
1. Loops not round.
2. Second loop not directly under first.
3. Model not level at start and finish of half rolls.
4. Changes in heading during loops and rolls.
5. Wings not level during loops.

● **Slow Roll.** Model rolls slowly through one complete revolution, in either direction. Downgrades:
1. Changes in heading.
2. Changes in altitude.
3. Roll rate not constant.
4. Model does not roll exactly 360 degrees.

● **Top Hat.** Model pulls up into a vertical attitude, pauses, makes a half roll, pauses, pulls over to inverted flight for a short period, pulls down, pauses, makes a half roll, pauses and recovers in level flight. Downgrades:
1. Model not vertical before starting and finishing rolls.
2. Roll rate not exactly 180 degrees.
3. Model does not fly straight and level inverted.
4. Vertical and horizontal legs not approximately the same length.
5. Rolls not at the same height.
6. Changes in heading during maneuver.

● **Horizontal Vertical.** Model pulls up, and completes ¼ of an inside loop to a vertical position, then does a complete outside loop to a vertical position again and recovers by doing a ¼ inside loop. Downgrades:
1. Loops not round.
2. Model not vertical at crossover point.
3. Changes in heading during loops.
4. Loops not same diameter.

5. Loops not at same altitude.
6. Model does not crossover at same point.

● **Figure M with ¼ Rolls.** Model pulls up into a vertical attitude, executes a ¼ roll, stall turns through 180 degrees, ¼ turns again in the same direction as the first roll, does a ½ outside loop, ¼ turns the same direction again, ¼ rolls in the same direction as the first roll, does an inverted stall turn through 180 degrees, ¼ rolls in the same direction as the other three and recovers to level flight. Viewed from the side the model executes a figure M. Downgrades:
1. Model not vertical at start and finish of rolls and stall turns.
2. Stall turns not 180 degrees.
3. ¼ rolls not exactly 90 degrees.
4. Bottom of outside loop not level with entry.
5. Changes in heading during ½ outside loop or rolls.
6. Stall turns not at same altitude.

● **Three Outside Loops.** Model pushes over and executes three consecutive outside loops. All loops should be round and superimposed. Downgrades:
1. Loops not round.
2. Loops not superimposed.
3. Wings not level during loops.
4. Changes in heading during loops.

● **Three-Turn Spin*** The model establishes a heading, power is reduced, the model is held in a slightly nose high attitude until it stalls and commences to spin. The model will autorotate through three complete turns and recover on the same heading but at a different altitude. Downgrades:
1. Entry not level.
2. Does not make three turns; less than two or more than four, score zero.
3. Does not finish on same heading.
4. Wings not level during recovery.
5. Spiral dive scores zero.

● **Three Horizontal Rolls.** Model rolls at a uniform rate through three complete revolutions in either direction. Downgrades:
1. Changes in heading during rolls.
2. Roll rate not constant.
3. Roll rate not constant.
4. Model does not do exactly three rolls.

● **Reverse Double Immelmann.** Model pushes over and executes ½ outside loop followed immediately by a ½ roll, pauses for approximately one second, does a ½ loop and immediately ½ rolls to level flight. Downgrades:
1. Changes in heading during ½ loops and ½ rolls.
2. ½ rolls not immediately after ½ loops.
3. Model pauses more than one second before ½ inside loop.
4. ½ loops not at same altitude.

● **Cuban Eight.** Model pulls up and executes an inside loop, when at 45 degrees inverted model does a half roll, followed by another half roll and recovers to level flight. Downgrades:
1. Model not 45 degrees before commencement of rolls.
2. Changes in heading in loops or rolls.
3. Changes in heading more than one second before ½ inside loop.
4. Rolls do not cross over at same point.

● **Three Inside Loops.** Model pulls up and executes three consecutive loops; all loops should be round and superimposed. Downgrades:
1. Loops not round.
2. Wings not level during loops.
3. Changes in heading during loops.
4. Changes in heading during loops.

● **Straight Inverted Flight.** Model half rolls to inverted and flies straight and level inverted, then half rolls back to level flight, half rolls may be in either direction. Downgrades:
1. ½ rolls not level.
2. Inverted flight not straight and level.
3. Changes in heading during rolls and inverted flight.

● **Vertical Eight.** Model pulls up and executes a complete inside loop, at the bottom pushes over and completes an outside loop directly under the inside loop. Downgrades:
1. Loops not round and same diameter.
2. Changes in heading during loops.
3. Wings not level during loops.
4. Outside loop not directly under inside loop.

● **Four-Point Roll.** Model rolls through 360 degrees, hesitating at each 90 degree point; at each hesitation wings are parallel or vertical to ¼ Roll. Downgrades:
1. Roll rate less than 90 degrees.
2. Model does not hesitate after each ¼ roll.
3. Roll rate is not constant.
4. Changes in altitude.

Figure M with 1/2 Rolls. Model pulls up into a vertical attitude, performs a 1/2 roll, a stall turn through 180 degrees, another 1/2 roll, then executes a half inverted loop, followed by a third 1/2 roll, a second stall turn and a fourth 1/2 roll, recovering in level flight. The rolls may be in any direction but the stall turns must be in opposite directions. Viewed from the side the model executes a figure M. Downgrades:

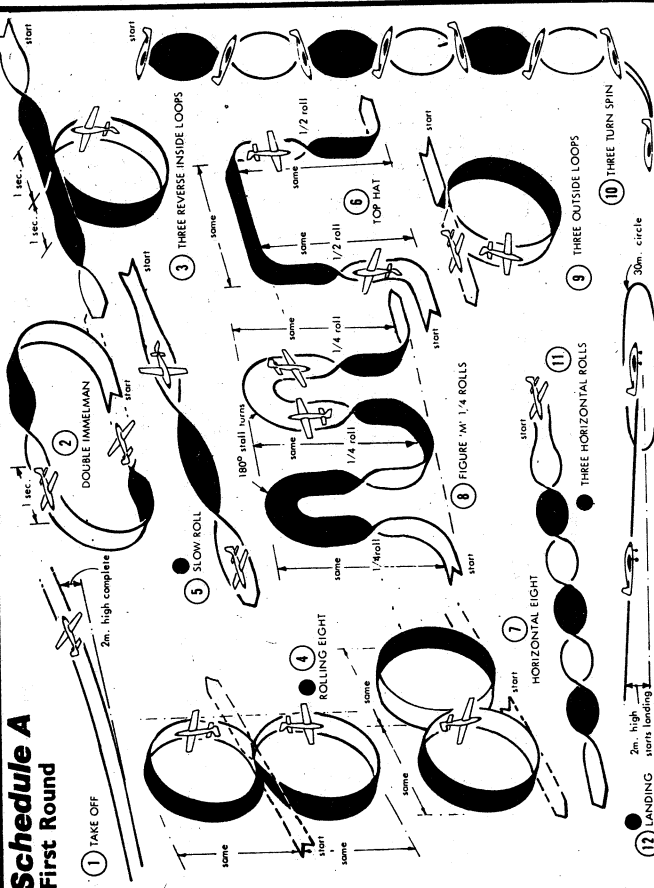
1. Model not vertical at start and finish of rolls and stall turns.
2. Stall turns not exactly 180 degrees.
3. 1/2 rolls not exactly 180 degree level with entry.
4. Bottom of outside loop not level with entry.
5. Changes in heading during 1/2 outside loop and rolls.

Cobra Roll. Model pulls up to a 45 degree angle, half rolls to inverted attitude, executes a 1/4 loop, half rolls to upright attitude and recovers in level flight. Downgrades:

1. Initial climb not 45 degrees.
2. Rolls not 180 degrees.
3. 1/4 loop not 90 degrees.

F.A.I. AEROBATIC SCHEDULE

Schedule A First Round



Three Reverse Outside Loops. Model half rolls to inverted, pauses for approximately one second and pushes up to execute three consecutive outside loops, pauses for approximately one second then half rolls to level flight; all loops to be round and superimposed. Downgrades:

1. Loops not round.
2. Loops not superimposed.
3. Changes in heading during loops and rolls.
4. Wings not level during loops.
5. Model pauses more than one second before and after loops.

Two Rolls in Opposite Directions. Model rolls 360 degrees in either direction, then immediately after rolls 360 degrees in the opposite direction. Downgrades:

1. Changes in heading.
2. Changes in altitude.
3. Roll rate not constant.
4. Rolls not exactly 360 degrees.
5. Second roll does not start immediately after first roll.

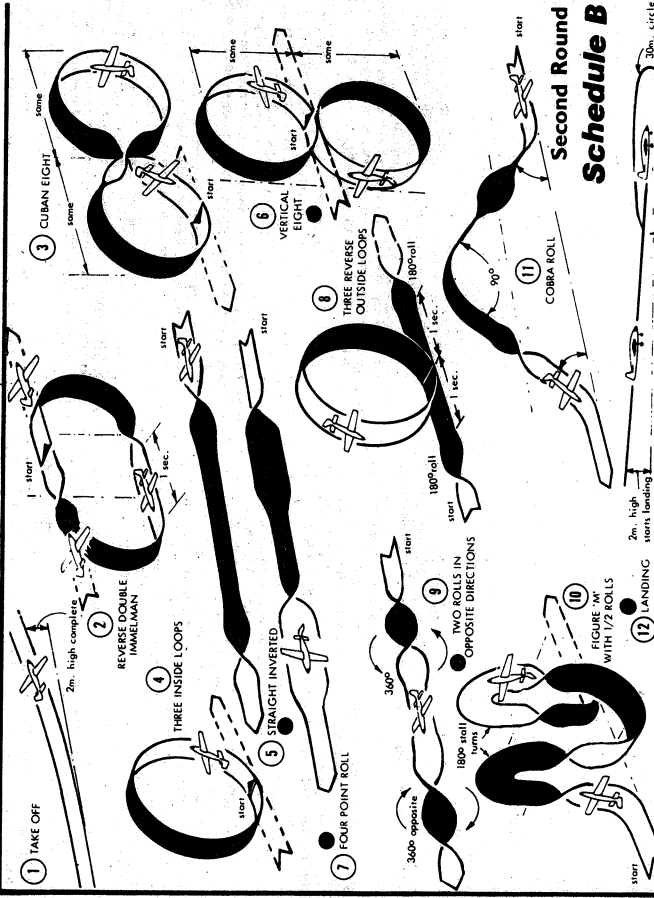
tude until it stalls and commences to spin. The model will auto-rotate through three complete turns and recover on the same heading at a different altitude, then half rolls to an upright position. Downgrades:

1. 1/2 rolls not 180 degrees.
2. Wings not level during entry and exit.
3. Spiral does not finish in same heading.
4. Does not make three turns; less than two or more than four score zero.

Square Horizontal Eight. Model pulls up and executes a square loop, when at the bottom of the third leg it does a complete square outside loop behind the inside loop, the model should recover sharply at each corner and the straight paths should be at least 20 meters (65 1/2 feet) long. Downgrades:

1. Loops not square.
2. Vertical downward paths do not coincide.

Illustrations Courtesy of Radio Modeller



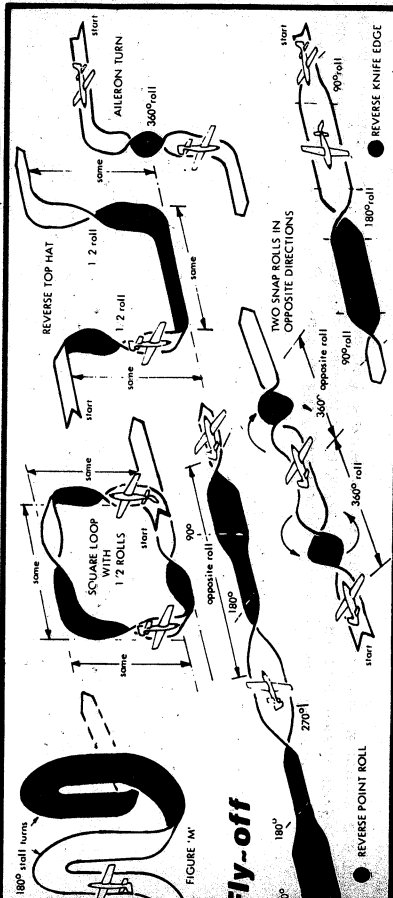
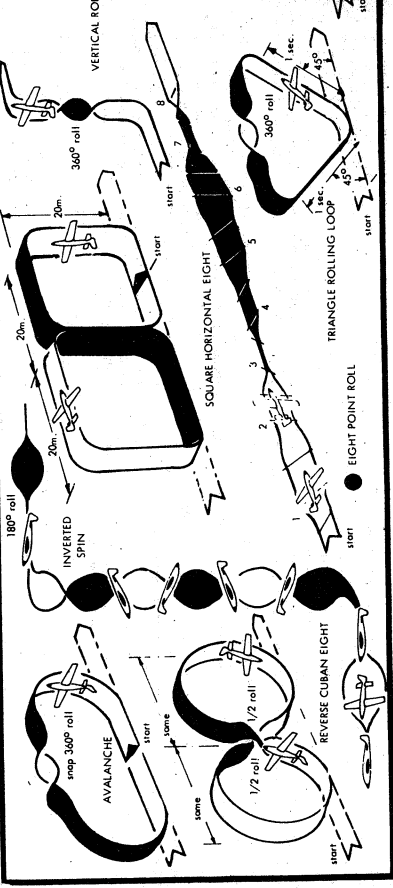
Landing. The model flares smoothly to touch the ground within the landing circle with no bouncing or changes in heading, rolls to a stop. Landing maneuver will start two meters (6 1/2 feet) from the ground. The landing is not judged, and it receives no score.

Avalanche. Model pulls up and completes a half loop, at the top it executes a complete snap roll*, recovers and does another half loop to finish in level flight. Downgrades:

1. Loop not round.
2. Changes in heading during loop.
3. Wings not level during loop.
4. Snap roll not 360 degrees.
5. Roll not snap roll.

Inverted Spin.* Model establishes a heading, half rolls to inverted, power is reduced, the model is held in a nose high attitude until it stalls and commences to spin. The model will auto-rotate through three complete turns and recover on the same heading at a different altitude, then half rolls to an upright position. Downgrades:

1. 1/2 rolls not 180 degrees.
2. Wings not level during entry and exit.
3. Spiral does not finish in same heading.
4. Does not make three turns; less than two or more than four score zero.



distance would stay within the 45 degree angle and a safe altitude and would be more clearly visible to the judge than at 150 meters distance. The competitor who performs loops in the 45 meters region is, therefore, allowing the judge to evaluate them more critically and the should suffer no downgrading for positioning. On the other hand, a 30 meters diameter loop at 100 meters distance should be downgraded.

The optimum size of maneuvers is governed to some extent by the size and normal flying speed of the model. Exceedingly small or light 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 in a sense determine the 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 best achieved by means of practice flights which all judges score. In this way, the standards for the flights, the defects in each maneuver should be discussed by all judges and agreement reached about the severity of defects. Once the contest is started, the individual judge should not alter his standard under any influence.

The contest director should clearly define areas in which it is considered unsafe for competitors to perform, such as above spectators, or over buildings etc. The definition of unsafe areas should be absolutely unambiguous.

Judging Individual Maneuvers. When in doubt, give the lower score. Perfection is not a common occurrence. The description of each maneuver is given, and then a number of reasons for downgrading are listed. The maneuver should be downgraded according to:

- 1) the number of defects observed.
- 2) the severity of the individual defects.
- 3) the number of times any one defect occurs.
- 4) the positioning of the maneuver.
- 5) the size of the maneuver.

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

A score of 10 should be given only if the maneuver is well positioned and no defects are observed. One or two minor defects should result in downgrading to at least an 8, while one severe defect should put it down to 6, as should a combination of three or four minor defects. Any demerit in poor positioning should be decided at the start of the maneuver and also fed into the final score for the maneuver. Bad position should be considered as equal to as many as 3 or 4 small defects. Improper size observed during or at the end of a maneuver might also result in as many as 3 to 4 demerits.

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 reasons for penalties 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 a fault in downgrading.

The straight and level entry is one of the more valuable portions of the maneuver for evaluation of how well the intended course of the maneuver was followed. The pilot will use it to announce "maneuver completed". The absence of a well defined straight and level exit should also result in downgrading.

Positioning. To achieve perfection, the competitor must position his maneuver in such a way that they can be easily judged. The first consideration on position is longitudinal distance from the competitor. All the judges should be located near the competitor so that they obtain identical views of the maneuver. The competitor should center his aerobatic maneuvers in such a way that they can be easily judged. The first consideration on position is longitudinal distance from the competitor: All the judges should be located near the competitor so that they obtain identical views of the maneuver. The competitor should center his aerobatic maneuvers at an average second center of mass (328 feet) from himself. The judge should be centered if the competitor is trying to hide his defects by flying at a distance.

Positioning of the maneuver involves more than distances. They should also be presented in a relative direction which displays the most difficult aspects of the maneuver. Specifically, maneuvers which have circular symmetry (such as Loops, Immelmans, Cuban Eights and Horizontal eights) should execute their circular path in a plane perpendicular to the line of sight to the model.

"End on" or "canted" presentation of the circular maneuvers should result in downgrading since it increases the difficulty of judging the symmetry of figure 8's and the "tracking" of consecutive loops.

While no special bonus is justified for exceptionally low altitude, excessively high altitude is cause for downgrading. Most maneuvers can be done at less than 100 meters (328 feet) longitudinal distance at altitudes that would not force the judge to look up at more than about 45 degree angle. If maneuvers are executed at high altitudes and close to or above the transmitter in a way that they force the judge to look up vertically or near vertically, they should be downgraded. The main reason for this is that most maneuvers cannot possibly be properly oriented when performed directly overhead.

Size of Maneuvers. The established criteria places an upper limit of about 100 meters for the total vertical size of a maneuver. Most competitors and judges will recognize this as more than ample. It should also be recognized that 150 meters of horizontal distance is a maximum value and not really the optimum. For example, a standard loop of 30 meters (98') diameter at 45 meter (148') longitudinal

Reverse Knife Edge. Model rolls 90 degrees and hesitates, then rolls 180 degrees in opposite direction and hesitates, then rolls 90 degrees to finish in level flight. Downgrades:

1. ¼ rolls more or less than 90 degrees.
2. Model does not hesitate in the two knife edge positions.
3. Roll rate no constant.

Reverse Top Hat. Model pushes into vertical downward attitude, half rolls and loops to level inverted flight, flies inverted for the same distance as the downward path, loops upward to vertical attitude, half rolls and pushes over to level flight. Downgrades:

1. Model not vertical at start and finish of half rolls.
2. Rolls not exactly 90 degrees.
3. Vertical attitude not level inverted.
4. Vertical attitude not approximately the same length.
5. Rolls not the same length and rate.
6. Changes in heading during maneuver.

Reverse Cuban Eight. Model pulls up into 45 degree climb, half rolls executes a ½ loop, half rolls to inverted and loops back to level flight at the same point as entry. Downgrades:

1. Loops not round and same size.
2. Model not at 45 degrees at commencement of rolls.
3. Changes in heading during loops and rolls.

Reverse Point Roll. Model rolls through 270 degrees, hesitating at each 90-degree point, then rolls 270 degrees in opposite direction, hesitating at each 90-degree point to finish in level flight. Downgrades:

1. ¼ rolls more or less than 90 degrees.
2. Model does not hesitate at each 90-degree point.
3. Roll rate not constant.

Triangle Rolling Loop. Model pulls up into 45-degree climb, holds the attitude for approximately two seconds, loops through 135 degrees, does one complete roll, loops through 135 degrees, holds the attitude for approximately two seconds and recovers in level flight at the same point that the maneuver started. The climbing and descending portions should be the same length. Downgrades:

1. Climbing and descending paths not 45 degrees.
2. Climbing and descending paths not same length.
3. Roll not 360 degrees.
4. Model changes heading during loops and roll.
5. Model does not start and finish maneuver at same point.

** If initial entry to a 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 spin that is initiated by its smoothness and increasing airspeed, during a spin the airspeed does not increase appreciably.*

*** A snap roll is autorotation in the horizontal axis; the plane rolls very rapidly with a nose-high attitude; if the plane rolls along its axis it is not a snap roll.*

3. Loops not same size.
4. Changes in heading.
5. Wings not level.
6. Loops not at same altitude.
7. Sides of squares not same size.

Eight-Point Roll. Model rolls through 360 degrees hesitating at each 45-degree point, the wings should be parallel, vertical to or 45 degrees to the horizon. Downgrades:

1. ¼ rolls more or less than 45 degrees.
2. Model does not hesitate after each 45 degrees.
3. Roll rate not constant.

Vertical Roll. Model pulls up and executes a 360-degree roll vertically upward and pushes over to finish in level flight. Downgrades:

1. Model not vertical at start and finish of roll.
2. Roll not exactly 360 degrees.
3. Roll not vertical.
4. Roll rate not constant.

Altium Turn. Model pushes over and executes a 360-degree roll vertically downward and recovers to finish in level flight. Downgrades:

1. Model not vertical at start and finish of roll.
2. Roll not exactly 360 degrees.
3. Roll not vertical.
4. Roll rate not constant.

Figure 8. Model pulls up into a vertical attitude and executes a 180-degree stall turn, in either direction, does a ½ outside loop, again executes a stall turn, in the opposite direction, and recovers in level flight. Downgrades:

1. Model not vertical before and after stall turns.
2. Stall turns not 180 degrees.
3. Climbing and diving paths not parallel.
4. Bottom of outside loop at different altitude to entry.
5. Altitude of second stall turn different to first.

Square Loop with ½ Rolls. Model pulls up and completes a square loop; in each side the model executes a ½ roll. Downgrades:

1. Loop not square.
2. Rolls not 180 degrees.
3. Wings not level during ½ loops.
4. Changes in heading during rolls and loops.
5. Sides of square not of equal length.

Two Snap Rolls in Opposite Directions. Model snap rolls** through 360 degrees, recovers and immediately snap rolls in the opposite direction, and recovers in level flight. Downgrades:

1. Rolls not 360 degrees.
2. Rolls not snap rolls**
3. Changes in heading.
4. Changes in altitude.

Copies of FAI Provisional Rules, such as RC Pylon Racing, RC Helicopters, RC Slope Soaring, RC Scale Soaring, etc., are available upon request from AMA HQ. Requests must state which particular rules are wanted and be accompanied by pre-addressed and stamped business-size return envelope.