

**OFFICIAL
MODEL
AIRCRAFT
REGULATIONS**

1982-83



Governing Sporting
Model Aviation



in
America

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Academy of Model Aeronautics

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

10.1. To qualify for bonus points planes must:

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

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

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

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

Bonus Breakdown:

Plane Scale:	Poor	Good	Excellent
Plane Semi-Scale:	50	75	100
	10	20	30

Note: Semi-scale includes full-bodied and profile types. Broken plus bonus. Example: 40 mph X 12 (6.4 + 2 balloons) plus 20 = 500 points. Note: Bonus points are tentatively awarded before flight; if flight qualifies then they are awarded. A crash or failure to break any balloons would result in a zero score.

flying level, dive over the barrier and knock out targets. Maximum altitude before dive is approximately 20 feet. Pilots are allowed five (5) passes to knock out targets. Pilot must signal when airplane is over target area, prior to each scoring pass by raising arm over head. All balloons broken in any pass will count; however, they must be broken by the plane itself. Balloons knocked over (except by prevailing winds) will not be replaced during flight. Pilots must not:

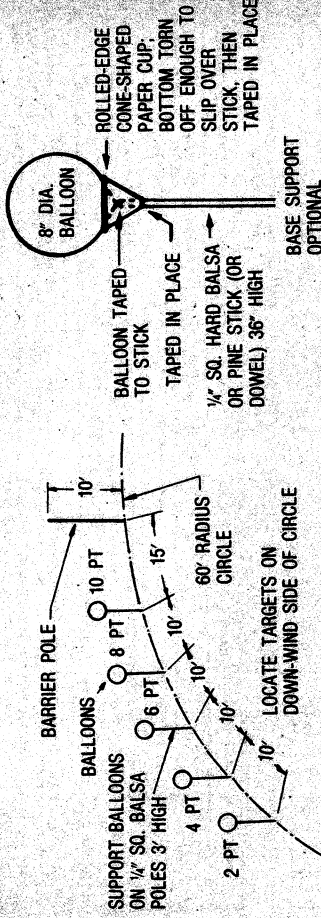
- A. Use two-speed control.
- B. Whip or lead model during speed run.
- C. Stunt or engage in acrobatic flying except the diving and climbing necessary to engage the targets.
- E. Crash
- F. Use more than one airplane.

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

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

CL DIVE BOMBING AND STRAFING

Engine Size (cc, in.)	Max. Model Weight	Required Minimum Diameter of Each Line					Pull Test
		1 Line	2 Lines	3 Lines	Multi-Strand	3 Lines	
1500-4099	4 lbs.	59'9" - 60'3"	.018"	.018"	.015"	.018"	100
4010-4599	4 lbs.	58'9" - 60'3"	.020"	.018"	.018"	.018"	105



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

1. Applicability. In addition to the following General Radio Control Rules and the specific rules for each radio control event, radio 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 interest of safety and consistency, they be followed in all radio control activity.

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 is now capable of confidently performing the maneuvers outlined in this competitive event. Furthermore, the contestant shall also similarly declare that any and all aircraft he or she enters in said competition have been test flown at least to the extent that they have performed the same competitive maneuvers and are of follow qualified to be flown in the contest and in the presence of fellow contestants, during the competition period.

39. RC PATTERN

1. Applicability. All pertinent AMA regulations (see sections entitled 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 compared to defined geometric descriptions and specified procedures. Maneuvers shall be judged according to the AMA Radio Control Judges Guide.

3. Licensing Requirements. All radio equipment and operation must conform to the regulations of the 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 inch (10cc). In a model powered by two or more reciprocating or rotary piston internal combustion engines driving separate propellers, 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 3 kg. (11 lb.) gross—but excluding fuel—ready for takeoff.

4.4. Controls. There shall be no radio equipment or aircraft control function limitations in any Pattern class except Notice. Radio equipment is only limited by FCC regulations.

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.

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

6. 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.

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

6.2. 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 officials, contestants and spectators are positioned. The judges shall be positioned right at the flight line, and in fact it 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 maneuver being executed or the previous maneuver (if the plane is between maneuvers) shall be scored zero. If no zero are earned during the same flight for flight line infringement, the contestant in the flight shall be scored zero, and the pilot shall be removed from the plane. Continued flying behind the flight line shall result in disqualification of the contestant by the Contest Director.

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

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

6.5. All planes must have rounded prop spinners or blunt faced hubs such that no propeller shaft protrudes. Rounded devices shall have a radius of not less than 3mm.

6.6. Knife-edge wings are not allowed. Leading edges must have 2mm minimum radius.

7. Pattern Event Classes. The Pattern event shall be divided into five classes. They shall (in order of increasing difficulty) be referred to as Novice, Sportsman, Advanced, Expert, and Master. The AMA rules are supplemental (see Supplemental and Provisions, p. 2). Competitors must be advanced prior to the start of the contest of any planned deviations from standard AMA rules pertaining to the events they have entered.

8. 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 one at any one 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 skill 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 promoted.

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 signed by a Contest Director and forwarded to the district Contest Board member and Vice-President for their approval.

8.2. A contestant will be mandatorily advanced through the classes as follows: A flier must move out of the Novice class if he places first, second or third and above at four other fliers (having recorded an official flight) in any sanctioned Pattern class contest. For Sportsman, Advanced and Expert fliers advancement takes place through the accumulation of points. In each 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 go 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 8.1.2.) 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.*

Examples
 ● (1) Contestant is one of 8 who flies officially in a given class except Novice and places first. He acquires 3 times 7 (the number he beat) or 21 classification points.
 ● (2) Contestant is one of 16 and places fifth. He receives 17 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 Record forms are available upon request from AMA HQ; please include a pre-addressed stamped envelope. Contestors' records are maintained in 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. The pilot announces the start.
 a) The model fails to commence the takeoff maneuver or 3 minutes allowed to each competitor.

● 14.9. Following is the full list of maneuvers for each class. Maneuvers marked with an asterisk are suggested for deletion where a shorter list is to be performed to save flight time at contests with large attendance.

● 15. **Novice Pattern Maneuvers.**

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

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

● 16. **Sportsman Pattern Maneuvers.**

1. Takeoff (U)
2. Straight Flight Out (U)
3. Procedure Turn (U)
4. Straight Flight Back (D)
5. Stall Turn (U)
6. Immelmann Turn (U)
7. 3 Inside Loops (U)
8. Straight Inverted Flight (D)
9. One 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 Spin Turn (U)
3. Cuban 8 (D)
4. Double Immelmann (U)
5. Four Point Roll (D)
6. Reverse Outside Loops (U)
8. Slow Roll (D)
9. 3 Inside Loops (U)
10. 3 Horizontal Rolls (D)
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. 3 Reverse Outside Loops (U)
7. Four Point Roll (D)
8. 3 Inside Loops (U)
9. Eight Point Roll (D)
10. Rolling 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.
 ● Suggested deletions for abbreviated maneuver schedules.

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

- | | |
|-------------------------------|-----|
| Take-off | K=1 |
| 3 Inside Loops | K=2 |
| 3 Outside Loops | K=2 |
| Cuban Eight | K=2 |
| Reverse Cuban Eight | K=2 |
| Horizontal Eight | K=2 |
| Vertical Eight | K=2 |
| Rolling Eight | K=2 |
| Double Immelmann | K=2 |
| Reverse Double Immelmann | K=2 |
| Straight Inverted | K=2 |
| Spin Roll | K=2 |
| 3 Reverse Outside Loops | K=2 |
| Reverse Outside Loops | K=2 |
| Avulch | K=2 |
| Slow Roll | K=2 |
| 3 Horizontal Rolls | K=2 |
| 2 Rolls in Opposite Direction | K=2 |
| Vertical Roll | K=2 |
| Aileron Turn | K=2 |

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 delay due to other aircraft traffic).

10.3. In the case of a mid-air collision during a Pattern flight the contestants must immediately land their aircraft. They may resume their flights with the same aircraft if they are judged to be airworthy or with a backup aircraft, beginning with the maneuver that was in progress or with the next scheduled maneuver. If collision occurred between maneuvers. The previously defined start-time 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 for the next contestant. 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. **Novice.** Sportsman 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 maximum of two passes may be made. In Novice a free pass is allowed following Three Inside Loops.

● 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 except direction of takeoff and landing shall be as specified by contest officials.

● 14.2. If a maneuver other than landing is done out of order it shall be scored zero. Judges may inform the pilot or helper that a maneuver has just been performed out of sequence.

14.3. If an illegal pass (crossing a line perpendicular to and between the model passes in front of the judges) a maneuver must be executed except after takeoff and before landing, where in each case a maximum of two passes may be made. In Novice a free pass is allowed following Three Inside Loops.

● 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 upwind/downwind orientation.

● 14.5. The following is the scoring method for a missed approach for 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 which should have been executed shall be scored zero.

● 14.6. 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 upwind/downwind orientation.

● 14.7. Expert (or his helper) may not touch his plane after it has been placed airborne until completion of flight; i.e., he may not land, place, or perform any maneuver in order to make adjustments to engine, trim, etc.

● 14.8. The contestant (or helper with permission of judges) must call out each maneuver before he attempts to perform it. Call out entry Completion shall also be called out at the straight and level exit. Failure to call out entry Completion shall be basis for down grade of the maneuver score. The competitor may make only one attempt at each maneuver during the flight.

- | | |
|------------------------------------|-----|
| Top Hat | K=3 |
| Figure M | K=3 |
| Inverted Spin | K=3 |
| Straight Horizontal Eight | K=4 |
| Triangle Rolling Loop | K=4 |
| Reverse Knife Edge | K=4 |
| Reverse Point Roll | K=4 |
| 4 Point Roll | K=4 |
| Reverse Top Hat | K=4 |
| Square Loop w/ four 1/2 Rolls | K=4 |
| Reverse Loop | K=5 |
| 3 Snap Rolls in Opposite Direction | K=5 |
| Figure M with 1/2 Rolls | K=5 |
| Figure M with 1/4 Rolls | K=5 |
| Landing | K=1 |

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 rules 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 operation of an RC Pattern event, and may be altered to fit local conditions.

20.1. All RC contestants shall be set up in "pits" at spot assigned by Event 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 Event Director. Any person causing interference will suffer immediate disqualification. The Event Director will provide a monitor receiver to check for interference.

20.3. The flight order shall be determined by position of contestant's 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 man shall 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, the No. 4 man becomes No. 3 and shall be requested to move his model and equipment onto the flight line. If he is not on hand to do so, he shall be dropped from the Flight List, and the List advanced to fill his place. The Event Director or his 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 crosswind from each other to minimize engine noise and flight pattern interference.

20.5.2. Contestants flying simultaneously shall carefully check receiver and transmitter operation before takeoff, to be sure no interference 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. If it is suggested that each such score be scored immediately after it is performed, Judges shall score maneuvers individually and without consultation between them. There should be enough judges available to establish a rotational procedure which will average out variations in judging. Sets of judges shall judge all contestants on the Flight List an equal number of flights. Different judges are used during the contest; all contestants shall have an equal opportunity to fly before all judges. Substitution of judges which includes equal exposure by all contestants shall be allowed. If adverse weather conditions preclude equal exposure for all contestants the results of these flights shall be disqualified.

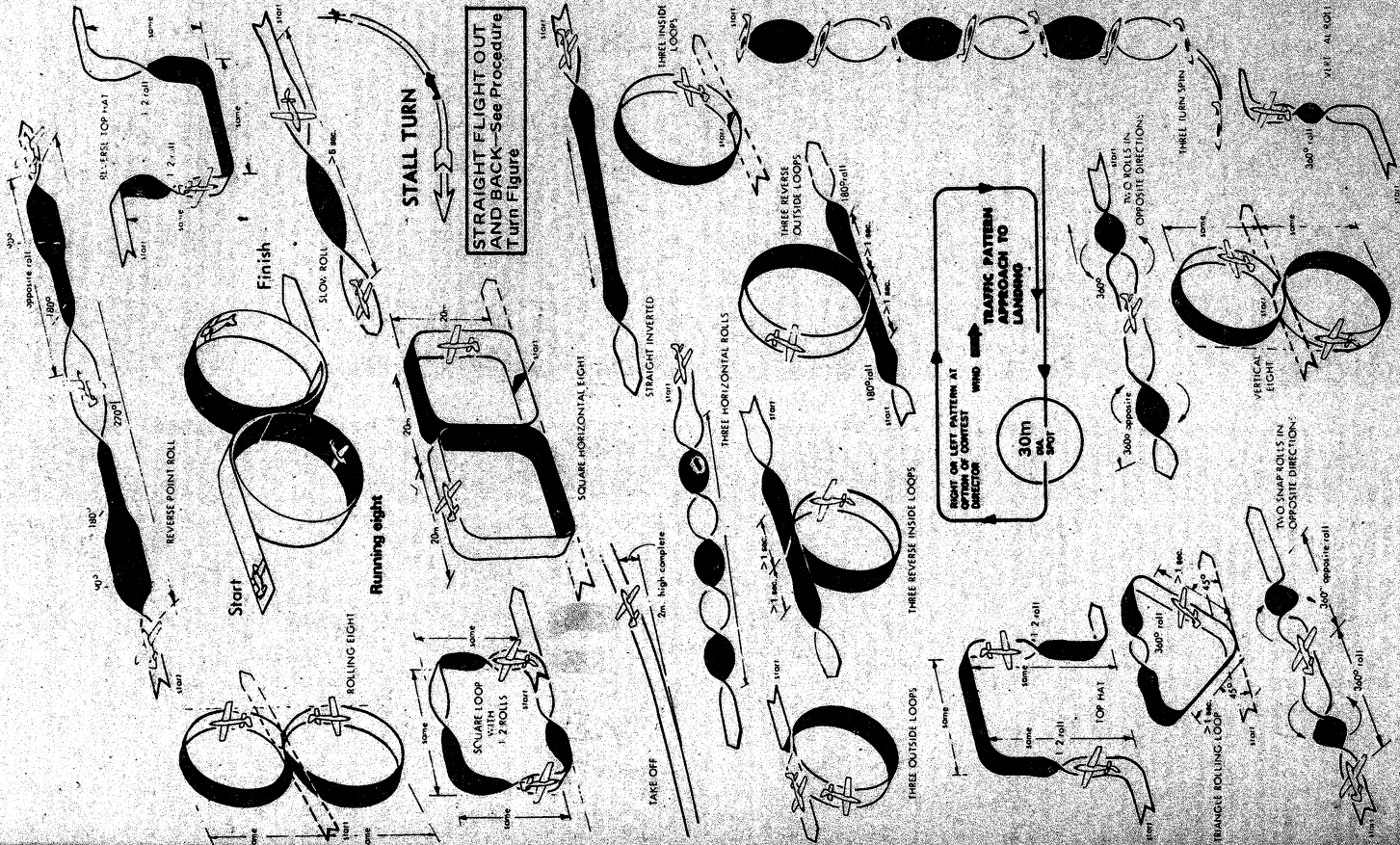
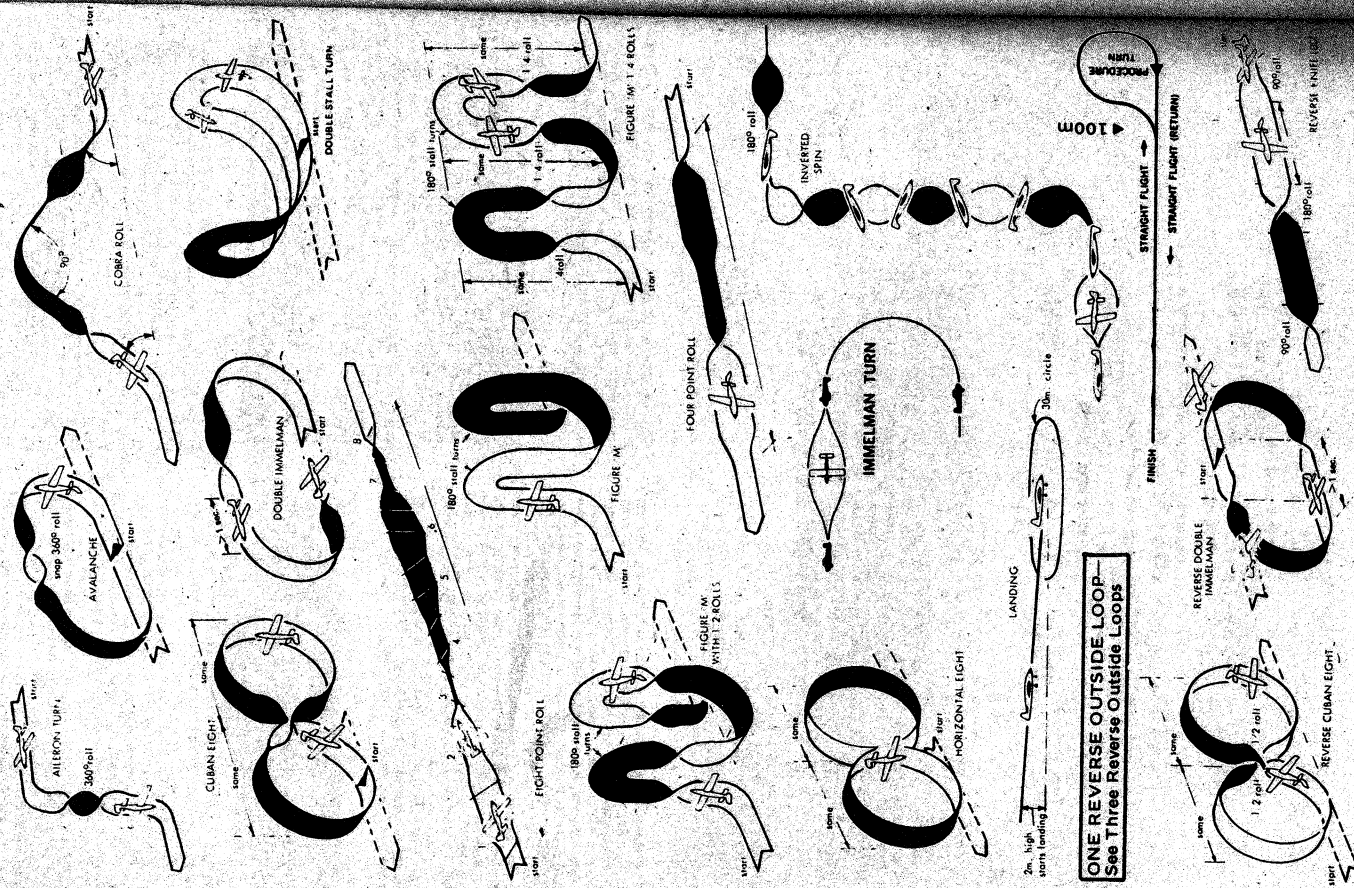
RC FREQUENCIES AND FLAGS

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 and 72-76 MHz bands will show two flags, each in the form of ribbons approximately 1" x 18"; 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.

26.865—Brown	27.185—Green
27.045—Red	27.095—Orange
	27.145—Yellow
	27.295—Blue
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	
51.20—Black & Light Blue	52.04—Black & Violet Ribbons
	72.72—White & Violet Ribbons
	72.74—White & Blue Ribbons
	72.76—White & Yellow Ribbons
	72.84—White & Green Ribbons

AMA RC PATTERN MANEUVERS

(In alphabetical order)



STRAIGHT FLIGHT OUT AND BACK—See Procedure Turn Figure

STALL TURN

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 developed countries.

B. 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.

C. 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 announced 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 optimum size as discussed in a later section. However, the judge should modify his image if the first portion of the maneuver clearly demonstrates that the contestant intends to do a maneuver of much smaller or larger dimensions than the judge first imagined. It will be noted that forming an image of the forthcoming maneuver is based on using the straight and level entry as a reference. If the contestant fails to go through this portion of the maneuver, it will be difficult and perhaps impossible to form an image before the start of the maneuver. The absence of a definite entry into a maneuver therefore increases the difficulty of judging its precision and competitors will recognize this as justification for downgrading.

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

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

b. Positioning. To achieve perfection, the competitor must position his maneuver 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 in an average distance of less than 100m from himself.

At short, the judge should be unobscured 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, Immersions, Cuban Eight's, and PAT Horizontal Eight's) should have the "hole" in the circular path clearly visible, preferably in a plane exactly perpendicular to the line of sight to the model. The same applies to the Straight Flight.

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

While no special bonus is justified for exceptionally low altitude, excessively high altitude is cause for downgrading. In general, all maneuvers except Straight Flight. Over Precision Turn, and Straight Flight Back should be executed within a judging frame defined by 60° up from horizontal. Maneuvers not properly centered within this frame should be downgraded. A contestant who competes in order here has been downgrading is almost an automatic reaction after a judge has seen downgrading for a few hours. He usually has a tired neck from looking at some maneuvers which must be followed overhead, and he is prone to be severe if he is forced to look there unnecessarily.

By the same token, never judges will refuse to even look at the remainder of a maneuver after an aircraft crosses the sun unnecessarily. There are also some places where the sun often cannot be avoided and the judge should follow through to the best of his ability. But he is completely justified in scoring zero if in his opinion the maneuver could have been placed elsewhere.

c. Size of Maneuvers. In the previous section it was pointed out that most maneuvers could be safely done at an average distance no greater than 100m from the competitor and judges, and at altitudes such that the line of sight to the model will seldom exceed a 60° elevation angle. These criteria place an upper limit of about 100m 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 100m of horizontal distance is a maximum value and not really the optimum. For example, an inside loop of 3m diameter at 50m longitudinal distance would stay within the 60° angle and a safe altitude and would be more clearly visible to the judge than at 100m distance. The competitor who performs loops in the outer region is therefore allowing the judge to evaluate them more critically and he should suffer no downgrading for positioning. On the other hand, a 30m diameter loop at 100m distance might be downgraded.

The optimum size of maneuvers is related to some extent on the size of the model flying speed of the model. For example, loops of 7 to 10m diameter done by a trim wingspan airplane would not necessarily look like a 7m or 10m diameter loop. However, a 7m or 10m diameter loop by a 75 km multi-jet gives the impression that an imaginary pilot in full scale situation would be downright uncomfortably small or not "checked out" due to the high "g" forces. Excessively small or tight maneuvers with unnecessarily high rates of roll pitch or yaw do not simulate full scale performance and they should be downgraded accordingly.

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

It is recognized that few RC judges have ever been passengers in full scale aerobatic airplanes and therefore have no other criteria with which to judge the smoothness of a maneuver. Two to three "g's" would not be excessive in such performance, particularly in violent maneuvers such as a snap roll or spin. However, by comparison, a 10m diameter loop at 75 km/hr results in about 10 "g's" which is close to or in excess of the design limits of most full scale aerobatic aircraft. Clearly, such tight maneuvers are not scale-like.

The matter of smoothness is basically related to scale-like appearance. For example, a perfect set of consecutive loops should have a constant radius defining a perfect circle. If cannot be made up of a series of straight flight increments with sudden angular jerks placed between. Such sudden jerks represent high "g" forces well in excess of full scale tolerances and maneuvers should be downgraded for this.

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

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

The responsibility for disqualifying pilots who persist in flying unsafely should be assigned to the judges by the C.D. The chief judge should be absolutely unambiguous. For example, if a pilot is downgraded that "maneuvers performed over the spectators area will be scored zero" and a note that "maneuvers can be performed over the spectators area at a safe altitude." Obeying such safety

regulations is just one more of the many pressures associated with winning a competition and the man who overcomes all pressures is more expert than one who does not.

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

A common problem with inexperienced judging is to score the first flights too high and then find there is no margin left to reward a superb flight. When in doubt, give the lower score. Remember that perfection is not a relative thing. Perfection is 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 number of 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 two or three defects. Two or three distinct turns would be considered two or three defects. It will be noted that for 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 (see 6.2)
2. Maneuver performed out of sequence (see 14.1.1)
3. Execution of an illegal pass; etc. (see 14.2., 14.3., 14.4. and 14.5.)
4. Maneuver not completed (upright and inverted)
5. Less than 2 or more than 4 spins in 3 Turn Spin maneuver
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.
10. Less than 2 or more than 4 rolls or loops when 3 are called for.

Suggested Downgrades. Certain types of defects pose difficult judging decisions. The following guidelines are suggested:

Stall Turn rotates through pitch axis (flaps over) instead of yaw axis. In Sportsman class where the Turn is the main point of the maneuver, a "severe downgrade" of 3 or 4 points for this defect alone; in other classes where the Turn is but one part of a larger maneuver (Figure M's), downgrade of 2 or 3 points.

Stall Turn yaws wrong direction in relation to flight-line (e.g. Fig. M 3) Downgrade 1/2 to 2/3; points depending upon quality of turn

Number of Loops or Axial rolls (where 3 are required). Two or four performed, severe downgrade of 3 or 4 points for that defect alone;

Maneuvers Off-Center. Deduct 2 points for each quarter of the total maneuver's length that is offset. Examples: (Assuming no offset with judges' permission due to sun) loops 4 points because maneuver is off center one half diameter; 2 of 3 axial rolls are offset—deduct about 1/2 points because maneuver is off center by 1/4.

Description of Maneuvers (in alphabetical order).

All maneuvers will start and finish in straight and level flight of at least 15 meters and have the same altitude and heading for entry and exit and entry.

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.

Altitude 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 rate not constant.

Airbrake. 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 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
6. Rolls not in same relative position of 45 degree paths.

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 not centered in the 45 degree descents and on each other.

Double Immelman. Model pulls up into a half inside loop, half-rolls to upright, flies straight and level for greater than 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
5. Level flight less than 1 second
6. 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, then completing half an inside loop, at which point a second Stall Turn is executed, followed by a quarter-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 loops
2. Model does not become exactly vertical at points of turn
3. Half-inside loop not at same altitude as entry and finish
4. Bottom of half-loop not at same altitude as entry and finish
5. Model turns left or right during pull-outs
6. Does not yaw tightly through 180 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. Center is middle of inverted flight.

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

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. 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

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 again in the same 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 stall turn through 180 degrees, 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 90 degrees
4. Bottom of outside loop not level with entry
5. Changes in heading during one-half outside loop and rolls
6. Stall turns not at same altitude

Four-Point Roll. Model rolls through 360 degrees, hesitating at each 90 degree point; at each hesitation wings are parallel to vertical to the horizon. Center is middle of inverted flight. 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. 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. Wings not round
2. Model not vertical at crossover point
3. Changes in heading during loops
4. Wings not same diameter
5. Loops not at same altitude
6. Model does not cross over at same point

Immelmann Turn. The model starts the Immelmann 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 Immelmann may be downgraded because:

1. Model not level at start
2. Model deviates left or right during half loop
3. Half loop completed exactly above point of commencement of half loop
4. Half roll does not commence immediately after half loop
5. Plane does not fly 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. Wings not level during entry and exit
4. Spiral dive scores zero
5. Does not finish in same heading
6. Does not make three turns; less than 2 or more than 4 score zero.

Landing. The landing maneuver will start two meters from the ground. The model flies smoothly to a nose-high attitude, dissipating all flying speed, then smoothly touching the ground, within the landing circle, the main wheels first, (tricycle landing gear) or main and tail wheels simultaneously for a conventional gear) with no bouncing or changes in heading after touch down. The nose wheel on a tricycle gear should settle gently to the ground after a brief roll out. The maneuver shall be considered complete once the plane has slowed below flying speed and has rolled straight for 15 meters. The landing will not be downgraded if:

1. plane rolls straight to a controlled stop in less than 15 meters.
2. wing dips, unless they are not immediately corrected, which are caused by air turbulence.
3. the pilot elects to "spin to a landing," to handle a crosswind condition, in which case the upward wing will be low.

Downgrades:

1. Model bounces after touchdown
2. Model impacts the ground due to lack of flare
3. Changes in heading
4. If model ends on its back, zero points
5. Model lands outside 30-meter circle
6. If any undercarriage leg retracts on landing, zero points
7. Aircraft "porpoises" and/or wanders during approach and flare.
8. Aircraft lands in other than a nose-high attitude.
9. Aircraft lands outside landing area or runway, zero points.
10. Aircraft touches down while not straight to runway and ground track.

One 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 altitude during turn
4. Turns not smooth and circular
5. Does not head back over exact outgoing path

This maneuver shall 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 Immelmann. Model pushes over and executes one half outside loop followed immediately by a one-half roll, pauses for greater than 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 less 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 rolls 180 degrees in opposite direction and hesitates, then rolls 90 degrees to finish in level flight. 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

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. One-quarter rolls more or less than 90 degrees
2. Model does not hesitate at each 90 degree point
3. Roll rate not 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. Roll does 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 level at start and finish of half rolls
4. Changes in heading during loops and rolls
5. Wings not level during loops

Rolling Eight. Model starts in level flight and completes 1/4 outside loops, model then does 1/4 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 greater than five seconds. Center is middle of inverted flight. Downgrades:

1. Changes in heading
2. Changes in altitude
3. Roll rate not constant
4. Model does not roll exactly 360 degrees

Square Loop with One-Half Rolls. Model pulls up and completes a square loop; in each side the model executes a one-half roll. Downgrades:

1. Loop not square
2. Wings 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 30 meters (65 1/2 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

Staff Turn. The model starts from straight and level flight and noses up to a vertical position, stalls, 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 Staff 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 during 180 degrees
5. Return path more than two wing-spans from entry path
6. Return path not parallel to entry path
7. Maneuver not finished at same altitude as entry
8. Plane not level at finish of maneuver
9. Model does not fly straight and level to complete maneuver

Straight Flight Back. Immediately after the Procedure Turn the model shall fly back along the same line as the outgoing path. 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.

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

Straight Flight Out. The model must be brought exactly parallel to the flight path and flown in an absolutely straight and level path for a distance of approximately 100 meters (330 feet) on the judges 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. Plane deviates left or right
2. Does not hold constant altitude
3. Turns not round
4. Gallops in yaw or roll on path.

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

Takeoff. The model must stand still on the ground with the engine(s) running, without being held. The throttle is then smoothly, not suddenly, advanced. After the take-off roll has started, the nose wheel lifts off the ground (tail wheel for a conventional gear airplane), and the aircraft assumes a climb attitude while still rolling on its main wheels. When the aircraft reaches flying speed it should gently lift off the ground and climb at a gradual angle. The aircraft must not deviate in heading during the take-off. The take-off is completed when the model is approximately two meters (6 1/2 feet) from the ground.

The take-off should not be downgraded for wing dips caused by air turbulence, unless the wings are not immediately leveled. 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. Top steep a climb angle
6. Gallops in elevation during climb
7. Wings not level at any time
8. Throttle not accelerated smoothly.

Three Horizontal Rolls. Model rolls at a uniform rate through three complete revolutions in either direction. Center is inverted portion second roll. Downgrades:

1. Changes in heading during rolls
2. Changes in altitude during rolls
3. Roll rate not constant
4. Model does not do exactly three rolls.

Three Inside Loops. Model pulls up and executes three consecutive loops; all loops shall be round and superimposed. Downgrades:

1. Loops shall be round
2. Loops not superimposed
3. Wings not level during loops
4. Changes in heading during loops
5. Exit not same altitude and heading as entry

Three Outside Loops. Model pushes over and executes three consecutive outside loops. All loops should be round and superimposed. Downgrades:

1. Loops not superimposed
2. Wings not level during loops
3. Changes in heading during loops

Three Reverse Inside Loops. Model half-rolls from level flight, pauses for greater than 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. Changes in heading during loops and rolls
3. Changes in heading during loops
4. Wings not level during loops
5. Model pauses more than one second before and after 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, pulls over to inverted flight for a distance equal to the vertical climb, pulls down, pauses, makes a half roll; pauses and recovers in level flight. Downgrades:

1. Model not vertical 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 parallel to the flight line, at a judges a turn away from the flight line of 90 degrees, a crosswind leg, a second turn of 90 degrees, a downwind leg, a third turn of 90 degrees, a crosswind leg, and fourth 90 degree turn and straight flight to constant altitude; the descent to touchdown. The first three legs will be at constant altitude; the descent to touchdown 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 greater than one second, loops through 135 degrees, does not 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 135 degrees
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. 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

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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. Changes in heading
3. Changes in altitude

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

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 exactly 360 degrees
2. Roll not vertical
3. Roll rate not constant

* 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 spiral dive is indicated 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.

opinion, is not up to reasonably safe standards in materials, workmanship, detail design, radio installation or condition as a result of damage.

10. Pattern Event Classes.
 10.1. The event shall be divided into three classes: in order of increasing difficulty, the classes are Sportsman, Advanced, and Unlimited.
 10.2. Contest Directors and/or the sponsors of a sanctioned meet shall determine which of the classes and events 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.

11. Contestant Classification.
 11.1. A contestant may enter any one pattern class at his own option. Advancement from the Sportsman Class to the Advanced Class is mandatory. Advancement from the Advanced Class to Unlimited Class is optional at any time. Contestant may return to Advanced class in future competitions when he so desires.
 11.2. Advancement from the Sportsman Class to the Advanced Class occurs after winning first place in the Sportsman Class three times. There shall be at least five entries and at least five contestants making official flights before the first place victory is counted towards advancement to the Advanced Class. If the Sportsman Class is not offered at a competition, then the contestant can enter any class and then compete in the Sportsman Class in future contests until three first place wins are accumulated.

11.3. For a flier to be reclassified from Advanced to Sportsman class, that person must make an application (using a form supplied by AMA-HQ), to be signed by a CD and forwarded to the district RC Contest Board member and Vice-President for their approval.

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

12.1. Contestant shall have two attempts to achieve an official flight. An attempt shall be made once the clock starts for the flight.

13. 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.

14. Aerobatic Zone.

14.1. All maneuvers shall be flown in an area in front of the judges, 60' on either side and no higher than 400 feet. Minimum altitude unless landing or taking off shall be 20 feet.

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

15. Time Limits.

15.1. Start engine and become airborne—two minutes.
 15.2. To enter the aerobatic zone upon command of appropriate official—one minute.

15.3. No time limit while in the aerobatic zone.
 15.4. Between leaving the aerobatic zone and touchdown for landing—two minutes unless required to hold upon command of appropriate official.

16. Point System

16.1. All classes shall have the scheduled maneuvers scored on a scale of 0-10.
 16.2. All free-style maneuvers will be scored on a scale of 0-10 and be from class entered or higher.

17. Determining the Winner. The highest score for the total of the best two flights shall be the winner provided three or more are flown.

18. Flight Pattern.

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

18.2. Contestant or anyone else may not touch his aircraft after it has become airborne until completion of flight. He may not land, give, aircraft trim, etc.

18.3. Contestant or helper shall call out each maneuver to the judges.

18.4. Takeoff and landing are not to be considered judged maneuvers. It is not necessary for the judges to see the aircraft take off or land. The aircraft may be carried to the takeoff point, and carried from the landing area, if so desired.

18.5. No flybys are allowed during the aerobatic sequence. If a flyby is performed then the next maneuver shall receive zero points (i.e., each upwind and downwind leg will consist of a maneuver).

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

2. General. All AMA regulations and FCC regulations covering the RC flier, his plane and equipment, shall be applicable to this event, except as noted herein. There shall be no limitation to the type of equipment fitted to the aircraft, nor the number of controls, except as noted in Par. 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.

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

3. Biplane and Open Events.

3.1. The biplane class of competition requires the model to be a realistic replica typical of similar full-size aircraft. The bottom wing shall be at least 30% of the total wing area. Proof of this percentage is the responsibility of the contestant. The landing gear must be of the fixed type.

3.2. A separate Open event for aerobatic monoplanes and biplanes accommodates models which are replicas of types which are known to be capable of aerobatic competition with the "Box" (Tournament of Champions style) Weight and engine upper joints shall be same as RC Giant Scale. Models are those used by the International Aerobatic Club and adapted by the International Miniature Aerobatic Club.

3.3. The skill classes shall be the same for both the Biplane and Open events. Biplanes may be allowed to compete in the open event; however, Open planes are not allowed to compete in the Biplane event.

4. Model Aircraft Specifications—Biplanes

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 rule shall not apply.

5. Model Aircraft Specifications—Open

5.1. Only one engine of the reciprocating internal combustion type with a total displacement not exceeding 3.7 cu. in. shall be used.

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

5.3. Maximum weight less fuel shall be 40 pounds. Use of large aircraft shall also be in accordance with the AMA Safety Code.

5.4. The builder of the model rule shall not apply.

6. Optional Biplane 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 bonus point system will be made prior to the starting of the first official flight of the competition. It is recommended that if the bonus system is used, it be so noted in all publicity prior to the contest.

7. Proof of Scale

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

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

7.3. The gross outline of the model shall approximate the full size outline of the object to be scaled. Exact scale is not required nor intended. The model shall be judged for likeness at a distance of approximately 10 feet.

7.4. 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.

7.5. If in the Biplane event only 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.

8. Registration Numbers.

8.1. 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.

8.2. 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.

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

9. 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