REF

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Competition Regulations 1994 and 1995

Rules Governing Model Aviation Competition in the United States

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ACADEMY OF MODEL AERONAUTICS
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RADIO CONTROL AEROBATICS

RADIO CONTROL, GENERAL

(FOR NONSCALE EVENTS)

1. Applicability. In addition to the following General Radio Control rules and the specific rules for each radio control event, radio control 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/she has previously and is now capable of confidently performing the maneuvers comprising his competitive event. Furthermore, the contestant shall also similarly declare that any and all aircraft he/she uses in said competition have been test flown at least to the extent that they have performed the same competitive maneuvers and are therefore qualified to be flown in the contest and in the presence of fellow contestants, contest officials, and all others who may be in the flight area during the competition period.

RADIO CONTROL PATTERN

For events 401, 402, 403, 404, 406.

1. Applicability. All pertinent AMA regulations (see sections entitled Sanctioned Competition, Criteria for Cancellation of Contests, Selection of Champions and Radio Control, General) shall apply 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 Pattern Judges Guide.

3. Licensing Requirements. All radio equipment and operation must conform to the regulations of the FCC. The AMA membership card of each entrant shall be checked at every sanctioned meet. An FCC amateur license is required for use of 50 and 53 MHz.

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 (10 cubic centimeters). In a model powered by two (2) or more reciprocating or rotary piston internal combustion engines driving separate propellers, the total displacement shall not exceed .8056 cubic inch (13.20 cubic centimeters) and none of these individual engines shall exceed .6102 cubic inch (10 cubic centimeters). Fifty 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. Noise Limit.** Each reciprocating or rotary piston internal combustion engine shall be equipped with an effective silencer. The maximum noise level for all classes shall be 96 decibels measured at three (3) meters from the center line of the model with the model standing on concrete or macadam, and 96 db if an earth or short grass surface must be used. All measurements will be taken perpendicular to the fuselage centerline on the right-hand downwind side of the model with the motor running at full power; the microphone to be placed on a stand 30 centimeters above the ground and in line with the motor. No noise reflecting objects shall be nearer than three (3) meters to model or microphone. A score penalty of five (5) percent of the raw flight score shall be assessed for those models registering over 96 db, and a 10 percent penalty for those registering over 98 db. The Event Director shall have the option of deleting the noise level requirement at any sanctioned event; however, such deletion must be published in advance of the event date. (See recommended sound reading procedures in addendum I at the rear of this book.)

4.3. Weight. No model may weigh more than five (5) kilograms (11 pounds) 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 Novice; however, the use of an "automatic pilot" type device, which places the model under anything less than full pilot control at all times, is prohibited in all classes of competition.

4.4.1. In the Novice class, aircraft must be of the fixed gear type, or, if the aircraft is equipped with retractable landing gear, the aircraft must be flown with the gear down.

4.5. Number of Airplanes. Two (2) 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. The height of the numerals must be at least one (1) inch. Both stroke and width shall be such as to enable ready recognition.

5. Number of Helpers. Each pilot is permitted one (1) helper during the flight. Two (2) helpers may be present during the starting of the engine(s). Once airborne no person other than the pilot shall operate the transmitter controls. Operation by anyone else shall require disqualification of the flight.

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

6.1. The Contest Director at an AMA sanctioned event has the authority to perform safety inspections of any equipment and to prevent any participant from using equipment which in the Contest Director's opinion is deemed unsafe.

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 (0). If two (2) zeros are earned during the same flight for flight line infractions, the remainder of the flight shall be scored zero (0), and the pilot shall be ordered to land 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. The 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 point not less than three (3) millimeters.

6.6. Knife-edge wings are not allowed. Leading edges must have two (2) millimeters minimum radius.

7. Pattern Event Classes. The Pattern event shall be divided into five (5) classes. The first four (4) shall (in order of increasing difficulty) be referred to as Novice, Sportsman, Advanced, and Master. The fifth class shall be referred to as FAI class. The Novice class is supplemental (see Supplemental and Provisional Rules, page 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.

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 no one at any time, except as noted in 8.1.2. and 8.2.5., 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 committed.

8.1.2. Exception: For a flier to be reclassified to a lower rank, that person must make application (using a form supplied by AMA HQ) to be signed by a Contest Director and forwarded to the petitioners District Contest Board representative 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 at the end of that calendar year if he places first, second, or third, and above at least four (4) other fliers (having recorded an official flight) in any sanctioned Pattern class contest. For Sportsman, and Advanced fliers, advancement takes place through the accumulation of points. In these 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 in Sportsman or Advanced classes will automatically be advanced to the next higher class up to the top AMA style class of Masters at the end of that calendar year.

8.2.2. A contestant may voluntarily move to the next higher class upon attaining the goals itemized in 8.2.1. but will not be required to do so until the end of the calendar year.

8.2.3. The time required to attain the goals of 8.2.1. has no limit. A contestant's point accumulation does not start over again at the beginning of each year, but continues until, if ever, the advancement goal 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 (0) 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.*

● **8.2.5.** There is no mandatory advancement into FAI from the Masters class.

Examples

1. The contestant is one (1) of eight (8) who flies officially in a given class, except Novice, and places first. He acquires three (3) times seven (7) (the number he beat) or 21 classification points.

2. The contestant is one (1) of 16 and places fifth. He receives 11 points.

3. The contestant accumulates 95 points in 1990 and thus remains in his declared class into 1991. At the first 1991 contest, he picks up 12 points. He may fly the rest of 1991 in his declared class but will be advanced to the next higher class starting January 1, 1992. (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 walletsize Classification Advancement Record forms are available upon request from AMA HQ; please include a preaddressed and stamped return envelope. CDs of meets having RC Pattern events are also provided with a small supply of such forms.

9. Number of Flights. At the beginning of a contest, before any flying is done, the CD shall announce the number of flights that will be flown. This number should be reasonably determined based upon the number of contestants and the time available. Once this number has been announced, this is the exact number of flights that must be flown. The winners in each class will be the contestants who are ahead when this number of flights is finished. Fewer flights may be flown if weather conditions cause some loss of flying time during the contest. Contest officials shall make every reasonable effort to ensure 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 three (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 three-minute (3) period. However, no points will be awarded for the subsequent takeoff maneuver.

10.2. Each competitor is entitled to one (1) attempt for each official flight. An attempt may be repeated at the judges' discretion only if, for some unforeseen reason, the model fails to make a start (i.e., safety delay due to other aircraft traffic, etc.). The Event Director shall have sole discretionary authority to grant a single repeat attempt, if, in his/her opinion, the competitor has encountered radio interference during the course of an official attempt.

10.2.1. When a competitor is allowed a reflight due to radio interference, the aircraft shall be impounded by the Event/Contest Director and only refueling will be allowed prior to the reflight attempt. Such a repeat attempt, if granted, shall start with the maneuver immediately preceding the point in the flight where the interference was encountered. If radio interference is again encountered during the reflight, the flight scores shall stand as originally recorded during the initial attempt. Whenever possible, data gathered by electronic monitoring should be consulted by the Event Director when making the decision to grant or deny an interference reflight.

10.3. In the case of a collision during a Pattern flight, the contestants must immediately recover their aircraft. They may resume their flights with the same aircraft if the aircraft are judged to be airworthy or with a backup or repaired aircraft. They will begin with the maneuver that was in progress or with the next scheduled maneuver if the collision occurred between maneuvers. The contestants may, at their option, elect to refly the entire flight. The previously defined starting times will apply for a resumed flight and the contestant will be allowed no more than two (2) passes in front of the judges for the purpose of trimming the plane. Scores of the previous maneuvers will be added to the scores of subsequent maneuvers in the resumed flight. Maneuver scores prior to the collision will not be used if the contestant chooses to refly the entire flight. The flight must be completed by the end of the round being flown, or within a timeframe designated by the CD.

10.4. Competitors must be present and ready when they are called to the flight line. Once a round is complete there will be no makeup flights. Competitors who are not present will receive zero (0) points for each flight they are not present. Late entries will receive zero (0) points for each flight they are not present.

11. Time Limits. Each contestant has three (3) minutes to start the engine and commence the take-off maneuver. When the contestant fails to commence within the three (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 three (3) minutes, but only if prior to takeoff (also see paragraph 10).

12. Point System. All classes shall be judged and scored cn a 10 to zero (0) basis to the nearest one half (1/2) point, with each individual maneuver score being multiplied by an assigned "K" factor degree of difficulty modifier. The flight score is the sum of the "K" multiplied maneuver scores.

13. Determining the Winner. Each flight score shall be normalized in the following manner. When all competitors for a class have flown in front of a particular set of judges once, the highest score shall be awarded 1,000 points. The remaining scores for that set of judges are then normalized to a percentage of the 1,000 points in the ratio of actual raw score over round winner's raw score multiplied by 1,000.

$$\text{Score Y} = \frac{Sy}{Sw} \times 1{,}000$$

Score y = points awarded to competitor
Sy = raw score of competitor
Sw = raw score of winner of round

For example: A total of 10 contestants are entered in Sportsman. After all 10 have flown in front of judge set A, the winner of that round has a raw score of 81. He will receive 1,000 points. Competitor Y has a raw score of 75.75 divided by 81 multiplied by 1.000 equals 925.9 points which is Y's score. *Note: If a class (example here Sportsman) is split between two (2) lines, the score can only be normalized after the second round when all 10 have flown in front of judge set A.*

13.1. In all classes, the winner shall be the only flight score when only one (1) round is flown; the highest total of the best two (2) flight scores when two (2) or three (3) rounds are flown; the highest total of the best three (3) flight scores when four (4) rounds are flown; and the highest total of the best four (4) flight scores when five (5) or more rounds are flown. Points from repeat flights may not be added to earlier flights. Each flight is complete in itself. In case of ties, the best nonscored flight of the contestant shall be used to determine the higher placement.

13.2. Although normalizing is the expected method of scoring at a contest, a CD has the option of not using normalizing if he so advertises in advance.

• 14. Flight Pattern and Maneuvering Area. The maneuver schedules of all classes must be executed in the order in which they are listed during an uninterrupted flight within a maneuvering area or "box" bounded by lines 60 degrees each side of center. The vertical height shall not exceed 60 degrees from the horizontal. The boundaries of the maneuvering area may be marked by the placement of vertical poles at the center position and 60 degrees right and left on a line approximately 150 meters in front of the pilot, or by surface lines of white or contrasting color originating at the pilot's position, or both, depending on local conditons and topography. The judges shall be seated not more than 10 meters behind the pilot's position (the apex of the 60 degree lines) and within an area described by the extension of the 60 degree lines to the rear of the pilot. Maneuvers must be performed where they can be clearly seen by the judges. Center maneuvers should be performed centered in the maneuvering area in a plane exactly perpendicular to the judges' line of sight to the model. Scored turnaround maneuvers should not exceed the 60 degree right and left limits of the maneuvering area. Maneuvers in those classes with all scored turnarounds should be performed along a line of flight approximately 150 to 175 meters from the judges, with the main criteria being visibility. Infractions of any of the above rules are cause for downgrading in addition to those downgrades listed in the Description of Maneuvers section. Unscored turnarounds in any class may exit the maneuvering area.

14.1. 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 (2) passes may be made. In the maneuver lists that follow (U) and (D) denote mandatory maneuver orientation (Upwind–Downwind). This orientation, or *Direction of Flight* shall be determined by the direction of takeoff and landing as specified by the Event Director. In all classes, entry into the maneuvering area for the first maneuver after takeoff shall be in the upwind (U) direction.

14.2. If a maneuver other than landing is done out of order it shall be scored zero (0). 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 centered on the judges) is made the maneuver which should have been executed shall be scored zero (0).

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, and in proper upwind/downwind orientation.

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

14.6. In all classes, the contestant (or helper with the permission of the judges) must call out the initiation and completion of the takeoff and landing maneuvers and all maneuvering area entries and exits.

• 15. Novice Pattern Maneuvers.

1.	Takeoff (U)	k=1
2.	Straight Flight Out (U)	k=1
3.	One Half Reverse Cuban 8	k=1
4.	Straight Flight Back (D)	k=1
5.	Stall Turn (U)	k=2
6.	Immelmann Turn (U)	k=2
7.	Split "S"	k=1
8.	Three (3) Inside Loops (U)	k=3
9.	One (1) Horizontal Roll (D)	k=1
10.	Landing (U)	k=1
	Total	k=14

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

• 16. Sportsman Pattern Maneuvers.

1.	Takeoff (U)	k=1
2.	Double Stall Turn (U)	k=3
3.	One Half Reverse Cuban 8	k=1
4.	Cuban 8 (D)	k=2
5.	Immelmann Turn (U)	k=2
6.	Split "S"	k=1
7.	Three (3) Inside Loops (U)	k=3
8.	Straight Inverted Flight (D)	k=1
9.	Stall Turn	k=2
10.	One (1) Reverse Outside Loop (U)	k=3
11.	Three (3) Horizontal rolls (D)	k=3
12.	One Half Cuban 8	k=1
13.	Square Loop	k=2
14.	Landing (U)	k=1
	Total	k=26

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

• 17. Advanced Pattern Maneuvers.

1.	Takeoff (U)	k=1
2.	Double Immelmann (U)	k=2
3.	One Half Reverse Cuban Eight	k=1
4.	Slow Roll (D)	k=3
5.	Stall Turn	k=2
6.	Top Hat with 1/2 Rolls (U)	k=3
7.	Humpty Bump with Options	k=2
8.	Four (4) Point Roll (D)	k=4
9.	Stall Turn with 1/2 Rolls	k=2
10.	Cobra Two Point Roll (U)	k=2
11.	Immelmann Turn	k=2
12.	Six Sided Outside Loop (D)	k=4
13.	Split "S"	k=1
14.	Avalanche (U)	k=3
15.	Top Hat with 1/4 Rolls	k=2
16.	Triangle Rolling Loop (D)	k=4
17.	1/2 Square Loop with 1/2 Roll	k=2
18.	Three Turn Spin (U)	k=3
19.	Landing (U)	k=1
	Total	k=44

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

18. Masters Pattern Maneuvers.

1.	Takeoff (U)	k=1
2.	Square Loop with Four (4) Half Rolls (U)	k=5
3.	Half Reverse Cuban Eight	k=1
4.	Four (4) Point Roll (D)	k=4
5.	Immelmann Turn	k=2
6.	Reverse Top Hat (U)	k=4
7.	One and half Turn Spin	k=3
8.	Square Horizontal Eight (D)	k=5
9.	Top Hat with 1/4 Roll	k=2
10.	Avalanche (U)	k=3
11.	Half Cuban Eight	k=1
12.	Triangle Rolling Loop (D)	k=4
13.	Stall Turn with 1/2 Rolls	k=2
14.	Cobra Point Roll with 1/4 Up and Down (U)	k=3
15.	Half Square Loop with 1/2 Roll in Vertical	k=2
16.	Six-sided Outside Loop	k=4
17.	Split "S"	k=1
18.	Figure M with Half Rolls (U)	k=5
19.	Humpty Bump with Pilot's Option	k=2
20.	Reverse Knife Edge (D)	k=4
21.	Half Square Loop with Full Roll in Vertical	k=3
22.	Three (3) Turn Inverted Spin (U)	k=4
23.	Landing (U)	k=1
	Total	k=66

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

19. FAI Pattern Maneuvers. The FAI class shall fly according to the current FAI RC Aerobatics (F3A) rules. The builder-of-the-model rule, if any, shall not be enforced. The AMA Competition Regulations will be applied when the FAI Sporting Code is silent on, or does not provide guidance concerning the conduct or rules of the FAI - F3A events.

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 the spot assigned by the 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 the discretion of the Event Director. Any person causing interference will suffer immediate disqualification. The Event Director should provide a monitor receiver, if available, to check for interference.

20.3. The flight order shall be determined by random draw within each class, except wherever possible, frequency shall not follow frequency, and identical frequencies on adjoining flight lines shall be separated by at least two (2) positions in the flight order. The flight order shall rotate top to bottom each round that fraction of its length which corresponds to the number of rounds to be flown; for example: One-sixth of its length each round for a six (6) round contest. Alteration of the flight order by anyone other than the Event Director or his designated representative is not allowed. When multiple flight lines are used, a separate flight order shall be established for each flight line.

20.4. The Event Director shall carry out the following procedure.

20.4.1. Numbers one, two, and three on the flight order shall be on the flight line with their models, equipment, and one (1) helper if desired. Number one is contestant flying or ready to fly, number two is next man to fly, etc.

20.4.2. Number one man shall have three (3), minutes from completion of preceding flight in which to release model for the start of his flight, unless the preceding flier's aircraft is on the same frequency. In this case, the flier shall be provided sufficient time to perform a radio safety check prior to going on the clock. False starts are permitted within the three (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 the contestant of the start and end of the three (3) minute period.

20.4.3. Numbers four, five, and six on the flight order shall have their planes and equipment in a ready box located near the flight line. As soon as a flight is completed, the number four man becomes number three 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 order, and the order advanced to fill his place. The Event Director or his representatives 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 (2) or more flights be flown simultaneously under the following conditions.

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

20.5.2. Individual maneuvering area markings are established for each flight line.

20.5.3. The Event Director shall arrange the multiple flight orders so that delays due to frequency conflicts are minimized as far as possible.

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 (2) helpers.

20.7. Each flight should be judged by at least two (2) judges, with their scores averaged or totaled to give final score for the flight. It is suggested that each maneuver be scored immediately after it is performed. Judges shall score maneuvers individually and without consultation between them. There should be enough judges available to establish a rotational procedure which will average out variations in judging. Sets of judges shall judge all contestants an equal number of times. If different judges are used during the contest, all contestants shall have an equal opportunity to fly before all judges. Substitution of judges which precludes equal exposure by all contestants shall be avoided. If adverse weather conditions preclude equal exposure for all contestants the results of these flights may be disqualified at the discretion of the Event Director.

Definitions

Attitude: The angle of the fuselage of the model with respect to its track.

Maneuvering Area: The aerobatic zone or "box", bounded by lines radiating from the pilot's position 60 degrees each side of center, with a vertical height not exceeding 60 degrees and a depth determined by the model's line of flight.

Symmetry: The balanced and equal correspondence of opposing or superimposed maneuver elements with respect to size, shape, and position.

Track: The trajectory or flight path of the center of gravity of the model with respect to fixed ground reference.

Wind Correction: An alteration of aircraft attitude made for the purpose of compensating for the effects of wind drift on the track of the model. All maneuvers in RC Aerobatics are required to be wind corrected in such a way as to preserve the shape of the maneuver in the track of the model as described in Section E of the AMA RC Pattern Judges' Guide.

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 meets these expectations.

B. Principles. The principles of judging an RC model shall be based on the perfection with which the model executes the maneuvers described in section E. The main criteria used to judge the degree of perfection are:

1. Precision of the maneuver.
2. Smoothness and gracefulness of the maneuver.
3. Positioning or display of the maneuver.
4. Size or dimensions of the maneuver relative to the maneuvering area, distance from the judges, and other maneuvers in the flight.

The above criteria are listed in order of importance; however, all of them must be met for a maneuver to be rated perfect. These criteria are discussed below.

a. Precision. Grading of maneuver precision will be based on how well the model tracks the shape of the individual maneuver as described in section E, Description of Maneuvers. All maneuvers in RC Aerobatics are required to be wind corrected in such a manner as to preserve the shape and symmetry of the maneuver in the track of the model. All straight lines, both horizontal and vertical, will be graded on the track projected by the model. Changes in attitude of the model to maintain a straight track will not be reason for downgrading the maneuver.

The judge should form an image of the forthcoming maneuver based on using the straight and level entry identified in section D, Judging Individual Maneuvers, as a reference. The absence of a definite entry into a maneuver increases the difficulty of judging its precision and competitors will recognize this as justification for downgrading. The straight and level exit from a maneuver is one of the more valuable portions of a maneuver in evaluating how well the intended course of the maneuver was followed. Therefore, the absence of a well definied straight and level exit should also result in downgrading.

Calling of the landing and takeoff maneuvers as well as all maneuvering area entries and exits is required (see 14.6.). Failure to correctly call an entry or exit of the maneuvering area should result in a major downgrade of the maneuver immediately following the failure to call.

b. Smoothness and Gracefulness. A most general definition would relate to providing a smooth, flowing, polished appearance in flight. 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 joined with sudden angular jerks. Rotations in the pitch axis of the model should be made evenly and be of sufficient radius to give a smooth appearance in flight. Excessivly tight maneuvers should be avoided.

c. Positioning. All scored maneuvers except landing and takeoff must be performed within the maneuvering area. The center maneuvers in all classes should be performed in the center of the maneuvering area in a plane exactly perpendicular to the judges' line of sight to the model. In those classes with scored turnarounds, the turnaround maneuvers should not exceed the limits of the maneuvering area as defined in the RC Pattern rules (see 14.).

The diagrams used to describe the maneuvers in section E are intended to represent the geometry of the maneuver three-dimensionally. They are not intended to define the best view of the maneuver to present to the judge. "End on" or "canted" presentation of maneuvers is reason for downgrading and should be avoided, unless the maneuver is intentionally offset (with permission of the judges) to avoid the sun.

While no bonus for exceptionally low altitude is justified, the entry and exit altitudes for all maneuvers should be the same (as noted in section E, Description of Maneuvers). In general, scored turnaround maneuvers are positioning maneuvers. Therefore, entry and exit altitude need not be the same if the pilot is making an altitude correction. The downgrade should be taken on the previous out of position maneuver. An additional downgrade for a position correction in the turnaround would, therefore, amount to two (2) downgrades for one (1) mistake. Unscored turnarounds, of course, may be used to position the aircraft in any manner required.

It should be noted that it will sometimes be impossible for a competitor to avoid the sun in the course of a flight involving scored turnarounds. The judge should follow through to the best of his/her ability, and resist the temptation to downgrade the maneuver for this unfortunate circumstance. In those classes with predominantly unscored turnarounds it may be possible for the competitor to offset maneuvers to avoid the sun. If this is to be done, it should be discussed between the competitor and the judges prior to the flight. If, after such discussion, an aircraft crosses the sun unnecessarily the judge is perfectly justified in being quite severe.

d. Size. Flying so far out as to make evaluation of a maneuver difficult should be severely downgraded. The main criteria here is *visibility*. For a large, highly visible model, a line of flight approximately 175 meters in front of the pilot may be appropriate, while a smaller and less visible model might have to be flown at 140 to 150 meters. Maneuvers performed on a line greater than approximately 175 meters in front of the pilot should be downgraded under any circumstances, as even the keenest eye begins to lose perspective at this distance.

Since the size of the maneuvering area varies proportionally with the distance from the judges to the model's line of flight, the size of the maneuvers will vary as well. In addition, maneuvers should be proportioned relative to the size of the other maneuvers in the flight. In other words, absolute maneuver size is of little importance; maneuver size relative to the available maneuvering area and other maneuvers in the flight is paramount.

In those classes with mostly unscored turnarounds, the competitor should proportion the maneuver sizes, especially those with loops, squares, or verticals, to the distance out within that broad corridor that he/she chooses to fly. Large maneuvers placed close in will suffer downgrading for exceeding the vertical 60 degree maneuvering area limit, and small maneuvers placed far out will suffer downgrading for appearing to hide the maneuver.

In all classes, the judge should be careful to judge only the skill with which the maneuver is flown and presented, not the performance of the aircraft. A slow flying model, flown closer to the judges and flying proportionally smaller maneuvers may present the same "pace" and appearance as a faster flying model flown at a greater distance with proportionally larger maneuvers.

C. Accurate and Consistent Judging. The most important aspect of consistent judging is for each judge to establish his/her standards and to maintain that standard throughout the meet. It is advisable for the Contest Director or Chief Judge to hold a briefing prior to the start of the meet in order to make the standards as uniform as possible. This is done best by means of a practice flight or flights which all judges score simultaneously and privately. After each flight, the defects in each maneuver should be discussed by all judges and agreement reached about the severity of the defects. However, once this is done and the contest is started, the individual judge should not alter his/her standards under any influence.

An accurate standard of judging is also very important. Being a consistent judge, whether high or