



Radio Control Precision Aerobatics Rule Book 2010

FORWARD

The Radio Control Precision Aerobatics rulebook has been revised to reflect changes made to the rules by both FAI and the Precision Aerobatics Committee. An attempt has been made to cull the repetitive data. This is the official document governing Precision Aerobatics in Canada.

The format of this document has changed considerably from previous versions. Though the format has been changed to try to make it more user friendly, the content is essentially the same as it has been for some time. Much of the text is extracted from the FAI Sporting Code.

The intent to any set of rules is to have a pre-determined guideline by which you can attend an event and reasonably know what to expect. If the rules are such that they are unreasonable or unmanageable then there is a pre-determined path to change or update those rules to reflect what the group of persons who utilize them needs.

The content of this rulebook is only as effective as the ability and dedication of its users to understand and apply its regulations. It is not perfect, but it should reflect the actual practice of Radio Control Model Aerobatics in Canada. Should you have any questions or suggestions to enhance the rules or the book, contact your local committee member or the Chairman.

Canadian pattern schedules have been set on a two-year cycle except for minor changes, i.e. one manoeuvre not the entire pattern. The next change may be made for the 2011 season.



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SECTION 1: GENERAL RULES

1.0 SCOPE OF RULES

These rules are published by the Precision Aerobatics Committee of the Model Aeronautics Association of Canada. They define the standard by which contests held in Canada should be operated.

For these rules to be effective as a standard, the Contest Director should do his/her best to apply the rules to their Precision Aerobatics contest. Particularly at MAAC sanctioned contests, if these rules are not to be applied then the advertising for the contest should reflect the changes that will be made.

Section 2: Contest Operation provides a guideline for the operation of contests. There should be some flexibility, which will allow a smaller local contest to proceed without being bound to the more rigid format of a larger, or FAI competition.

1.1 COMPETITOR ELIGIBILITY

All pilots at MAAC Charter Clubs are required to produce a valid membership card for either MAAC or AMA. These numbers must be recorded on the entry form of the contestant.

Should a competitor turn up without proof of valid membership in either MAAC or AMA they may be enrolled on the spot by a MAAC Charter Club. The appropriate membership forms are available from MAAC and can be sent with your Sanction forms should you request it. When the competitor completes the application for membership and pays the fee the Contest Director should co-sign the form noting the time and date of the application.

Should a MAAC member turn up without proof of membership, this application process should be completed and upon receipt of the application MAAC HQ will return the check to anyone who is already a member. This process will protect both the member and the club in the event of an unplanned incident.

1.2 CHARACTERISTICS OF RADIO CONTROLLED AEROBATICS MODELS

1.2.1 DEFINITION OF RADIO CONTROLLED POWER MODEL

An aeromodel which is aerodynamically manoeuvred by control surface(s), in attitude, direction and altitude by a pilot on the ground using radio control, but not a helicopter.

1.2.2 PREFABRICATION OF THE MODEL

No restrictions.



1.2.3 CONSTRUCTION PARAMETERS OF THE MODEL

Maximum overall span: 2 m

Maximum overall length: 2 m

Maximum total weight: 5 kg without fuel

Power source limitations: Any suitable power source may be utilized except those requiring solid propellants, gaseous or liquefied gaseous fuels. Electric powered models have no restriction on voltage or current for the propulsion circuit. Model aircraft using electric motors, as a power source, shall be weighed without batteries used for those motors.

1.2.4 NOISE RESTRICTIONS

The maximum noise level will be 96 dB measured at three meters from the centerline of the model placed on the ground at the flying site. With the model running at full power, measurement will be taken 90 degrees to the flight path on the right hand side, downwind from the model. The microphone will be placed on a stand 30 cm. above the ground in line with the motor. No noise reflecting objects shall be nearer than three meters to the model or microphone. The noise measurement will be made prior to each flight.

In the event that a model fails the noise test, no indication shall be given to the pilot, and/or his team, or the judges, and both the transmitter and the model shall be impounded by the flight line official immediately following the flight. No modification or adjustment to the model shall be permitted (other than refueling). The model shall be re-tested by a second noise steward using a second noise meter and in the event that the model fails the re-test, the score for the preceding flight shall be 0.

The flight time will be interrupted while the noise check at the flying site is being made. The competitor shall not be delayed more than 30 seconds for the noise check.

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

1.2.5 RADIO EQUIPMENT

Radio Equipment shall be of the open loop type (i.e., no electronic feedback from the model to the ground). Autopilot control utilizing inertia, gravity or any type of terrestrial reference is prohibited. Automatic control sequencing (preprogramming or automatic control timing devices are prohibited).

Examples:

Permitted:



- a) Control rate devices that are manually switched by the pilot.
- b) Any type of button or lever control that is initiated and terminated by the pilot.
- c) Manually operated switches to couple control functions.

Not Permitted:

- a) Snap buttons with automatic timing mode.
- b) Preprogramming devices to automatically perform a series of commands.
- c) Autopilots or Gyro devices for any automatic controls or functions.

1.2.6 IDENTIFICATION OF MODEL

All models entered in a Radio Control Precision Aerobatics competition shall be identified by the contestant's MAAC (or AMA) number permanently attached in an easily visible location on the model. Both stroke and width shall be such as to be readily recognizable.

1.2.7 NUMBER OF AIRCRAFT

The contestant may enter two aircraft and fly either one as he sees fit. Radio equipment and engine may be changed at any time. This means that a contestant may bring two aircraft to the ready line for an official attempt - providing the second aircraft is on a frequency consistent with the flight line in question. Substitution of the second aircraft must be one within the three minute starting time.

1.3 SAFETY REQUIREMENTS

Consideration of safety for spectators, contest personnel and other contestants is of the utmost importance in this event, and the following safety provisions must be observed.

1.3.1 GENERAL INSPECTION

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

1.3.2 CONTROL OF AIRCRAFT

If any part of a manoeuvre is performed over a controlled spectator area, pit area, parking area, etc., the contestant shall receive a zero score for that manoeuvre. Continued flying of any sort over a controlled spectator area, pit area, parking area, etc., shall result in the flight being disqualified by the judge(s) provided the contestant has been warned at least once.

Inability to control the aircraft on the ground, or dangerous flying of any sort, or poor sportsmanship of any kind shall be grounds for disqualification of the aircraft of contestant involved.



1.3.3 PROPELLERS

Either acorn type nuts or spinners with a minimum radius of 1/8" shall protect all propeller shafts.

Metal propellers are prohibited.

1.4 **MAAC RADIO CONTROL PRECISION AEROBATICS PROGRESSION SYSTEM**

Competitors may move up from one class to the next higher class at any time they desire. A competitor may not move back a class unless s/he has not placed 1st, 2nd or 3rd in any contests for 1 full year, at which time s/he may move back 1 class only. A competitor may not move back a class more than once every three full years.



SECTION 2: CONTEST OPERATION

This section contains the guidelines for running a Precision Aerobatics Contest.

Section 2.0 contains the general rules for how to run your contest. Section 2.1 is specific to a Team Trial, and Section 2.2 contains suggestions for setting up your field.

2.0 GENERAL CONTEST OPERATIONS

This section contains the generic rules which will apply to all contests run in Canada. These are meant as a guideline and are subject to local conditions.

In the event of a conflict between rules, the rule specific to the level of the contest will take precedence.

2.0.1 NUMBER OF HELPERS

Each pilot is allowed two helpers. One may be present during start of motor, to carry airplane out, and to retrieve airplane, while the other calls the manoeuvres.

2.0.2 DEFINITION OF AN ATTEMPT

There is an attempt when the competitor is given permission to start and:

- a) When the pilot announces the takeoff manoeuvre;
- b) When the model fails to commence the takeoff manoeuvre within the 3 minutes allowed for the competitor; and
- c) If the motor stops after the pilot has announced the start of takeoff and before the model is airborne, it may be started (within the 3 minute period). However, no points will be awarded for the subsequent takeoff manoeuvre.

2.0.3 NUMBER OF ATTEMPTS

Each competitor is entitled to one attempt for each official flight.

An attempt can be repeated at the judge's (or CD's) discretion only when for any unforeseen reason outside the control of the competitor, the model fails to make a start. (E.g. There is radio interference.)

When a flyer is instructed to land the aircraft during a flight by the Contest Director or his/her representative for reasons outside the control of the competitor, it shall be the competitor's decision whether to start the entire flight over or to continue from the point of the last completed and judged manoeuvre.



2.0.4 DEFINITION OF AN OFFICIAL FLIGHT

There is an official flight when an attempt is made, whatever the result.

2.0.5 MARKING

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

Landing outside the landing zone is considered unsafe and will be penalized with the loss of 10 points from the flight score for each counting judge.

Note: The landing zone may be designated by:

- a) A circle of 50 meters (165 feet) radius, or
- b) Lines across a standard runway spaced 100 meters (328 feet) apart, where the runway is at least 10 meters (32 feet) wide.

If any manoeuvre is not completed as described or is unrecognizable as described, the manoeuvre shall receive a score of zero.

In Sportsman, the scoring is 10 for each manoeuvre with no K factor. For Intermediate, Advanced, Expert and FAI, the scoring is 10 for each manoeuvre with K factors as indicated on the manoeuvre lists.

If two or more judges are used, all scores are added together for each manoeuvre then multiplied by the K factor where applicable. If 4 or more judges are used, then the high and low scores are discarded and the remaining scores are added for each manoeuvre and multiplied by the K factor where applicable.

In all classes, the manoeuvres must be flown in the order as listed on the score sheet. Manoeuvres flown out of sequence will receive an automatic ZERO score.

Manoeuvres not flown as marked (i.e., two loops instead of three) will receive an automatic ZERO score.

2.0.6 MARKING SPORTSMAN

Each manoeuvre may be awarded marks between 0 and 10 by each of the judges during flight. Any manoeuvre not completed should be scored 0. The manoeuvre must be performed in a plane and at a height, which will allow them to be seen clearly by the judges, approximately 60° vertically and 90° horizontally. The non-observance of this rule will be penalized by loss of points.

In Sportsman, two dead passes are allowed in addition to the one after takeoff and the one before landing.

The pilot or his/her helper must announce the beginning and completion of each manoeuvre.



2.0.7 MARKING INTERMEDIATE, ADVANCED, EXPERT AND FAI

Each manoeuvre may be awarded marks between 0 and 10 by each of the judges during the flight, with the exception of the FAI Takeoff and Landing Procedures, which are, judged either 0 or 10. These marks are multiplied by a coefficient, which varies with the difficulty of the manoeuvre. Any manoeuvre not completed should be scored 0.

Center manoeuvres should be performed in the center of the manoeuvring area while turnaround manoeuvres should not extend past a line 60° left or right of center. Vertical height should not exceed 60 degrees.

Manoeuvres should be performed along a line a flight not more than approximately 150 meters in front of the judges. Infractions of this rule will be cause for downgrading by each judge individually and in proportion to the degree of infraction.

The maneuvering area will be clearly marked with white vertical poles, a minimum of 100 mm. in diameter and a minimum of 4 meters high, placed on center and 60 degrees each side of center on a line 150 meters will also be used to mark the extreme limited (60° left and right of center) of the manoeuvring zone. Audible or visual signals to indicate violations of the manoeuvring zone are NOT to be employed.

The judges should 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.

At the conclusion of the flight, each judge will independently score the model for in-flight noise level, indicating if the model is too noisy, the flight score will be penalized 5 points for each counting judge.

Note: The above paragraph is optional at local contests and should be advertised if it to be imposed.

2.0.8 PILOT'S BRIEFING

The Contest Director should review and comment on all of the following items:

- a) Local rules, safety, spectator's area;
- b) Review list(s) of flyers/judges, if applicable;
- c) Define the number of attempts per round for all classes;
- d) State the time limits in effect for all classes;
- e) If fly-offs are to be held, CD to review and comment;
- f) Time allowed between flights;
- g) Dead pass rule.



The procedures listed in Section 2.0.9 are suggestions that may be altered at the discretion of the event director or CD to suit local conditions.

All contestants shall be set up in a "Pit Area" assigned by C/D so that they may be under his immediate control.

There will be no testing of transmitters during the flying period of the contest except that which has the approval of the C/D. Any unauthorized use will be grounds for immediate disqualification of the person involved.

It is strongly suggested that the C/D impound, in an appropriate area, the contestant's transmitter prior to the commencement of flying. Should a contestant register after flying has commenced, his transmitter should be impounded at the time of registration. All transmitters are to be re-impounded after each flight.

The flight line order shall be determined by the position of contestants' names on a flight list(s) maintained by the flight line coordinator(s). The list(s) shall include all classes and frequencies as are necessary. The contestant shall have his name on the list only once at any one time, unless scale is being flown from the same flight list. Since many contestants act as mechanics for other contestants, positions between contestants may be traded only once (with the approval of the compatibility of adjacent contestant frequencies). In an effort to speed up the flight lines, the frequencies will be distributed as evenly as possible between flight lines; in addition, (wherever possible), contestants with identical frequencies will not follow each other on the flight line in question but rather, will be separated by a contestant on a different frequency.

Unless stated otherwise, at the pilot's briefing session at the start of the contest, the flight line list shall carry over from day to day. Contestants will obviously not be listed on the flight line in order of entry; preference (low on the flight line list or as requested) should be given to flyers that pre-register in order of receipt of entry forms.

No flight line information shall be posted until it has been seen and checked by the CD.

The flight line coordinator should carry out the following procedure:

- a) Numbers 1, 2, and 3 on the flight list should be in ready boxes with their aircraft, equipment and one helper if desired.
- b) As each flight is completed, each contestant shall move his aircraft to the next lower "ready box" number. When ready, box No. 1 is vacated by the contestant going to fly.
- c) The flight line coordinator will then fill No. 3 box from his flight list and warn the next contestant to get ready.
- d) It is strongly recommended that two flight lines and lists be used.



- e) Should a contestant oppose flying simultaneously with another, he may only change position at the discretion of the flight line coordinator. The flight line coordinator's decision shall be final.
- f) Should a contestant not be ready to fly when his turn comes up, he may lose the flight of the round in question, subject to the discretion of the C.D. Contest Directors and flight line coordinators should discourage the habit of allowing a flyer "to drop to the bottom of the flight line", as this wastes time and disrupts the order of the flight line sequence.

There shall be no limit on the number of flights (other than that imposed by time available).

Flying shall be done in the area of sky as designated by the CD or judge(s): wind, sun, other flight line, spectator's area, etc., shall be taken into consideration.

2.0.10 SCORE SHEETS

It is mandatory that score sheets be used so that the score for each individual manoeuvre may be recorded.

No scores can be changed after a score has been entered and the flight has ended.

The score sheets must be returned to the contestant after the total score has been recorded. This will allow him to see how well he has done each manoeuvre in the eyes of the judges. (He may also check the score sheet for errors and comments.)

Flyers are not permitted to have the score sheet in their possession from the time the flight commences until the scores have been entered or tabulated.

Any disputes regarding the scoring of a manoeuvre should be brought to the attention of the CD immediately after they are noticed.

Incorrect totaling of the score must be brought to the attention of the recorder immediately.

When computer scoring is used it is recommended that the tear away portion of the score sheet be attached to the raw score printout. This will ensure the scores on the score sheet match the scores in the computer.

2.0.11 OFFICIALS

The recommended officials for a contest are as follows:

- a) Contest Director
- b) Recorder (for entries and scores) One recorder for each judge for Intermediate, Advanced, Expert and FAI classes.
- c) Transmitter Controller (for impounding area)



- d) Flight line coordinator
- e) Three judges per flight line (2 or more)
- f) One timekeeper per flight line
- g) One runner per flight line (to transport scores from judges to recorder)
- h) Enough people to relieve and rotate each other

If flyer/judges are to be used, the flyers that are selected to judge will be notified when and where they are to judge via a list posted in a prominent location before the start of the first round. Except in the instance of a valid excuse, failure to judge, or late arrival for the start of a round, could be reason for disqualification. Flyers unable to judge should so indicate in writing when registering.

2.0.12 DISPUTES

Any grievances must be brought to the attention of the C.D. or his representatives immediately. His decisions or interpretations are final. If a contestant is not satisfied with a decision, he may write to the R/C Precision Aerobatics Committee Chairman, giving full details, so that further rules, changes, interpretations, etc., may if necessary, be incorporated into the rule book.

It is realized that due to unforeseen circumstances, problems do arise at a contest; in such cases the C.D. of that contest has the final say. This type of problem should be noted in the CD's report and decision made.

If a Contest Director fails to file a report of a contest within two weeks from the date of the contest, his Contest Director's license shall be revoked.

A copy of the Contest Director's contest report must be sent to the R/C Precision Aerobatics Committee chairman.

2.0.13 LATE ARRIVAL

Should a contestant enter late and have missed a flight (or round), he/she may not pick it up.

2.0.14 FLY-OFFS

Where the winners of a Precision Aerobatic competition are to be determined by final fly-offs involving contestants that qualify in earlier round, the C.D. or event directors shall clarify the following points at the pilot's briefing session before commencement of the qualifying rounds:

- a) How many pilots will qualify for the fly-offs.
- b) In the event of a tie for the last qualifying position: Ties are broken by the next highest flight score, not already used in the calculations of placings.



- c) In the event one or more of the qualifiers decides not to fly or is unable to fly in the fly-offs, these remaining qualifying positions will NOT be filled by non-qualifying contestants.
- d) The minimum number of rounds to be flown and the manner in which winner will be selected – best 1 of 1, 1 of 2, 2 of 2, 2 of 3, 3 of 3, .. of 3, .. of 4, etc.

2.0.15 EXECUTION OF MANOEUVRES

The manoeuvres must be executed during an uninterrupted flight in the order in which they are listed. The competitor may make only one attempt at each manoeuvre during the flight. The pilot has three minutes to start his motor and ten minutes to complete his flight, both the three minutes and the ten minutes to start when the competitor is given permission to start his motor.

The model must take-off and land unassisted, that is, no hand launched flights. If any part of the model is dropped during the flight, scoring will cease at that point and the model must be landed immediately.

The flight ends when the landing sequence is completed. Scoring will cease with the expiration of the ten-minute time limit.

2.0.16 Scoring

For scoring of PA contests with 4 or less rounds, best 3 scores be used to determine standings. When there are more than 4 rounds, the best 4 scores be used to determine standings. Note: a minimum of 3 rounds must be completed to make a contest official.

2.1 TEAM TRIALS

The Team Trials is a contest, which is used to select the pilots who will represent Canada in Official International Competitions sanctioned by the FAI. The Canadian Team Trials follow the current FAI Preliminary (P-xx) and Semi-Finals (F-xx) round and scoring structure for choosing the Canadian National Team.

Judging requirements will be left at the discretion of the CD, however no less than 3 judges for preliminary rounds, and 5 for semi-final rounds will be utilized.

The current Preliminary and Semi-Final schedules as defined in the FAI Sporting Code will be used at the Team Trials competition in the above format. To ensure continuity with International Competition and prove an ability to meet such criteria, the rules specified in the FAI Sporting Code will be strictly adhered to.

The inability to meet any of the FAI Sporting Code rules at a Team Trials will be documented in detail and forwarded to MAAC headquarters and the Chairman of the Precision Aerobatics Committee.

Effective 01 September, 1999, FAI - F3A team members must qualify previous to the team trials, by competing in 4 qualifying events. The qualifying events will be in a 2-year period preceding the team trials, with no less than 1 event in each year. A qualifying event is a MAAC sanctioned Precision Aerobatics



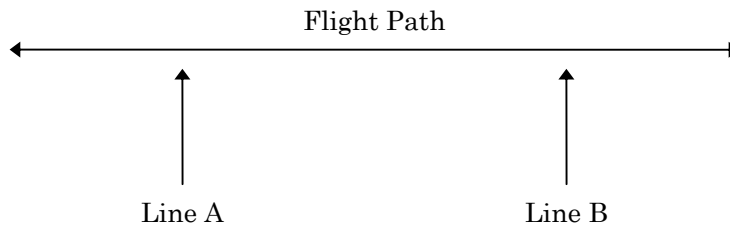
event with a minimum of 3 FAI pilots, and excludes the team trials. The onus is on the individual competitor to prove he/she has met this requirement to the team trials contest director at time of team trials.

The qualification for the team trials may be waived for a pilot who is unable to meet the qualification standards but believes they have sufficient experience to attend the team trials. The pilot who wishes to attend the team trials without proper qualification must submit a letter detailing their reasoning to be allowed to participate to the committee chairman at least two months prior to the event. The committee chairman shall respond with his/her decision in writing no later than one month prior to the event.

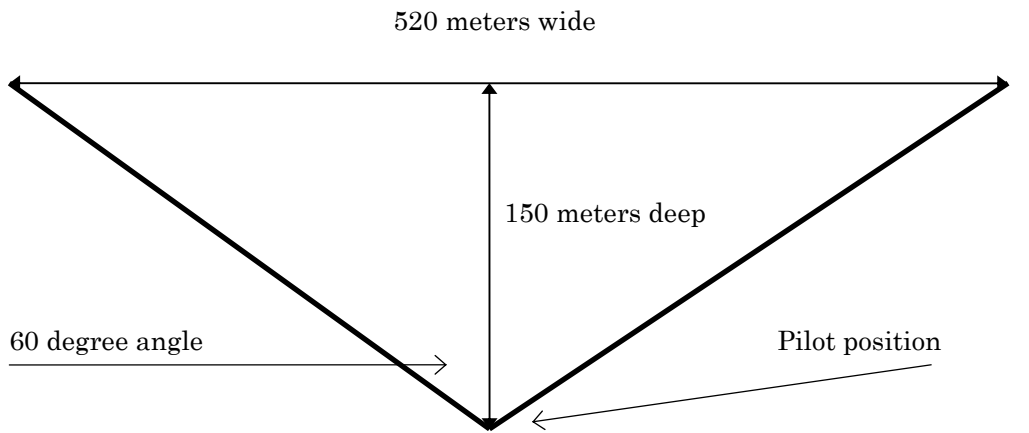
The Contest Director is to complete a CD's Report and forward a copy to MAAC headquarters and the Chairman of the Precision Aerobatics Committee within 10 days of the conclusion of the contest.

2.2 FIELD SETUP

It is suggested that contest directors be prepared to operate two flight lines. In the event that both are not needed the CD can decide which is to be used.



Turnaround flight is performed in a box, which is approximately 520 meters wide and 150 meters deep. It is a good idea to mark the two lines running at 60 degrees from the apex in a contrasting color to allow the pilot, who stands at the apex, the ability to visualize the edges of the box.

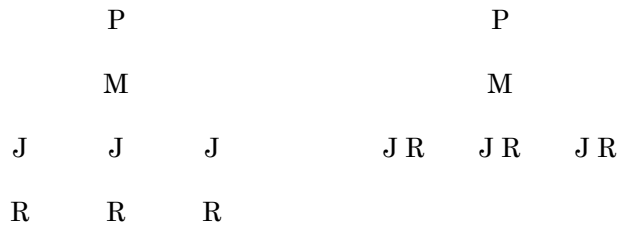


2.3 JUDGE AND RECORDER POSITIONING

Judges are required for all events. Most judges will desire to have a recorder so as not to miss something that happens in the sky while writing down the previous score. Use the appropriate number of judges and recorders as suits you conditions.

Judges should be positioned about 5 to 15 feet behind the pilot and mechanic, inside a triangle, which would be prescribed by extending the lines denoting the ends of the box. They should be close enough that they can hear the mechanic call the manoeuvres, but far enough away that the pilot and mechanic cannot hear the score for each manoeuvre passed to the recorder.

This diagram is a guide. Adjust the actual positioning to suit your local needs.



2.4 TRANSMITTER IMPOUND

Although a transmitter impound is not a requirement, most CD's would not consider running a contest without using one. Even with an impound in force during your contest, it is a good idea for the impound attendant to utilize a standard MAAC Frequency Control Board to track the frequencies in use.

The attendant should also have a copy of the flight rotation to allow him to identify a frequency conflict before it arrives. Usually with only one flight line this would not be a problem, however when using more than one flight line it is common to have to make the occasional shift in flight order due to frequencies.



SECTION 3: JUDGING GUIDELINES

3.0 PURPOSE

The purpose of the FAI F3A Judges Guide is to furnish an accurate description of the major classes of aerobatic manoeuvres and their judging criteria as reference for use in developing a uniformly high standard of judging.

3.1 PRINCIPLES

The principles of judging an aerobatic model should be based on the perfection with which the model executes the aerobatic manoeuvres as described in Annex 5A. The main principles used to judge the degree of perfection are:

- a) Precision of the manoeuvre.
- b) Smoothness and gracefulness of the manoeuvre.
- c) Positioning or display of the manoeuvre.
- d) Size of the manoeuvres relative to the maneuvering area and other manoeuvres in the flight.

The above requirements are listed in order of importance, however, all of them must be met for a manoeuvre to receive a high score.

3.2 ACCURATE AND CONSISTENT JUDGING

The most important aspect of consistent judging is for each judge to establish his standard and then maintain that standard throughout the contest. It is advisable for the contest director or the organizer to hold a conference prior to the start in order to discuss judging and make the standards as uniform as possible. This is effected by means of practice flights, which all judges score simultaneously and privately. After these flights, the defects in each manoeuvre should be discussed by all judges and agreement reached about the severity of defects. Once the contest is started, the individual judge should not alter his standard under any influence.

An accurate standard of judging is also very important. Being a consistent judge, whether high or low, is not good if the scores awarded are not a fair reflection of the manoeuvre performed.



3.3 CRITERIA FOR JUDGING MANOEUVRES

In Annex 5A, a description of each manoeuvre is given along with a partial listing of possible downgrades. Each manoeuvre should be downgraded according to:

- a) The type of defect;
- b) The severity of the defect;
- c) The number of times any one defect occurs, as well as the total number of defects;
- d) The positioning of the manoeuvre;
- e) The size of the manoeuvre relative to the other manoeuvres being flown.

A high score should be given only if no major defects are found and the manoeuvre is well positioned. When in doubt, give the lower score.

3.3.1 ATTITUDE AND FLIGHT PATH

The flight path of a model is the trajectory of its center of gravity. The attitude is the direction of the fuselage centerline in relation to the flight path.

If not otherwise stated, all judging is based on flight path.

3.3.2 THE 1 POINT/15 DEGREE RULE

This basic rule provides a general guide for downgrading deviations from defined manoeuvre geometry. One point should be subtracted for each approximate 15 degrees deviation. In general lines can and should be judged more critically than deviations in yaw or roll.

3.3.3 GRADING CRITERIA FOR THE INDIVIDUAL MANOEUVRES

These criteria are furnished to provide the judge with a guide for downgrading deviations from the defined manoeuvre geometry. The manoeuvres are divided into their different components; lines, loops, rolls, stall-turns, snap rolls, spins and loop/roll combinations.

3.3.4 LINES

All aerobatic manoeuvres are started and ended by a horizontal line. When no line is flown between two manoeuvres, the upcoming manoeuvre should be downgraded by 2 points.



The total length of a vertical or climbing line, as dictated by the performance of the model, is not a grading criterion. The model's performance must not be allowed to influence a judge's mark.

All lines within a manoeuvre have a beginning and an end, which define their length. They are preceded and followed by part loops. The length of a line should only be graded when a manoeuvre contains several lines with a given relationship, as in a square loop. If there is a minor misrelation, 1 point is subtracted; more points are subtracted for greater defects.

Whenever a type of roll is placed on a line, the length of the line before and after the roll must be equal. One point is subtracted for a reasonable difference. If there is a complete absence of a line before or after the roll, 2 points are subtracted.

3.3.5 LOOPS

A loop must have, by definition, a constant radius, and must be flown in the vertical plane throughout. It starts and ends by a well-defined line, which, for a complete loop will be horizontal but for a part-loop however, such lines may be in any other plane of flight as required by the particular manoeuvre being flown.

The part-loops within one manoeuvre must have the same radius. A slight difference in radius should downgrade the manoeuvre by 1 point, while a more severe difference may downgrade it by 2 or 3 points.

Every loop or part-loop must be flown without interruption to the circular flight path. Every clearly seen segmentation should be downgraded by 1 point.

If the loop is not flown entirely in the vertical plane, i. e., it drifts to one side, a minor drift should be downgraded by 1 point, while a more severe drift should be downgraded by several points.

In a hesitation loop, such as a square loop, higher marks should not be awarded for flying tight, high g corners. The criteria is the loop should be hesitated by a visible line the defined number of times and all part-loops should have the same radius.

3.3.6 ROLLS

Rolls may be flown as individual manoeuvres, or as parts of other manoeuvres. The following criteria apply to all rolls:

- a) The rate of roll must be constant. Small variations in roll- rate should be downgraded by 1 point, while more severe variations receive heavier downgrades.
- b) The roll must have a crisp and well defined start and stop. If a start or stop is badly defined, 1 point is subtracted for each.



- c) All rolls flown on lines between part-loops must be placed on the middle of that line. For downgrading, see 4.3.1.
- d) Point-rolls must hesitate with equal time on each point. 1 point is subtracted for slight variations, while more severe mistiming is further downgraded. If one or more point is not visible, or there are more than the required number of points, the manoeuvre is severely downgraded (5 or more points).

3.3.7 STALL TUNS

The criteria in this manoeuvre are mainly about lines. The lines must have exactly vertical and horizontal flight paths.

The maximum allowable radius of the pivot is 1/2 wingspan. If the radius exceeds 1-1/2 wingspan, the manoeuvre is severely downgraded. If the model shows a pendulum movement after the pivot, it is downgraded by one point.

The entry and exit must consist of part-loops with even and equal radius.

Any types of rolls must be placed on the middle of the lines. The length of the vertical lines is not a judging criteria.

3.3.8 SNAP ROLLS

A snap roll is a rapid auto-rotative roll where the model is in a stalled attitude.

Snap-rolls have the same judging criteria as axial rolls as far as start and stop of the rotation and constant flight path through the manoeuvre.

Since the model is in a stalled condition throughout the manoeuvre, the attitude and flight path must show a definite break before the rotation is started. If the stall does not occur and the model barrel rolls around, the manoeuvre is zeroed.

Snap rolls can be flown both positive and negative. The same criteria apply. If the model returns to an unstalled condition during the snap, it is severely downgraded.

3.3.9 SPINS

All spins begin and end by horizontal lines. In order to spin, the model must be stalled. The entry is flown in a near horizontal flight path with the nose-up attitude increasing as the speed decreases. The nose then drops as the model stalls. Simultaneously as the nose drops the wing also drops in the direction of the spin.

If the model does not stall or if the model is snap-rolled into the spin, the manoeuvre is zeroed.

After the defined number of turns, the stop of rotation is judged in the same manner as for a roll, i.e., one point downgrade for each 15-degree deviation of heading.



A near vertical downward line of visible length must be held after the rotation stops. The pull or push-out is judged like a part-loop. Remember that different models spin in different attitudes, and that the attitude is not to be taken into consideration as long as the model is stalled.

3.3.10 LOOP/ROLL COMBINATIONS

These manoeuvres are the most widely used turn-arounds. They are very diversified, but all are combined of loops, rolls/snap rolls and lines. All judging criteria for these apply.

There are, however, some judging criteria, which should be explained further. In the Immelmann Turn, the half roll should be flown immediately after the half loop. A visible line in between should be downgraded by 2 points.

One Half Cuban 8's and Half Reverse Cuban 8's, the roll should be placed on the middle of the line. The radius of the 1/8 loop should be the same as the 5/8 loop.

In Humpty-Bumps, the loop on the top must be of reasonable size and have a constant radius. Falling forward (or tight radius) should be downgraded.

3.3.11 WIND CORRECTION

All manoeuvres are required to be wind corrected in such a way that the shape of the manoeuvre as described in Annex 5A is preserved in the model's flight path.

3.3.12 POSITIONING

The entire flight must be within the aerobatic zone to avoid being penalized. The middle manoeuvre should be flown with its center 90 degrees in front of the judges line. If the manoeuvre is flown off-center, it will be downgraded according to the misplacement. This may be in the range of 1 to 4 points subtracted.

If an entire manoeuvre including entry and exit is flown out of the aerobatic zone, it should be zeroed. Downgrades for flying a manoeuvre partially out of the zone should be in proportion to the degree of infraction, i. e. a small part of the manoeuvre flown past the 60 degree line would call for a minor downgrade, perhaps up to one point, while most of the manoeuvre flown past the 60 degree line should be downgraded more severely, say three or more points. Also, violations of the 60 degree line that occur near the 150 meter line (i.e. approximately over the



60 degree flags) should be downgraded much less severely than violations along a line further out and more distant from the judges.

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

In general, turn-around manoeuvres are positioning manoeuvres. Therefore, entry and exit altitude need not be the same if the pilot is making an altitude adjustment.

3.3.13 Hot-Dogging

The execution of free-style aerobatic manoeuvres or “hot-dogging” during the allowed free passes after takeoff and before landing is specifically prohibited. Contestants may manoeuvre the aircraft as necessary for trim purposes, and may employ any simple 180-degree turnaround manoeuvre of their choice to position the aircraft for landing or entry into the manoeuvring area. If, in the judges opinion, a prohibited manoeuvre has been performed during the allowed free passes the following manoeuvre shall be scored zero.

3.4 EXAMPLES

An Avalanche is entered in a slight climb, the flight path turns 15 degrees to one side after the snap and a wing is 15 degrees low during the exit. $10 - 1 - 1 - 1 = 7$ points.

A 4 point roll is started late and ends up slightly off-centre and the third point is not visible. $10 - 1 - 6 = 3$.

A Square Rolling Loop has the first leg climbing 100 degrees. Gallops in elevation across the top, stops the vertical downward 1/2 roll 15 degrees too early, corrects it, and ends up 15 degrees to one side after the bottom half roll. $10 - 1 - 2 - 1 - 1 = 5$ points.

An otherwise flawless slow roll is about 45 degrees off-center. This must be considered as a severe misplacement. $10 - 4 = 6$ points.

A Half Reverse Cuban 8 is started too late, and the pilot “squeezes” the manoeuvre together by flying a 60 degree line and making no line after the half roll. The manoeuvre still gets about halfway out of the zone. $10 - 1 - 2 - 3$ (misplacement, going out of the zone) = 4 points.

During an inverted spin entered flawlessly, the model un-stalls and makes the final 90-degree of rotation as a vertical barrel roll. $10 - 6 = 4$ points.

A competitor flies a flawless 4 Point Roll, $10 - 0 = 10$ points. You will not see too many of these in a competition but the manoeuvre should be awarded a 10 if there are no flaws that would otherwise downgrade it to a 9.



SECTION 4: AEROBATIC SEQUENCES

4.1 SPORTSMAN

	Manoeuvre	K	Description Reference
1	Takeoff	1	5.1
	Enter Box		
2	Straight Flight Out (upwind)	1	5.2
3	Procedure Turn	1	5.3
4	Straight Flight Back (downwind)	1	5.4
	Exit Box		
	Enter Box		
5	One Loop (upwind)	1	5.5
6	One Immelmann	2	5.6
7	Split "S"	2	5.7
	Exit Box		
	Enter Box		
8	One Horizontal Roll (downwind)	1	5.8
9	½ Reverse Cuban Eight	2	5.9
10	Cobra Without Rolls	1	5.10
	Exit Box		
	Enter Box		
11	Straight and Level Flight	1	5.11
12	½ Cuban Eight	2	5.12
13	Stall Turn	1	5.13
	Exit Box		
	Enter Box		
14	Rectangular Approach	1	5.14
15	Landing	1	5.15



4.2 INTERMEDIATE

	Manoeuvre	K	Description Reference
1	Takeoff	1	5.1
2	Reverse Cuban 8	2	5.16
3	Pull Push Pull Humpty Bump, 1/2 Roll Down	2	5.17
4	2 Point Roll	2	5.18
5	Stall Turn	1	5.3
6	3 Inside Loops	3	5.19
7	1/2 Reverse Cuban 8	1	5.9
8	2 Horizontal rolls	2	5.20
9	1/2 Cuban 8	2	5.12
10	Stall turn w 1/4 rolls up and down (center manoeuvre)	2	5.21
11	Immelmann turn	2	5.6
12	1 Outside Loop	2	5.22
13	Split S	2	5.7
14	Square Loop	2	5.23
15	Landing	1	5.15



	Manoeuvre	K	Description Reference
1	Takeoff	1	5.1
2	Stall Turn with $\frac{3}{4}$ Rolls up and down	3	5.24
3	Half Reverse Cuban Eight	2	5.9
4	Slow Roll	3	5.25
5	Immelmann Turn	2	5.6
6	Six Sided, outside loop from top	4	5.26
7	Bunt with $\frac{1}{2}$ Roll out	2	5.27
8	Triangle Rolling Loop (1 roll)	4	5.28
9	Stall Turn with $\frac{1}{2}$ Rolls up and down	2	5.29
10	Avalanche	3	5.30
11	Humpty Bump with options	2	5.31
12	Four Point Roll	4	5.32
13	Half Square Loop with $\frac{1}{2}$ roll up	2	5.33
14	45 Degree down, One Positive snap	3	5.34
15	Top Hat with $\frac{1}{4}$ rolls	2	5.35
16	Reverse Cuban 8 with $\frac{1}{2}$ rolls	3	5.16
17	Half Square Loop $\frac{2}{4}$ pt. Roll in Vertical	2	5.36
18	3 Turn Spin	3	5.37
19	Landing	1	5.15



	Manoeuvre	K	Description Reference
1	Takeoff	1	5.1
2	Half Clover with 2/4 pt Roll up, ½ roll down	4	5.38
3	Humpty Bump (pull, pull, pull) 2/4 pt Roll up	2	5.39
4	Eight Point Roll	4	5.40
5	Half Cuban Eight, 2/2 pt Roll down, exit inverted	2	5.41
6	Avalanche with 1 ½ Snap (from bottom)	4	5.42
7	Half Square loop on corner with ½ Rolls, exit inverted	2	5.43
8	Eight sided loop (from top), exit inverted	4	5.44
9	Reverse Humpty Bump with ½ or ¼ Rolls down and Up, exit inverted	3	5.45
10	45 degree down 1 ½ Positive Snap Roll, exit inverted	3	5.46
11	Stall Turn with ½ Rolls up and down, exit inverted	2	5.47
12	Inverted 4 Point Roll	4	5.24
13	Humpty Bump (push, pull, pull) 2/4 pt Roll, exit inverted	3	5.49
14	Figure M with ¾ Rolls	5	5.50
15	Top Hat with ¼ Rolls	2	5.35
16	Two 2/2 pt Rolls Reversed	4	5.51
17	Immelmann Turn	2	5.2
18	Hour Glass with 2/4 pt Roll down (mid entry, top first) exit inverted	5	5.52
19	Mid-Entry Figure Nine	1	5.53
20	Double Immelmann with Full Rolls	3	5.54
21	Half Square Loop with 2/2pt Roll up, exit inverted	2	5.55
22	2 ½ Turn Inverted Spin,	3	5.56
23	Landing	1	5.15

4.5 FAI

At MAAC Local competition only the F3A preliminary “P” schedule shall be flown.

At MAAC National Competitions, FAI class will fly 4 rounds of the preliminary “P” schedule and 2 rounds of the final “F” schedule.



SECTION 5: DESCRIPTION OF MANEOUVRES

Section 5 provides descriptions and downgrades for all manoeuvres. Beside each description is a code that indicates the sequence that uses the manoeuvre. The codes are as follows:

S - Sportsman

I - Intermediate

A - Advanced

M - Masters

All manoeuvres will start and finish in straight and level flight. Center manoeuvres will start and finish on the same heading while turn-around manoeuvres will finish on a heading 180 degrees to entry.

All manoeuvres which have more than one loop or part loop will have the loops or part loops the same diameter, similarly all manoeuvres which have more than one roll will have the same roll rate. All consecutive rolls will be at the same altitude and heading.

All manoeuvres with $\frac{1}{2}$ rolls and $\frac{1}{4}$ rolls will have short pauses of equal length before and after the rolls unless noted otherwise.

Any violation of the above will be reason for downgrading in addition to the downgrades listed in the manoeuvres descriptions.

5.1 TAKEOFF - S.1, I.1, A.1, M.1

The model must stand still on the ground with the motor running, without being held, and must then take off. The takeoff run should be straight, the model should lift gently from the ground and climb at a gradual angle. The takeoff is completed when the model is approximately two meters from the ground.

Downgrades:

- Model does not stand still when released.
- Changes heading during takeoff and climb.
- Model jumps from ground.
- Retouches ground after becoming airborne.
- Too steep a climb angle.
- Gallops in elevation during climb.



5.2 STRAIGHT FLIGHT OUT - S.2 (UPWIND)

The model will be flown in an absolutely straight and level path into the wind for three to five seconds centered in front of the judges (center line).

Downgrades:

- Deviates left or right.
- Does not hold constant altitude.
- Gallops in elevation.
- Not centered on takeoff or center line.

5.3 PROCEDURE TURN - S.3

After the Straight Flight Out, model makes a 90° turn in the direction away from the flight line and then a 270° turn in the opposite direction back to the reverse flight path of the Straight Flight Out.

Downgrades:

- First turn not exactly 90°.
- Opposite turn not exactly 270°.
- Changes in altitude during turns.
- Turns not smooth and circular.
- Does not head back over exact outgoing path.

5.4 STRAIGHT FLIGHT BACK - S.4 (DOWNWIND)

The model flies straight and level on the same line and altitude as the Straight Flight Out.

Downgrades:

- Deviates left or right.
- Does not hold constant altitude.
- Gallops in elevation.
- Straight flight lines not the same.
- Not centered in front of Judges (center line).

Note: Each of the manoeuvres (i.e. Straight Flight Out, Procedure Turn and Straight Flight Back) should be judged as separate maneuvers.



5.5 ONE INSIDE LOOP - S.5 (UPWIND)

Model flies straight and level, pulls up and performs one complete loop and finishes at the same altitude and direction.

Downgrades:

- Not a smooth and level entry.
- Not round.
- Changes heading during loop.
- Exits at a different altitude.
- Exit not smooth and level or model gallops.

5.6 IMMELMANN TURN - S.6 (UPWIND), I.11, A.5, M.17

Model pulls up and completes a half inside loop then immediately half rolls to recover in level flight at a higher altitude than entry.

Downgrades:

- Changes in heading during half loop or half roll.
- Half roll not immediately after half loop.
- Half loop not of constant radius.

5.7 SPLIT S – S.7, I.13

Model half rolls to inverted then immediately executes half an inside loop to level flight at a lower altitude than entry.

Downgrades:

- Changes in heading during half loop or half roll.
- Half loop not immediately after half roll.
- Half loop not constant radius.



5.8 ONE HORIZONTAL ROLL - S.8 (DOWNWIND)

Model rolls through 360° on a straight and level path.

Downgrades:

- Model varies in altitude.
- Model not level on entry or exit.
- Roll not 360°.
- Model changes heading.

5.9 HALF REVERSE CUBAN EIGHT – S.9, I.7

Model pulls into a 45-degree climb, half rolls, then executes part of a loop back to level flight.

Downgrades:

- Model not at 45 degrees before commencing half roll.
- Changes in heading in roll.
- Half roll not exactly 180°.
- Loop not round
- Half roll not on center of 45-degree line.

5.10 COBRA WITHOUT ROLLS - S.10 (UPWIND)

Model pulls up to 45-degree upline, Push to a 45-degree downline, then pulls to recover in level Flight.

Downgrades:

- Up and Down lines not 45 Degrees
- Maneuver off center
- Radius's not equal.

5.11 STRAIGHT AND LEVEL FLIGHT - S.11 (DOWNWIND)

The model flies straight and level.

Downgrades:

- Deviates left or right.
- Does not hold constant altitude.
- Gallops in elevation.
- Maneuver off center.



5.12 HALF CUBAN EIGHT – S.12, I.9

Model pulls up and commences an inside loop, when at 45 degrees inverted model does a half roll then pulls up to recover in level flight.

Downgrades:

- Loop not round.
- Model not at 45 degrees before and after half roll.
- Changes in heading during half roll.
- Half roll not on center of 45-degree line.

5.13 STALL TURN - S.13, I.5, A.3

Model pulls up into a vertical flight path, stall turns through 180° to a vertical dive, then pulls up to recover in level flight.

Downgrades:

- Flight path not vertical at start and finish of stall turn.
- Stall turn not exactly 180°.
- Radiuses of entry and exit ¼ loops not equal.

5.14 RECTANGULAR APPROACH - S.14

The manoeuvre commences with the model flying straight and level into wind over the takeoff line, a turn of 90 degrees, a crosswind leg, a second turn of 90 degrees, a downwind leg, a third turn of 90 degrees, a crosswind leg, a fourth turn of 90 degrees and straight flight towards the point of touchdown. The first three legs will be at constant altitude, the descent to touchdown will commence after the second crosswind leg. The maneuver is completed just prior to two meters from the ground.

Downgrades:

- Legs of rectangle are not straight.
- The 90° turns are not smooth, precise or sharp.
- Turns more or less than 90 degrees.
- Gallops in elevation.
- If model does not land after approach, ZERO points.



5.15 LANDING - S.15, I.15, A.19, M.23

The model flares smoothly to touch the ground within the landing circle with no bouncing or changes in heading and rolls to a stop. Landing maneuver will start two meters from the ground. The landing maneuver ends when the aircraft comes to a rest or has rolled 10 meters, whichever comes first.

Downgrades:

- Model impacts the ground due to lack of flare.
- Model bounces after touchdown.
- Wings not level.
- Changes in heading.
- If model ends on its back, ZERO points.
- If any under-carriage leg retracts on landing, ZERO points.
- If any part comes off the model on landing, ZERO points.

5.16 REVERSE CUBAN EIGHT – I.2, A.16

Model pulls up into a 45° climb, half rolls, executes a 3/4 loop, half rolls to inverted and loops back to level flight at the same point as entry.

Downgrades:

- Loops not round and same size.
- Flight path not at 45° at start and finish of rolls.
- Changes in heading during loops and rolls.
- Half rolls not 180 degrees.
- Half rolls not on center of 45-degree lines.

5.17 PULL-PUSH-PULL HUMPTY BUMP, ½ ROLL DOWN – I.3,



Model pulls into a vertical attitude, pauses, then pushes into a half outside loop, executes a half roll, then recovers into level flight.

Downgrades:

- Upline and downline not vertical.
- Half loop not round and same diameter as $\frac{1}{4}$ loops.
- Half roll not exactly 180° .

5.18 2 POINT ROLL - I.4

Model rolls through 360° in either direction, hesitating when inverted.

Downgrades:

- $\frac{1}{2}$ rolls more or less than 180° .
- Model does not hesitate after half rolls.
- Roll rates not constant.
- Changes in attitude.

5.19 THREE INSIDE LOOPS - I.6

Model pulls up and executes three consecutive loops, all loops should be round and superimposed.

Downgrades:

- Loop not round.
- Loops not superimposed.
- Wings not level during loops
- Changes in heading during loops

5.20 2 HORIZONTAL ROLLS - I.8

Model rolls at a uniform rate through 2 complete revolutions in either direction.

Downgrades:

- Changes in heading during rolls
- Changes in altitude during rolls
- Roll rates not constant.
- Model does not do exactly 2 rolls



5.21 STALL TURN, 1/4 ROLL UP AND DOWN – I.10

Model pulls up into a vertical flight path, performs a 1/4 roll, stall turns through 180° to vertical, performs a second ¼ roll then pulls up to recover in level flight.

Downgrades:

- Flight path not vertical at start and finish of rolls and stall turn.
- Rolls and stall turn not exactly 90° and 180° respectively.
- Radiuses of entry and exit ¼ loops not equal.

5.22 ONE OUTSIDE LOOP (FROM THE TOP) - I.12

Model pushes over and executes outside loop. The one loop should be round.

Downgrades:

- Loop not round.
- Wings not level during loop.
- Changes in heading during loop.

5.23 SQUARE LOOP - I.14

Model pulls up and executes a square loop.

Downgrades:

- Loop not square.
- Sides of square not same size.
- Changes in heading.
- Wings not level.
- Radiuses not equal

5.24 STALL TURN, 3/4 ROLL UP AND DOWN – A.2



Model pulls up into a vertical flight path, performs a 3/4 roll, stall turns through 180° to vertical, performs a second 3/4 roll then pulls up to recover in level flight.

Downgrades:

- Flight path not vertical at start and finish of rolls and stall turn.
- Rolls and stall turn not exactly 270° and 180° respectively.
- Radiuses of entry and exit ¼ loops not equal.

5.25 SLOW ROLL - A.4,M.12

Model rolls slowly through one complete revolution, in either direction, maneuver takes greater than five seconds. Center is middle of inverted flight.

Downgrades:

- Changes in heading.
- Changes in altitude.
- Roll rates not constant.
- Model does not roll exactly 360°.

.26 SIX SIDED, OUTSIDE LOOP FROM TOP – A, 6

Model pushes to a 60 degree downline and completes a six-sided outside loop. Each angle of the six sided loop is 60 degree

Downgrades:

- Sides of loop not equal length
- Radiuses of loop not equal.
- Climbing and descending paths not 60 degrees
- Model does not start and finish the loop at the same point.



5.27 BUNT WITH 1/2 ROLL OUT A.7

Model pushes from level flight and completes a half outside loop then immediately completes a ½ roll to recover in straight and level flight.

Downgrades:

- Changes in heading during half loop or half roll.
- ½ roll not immediately after half loop.
- Half loop not of constant radius.
- Changes to heading during ½ loops and ½ rolls.

5.28 TRIANGLE ROLLING LOOP (1 ROLL) A.8

Model pulls through a partial loop to a 45 degree up track, hesitates, pulls through 135 degrees to level inverted flight, hesitates, performs a full roll, hesitates, pushes through 135 degrees to an inverted 45 degree down track, hesitates, and pushes up to recover in level inverted flight.

Downgrades:

- Climbing and descending paths not at 45 degrees.
- Climbing and descending paths not same length.
- Loop segments not round and of equal size and radius.
- Model does not start and finish maneuver at same point.
- Full roll not centered on line segments.

5.29 STALL TURN WITH ½ ROLL IN UP LINE & DOWN LINE - A.9

Model pulls up into a vertical flight path, performs a half roll, executes a 180° stall turn (left or right), perform another half roll, then pulls up to recover in level flight.

Downgrades:

- Flight path not vertical at start and finish of rolls and stall turn.
- Stall turn and half rolls not exactly 180.
- 1/2 rolls not centered on vertical lines



5.30 AVALANCHE - A.10

Model pulls up into a $\frac{1}{2}$ inside loop, at the top it executes a snap roll, positive or negative, then executes a $\frac{1}{2}$ inside loop to finish in level flight.

Downgrades:

- Half loops not of constant radius.
- Snap roll more or less than 1 turn.
- Roll not snap roll, score zero.
- Changes in heading.

5.31 Humpty Bump with Pilots Option- A.11

Model pulls into a vertical flight path, executes a half roll (or optional $\frac{1}{4}$ roll) pushes or pulls through a half loop to a vertical flight path, Pauses (or executes the second $\frac{1}{4}$ roll), then recovers into level flight.

Downgrades:

- Flight path not vertical at beginning and end of $\frac{1}{2}$ or $\frac{1}{4}$ rolls.
- Half loop not round and same diameter as $\frac{1}{4}$ loops.
- Roll rates not constant.
- Rolls not centered.

5.32 FOUR POINT ROLL - A.12

Model rolls through 360° , hesitating at each 90° point; at each hesitation, wings are parallel or vertical to the horizon.

Downgrades:

- $\frac{1}{4}$ Rolls more or less than 90° .
- Model does not hesitate after each $\frac{1}{4}$ roll.
- Roll rates not constant.
- Changes in altitude.



5.33 HALF SQUARE LOOP WITH $\frac{1}{2}$ ROLL IN VERTICAL - A.13

Model pulls into a vertical flight path, executes a $\frac{1}{2}$ roll, then pushes to recover in level flight at a higher altitude than entry.

Downgrades:

- Wings not level during $\frac{1}{4}$ loops.
- Flight path not vertical at start and finish of $\frac{1}{2}$ roll.
- Roll not exactly 180° .

5.34 45° DOWN, POSITIVE SNAP ROLL – A.14

Model pulls into a 45° dive and performs a complete positive snap roll, left or right, then pulls to recover in level flight at a lower altitude.

Downgrades:

- Diving path not at 45° .
- Snap roll not 360° .
- Roll not snap roll - zero.
- Negative snap roll - zero.

5.35 TOP HAT WITH $\frac{1}{4}$ ROLLS – A.15

Model pulls into a vertical attitude, executes a $\frac{1}{4}$ roll, left or right, pulls over to inverted flight, pauses, pulls down, executes a second $\frac{1}{4}$ roll, then pulls up to recover in level flight.

Downgrades:

- Model not vertical at start and finish of $\frac{1}{4}$ rolls.
- $\frac{1}{4}$ rolls not exactly 90° .
- Model does not fly straight and level inverted.



5.36 HALF SQUARE LOOP, 2/4 POINT ROLL UP – A.17, M.9

Model pulls into a vertical flight path, executes two points of a four-point roll, then pushes to recover in level flight.

Downgrades:

- Loss of heading in quarter loops.
- Flight path not vertical before and after 2/4-point roll.
- 2/4 point roll not exactly 180 degrees.

5.37 3 TURN SPIN A.18, M.22

Model establishes a heading and with reduced power, the model is held in a nose high attitude until it stalls and commences to spin. The model autorotates through 3 turns, holds a near vertical downline, then upright flight.

Downgrades:

- Entry flight path not level.
- Snap roll at entry, zero.
- Spin less than 2½ turns or more than 3 ½ turns scores zero.
- Spiral dive more than ½ turn scores zero.

5.38 HALF CLOVER WITH 2/4 PT ROLL UP, ½ ROLL DOWN –M.2

Model pulls to a vertical upline and performs two points of a four point roll. Push into a ¾ outside loop, fly inverted, push into a second ¾ loop to a vertical downline, flowed by a half roll, pull to reover in straight and level flight.

Downgrades:

- Loop segments not round and of equal radiues
- Hesitations on point rolls not equal
- Rolls not centered on vertical lines
- Entry and exit not same altitude



5.39 HUMPTY BUMP (PULL, PULL, PULL) 2/4 PT ROLL UP – M.3

Model pulls up into a vertical flight path, performs a 2/4 pt roll, pulls through 180° to vertical downline, pulls to recover in straight and level flight

Downgrades:

- 2/4 point roll not centered.
- Loop segments not same radius Radiuses.

5.40 EIGHT POINT ROLL – M.4

Model From straight and level flight, rolls through 360 degrees, hesitating at each 45 degree point, finish roll in straight and level flight.

Downgrades:

- 1/8 Rolls more or less than 45°.
- Roll not centered
- Model does not hesitate after each part roll.
- Roll rates not constant.
- Changes in altitude and heading.

5.41 HALF CUBAN EIGHT 2/2 PT. ROLL– M.5

Model pulls up and commences an inside loop, when at 45 degrees inverted model does a 2/2 pt. roll then pulls up to recover in level flight.

Downgrades:

- Loop not round.
- Model not at 45 degrees before and after 2/2 pt. roll.
- Changes in heading during 2/2 pt. roll.
- 2/2 pt. roll not on center of 45-degree line.



5.42 AVALANCHE WITH 1 ½ SNAPS- M.6

Model pulls up into a loop, at the top it executes a 1-½ snap roll, positive or negative, then recovers to complete the loop and finish in level flight.

Downgrades:

- Loop not round.
- Snap roll more or less than 1 ½ turns.
- Roll not snap roll, score zero.
- Changes in heading.

5.43 HALF SQUARE LOOP ON CORNER WITH ½ ROLLS- M.7

From upright, pull to a 45 degree upline, and perform ½ roll. Push through 90 degrees to a 45 degree upline, perform a half roll in either direction and pull to exit inverted.

Downgrades:

- Lines not 45 degrees
- Loop segments not same radius.
- Rolls not centered

5.44 EIGHT SIDED LOOP FROM TOP –M.8

Model pushes through a 1/8 loop to a 45 degree downline and perform a eight sided loop, exit inverted

Downgrades:

- Loop segments not round and of equal size and radius.
- Model does not start and finish maneuver at same point.
- All eight sides not of equal length.



5.45 REVERSE HUMPTY BUMP WITH $\frac{1}{2}$ OR $\frac{1}{4}$ ROLLS DOWN AND UP, EXITE INVERTED– M. 9

Pull to a vertical downline, perform a $\frac{1}{4}$ Roll (or alternate $\frac{1}{2}$ roll) push or push through $\frac{1}{2}$ outside loop to a vertical upline, perform $\frac{1}{4}$ Roll (or alternate $\frac{1}{2}$ roll), pull to recover in inverted flight

Downgrades:

- Loop segments not same radius
- Rolls not centered

5.46 45° DOWN, POSITIVE 1 $\frac{1}{2}$ SNAP ROLL – M. 10

Model pushes into a 45° dive and performs a complete positive 1 $\frac{1}{2}$ snap roll, left or right, then pushes to recover in level inverted flight at a lower altitude.

Downgrades:

- Diving path not at 45°.
- Snap roll not 540°.
- Roll not snap roll - zero.
- Negative snap roll - zero.

5.47 STALL TURN, 1/2 ROLL UP AND DOWN, EXITED INVERTED – M.11

Model pushes up into a vertical flight path, performs a 1/2 roll, stall turns through 180° to vertical, performs a second 1/2 roll then pushes out to recover in inverted level flight.

Downgrades:

- Flight path not vertical at start and finish of rolls and stall turn.
- Rolls and stall turn not exactly 90° and 180° respectively.
- Radiuses of entry and exit $\frac{1}{4}$ loops not equal.
-



5.48 INVERTED 4 POINT ROLL– M.12

Model rolls through 360°, hesitating at each 90° point; at each hesitation, wings are parallel or vertical to the horizon.

Downgrades:

- ¼ Rolls more or less than 90°.
- Model does not hesitate after each ¼ roll.
- Roll rates not constant.
- Changes in altitude.

5.49 HUMPTY BUMP, 2/4 PT ROLL, EXIT INVERTED – M.13

From upright, pull to vertical upline, perform 2 points of a 4-pt roll, and pull through a half inside loop to a vertical downline, and model pull to exit upright

Downgrades:

- Loop segments not same radius
- 2 of 4-point roll not centered

5.50 FIGURE M WITH 3/4 ROLLS – M.14

Model pulls up into a vertical attitude, performs a 3/4 roll, executes a 180° stall turn, another 3/4 roll, then does a ½ outside loop, again pushes up into a vertical attitude, followed by a third 3/4 roll, a second 180 degree stall turn and a fourth 3/4 roll, recovering in level flight. All stall turns and rolls may be in either direction.

Downgrades:

- Model not vertical at start and finish of stall turns and rolls stall turns.
- Stall turns not 180°.
- 3/4 rolls not exactly 270 degrees.
- Bottom of outside loop at different altitude to entry.
- Altitude of second stall turn different from the first.



5.51 TWO 2/2 PT ROLLS REVERSED – M.16

Model performs a two point (2/2pt) roll, immediately performs a two point (2/2pt) roll in the opposite direction.

Downgrades:

- $\frac{1}{2}$ Rolls more or less than 180°.
- Model does not hesitate after each part roll.
- Roll reversal not immediate.

5.52 MID ENTRY HOUR GLASS WITH 2/4 PT ROLL DOWN, EXIT INVERTED – M.18

Model pulls into a 45 degree upline, pull 135 degrees to horizontal inverted, pull 135 degrees to 45 degree down line and perform two points of a four point roll, pull 135 degrees to horizontal, pull 135 degrees to 45 degree upline, then pull 45 degrees to exit inverted on the same level as that of entry.

Downgrades:

- Loop segments not round and of equal size and radius
- 2/4 pt roll not centered
- Lines not 45 degrees
- Change in altitude from entry to exit

5.53 MID ENTRY FIGURE NINE – M. 19

From inverted model pushes to perform $\frac{3}{4}$ of an outside loop, to a vertical down line, then pulls to exit upright.

Downgrades:

- Radius and loop size not constant.



5.54

DOUBLE IMMELMAN WITH FULL ROLLS- M.20

From upright model pulls to complete a half inside loop, followed immediately by a full roll, pull through a half loop followed immediately by a full roll, to exit upright.

Downgrades:

- Half loops not constant and equal radius
- Rolls not immediate on completion of half loops
- Roll rate not constant

5.55

HALF SQUARE LOOP WITH 2/2 PT ROLL UP, EXIT INVERTED – M.21

From straight and level, pull to vertical upline, perform a two point (2/2pt) roll, and pull to exit inverted.

Downgrades:

- $\frac{1}{2}$ Rolls more or less than 180°.
- Model does not hesitate after each part roll.
- Roll rate not constant
- Radius not equal size

5.56

INVERTED 2 1/2 TURN SPIN – M. 22

Model establishes a inverted heading and with reduced power, the model is held in a nose high attitude until it stalls and commences to spin. The model autorotates through 2 1/2 turns, holds a near vertical downline, then recovers to upright flight,

Downgrades:

- Entry flight path not level.
- Snap roll at entry, zero.
- Spin less than 1½ turns or more than 2½ turns scores zero.
- Spiral dive more than ½ turn scores zero.

