

ANNEX 5A

DESCRIPTION OF MANOEUVRES FOR R.C. AEROBATICS

5A.1.13. The shape of all manoeuvres is judged on the flight path of a model aircraft, and manoeuvres must start and finish in straight and level upright or inverted flight. Centre manoeuvres must start and finish on the same heading, while turn-around manoeuvres must finish on a heading 180 degrees to entry. When appropriate, entry and exit of centre manoeuvres must be at the same altitude, unless specified otherwise. Positioning adjustments in altitude are allowed in turn-around manoeuvres.

All manoeuvres which have more than one loop or parts of loops must have the loops and parts of loops the same diameter and in the case of consecutive loops, in the same place. Similarly, all manoeuvres which have more than one continuous roll must have the same roll rate. All manoeuvres which have more than one point roll, must have the same roll rate, and the points must be of equal duration. Where there is a combination of continuous rolls and point rolls within a manoeuvre, the roll rate for the point rolls does not necessarily have to be the same as the roll rate for the continuous rolls. All consecutive rolls (continuous and/or point rolls) on a horizontal line must be at the same altitude and heading.

All manoeuvres with rolls, part rolls, point rolls, or snap-rolls, or combinations of same, must have lines of equal length before and after the rolls or combinations, except when specified otherwise. Barrels rolls and axial rolls instead of specified snap-rolls must be scored zero. Spiral dives instead of specified spins must be scored zero. Snap-roll entries to spins must be scored zero. Wing-overs instead of stall turns must be scored zero.

Any violation of the above will be reason for downgrading, in addition to the downgrades for deviations from the manoeuvre descriptions and the judging notes in Annex 5A, the Judges Guide (Annex 5B) and any official judge training material. Note that these lists are not all-inclusive.

PRELIMINARY SCHEDULE P-05

P-05.01 Take-off sequence: Place the model aircraft on the runway, and take off. Soon after reaching a safe height, turn 90 degrees toward the line defined by the upwind and downwind markers. When approximately over this line, turn 270 degrees in the opposite direction for a downwind trim pass with the model aircraft upright. When approaching the downwind marker, perform a 180 degree turn, reversal, or other turn-around manoeuvre of the competitor's choice.

Judging notes:

- Take-off sequence not followed, zero points.
- Model aircraft passes behind the judges line (zero line), zero points.
- Model aircraft is flown very far past the left-hand and/or right-hand marker flags, zero points.
- Only two scores, a zero or a 10, may be awarded for the take-off sequence.

P-05.02 Reverse Cuban eight, 4/8pt. roll first, 2/2pt. roll second, exit inverted: Pull to a 45 degree upline, execute four points of an eight-point roll, followed by a three-fourths inside loop and a two-point roll on the second 45 degree line. Push through 5/8 of an outside loop to exit inverted.

P-05.03 Stall turn, 2/4pt. roll up, negative snap-roll down: Push vertical and perform two points of a four-point roll followed by a stall turn. On the downline perform a negative snap-roll, then pull to level flight.

Judging notes:

- Snap-roll must be negative.

P-05.04 Reversed four-point roll: On a horizontal line perform two points of a four-point roll, followed by two points of a four-point roll in the opposite direction.

P-05.05 Half square loop, full roll up, exit inverted: Pull vertical and perform a full roll, pull to exit inverted.

P-05.06 Inverted triangle loop, with half rolls, exit inverted: Pull through 135 degrees to a 45 degree downline and perform a half roll. Push through 90 degrees to a 45 degree upline, perform a half roll, and pull to exit inverted.

P-05.07 Two turn inverted spin: Perform two consecutive inverted (negative) spins, then pull to level flight.

Judging notes:

- Snap-roll entry, zero points.
- Forced entry, downgrade.

P-05.08 Loop with integrated slow roll on top: Pull up and complete an inside loop. Over the full top 90 degree quadrant of the loop perform a full roll, integrated with the circular path of the loop.

P-05.09 Half clover, 2/4pt- roll up, half roll down, exit inverted: Pull to a vertical upline and perform two points of a four-point roll. Push into $\frac{3}{4}$ outside loop, fly inverted, push into a second $\frac{3}{4}$ outside loop, followed by a half roll on the downline. Push to exit inverted.

Judging notes:

- Upline and downline must coincide.

P-05.10 45 degrees up with 4pt. roll, exit inverted: Push to a 45 degree upline and perform a four-point roll. Pull to exit inverted.

P-05.11 Reverse humpty bump, pull-push-push, with options: Pull to a vertical downline and perform two points of a four-point roll (or alternatively three points of a four point roll). Push through a half outside loop to a vertical upline and perform a half roll (or alternatively a quarter roll). Push to recover upright.

P-05.12 Reverse double immelmann, full roll first, 2/4pt. roll second, exit inverted: Push to a half outside loop, followed immediately by a full roll, fly inverted, then push to a half outside loop, followed immediately by two points of a four-point roll to exit inverted.

Judging notes:

- The straight inverted flight is equal to the diameter of the half outside loops.

P-05.13 Goldfish, with half rolls: Pull to a 45 degree downline and perform a half roll, followed by $\frac{3}{4}$ of an inside loop. On the second 45 degree downline, perform a half roll, then pull to recover upright.

P-05.14 Square loop, with half rolls and 2/4pt. rolls: Pull to a vertical upline and complete a square loop. In each of the vertical legs, perform a half roll, and in the horizontal legs two points of a four-point roll.

P-05.15 Half reverse Cuban eight, with full roll, exit inverted: Pull to a 45 degree upline and perform a full roll. Push through $\frac{5}{8}$ of an outside loop to exit inverted.

P-05.16 Four points of an 8pt. roll, slow roll opposite: On a horizontal line, perform four points of an eight-point roll from inverted, followed immediately by a slow roll in the opposite direction.

P-05.17 Humpty bump, positive snap-roll up, exit inverted at mid-level: Pull to a vertical upline, perform a full positive snap-roll, then pull through a half outside loop to a vertical downline, then push to exit inverted.

P-05.18 Vertical eight, mid-entry, with half roll integrated with the loops: Push to complete a full outside loop, then perform a half roll, followed by a full outside loop directly under the first outside loop, to recover upright. The half roll must be fully integrated with the circular flight path of the last $\frac{1}{8}$ th quadrant of the first outside loop, and the first $\frac{1}{8}$ th quadrant of the second outside loop.

P-05.19 Split S, with full roll, exit inverted: Perform a full aileron roll, followed immediately by a half outside loop, to exit inverted.

Judging notes:

- The half outside loop is immediately after the roll.

P-05.20 Three-quarter slow roll from inverted, exit inverted: From level inverted flight perform three-quarters of a slow roll to knife edge, then immediately perform three-quarters of a slow roll in the opposite direction to recover in level inverted flight.

Judging notes:

- The roll reversal is immediate, with no pause.

P-05.21 Half square outside loop with 2/4pt. roll up, exit inverted: From level inverted flight push to a vertical upline and perform two points of a four-point roll, then pull to exit inverted.

P-05.22 Two two-turn inverted spins, opposite from inverted, half roll exit: From inverted, perform a two-turn inverted spin then immediately perform a two-turn inverted spin in the opposite direction. Hold a vertical downline, then push to level inverted flight followed by a half roll to recover upright.

Judging notes:

- Snap-roll entry, zero points.
- Forced entry, downgrade.
- The spin reversal is immediate.
- The exit half roll is part of the manoeuvre.

P-05.23 Landing sequence: At reduced power, execute a 180 degree level or descending turn within the aerobatic zone to a downwind heading. Fly a downwind leg, with the model aircraft upright. When approximately over the downwind marker, turn 180 degrees toward the runway, and fly a descending approach to the runway, touching down in the landing zone. The landing sequence is complete when the model aircraft has either rolled 10 meters or comes to rest, if within 10m.

Judging notes:

- Model aircraft does not follow landing sequence, zero points.
- Turns which are not either level or descending will be cause for awarding a zero score for the landing.
- If any landing gear leg retracts on landing, zero points.
- If the model aircraft lands anywhere outside the landing zone before the landing is completed, zero points. The landing zone is designated by a circle of 50m radius or lines across a standard runway spaced 100 metres apart where the runway is at least 10m wide.
- Only two scores, a zero or a ten, may be awarded for the landing sequence

PRELIMINARY SCHEDULE P-07

P-07.01 Take-off sequence. See P-05.01.

P-07.02 Half clover, with 2/4-pt. roll up and half roll down. Pull to a vertical upline and perform two points of a four-point roll. Push into $\frac{3}{4}$ outside loop, fly inverted, push into a second $\frac{3}{4}$ outside loop to a vertical downline, followed by a half roll. Pull to recover in level flight.

Judging notes:

- Upline and downline must coincide.

P-07.03 Half square loop on corner, with half rolls, exit inverted: Pull to a 45 degree upline and perform a half roll. Push through 90 degrees to a 45 degree upline and perform a second half roll, then pull to a level inverted exit.

P-07.04 Reverse Cuban eight from top, 2/4pt. roll and 4/8pt. rolls in downlines, exit inverted: From inverted, pull to a 45 degree downline, and perform two points of a 4-point roll. Pull through $\frac{3}{4}$ of an inside loop and on the second 45 degree downline, perform four points of an eight-point roll, then pull through $\frac{5}{8}$ of an inside loop to exit inverted.

P-07.05 Half reverse Cuban eight, from top, with 2/2pt. roll: From inverted, pull to a 45 degree downline and perform two points of a two-point roll. Then push through a $\frac{5}{8}$ outside loop to recover in level flight.

P-07.06 45 degrees down with 1 $\frac{1}{2}$ positive snap roll, exit inverted: Push to a 45 degree downline, and perform one and one half positive snap rolls. Push 45 degrees to exit inverted.

Judging notes:

- Snap roll must be positive.

P-07.07 Push-push-push humpty bump with half roll or $\frac{1}{4}$ roll options, exit inverted: Push to a vertical upline and perform a half roll (or alternatively a quarter roll), then push through a half outside loop to a vertical downline (and perform a second quarter roll) and push to exit inverted.

P-07.08 Eight-point roll from inverted, exit inverted: From inverted on a horizontal line, perform an eight-point roll, to exit inverted.

P-07.09 Stall turn, half roll up, 2/2pt. roll down: Push to a vertical upline and perform a half roll, followed by a stall turn. On the downline perform a two points of a two-point roll and pull to recover upright..

- P-07.10 Loop with integrated 4-point roll on top:** Pull up to complete a loop. Over the full top 90 degree quadrant of the loop perform a four-point roll, integrated with the circular path of the loop.
- P-07.11 Immelmann turn:** Pull to complete a half inside loop, followed immediately by a half roll to exit upright.
- Judging notes:
- The half roll must be immediately after the half loop.
- P-07.12 Square loop on corner from top, with half rolls:** Push to a 45 degree downline to complete a full square loop on corner. In each of the sides, perform a half roll.
- P-07.13 Figure 6 with half roll:** Push to a vertical downline and perform a half roll, followed by $\frac{3}{4}$ of an outside loop to recover upright.
- P-07.14 Hourglass, mid-entry, with 2/4pt. roll down, exit inverted:** Pull to a 45 degree upline, pull 135 degrees to horizontal inverted, pull 135 degrees to a 45 degree downline and perform two points of a four-point roll, pull 135 degrees to horizontal, pull 135 degrees to a 45 degree upline, then pull 45 degrees to exit inverted on the same level as that of entry.
- P-07.15 Three-quarter vertical eight:** Push to complete a full outside loop, followed by a half inside loop directly below the outside loop to recover upright.
- P-07.16 Reverse knife-edge, exit inverted:** On a horizontal line, perform a quarter roll to knife-edge and fly a straight line. Roll 180 degrees in the opposite direction and fly a second line in knife-edge flight, then perform a quarter roll in the same direction to exit inverted.
- Judging notes:
- The knife-edge segments are of equal length and duration, and must be long enough to demonstrate controlled, sustained knife-edge flight.
- P-07.17 Half square outside loop, 2/4pt. roll up, exit inverted:** Push to a vertical upline and perform two points of a four-point roll, then pull to exit inverted.
- P-07.18 2 $\frac{1}{2}$ turns inverted spin:** Perform two and a half consecutive inverted (negative) spins, hold a vertical downline, then pull to level flight.
- Judging notes:
- Snap entry, zero points.
 - Forced entry, downgrade.
- P-07.19 Half horizontal hourglass, half roll and 2/2pt. rolls opposite in uplines:** Pull to a 45 degree upline and perform a half roll. Pull 135 degrees to a vertical downline, pull 135 degrees to a 45 degree upline and perform two points of a two-point roll in opposite direction, then push to recover upright.
- P-07.20 Horizontal eight from top, with integrated half rolls:** Push to complete $\frac{3}{4}$ of an outside loop, perform a half roll, integrated with the last $\frac{1}{8}$ quadrant of the first loop and the first $\frac{1}{8}$ quadrant of the following loop, then push to complete a full outside loop directly behind the first outside loop, perform a half roll, integrated with the last $\frac{1}{8}$ quadrant of the loop and the first $\frac{1}{8}$ quadrant of the following part-loop, and push to recover upright.
- Judging notes:
- The two outside loops are round, with the half rolls integrated with portions of the loops.
- P-07.21 Half outside loop with full roll, exit inverted:** Push to complete a half outside loop, followed immediately by a full roll, to exit inverted.
- Judging notes:
- The full roll must be immediately after the half outside loop.
- P-07.22 Six-sided loop, with 2/4pt. roll on top:** Push to a 60 degree upline and complete a six-sided loop. In the top leg, perform two points of a four-point roll.
- P-07.23 Landing sequence:** See P-05.23.

FINALS SCHEDULE F-05

F-05.01 Take-off sequence: See P-05.01.

F-05.02 Rolling loop with one roll: Pull to complete a loop, with a full roll integrated with the entire loop.

F-05.03 Half square loop on corner with 2/4pt. rolls, exit inverted: Pull to a 45 degree upline and perform two points of a four-point roll. Push through 90 degrees to a 45 degree upline and perform two points of a four-point roll, then pull to exit inverted.

F-05.04 Reverse humpty bump with full roll down and positive snap-roll up, exit inverted: Before centre, pull to a vertical downline and perform a full roll, followed by a half outside loop to a vertical upline. Then perform a positive snap-roll and pull to exit inverted.

Judging notes:

- Snap-roll must be positive.

F-05.05 Figure 6 with half roll, exit inverted: Pull to a vertical downline and perform a half roll, followed by $\frac{3}{4}$ of an inside loop to exit inverted.

F-05.06 Hourglass, inverted mid-entry, with 2/4pt. roll down: Push to a 45 degree upline, push 135 degrees to horizontal, push 135 degrees to a 45 degree downline and perform two points of a four-point roll, push 135 degrees to inverted horizontal, push 135 degrees to a 45 degree upline, then push 45 degrees to recover upright on the same level as that of entry.

F-05.07 Two turn positive spin, exit inverted: Perform two consecutive positive spins, then push to level inverted flight.

Judging Notes:

- Snap roll entry, zero points.
- Forced entry, downgrade.

F-05.08 Reverse 3/4-pt. roll, inverted to inverted: On a horizontal line from inverted, perform three points of a four-point roll in one direction, followed by three points of a four-point roll in the opposite direction, to exit inverted.

F-05.09 Stall turn, 2/8pt. roll up, 3/4pt. roll down: From inverted push to a vertical upline and execute two points of an eight-point roll, followed by a stall turn. On the downline, perform three points of a four-point roll and pull to recover upright.

F-05.10 Rolling circle with three rolls in opposite directions, first roll to the outside: Perform a rolling circle (away from or towards the runway), with three rolls in opposite directions, the first and third rolls to the outside of the circle, to recover in upright flight at the same point as entry.

Judging Notes:

- Roll rate must be constant.
- Roll reversal must be immediate.
- Circle must be of constant radius and wind corrected.
- Manoeuvre must be downgraded if the circle is too large, and too far out, or if done towards the runway, the circle is outside the manoeuvring zone.

F-05.11 Half roll, half outside loop, full roll: Perform a half roll to inverted, then push to complete a half outside loop, followed immediately by a full roll, to exit upright.

Judging notes:

- The half roll and full roll are immediately before and immediately after the half outside loop.

F-05.12 Reverse avalanche with 1 ½ negative snap roll, exit inverted: Push to a half outside loop. At the bottom perform a one-and-a-half negative snap roll, then pull through a half loop to exit inverted.

Judging notes:

- Snap roll must be negative.

F-05.13 Reverse humpty bump with options, pull-push-push: Pull to a vertical downline, perform two points of an eight-point roll (or alternatively two points of a four-point roll), then push through a half outside loop to a vertical upline, perform a quarter roll (or alternatively a half roll), then push to recover upright.

F-05.14 Reverse golf ball from top, with half rolls: Push to a 45 degree downline, perform a half roll, pull through $\frac{3}{4}$ of an inside loop to a 45 degree upline, perform a second half roll and push to recover upright..

F-05.15 Half square outside loop, with 1 $\frac{1}{2}$ positive snap-roll down: Push to a vertical downline and perform a 1 $\frac{1}{2}$ positive snap-roll, then pull to exit upright.

Judging notes:

- Snap-roll must be positive.

F-05.16 Reverse knife-edge, exit inverted: On a horizontal line, perform a quarter roll to knife-edge and fly a straight line. Roll 180 degrees in the opposite direction and fly a second line in knife-edge flight, then perform a quarter roll in the same direction to exit inverted.

Judging notes:

- The knife-edge segments are of equal length and duration, and must be long enough to demonstrate controlled, sustained knife-edge flight.

F-05.17 Rolling half outside loop with full roll: Push to complete a half outside loop, with a full roll integrated with the half loop.

F-05.18 45 degree down, with 2/4pt. roll and negative snap-roll opposite, half roll exit: Push to a 45 degree downline and perform two points of a four-point roll, followed immediately by a negative snap-roll in the opposite direction. Push to inverted, and perform a half roll to recover upright.

Judges notes:

- Snap roll is immediately after 2/4pt. roll.
- Snap roll must be in the opposite direction to the 2/4pt. roll.
- Snap roll must be negative.
- Exit half roll is part of the manoeuvre.

F-05.19 Landing sequence: See P-05.23.

FINALS SCHEDULE F-07

F-07.01 Take-off sequence: See P-05.01.

F-07.02 Pull-push-push humpty bump, 4/8pt. roll up, positive snap-roll down, exit inverted: Pull to a vertical upline and execute four points of an eight-point roll. Push through a half outside loop to a vertical downline and perform a positive snap-roll, then push to exit inverted.

Judging notes:

- Snap-roll must be positive.

F-07.03 Three-quarters of a reverse Cuban eight, half roll and 2/4pt. rolls in uplines: Push to a 45 degree upline and perform a half roll. Push through $\frac{3}{4}$ of an outside loop to a 45 degree upline and perform two points of a four-point roll, then push to recover upright.

F-07.04 Reverse double avalanche: Push to complete an outside loop. At the bottom perform a negative snap-roll, and at the top a positive snap-roll.

Judging notes:

- Snap rolls must be negative and positive respectively.

F-07.05 Half square outside loop, 2/2pt. roll opposite, exit inverted: Push to a vertical downline and perform two points of a two-point roll in opposite directions. Push to exit inverted.

Judging notes:

- The reversal of the 2-pt. rolls must be immediate.

F-07.06 Rolling figure S, with integrated opposite rolls, exit inverted: Push to a half outside loop, followed immediately by a second half loop directly above the first to exit inverted. In each half loop, perform a roll (second roll in opposite direction) that is integrated with the half loop.

Judging notes:

- Half loops must be round.
- Rolls must be continuous and integrated with the half loops.
- Rolls must be in opposite directions.
- Roll reversal is immediate.

F-07.07 Negative snap-roll, half loop: From inverted, perform a negative snap-roll, followed immediately by a half inside loop, to recover upright

Judging notes:

- Snap-roll must be negative.
- Half loop is immediately after snap-roll.

F-07.08 Slow roll from knife-edge, exit inverted: On a horizontal line perform a quarter roll to knife-edge, then perform a slow roll in the opposite direction to a knife-edge position, followed by another quarter roll in the opposite direction to the slow roll, to exit inverted.

Judging notes:

- Knife-edge positions need to be demonstrated only briefly.

F-07.09 Top hat with 3/4pt. roll up and ¼ roll down: Push to a vertical upline and perform three points of a four-point roll, pull to level inverted flight, pull to a vertical downline and perform a three-quarter roll, then pull to exit upright.

Judging notes:

- Horizontal cross-box leg must be inverted.
- Inverted cross-box horizontal leg may be only very brief, or longer if required by the competitor.

F-07.10 Rolling circle, two rolls reversed: Perform a rolling circle (away from or towards the runway), with two rolls in opposite directions. The first roll is to the outside of the circle and the second roll is to the inside of the circle, to recover upright, at the same point as entry.

Judging notes:

- Roll rate must be constant.
- Roll reversal must be immediate.
- Circle must be of constant radius and wind corrected.
- Manoeuvre must be downgraded if the circle is too large, and too far out, or if done towards the runway, the circle is outside the manoeuvring zone.

F-07.11 Pull-push-pull humpty bump, with roll options: Pull to a vertical upline (and as an option, perform a quarter roll), push through a half outside loop to a vertical downline, perform a half roll (or alternatively a quarter roll) and pull to recover upright.

F-07.12 Vertical half square loop, four-point roll up, 2 ½ negative spins, exit inverted: After centre, pull to a vertical upline and perform a four-point roll. Pull to level inverted flight, gradually reducing power while maintaining a horizontal flight path. Perform two and a half consecutive inverted (negative) spins, then push to exit inverted.

Judging notes:

- Snap-roll entry, zero points.
- Forced entry, downgrade.

F-07.13 Half square loop on corner, with half rolls, exit inverted: Push to a 45 degree upline and perform a half roll. Pull through 90 degrees to a 45 degree upline and perform a second half roll, then push to recover upright.

F-07.14 Reverse triangle with knife edge: Push to a 45 degree downline, then push 135 degrees to level inverted flight. Perform a quarter roll to knife edge and fly a straight line, followed by a quarter roll to level inverted flight. Push through 135 degrees to a 45 degree upline and push 45 degrees to recover upright.

Judging notes:

- The knife-edge segment must be long enough to demonstrate controlled, sustained knife-edge flight.

F-07.15 Rolling half loop, exit inverted: Push to complete a half outside loop, with a full roll integrated with the half loop, to exit inverted.

F-07.16 Four-point roll from inverted, exit inverted: From level inverted flight perform a four-point roll, to recover in level inverted flight.

F-07.17 Stall turn, 4/8pt. roll up, half roll down, exit inverted: Push to a vertical upline and perform four points of an eight-point roll, followed by a stall turn to a vertical downline. Perform a half roll down and push to exit inverted.

F-07.18 45 degree up with 1 ½ negative snap-roll: From inverted push to a 45 degree upline, perform one and a half negative snap-roll, then push to recover upright.

Judging notes:

- Snap rolls must be negative.
- Exit altitude is at a higher flight level.

F-07.19 Landing sequence: See P-05.23.