

5.4. CLASS F3C HELICOPTERS

5.4.1. DEFINITION OF A RADIO CONTROLLED (R/C) HELICOPTER

An R/C helicopter is a heavier-than-air model aircraft (MA) that derives all of its lift and horizontal propulsion from a power driven rotor system(s) rotating about a nominally vertical axis (or axes). Fixed horizontal supporting surfaces up to 4% of the swept area of the lifting rotor(s) are permitted. A fixed or controllable horizontal stabiliser of up to 2% of the swept area of the lifting rotor(s) is permitted. Ground effect machines (hovercraft), convertiplanes or aircraft that hover by means of propeller slipstream(s) deflected downward are not considered to be helicopters.

5.4.2. BUILDER OF THE MODEL AIRCRAFT

Paragraph B.3.1.a) of Section 4b (Builder of the model aircraft) is not applicable to class F3C.

5.4.3. GENERAL CHARACTERISTICS

- a) AREA: The swept area of the lifting rotor cannot exceed 250dm². For helicopters with multiple rotors whose rotor shafts are more than one rotor diameter apart the total swept area of both rotors cannot exceed 250dm². For helicopters with multiple rotors whose rotor shafts are less than one rotor diameter apart the swept area of both rotors (counting the area of superposition only once) cannot exceed 250dm². The tail rotor must be driven by the main rotor and must not be driven by a separate engine/motor.
- b) WEIGHT: The weight of the model aircraft (with fuel / with batteries) must not exceed 6.5 kg.
- c) MOTOR: Maximum piston engine displacement: 15 cm³ 2-cycle, 20 cm³ 4-cycle, 25 cm³ gasoline only. Electric motors are limited to a maximum no load voltage of 51 volts for the propulsion circuit.
- d) GYROS: The use of automatic stabilisation devices that utilise external references is forbidden. The use of pre-programmed flight manoeuvres is forbidden. The use of an electronic rate sensor is limited to rotation about the yaw axis.
- e) ROTOR BLADES: All-metal main or tail rotor blades are prohibited.

5.4.4. NOISE LIMIT

Noise level measurements must be made before the start of a competition, preferably during the official practice day. The noise level must be measured at a distance of 3m (3 metre) while the helicopter is hovering with the skids/landing gear at 2m over the centre of a 2m diameter circle. A remote microphone mounted on a tripod must be used. The engine speed (RPM) must be the same as that used during the hovering portion of the flight schedules. During the measurement the helicopter must be rotated through 360° to determine the maximum noise level. The sound pressure level must not exceed 87dB (A) over a soft (grass) surface or 89dB (A) over a hard (asphalt, concrete, etc.) surface. If the noise level limit is exceeded during the first measurement, two additional measurements must be made to substantiate the excessive noise level. The competitor may modify the helicopter and/or silencer system to reduce the noise level and after verification of an acceptable level, will be permitted to fly. If the noise level cannot be reduced to or below the noise level limit it will not be allowed to fly in the competition. The measuring equipment must be calibrated to the dB (A) sound pressure level scale defined in applicable ISO Standards. If noise measuring equipment that can be calibrated to ISO Standards is not available, the measurements will be advisory only and no competitor can be excluded from the competition.

5.4.5. CONTEST AREA LAYOUT

See FIGURE 5.4.A. Note: If two flight lines are used they must be parallel, operate simultaneously, face in the same direction and be separated by a minimum of 500m for a "front-to-back configuration" or a minimum of 1000m for a side-by-side configuration.

5.4.6. NUMBER OF HELPERS

Each competitor is allowed only one mechanic/caller. The mechanic/caller must announce the start, finish and name or number of each manoeuvre, and should inform the pilot of wind direction, remaining flight time, proximity to prohibited areas and intrusions into the flight area. Team managers may observe the flight from a position 5m behind the judges and away from the start circle. Team managers may serve as mechanic/caller if no separate person is available for this task.

5.4.7. NUMBER OF MODEL AIRCRAFT

The number of model aircraft eligible for entry is two (2). Model aircraft numbers 1 and 2 may only be exchanged within the start circle. Both model aircraft must use the same radio frequency.

5.4.8. NUMBER OF FLIGHTS

At Continental and World Championships, each competitor is entitled to four (4) official preliminary flights.

After completion of the preliminary flights the top 15 are entitled to three fly-off flights. At national and open International Competitions the preliminary/fly-off system is not mandatory.

5.4.9. DEFINITION OF AN OFFICIAL FLIGHT

There is an official flight when the competitor is officially called. The flight may be repeated if, for any unforeseen reason outside the control of the competitor, the model aircraft fails to make a start such as:

- a) The flight cannot safely be made within the allowed time limit.
- b) The competitor can prove that the flight was hindered by outside interference.
- c) Judging was impossible for reasons beyond the control of the competitor (model aircraft, engine, or radio failures are not considered to be outside the control of the competitor). In such cases the flight **shall** be repeated as close to the published time as possible. The competitor, however, has the right to refuse a reflight.

5.4.10. SCORING

Each manoeuvre is given a score between 0 and 10 (including half) points by each judge. A new score sheet is issued to each competitor for each round. Only the competitor's number (no name or nationality) will appear on the score sheet. Any manoeuvre not completed shall be scored zero (0) points. If a manoeuvre is scored zero points all judges must agree. There shall be an official located on the field where any flight over the prohibited area can be observed. The prohibited area is the shaded area in Figure 5.4.A behind the judges' line. The area extends to infinity to the left, right and rear. A visual or audible signal shall be given to indicate such over flights. Competitors flying over this area will be penalised by scoring zero (0) points for the current flight. However, the judges shall score all manoeuvres.

If an infringement has been made, the scores will be deleted from all score sheets after the flight. In addition, there shall be no score when:

- a) The competitor flies a model aircraft that has been flown in the same competition by another competitor, or flies a model aircraft that does not comply with the definition and general characteristics of a radio controlled helicopter.
- b) The competitor does not deliver his transmitter to the impound or operates any transmitter at the competition area during a round without permission.
- c) The competitor starts his model aircraft outside of the start circle.
- d) The competitor gets his transmitter from the impound before he is officially called.

5.4.11. CLASSIFICATION

After the completion of four official (preliminary) rounds, the best three scores will be used to determine the placings. The top 15 of all competitors then compete in three fly-off rounds to determine the final individual classification. The results of the best three preliminary rounds (normalised to 1000 points) will count as one score. This score, plus the three fly-off scores, provide four scores with the best three to count for the final individual classification. The fly-offs to determine the individual classification are only required for World and Continental Championships.

If the competition is interrupted during the preliminary rounds, the final individual classification will be determined by counting all completed preliminary rounds and dropping the lowest. If the competition is interrupted during the fly-off rounds, the final individual classification will be determined by counting all completed fly-off rounds plus the results from the preliminary rounds and dropping the lowest.

All scores for each round will be normalised by awarding 1000 points to the highest scoring flight. The remaining scores are then normalised to a percentage of the 1000 points in the ratio of actual score over the score of the winner of the round. If only one round is possible then the classification will be based on that one round.

For example:

$\text{Points}_{(X)} = \text{Score}_{(X)} \text{ divided by } \text{Score}_{(W)} \text{ multiplied by } 1000$

Where

$\text{Points}_{(X)} = \text{Points awarded to competitor X}$

$\text{Score}_{(X)} = \text{Score of competitor X}$

$\text{Score}_{(W)} = \text{Score of winner of the round}$

Ties for any of the first three places will be broken by counting the highest throwaway score. If the tie still stands a "sudden death" fly-off must take place within one hour of the end of the scheduled fly-off rounds.

The team classification for World and Continental Championships is established at the end of the competition (after the fly-off flights) by adding the numerical final placing of the three team members of each nation. Teams are ranked from the lowest numerical scores to the highest, with complete threecompetitor teams ahead of two-competitor teams, which in turn are ranked ahead of one-competitor teams.

In case of a tie, the best individual placing decides the team ranking.

5.4.12. JUDGING

At Continental and World Championships the organiser must appoint a panel of five judges for each round/flight line. When the entry exceeds 55, two flight lines must be used. The judges must be of different nationalities and must be selected from the current CIAM list of international judges. When using two separate panels, the organiser is allowed to use two judges of the same nationality, one on each panel. Those selected must reflect the approximate geographical distribution of teams participating in the previous World Championship with the final list approval by the CIAM Bureau. For the preliminary rounds the final score of each flight is obtained by deleting the highest and lowest scores for each manoeuvre from the five judges. For the fly-off rounds ten judges shall be used while dropping the two lowest and two highest scores for each manoeuvre. At open or other International Competitions the number of judges may be reduced to a minimum of three with no throwaway scores.

- a) There shall be training flights for judges with a debriefing session immediately before a Continental or World Championships.
- b) The scoring system must be organised in such a way that the competitors and the spectators can clearly see the scores awarded by all judges after each flight. The score sheet notation must be written by the judges themselves.

5.4.13. ORGANISATION

TRANSMITTER & FREQUENCY CONTROL (See VOLUME ABR, Section 4B, Paragraph B.11.2). When all transmitters are of the spread spectrum type a transmitter impound is not required.

FLIGHT ORDER

The flight order for the first preliminary round will be determined by a random draw, taking into account that frequency will not follow frequency and team member will not follow team member of the same team. The flight order for preliminary rounds two, three and four will start at the first, second and third quarter of the initial order. The flight order for the first fly-off round will be established by a random draw. The flight order for the second and third fly-off rounds will start at the first and second third of the initial order.

PREPARATION TIME

A competitor must be called at least 5 minutes before he is required to enter the start circle. A start circle 2m in diameter will be provided away from the flight line, spectators, competitors and model aircraft (see FIGURE 5.4.A). When the previous competitor's flight time reaches 6 minutes the flight line director can give the signal to start the engine. The competitor is given 5 minutes to start the engine and make last minute adjustments. The model aircraft may only be hovered in the start circle up to 2m and must not be rotated beyond 180° left or right relative to the competitor. If the model aircraft is rotated beyond 180° the flight is terminated. The competitor in the start circle must reduce his engine's speed to an idle when the preceding competitor has completed the eighth manoeuvre. If the competitor is not ready after the 5 minute preparation time, he is allowed to complete his adjustments in the start circle; however, his flight time will have started at the end of the 5 minute interval.

FLIGHT TIME

The flight time of 10 minutes begins when the competitor's model leaves the start circle with the permission of the flight line director and the judges. If the allotted time expires before a manoeuvre is completed, that manoeuvre and all remaining manoeuvre(s) will be scored zero.

RESTRICTIONS

After starting the model aircraft in the start circle the model aircraft must be flown at 2m to the helipad along the model entry path shown on the Contest Area Layout (Figure 5.4.A). The pilot may test hover the helicopter on the helipad and reposition it, before announcing the start of the first manoeuvre, to accommodate wind conditions. If the engine stops the flight is terminated.

INTERRUPTION OF A COMPETITION

If the wind component perpendicular to the flight line exceeds 8ms/s for a minimum of 20 seconds during a flight, the competition must be interrupted. The flight will be repeated and the competition continued as soon as the wind subsides below the criterion. If the wind does not subside before the round is completed, the entire round will be dropped. The determination will be made by the organiser with concurrence of the FAI Jury.

5.4.14. MANOEUVRE SCHEDULES

FLIGHT PROGRAM

The flight program consists of manoeuvre schedules P and F for the years 2010 - 2013. Each schedule consists of ten (10) manoeuvres (see ANNEX 5D - F3C MANOEUVRE DESCRIPTIONS).

PERFORMANCE OF THE SCHEDULES

The competitor must stand in the 2m circle (labelled P in Figure 5.4.A - F3C Contest Area Layout) located 6m in front of the centre judge. Before the start of the first manoeuvre the competitor must fly the model aircraft at 2m altitude to the 1m circle of the helipad. The model aircraft may face left or right but must be parallel with the judges' line. Each hovering manoeuvre ends with a landing

on the helipad and after each landing the model aircraft may be repositioned (but maintains same direction) prior to the next takeoff.

After completing the hovering manoeuvres the competitor is allowed one free pass to set up for the flying sequence. All aerobatics manoeuvres must be performed in an airspace that will allow them to be clearly seen by the judges. This airspace is defined by a field of view up to 60° above the horizon and between lines 60° to the right and left of judges 1 and 5. The non-observance of this rule will be penalised by a loss of points. The aerobatics manoeuvres must be performed in a smooth flowing sequence, with a manoeuvre performed on each pass before the judges. There are no restrictions on turnaround manoeuvres. The competitor must perform each listed manoeuvre only once during a flight. The competitor or his caller must announce the name (number) and start and finish of each manoeuvre. A manoeuvre performed out of sequence will result in a zero score for that manoeuvre only. Before the autorotation manoeuvre the competitor is allowed another free pass to accommodate a possible change in wind direction.

5.4.15. MANOEUVRE DESCRIPTIONS AND DIAGRAMS

Refer to ANNEX 5D

ANNEX 5D

F3C MANOEUVRE DESCRIPTIONS AND DIAGRAMS

The manoeuvre schedules are listed below with the starting and ending direction (UU = Upwind - Upwind; DD = Downwind - Downwind; DU = Downwind - Upwind; UD = Upwind - Downwind) of each manoeuvre, relative to the wind, as indicated. The competitor has 10 minutes to complete each schedule. Schedule P will be flown for the preliminary rounds 1 through 4. Schedule F will be flown for the Fly-Off rounds.

SCHEDULE P

- P1. FIGURE "M" WITH HALF PIROUETTES..... (UU)
- P2. SEMI CIRCLE WITH PIROUETTE (UU)
- P3. DIAMOND 3 (UU)
- (FLY BY)
- P4. CUBAN 8 WITH HALF 4 POINT ROLLS (DD)
- P5. PULLBACK WITH BACKWARD ROLL..... (UU)
- P6. COBRA ROLL WITH $\frac{3}{4}$ PUSHED FLIP..... (DD)
- P7. CANDLE WITH TWO HALF ROLLS, HALF PUSHED FLIP..... (UU)
- P8. TWO OPPOSITE TWO POINT ROLLS (DD)
- P9. INSIDE LOOP WITH PIROUETTE (UU)
- (FLY BY)
- P10. AUTOROTATION WITH TWO 90° TURNS (DU)

5D.1 GENERAL

The manoeuvres are displayed in pictorial form in Figures 5D-P and 5D-F for the case where the wind direction is left to right. The following descriptions apply to all manoeuvres and if not performed properly must result in downgrades. Points will also be subtracted if a manoeuvre is not performed as described. The starting/ending altitude for the hovering manoeuvres is 2m above the helipad. If a manoeuvre is unrecognisable it must be severely downgraded. If pirouettes are performed in the wrong direction, the score shall be zero (0) points. Ascents from, and descents to, the helipad must be vertical. Landings must be smooth and centred on the helipad. During the hovering manoeuvres all stops must be of 2 seconds minimum duration (unless specified otherwise). Circular and linear hovering segments must be performed at a constant speed. Every pirouette must be performed at a constant turning rate. The hovering manoeuvres must be started with the nose of the model aircraft (MA) facing left or right and must be flown as a unit (the starting heading must be same for each hovering manoeuvre). The competitor must stand in the 2m diameter circle marked "P" in Figure 5.4.A during all manoeuvres. All aerobatic manoeuvres must start and end in the direction indicated with a straight and level flight line of 10m minimum length. Entry and exit must be at the same altitude and heading. Loops or parts of a loop must be round and have the same diameter. Consecutive loops must be in the same location and plane. Rolls must be performed at a constant roll rate. Consecutive rolls must have the same roll rate and must be at the same altitude and heading. During all aerobatics manoeuvres the competitor must maintain his MA above a minimum altitude of 10 m. Aerobatic manoeuvres must be centred within the 120° horizontal field of view and must be symmetrical about the centre line. Aerobatic manoeuvres flown at a distance greater than 100m from the judges' line will be downgraded. In case of a dispute the following text takes precedence over Figures 5D-P and 5D-F.

5D.2 SCHEDULE P

P1. FIGURE "M" WITH HALF PIROUETTES – (UU)

The MA lifts off from the helipad and hovers at 2m. MA backs up, stops and hovers over flag 1(2). MA ascends 2.5m while performing a 180° pirouette and stops for 1 second, continues ascent while performing a 180° pirouette and stops at 5m. MA descends 2.5m at 45° while performing a

180° pirouette and stops for 1 second. MA continues 45° descent while performing a 180° pirouette and stops at 2m. MA ascends 2.5m at 45° while performing a 180° pirouette and stops for 1 second, continues ascent while performing a 180° pirouette and stops at 5m. MA descends 2.5m while performing a 180° pirouette and stops for 1 second, continues descent while performing a 180° pirouette and stops at 2m over flag 2(1). MA backs up 5m, stops and hovers over helipad. MA descends and lands on helipad.

P2. SEMI CIRCLE WITH PIROUETTE – (UU)

MA takes off vertically to 2m and stops. MA flies backward to flag 1(2) and stops. MA then performs a semi circle with 5m radius with a simultaneous full pirouette in either direction to 2m above flag 2(1) and stops. MA hovers backward to helipad and stops. MA descends to helipad and lands.

P3. DIAMOND 3 – (UU)

MA ascends vertically to 2m and stops. MA ascends backwards 2.5m in a straight line while simultaneously performing a 90° pirouette (nose to the pilot) and stops over flag 1(2). MA ascends sideways 2.5m in a straight line and stops over helipad. MA performs a 360° pirouette in either direction and stops. MA descends sideways 2.5m in a straight line and stops over flag 2(1). MA descends 2.5m in a straight line while simultaneously performing a 90° pirouette in opposite direction to the first one and stops at 2m over helipad. MA descends to helipad and lands.

P4. CUBAN 8 WITH HALF 4 POINT ROLLS – (DD)

MA flies straight and level for a minimum of 10m and performs a 5/8 inside loop. When MA is in 45° descent and inverted it performs a half 4 point roll (180° roll with hesitation at 90°) in either direction to upright and enters a ¾ inside loop. When the MA is again in 45° descent and inverted it performs a second half 4 point roll (180° roll with hesitation at 90°) in either direction and finishes the first partial loop in upright attitude. MA flies 10m straight and level exit.

P5. PULLBACK WITH BACKWARD ROLL – (UU)

MA flies straight and level for 10m and enters the manoeuvre by pulling up into a vertical ascent after passing the centre line. After MA comes to a stop the MA accelerates with a 90° pushed travelling flip to backward flight and performs a full backward roll at constant altitude. This is followed by another 90° pushed travelling flip to a vertical nose down stop. MA then continues by descending on a path that mirrors the entry path. After the descent, MA transitions to same heading and altitude as at the start of the manoeuvre. MA continues for 10m to finish the manoeuvre.

P6. COBRA ROLL WITH ¾ PUSHED FLIP – (DD)

MA flies straight and level for 10m and enters the manoeuvre by pulling up into a 45° climb. After a 5m minimum straight segment MA performs a half roll in either direction to the inverted position and continues to climb at 45° for 5m minimum. After MA comes to a stop MA makes a 270° pushed stationary flip before it enters a 45° dive and after a 5m minimum straight segment performs another half roll in either direction. MA continues for 5m minimum and then recovers at starting altitude in level flight for 10m to finish manoeuvre.

P7. CANDLE WITH TWO HALF ROLLS, HALF PUSHED FLIP – (UU)

MA flies straight and level for 10m and enters the manoeuvre by pulling up into a 5m (minimum) vertical ascent, followed by half roll and another 5m (minimum) ascent. MA performs a half pushed travelling flip such that the first half occurs during the ascent and the second half occurs

during the descent. MA goes into a vertical 5m descent followed by a half roll and another 5m descent to same altitude as entry. MA continues for 10m to finish the manoeuvre.
Note : MA must be horizontal at the top.

P8. TWO OPPOSITE TWO POINT ROLLS – (DD)

MA flies straight and level for a minimum of 10m and performs a 180° roll and continues with 1 second inverted flight. MA performs a second 180° roll in same direction followed by 1 second upright flight. MA performs third 180° roll in opposite direction of first two and continues with 1 second inverted flight. MA performs fourth 180° roll in same direction as third 180° roll to upright flight. Manoeuvre is completed with 10m straight and level flight.

P9. INSIDE LOOP WITH PIROUETTE – (UU)

MA flies straight and level for 10m minimum entry. MA performs an inside loop with a travelling 360° pirouette on top with minimum duration of 2 seconds. Manoeuvre is completed with 10m straight and level flight.

P10. AUTOROTATION WITH TWO 90° TURNS – (DU)

MA flies at a minimum altitude of 20 m. Manoeuvre begins when MA crosses an imaginary plane that extends vertically upward from a line drawn from the centre judge out through the helipad. MA must be in the autorotation state when it cuts this plane. The engine power must be reduced to idle (or off) at this point and the MA must be descending. The first 90° turn must be made after the MA has made 1/3 of the total descent. After this turn the MA must fly straight before the next turn is made after the MA has made 2/3 of the descent. The MA then flies straight down to the helipad. Each leg of the manoeuvre must be a minimum of 10m in length. The descent rate must be constant from start to a point just before touchdown on the helipad. The flight path of the MA must appear as an open square when viewed from above, starting at the vertical plane and ending at a line drawn from the centre judge through the helipad.

Scoring criteria for landing: See ANNEX 5E Paragraph 5E.6.10.