FÉDÉRATION AÉRONAUTIQUE INTERNATIONALE

SPORTING CODE
SECTION IV

2002 Edition

Effective February 10, 2002

VOLUME F3C – R.C. HELICOPTERS

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RULE FREEZE FOR THIS VOLUME

With reference to paragraph A.12 of Volume ABR :

In all classes, the four year rule for no changes to model aircraft / space model specifications, manoeuvre schedules and competition rules will be strictly enforced, but in step with the World Championship cycle of each category. This means that in Volume F3C changes can next be agreed at the Plenary meeting 2005 for application from January 2006.

The only exceptions allowed to the four year rule freeze are genuine and urgent safety matters, indispensable rule clarifications and noise rulings.

FEDERATION AERONAUTIQUE INTERNATIONALE

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Permission and authority to exploit any rights to any commercial activity at such events, including but not limited to advertising at or for such events, use of the event name or logo for merchandising purposes and use of any sound and/or image, whether recorded electronically or otherwise or transmitted in real time, must be sought by way of prior agreement with FAI. This includes specifically all rights to the use of any material, electronic or other, that forms part of any method or system for judging, scoring, performance evaluation or information utilised in any FAI International Sporting Event7.

Each FAI Air Sport Commission8 is authorised to negotiate prior agreements on behalf of FAI with FAI Members or other entities as appropriate, of the transfer of all or parts of the rights to any FAI International Sporting Event (except World Air Games events9) which is organised wholly or partly under the Sporting Code section10 for which that Commission is responsible11. Any such transfer of rights shall be by "Organiser Agreement"12 as specified in the current FAI Bylaws Chapter 1, paragraph 1.2 "Rules for Transfer of Rights to FAI International Sporting Events".

Any person or legal entity which accepts the responsibility for organising an FAI Sporting Event, whether or not by written agreement, in doing so also accepts the proprietary rights of FAI as stated above. Where no formal transfer of rights has been established, FAI retains all rights to the event. Regardless of any agreement or transfer of rights, FAI shall have, free of charge for its own archival and/or promotional use, full access to any sound and/or visual images of any FAI Sporting Event, and always reserves itself the right to have any and all parts of any event recorded, filmed and/or photographed for such use, without charge.

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1 FAI Statutes, Chapter 1, para. 1.6
2 FAI Sporting Code, General Section, Chapter 3, para 3.1.3.
3 FAI Statutes, Chapter 1, para 1.8.1
4 FAI Statutes, Chapter 5, para 5.1.1.2; 5.5; 5.6 and 5.6.1.6
5 FAI Bylaws, Chapter 1, para 1.2.1
6 FAI Statutes, Chapter 2, para 2.3.2.2.5,
7 FAI Bylaws, Chapter 1, para 1.2.3
8 FAI Statutes, Chapter 5, para 5.1.1.2; 5.5; 5.6, 5.6.1.6
9 FAI Sporting Code, General Section, Chapter 3, para 3.1.7
10 FAI Sporting Code, General Section, Chapter 1, paras 1.2. and 1.4
11 FAI Statutes, Chapter 5, para 5.6.3
12 FAI Bylaws, Chapter 1, para 1.2.2

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VOLUME F3C

TECHNICAL REGULATIONS FOR RADIO CONTROLLED HELICOPTERS

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 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 percent 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 of Section 4b (Builder of the model aircraft) is not applicable to class F3C.

5.4.3. GENERAL CHARACTERISTICS

AREA: The swept area of the lifting rotor cannot exceed **250**dm^2. For helicopters with multiple rotors whose rotor shafts are more than one rotor diameter apart the total swept area of both rotors cannot exceed **250**dm^2. 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 **250**dm^2.

a) WEIGHT: The weight of the model aircraft (without fuel with batteries) must not exceed 6 kg.

b) MOTOR: Maximum piston engine displacement : **15** cm^3 two cycle,
20 cm^3 four cycle,
25 cm^3 gasoline only.

Electric motors are limited to a maximum no load voltage of 42 volts for the propulsion circuit and one battery change after the hovering manoeuvres.

c) 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.

d) 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 3 metres while the helicopter is hovering at eye level over the centre of a 2 metre 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 degrees to determine the maximum noise level. The sound pressure level must not exceed 90dB (A) over a soft (grass) surface or 92dB (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 the noise measurement criteria cannot be met, 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.

5.4.6. NUMBER OF HELPERS

Each competitor is allowed only one mechanic/caller. The mechanic/caller must announce the start, finish and name of each manoeuvre, and may inform the pilot of wind direction, remaining flight time, proximity to prohibited areas and intrusions into the flight area. The mechanic/caller must not act as a coach. Team managers may observe the flight from a position 5 metres behind the judges and away from the start box. 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 box. 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 10 (or 20 percent) of all competitors (whichever is greater and rounded up in case of a fraction) 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 at the Contest Director's discretion when 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 may be repeated immediately after the attempt, during the same round or at the end of the round, at the discretion of the Contest Director.

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 box.

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 team standings. The top 10 (or 20 percent) of all competitors (whichever is greater and rounded up in case of a fraction) 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 Continental and World Championships. If the competition is interrupted during the preliminary rounds, the final team 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. 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:

$Points_{(X)} = Score_{(X)}$ /divided by $Score_{(W)}$ multiplied by 1000

Where	$Points_{(X)}$	=	Points awarded to competitor X
	$Score_{(X)}$	=	Score of competitor X
	$Score_{(W)}$	=	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.

5.4.12. JUDGING

At Continental and World Championships the organiser must appoint a panel of five judges for each round/flight line. The judges must be of different nationalities and must be selected from the current 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. The final score of each flight is obtained by deleting the highest and lowest scores for each manoeuvre from the five judges. 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 Section 4b, Paragraph B.8)

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 rounds two, three and four will start at the first, second and third quarter of the initial order. The flight order for each fly-off round will be established by a separate random draw.

PREPARATION TIME

A competitor must be called at least 5 minutes before he is required to enter the start box. A start box 2 metres 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 gives 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 box up to eye level and must not be rotated beyond 180 degrees left or right relative to the competitor. If the model aircraft is rotated beyond 180 degrees the flight is terminated. The competitor in the start box must reduce his engine's speed to an idle when the preceding competitor has completed the **third to last** manoeuvre. If the competitor is not ready after the 5 minute preparation time, he is allowed to complete his adjustments in the start box; however, his flight time will have started at the end of the 5 minute interval.

FLIGHT TIME

The flight time of 9 or 10 minutes begins when the competitor leaves the start box with the permission of the flight line director and the judges. If the allotted time expires before the schedule is completed, the remaining manoeuvre(s) will be scored zero.

RESTRICTIONS

The competitor must fly his model aircraft from the start box directly to (and land on) the helipad after he leaves the start box. The model aircraft must be flown with the skids or landing gear at eye level without practicing manoeuvres (no rotations beyond 180 degrees relative to the competitor). After the competitor has left the start box he is not allowed to touch the model aircraft, and if the motor stops, the flight is terminated. Before the first manoeuvre is called out the pilot may reposition the helicopter to accommodate the wind conditions. For the case of electric motors the competitor (or his mechanic/caller) is allowed to change the battery once after the last hovering manoeuvre without making any adjustments to the model aircraft and the flight time clock will be stopped for a maximum of 2 minutes. Also for the case of electric motors, the mechanic/caller may carry the model by the rotor head and place it on the helipad without any adjustment to the model.

5.4.14. 5.4.14.MANOEUVRE SCHEDULES

FLIGHT PROGRAM

The flight program consists of Manoeuvre Schedule A with nine (9) manoeuvres and Manoeuvre Schedule B with ten (10) manoeuvres (see ANNEX 5D - F3C MANOEUVRE DESCRIPTIONS). 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 K-factors for the hovering manoeuvres in each schedule are equal to two (2) and for the remaining manoeuvres the K-factors are one (1). The competitor has 9 minutes to complete Schedule A and 10 minutes to complete Schedule B. Schedule A will be flown for the preliminary rounds 1 through 4. Fly-off rounds 1, 2 and 3 will use Schedule B.

SCHEDULE A

			K-FACTOR
1	VERTICAL RECTANGLE 1	(UU)	2
2	NOSE IN / TAIL IN HORIZONTAL EIGHT	(UU)	2
3	**VERTICAL TRIANGLE WITH 180º & 360º PIROUETTES** ..... (FLY BY)	(UU)	2
4	2 CONSECUTIVE AXIAL ROLLS	(DD)	1
5	2 CONSECUTIVE INSIDE LOOPS	(UU)	1
6	INSIDE LOOP WITH HALF ROLLS	(DD)	1
7	**ROLLING STALL TURN + 540° STALL TURN**	(UD)	1
8	**PUSH-OVER WITH 360° PIROUETTE** ..... (FLY BY)	(UU)	1
9	AUTOROTATION WITH 180° TURN	(DU)	1

SCHEDULE B

			K-FACTOR
1	**VERTICAL RECTANGLE 3**	(UU)	2
2	CIRCLE WITH THREE 360° PIROUETTES	(UU)	2
3	**TRIANGLE WITH TWO 360° PIROUETTES** (FLY BY)	(UU)	2
4	ROLL REVERSAL	(DD)	1
5	**ONE LOOP WITH STRAIGHT ROLL**	(UU)	1
6	CUBAN EIGHT	(DD)	1
7	**DOUBLE ROLLING STALL TURN**	(UU)	1
8	**COBRA ROLL W/ 1/2 ROLLS + OUTSIDE FLIP**	(DD)	1
9	**PULLUP WITH 360° INVERTED PIROUETTE** (FLY BY)	(UU)	1
10	**AUTOROTATION WITH TWO 90° TURNS**	(DU)	1

PERFORMANCE OF THE SCHEDULES

The competitor must stand in the 1,2 metre circle (labelled P in Figure 5.4.A - F3C Contest Area Layout) located 4,0 metres from the 10 metre square and in front of the centre judge. Before the start of the first manoeuvre the competitor must land or place the model aircraft on the helipad. The model aircraft may face left or right but must be parallel with the judges' line. The manoeuvres must be executed as described with landings performed only where listed.. 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 degrees above the horizon and between lines 60 degrees 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 execute 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 and all remaining manoeuvres. Before the autorotation manoeuvre the competitor is allowed another free pass to accommodate a possible change in wind direction.

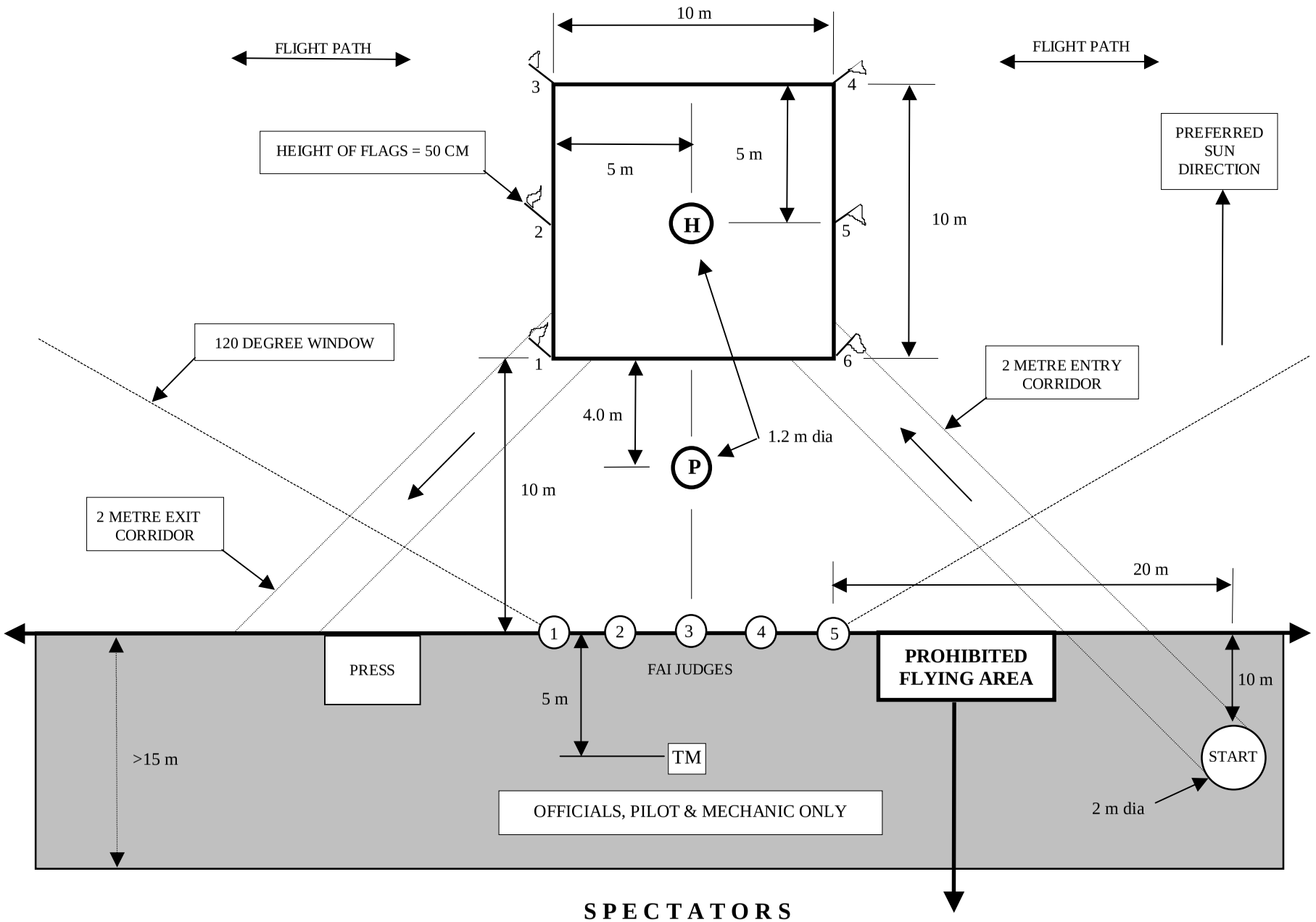
5.4.15. MANOEUVRE DESCRIPTIONS

Refer to ANNEX 5D

5.4.16. JUDGES' GUIDE

Refer to ANNEX 5E

FIGURE 5.4.A - F3C CONTEST AREA LAYOUT



ANNEX 5D

F3C MANOEUVRE DESCRIPTIONS

5D.1 GENERAL

The manoeuvres are displayed in pictorial form in Figures A1 and A2 for the case where the wind direction is left to right. The following descriptions apply to all manoeuvres and if not executed properly must result in downgrades. If a manoeuvre is unrecognisable 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. Circular and linear hovering segments must be executed at a constant speed. Pirouettes must be performed at a constant turning rate. The hovering manoeuvres must be started with the nose of the model aircraft 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 1,2 metre diameter circle marked "P" in Figure 5.4.A during all manoeuvres. All aerobatics manoeuvres must start and end in the direction indicated with a straight and level flight line of 10 metre 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 executed 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 model aircraft above a minimum altitude of 10 metres. Aerobatics manoeuvres must be centred within the 120 degree horizontal field of view. Aerobatics manoeuvres flown at a distance greater than 100 metres from the judges' line will be downgraded. In case of a dispute the following text takes precedence over Figures A1 and A2.

5D.2 SCHEDULE A

A1. VERTICAL RECTANGLE 1 - UPWIND/UPWIND

Model aircraft takes off vertically from the helipad and ascends to eye level and stops. It then flies backwards to one of the centre flags (2 or 5) and stops. Model aircraft then climbs vertically 4 m while simultaneously performing a slow 360 degree pirouette and stops. Model aircraft then flies forward 10 m to opposite centre flag and stops. Model aircraft then descends 2 m and stops before it makes a pirouette in the opposite direction to the first pirouette. Model aircraft makes a stop before it descends 2 m to eye level. Model aircraft then flies backward to the centre helipad, makes a stop before it lands on the helipad.

Points will be subtracted for the following reasons:

1. Lateral position changed during 360 degree pirouette.
2. Pirouettes were not exactly 360 degrees.
3. Pirouettes were not centred over the flags.
4. Pirouettes were same direction (score = zero).

A2. NOSE-IN / TAIL-IN HORIZONTAL EIGHT – UPWIND/UPWIND

Model aircraft takes off from helipad and ascends vertically to eye level and stops. Model aircraft then flies a nose-in circle in either direction for the first half of the eight followed by a tail-in circle in the opposite direction for the second half of the eight. The manoeuvre must be executed parallel to the judges' line and the circles must be centred on the centre flags (2 and 5). Model aircraft returns to a point directly over the helipad and stops. Model aircraft then descends to a landing on the helipad.

Points will be subtracted for the following reasons:

1. Radii of the circles were not the same.
2. Nose or tail of model aircraft did not always point to centre of circle.

A3. VERTICAL TRIANGLE WITH 180 & 360 º PIROUETTES - UPWIND/UPWIND

Model aircraft takes off vertical from the helipad to eye level and stops. Model aircraft then flies backwards from the helipad to one of the centre flags (2 or 5) and stops. Model aircraft then performs a 180 degree tail rotor turn in either direction and stops. Model aircraft then climbs backwards at 45 degree to a point 5 m above eye level and directly over the helipad and stops. The model aircraft performs a 360 degree pirouette in either direction and stops again. Model aircraft descends backwards at 45 degree to eye level directly over the opposite centre flag and stops. Model aircraft performs a 180 degree tail rotor turn in opposite direction to the first 180 degree turn and stops. Model aircraft then flies backward to the helipad, stops and descends to a landing on the helipad.

Points will also be subtracted for the following reasons:

1. Ascent and/or descent was not at 45 degrees
2. Model aircraft rotated during ascent and/or descent.
3. Model aircraft did not maintain lateral position during pirouettes.
4. 180 degree pirouettes were in the same direction (Score=zero).

A4. TWO CONSECUTIVE AXIAL ROLLS – DOWNWIND/DOWNWIND

Model aircraft flies straight and level for a minimum of 10m. Model aircraft executes two (2) consecutive rolls while maintaining longitudinal axis in the direction of flight. Rolls may be executed in either direction. The total duration must be a minimum of 4 seconds. Model aircraft must be in upright attitude when it crosses the centreline (CL in Figure 5.4.A).

Points will be subtracted for the following reasons:

1. Model aircraft hesitated between rolls.

A5. TWO CONSECUTIVE INSIDE LOOPS – UPWIND/UPWIND

Model aircraft flies straight and level for a minimum of 10m, then enters the first loop. The second loop immediately follows the first loop and must be in same location and plane (superimposed).

Points will be subtracted for the following reasons:

1. Model aircraft hesitated between loops.

A6. INSIDE LOOP WITH HALF ROLLS – DOWNWIND/DOWNWIND

Model aircraft flies straight and level for a minimum of 10 m, executes a half roll to inverted position followed by a recognisable straight segment, followed by a downward inside loop. Immediately after the completion of the inside loop model aircraft flies a recognisable straight segment followed by a second half roll back to the upright position. Flying straight and level for 10 m minimum completes manoeuvre. Half rolls may be executed in either direction.

Points will also be subtracted for the following reasons::

1. Model aircraft drifted toward or away from the judges.
2. Half rolls were not exactly 180 degrees.

A7. ROLLING STALL TURN + 540 STALL TURN - UPWIND/DOWNWIND

Model aircraft flies straight and level for a minimum of 10 m, then transitions to a vertical ascent at 90 degrees immediately followed by a half roll in either direction and vertical ascent of one fuselage length minimum. When the vertical ascent ends, model aircraft executes a 180 degree pirouette so that the nose points downward. After diving, the model aircraft makes a half loop so the model aircraft transitions to a second vertical ascent. After the model aircraft comes to a stop, model aircraft executes a 540 degree pirouette, so that the nose points downward. After descending, model aircraft transitions back to same altitude and opposite heading as at beginning of manoeuvre.

Points will be subtracted for the following reasons:

1. Model aircraft did not ascend vertically.
2. Model aircraft drifted toward or away from the judges.
3. Pirouette was not exactly 180 degrees.
4. Pirouette was not exactly 540 degrees.
5. Half roll was not exactly 180 degrees.

A8. PUSHOVER WITH 360º PIROUETTE - UPWIND/UPWIND

Model aircraft flies straight and level for 10 m minimum and then enters a 90 degree vertical ascent. When model aircraft comes to a stop, nose of model aircraft is pushed forward 90 degrees to level and upright position and stops. Model aircraft then executes a slow (4sec minimum) 360 degree pirouette in either direction and stops. This is followed by nose of model aircraft pushed over 90 degrees again to vertical (nose down) position followed by vertical descent and 90 degree pullout back to the same altitude and heading as at start of the manoeuvre. Manoeuvre is completed by flying straight and level for 10 m minimum.

Points will be subtracted for the following reasons:

1. Vertical segments were not parallel.
2. Model aircraft drifted toward or away from the judges.
3. Pirouette was not 360 degrees.
4. Pirouette was too fast.
5. Pushovers were not 90 degrees.

A9. AUTOROTATION WITH 180 DEGREE TURN - DOWNWIND/UPWIND

Model aircraft flies at a minimum altitude of 20m. Manoeuvre begins when model aircraft crosses an imaginary plane that extends vertically upward from a line drawn from the centre judge out through the helipad. Model aircraft must be in the auto rotation state when it cuts this plane, the engine must be off at this point and the model aircraft must be descending. The 180° turn must start at this point and the turning and descending rate must be constant from this point to a point just before touchdown on the helipad. The flight path of the model aircraft must appear as a semi-circle when viewed from above, starting at the vertical plane and ending at a line drawn from the centre judge through the helipad. The model aircraft's flight path must never be parallel to the ground or judge's line.

Scoring criteria:

The maximum score of 10 points can only be achieved when the model aircraft makes a smooth touchdown on the helipad with the skids or landing gear completely inside the 1,2m circle and parallel to the judge's line. A maximum score of 9 points can be obtained with a perfect landing inside the 1,2m circle but with part of the landing gear touching the circle (rotor shaft must point to inside of circle when viewed from above). If the model aircraft makes a perfect landing inside the 10m square the manoeuvre can achieve a maximum score of 8 points. If the model aircraft makes a perfect landing outside the 10m square a maximum score of 5 points can be awarded. If the flight path is stretched (flying parallel to the ground and/or judge's line) to reach the square, line or helipad, the manoeuvre will be severely downgraded. If the 180° turn is completed outside the 10m square the maximum score can only be 5 points.

Points will be subtracted for the following reasons:

1. Model aircraft made a hard landing.
2. Model aircraft landed while it still had forward speed.
3. Model aircraft did not perform an exact 180° turn.
4. Model aircraft did not maintain a constant rate of descent during 180° turn.
5. Model aircraft did not maintain a constant turning rate during 180° turn.
6. Flight path was stretched to reach helipad or square.
7. If engine was still running after crossing plane, score will be zero.

5D.3 SCHEDULE B

B1. VERTICAL RECTANGLE 3 – UPWIND/UPWIND

Model aircraft takes off vertically from the helipad and ascends to eye level and stops. Model aircraft then flies backwards to the outer flag (2 or 5) and stops. Model aircraft climbs 4 m above eye level while simultaneously performing a slow 360 degree pirouette in either direction and stops. Model aircraft then flies forward 10 m to opposite centre flag while simultaneously performing a slow 360 degree pirouette in either direction and stops. Model aircraft then descends 4 m to eye level while simultaneously performing a slow 360 degree pirouette in the opposite direction to the first pirouette and stops again. Model aircraft then flies backward to the helipad and stops. Model aircraft then descends to a smooth landing on the helipad.

Points will also be subtracted for the following reasons:

1. Model aircraft did not ascend or descend in a straight line in vertical segments.
2. Lateral position changed during 360 degree pirouette.
3. Pirouettes were not exactly 360 degrees.
4. Pirouettes were not centred over the flags.
5. Pirouettes were in same direction (score = zero).

B2. CIRCLE WITH 360 DEGREE PIROUETTES – UPWIND/UPWIND

Model aircraft takes off vertically from helipad and stops at eye level. Model aircraft then flies backwards to one of the centre flags (2 or 5) and stops. Model aircraft then flies a circle in either direction while simultaneously rotating three times (relative to the centre of the circle) about its yaw axis. The three pirouettes must be executed in the same direction as the circular path and at a constant rate (for a clockwise circle viewed from above, the pirouettes must be executed in clockwise direction). Model aircraft comes to a stop at 360° point. Model aircraft flies forward to a point directly over the helipad and stops. Model aircraft descends vertically to a landing on the helipad.

Points will be subtracted for the following reasons:

1. Circle was not round.
2. Nose or tail was not pointing to centre of the circle at appropriate points.
3. Pirouettes were not executed at a constant rate.
4. Pirouettes in opposite direction to circle (score =zero).

B3. TRIANGLE WITH TWO 360º PIROUETTES- UPWIND/UPWIND

Model aircraft takes off vertically from helipad to eye level and stops. Model aircraft then flies backwards from the helipad to one of the centre flags (2 or 5) and stops. Model aircraft then makes a 45° climb to a point directly over the helipad while performing a slow 360 degree pirouette and stops. The model aircraft then makes a 45° descent while performing a slow 360 degree pirouette in opposite direction to eye level directly over the opposite centre flag and stops. Model aircraft then flies backward to the helipad, stops and descends to a landing on the helipad.

Points will also be subtracted for the following reasons:

1. Ascent and/or descent were not at 45 degrees.
2. Model aircraft did not make a constant rotation during ascent and/or descent.
3. 360 degree pirouettes were in same direction (score = zero)

B4. ROLL REVERSAL - DOWNWIND/DOWNWIND

Model aircraft flies straight and level for a minimum of 10 m. Model aircraft executes a roll in either direction followed by a recognisable upright straight segment, followed by a roll in the opposite direction while maintaining longitudinal axis in the direction of flight. Second roll must be executed at same roll rate. The straight segment must be centred on the centre line. The total duration of the two rolls must be four (4) seconds minimum.

Points will also be subtracted for the following reasons:

1. Duration of manoeuvre was less than 4 seconds.
2. Upright straight segment between rolls was not centred.

B5. ONE LOOP WITH A STRAIGHT ROLL - UPWIND/UPWIND

Model aircraft flies straight and level for a minimum of 10 m, then enters a half inside loop. When the half loop is finished the model aircraft performs an axial roll in either direction and then performs a second half loop back to the same altitude as at the start of the manoeuvre. The model aircraft then flies straight for the distance of the roll plus 10 m.

Points will also be subtracted for the following reasons:

1. Half inside loops not round
2. Axial roll not level
3. Half inside loops not same diameter

B6. CUBAN EIGHT - DOWNWIND/DOWNWIND

Model aircraft flies straight and level and executes a 5/8 inside loop. When the model aircraft is in 45 degree descent and inverted it executes a 1/2 roll in either direction to upright and enters a 3/4 inside loop. When the model aircraft is again in 45 degree descent and inverted it executes a second 1/2 roll in either direction and finishes the first partial loop in upright attitude.

Points will also be subtracted for the following reasons:

1. Half rolls were not 180 degrees.
2. Half rolls were not superimposed.

B7. DOUBLE ROLLING STALL TURN - UPWIND/UPWIND

Model aircraft flies straight and level for a minimum of 10 m, then transitions to a vertical ascent at 90 degrees immediately followed by a half roll in either direction and followed by a vertical ascent of one fuselage length minimum. When the vertical ascent ends, model aircraft executes a 180 degree pirouette so that the nose points downward. After diving, the model aircraft makes a half inside loop and then executes a 180 degree pirouette so that the nose points downward. The model aircraft then immediately makes a half roll in opposite direction of the first. The model aircraft then transitions back to same altitude and heading as at beginning of manoeuvre.

Points will also be subtracted for the following reasons:

1. Model aircraft did not climb vertically.
2. Model aircraft drifted toward or away from the judges.
3. Half rolls were not exactly 180 degrees.
4. Rolls were not performed at same altitude
5. Pirouettes were not exactly 180 degrees.
6. Pirouettes were not performed at same altitude.
7. If half rolls were in same direction, score = zero.

B8. COBRA ROLL WITH HALF ROLLS AND OUTSIDE FLIP - DOWNWIND/DOWNWIND

Model aircraft flies straight and level for 10 m and enters the manoeuvre by pulling up into a 45 degree climb. After a 5 m minimum straight segment the model aircraft performs a half roll in either direction to the inverted position and continues to climb at 45 degrees for 5 m minimum. At this point the model aircraft makes an outside flip before it enters a 45 degree dive and after a 5 m minimum straight segment performs another half roll in either direction. Model aircraft continues for 5 m minimum and then recovers at starting altitude in level flight for 10 m to finish manoeuvre.

Points will also be subtracted for the following reasons:

1. Ascending and/or descending segments were not at 45 degrees.

2. Straight segments before and after half rolls were not recognisable.
3. Flip was not made on the centreline.
4. Model aircraft moved horizontally or vertically during flip.

B9. PULLUP WITH 360º INVERTED PIROUETTE - UPWIND/UPWIND

Model aircraft flies straight and level for 10 m minimum and then enters a 90 degree vertical ascent. When model aircraft comes to a stop, nose of model aircraft is pulled back 90 degrees to level and inverted position and stops. Model aircraft then executes a slow [4 sec minimum] 360 degree pirouette in either direction and stops. This is followed by nose of model aircraft pulled back 90 degrees again to vertical (nose down) position followed by vertical descent and 90 degree pullout back to the same altitude and heading as at start of the manoeuvre. Flying straight and level for 10 m minimum completes manoeuvre.

Points will also be subtracted for the following reasons:

1. Vertical segments were not parallel.
2. Model aircraft drifted toward or away from judges.
3. Pirouette was not 360 degrees.
4. Pullbacks were not 90 degrees.

B10. AUTOROTATION WITH TWO 90º TURNs - DOWNWIND/UPWIND

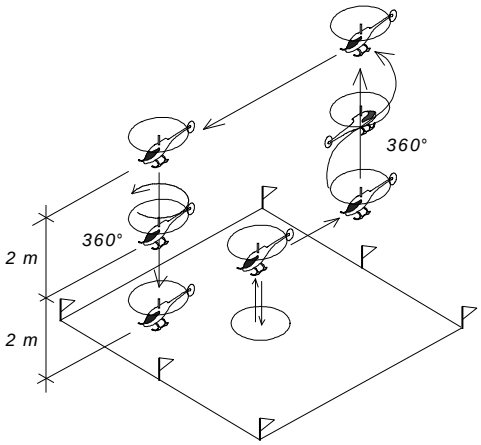
Model aircraft flies at a minimum altitude of 20 m. Manoeuvre begins when model aircraft crosses an imaginary plane that extends vertically upward from a line drawn from the centre judge out through the helipad. Model aircraft must be in the autorotation state when it cuts this plane, the engine must be off at this point and the model aircraft must be descending. The first 90 degree turn must be made after the model aircraft has made 1/3 of the total descent. After this turn the model aircraft must fly straight before the next turn is made after the model aircraft has made 2/3 of the descent. The model aircraft 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 model aircraft 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:
The maximum score of 10 points can only be achieved when the model aircraft makes a smooth touchdown on the helipad with the skids or landing gear completely inside the 1,2 m circle and parallel to the judge's line. A maximum score of 9 points can be obtained with a perfect landing inside the 1,2 m circle but with part of the landing gear touching the circle (rotor shaft must point to inside of circle when viewed from above). If the model aircraft makes a perfect landing inside the 10 m square the manoeuvre can achieve a maximum score of 8 points. If the model aircraft makes a perfect landing outside the 10 m square a maximum score of 5 points can be awarded. If the flight path is stretched (flying parallel to the ground) to reach the square, line or helipad, the manoeuvre will be severely downgraded.

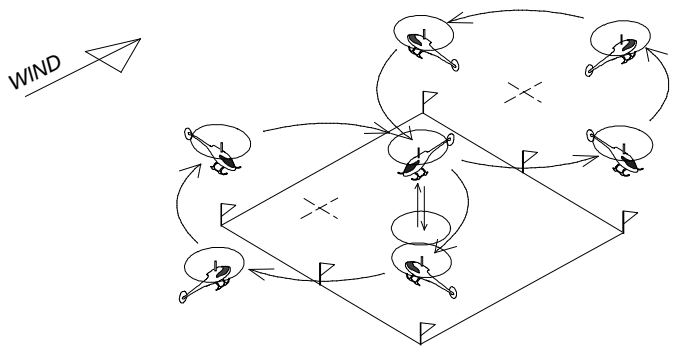
Points will also be subtracted for the following reasons:

1. Model aircraft made a hard landing.
2. Model aircraft landed while it still had forward speed.
3. Model aircraft did not perform two exact 90° degree turns.
4. Model aircraft did not maintain constant rate of descent during ***3*** segments and turns.
5. Flight path was stretched to reach helipad or square.
6. If engine was still running after crossing plane, score will be zero

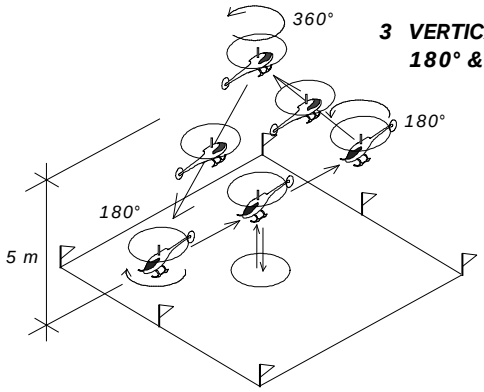
2002 F3C MANOEUVRE SCHEDULE A



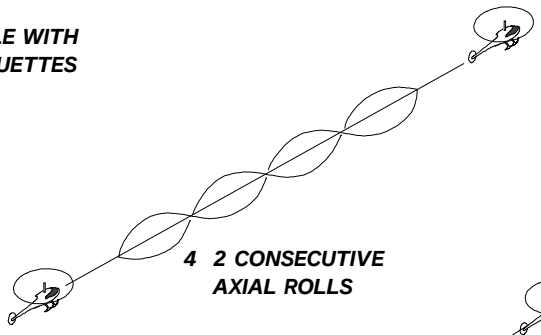
1 VERTICAL RECTANGLE 1



2 NOSE IN / TAIL IN HORIZONTAL EIGHT

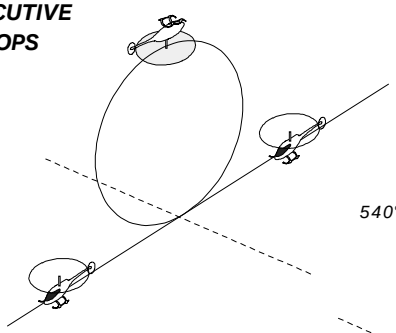


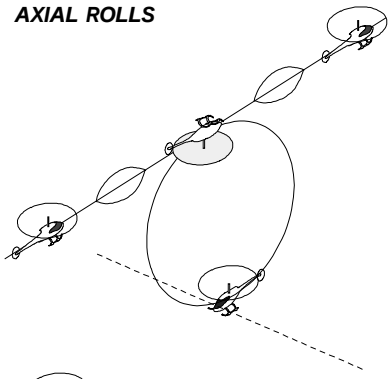
3 VERTICAL TRIANGLE WITH 180° & 360 ° PIROUETTES



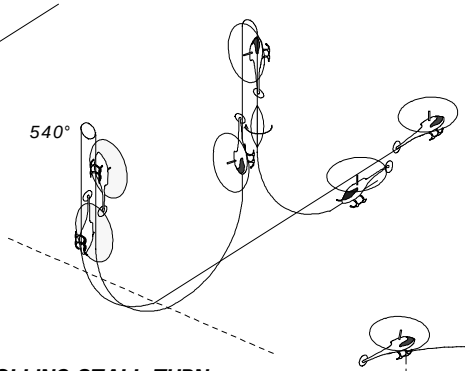
4 2 CONSECUTIVE AXIAL ROLLS

5 2 CONSECUTIVE INSIDE LOOPS



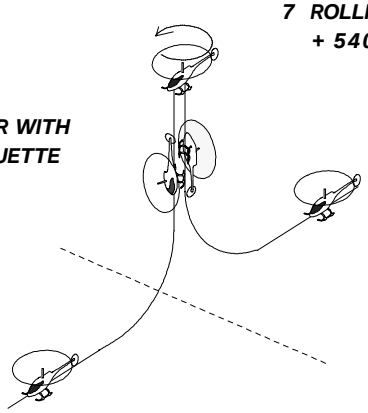


6 INSIDE LOOP WITH HALF ROLLS

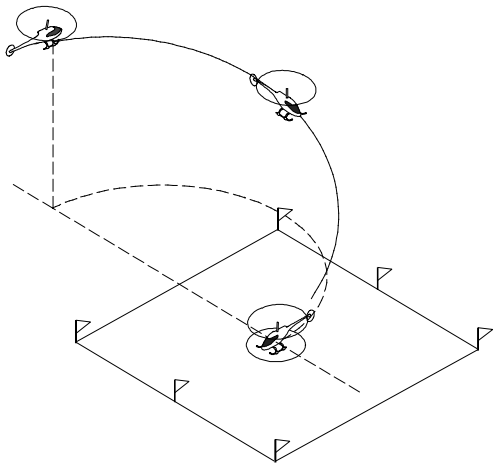


7 ROLLING STALL TURN + 540° STALL TURN

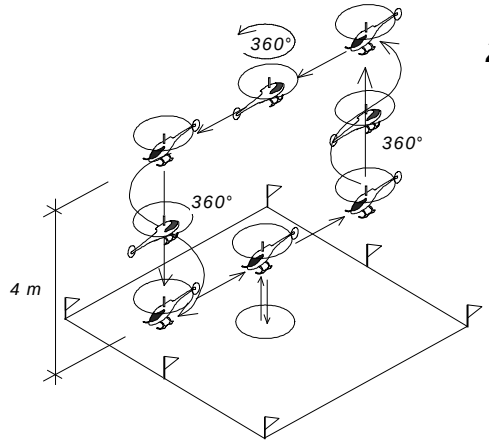
8 PUSH-OVER WITH 360° PIROUETTE



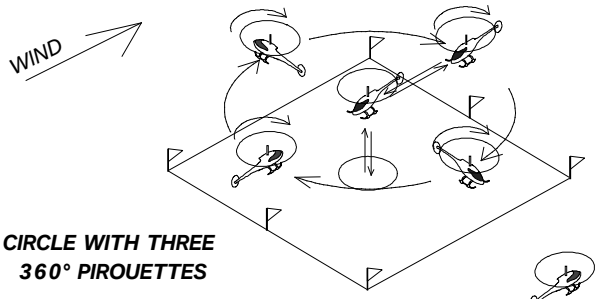
9 AUTOROTATION WITH 180° TURN



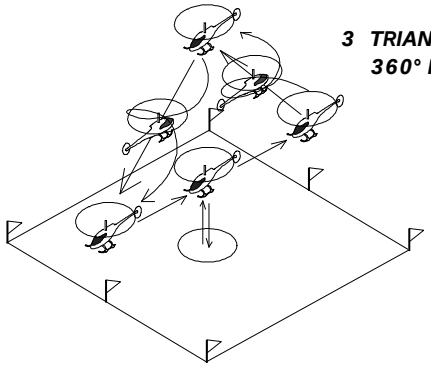
2002 F3C MANOEUVRE SCHEDULE B



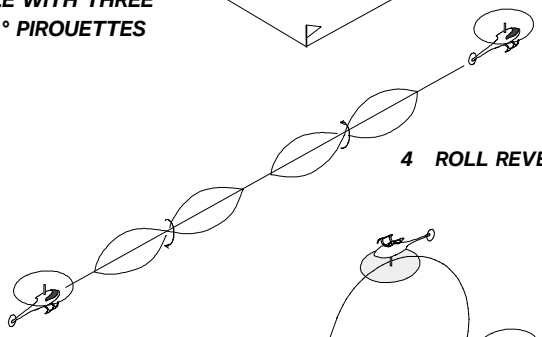
1 VERTICAL RECTANGLE 3



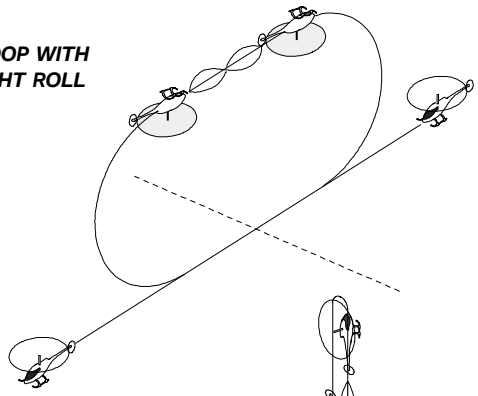
2 CIRCLE WITH THREE 360° PIROUETTES



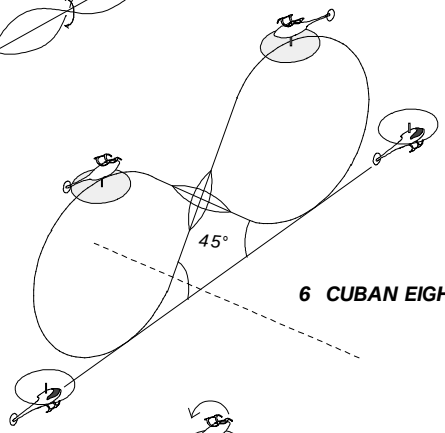
3 TRIANGLE WITH TWO 360° PIROUETTES



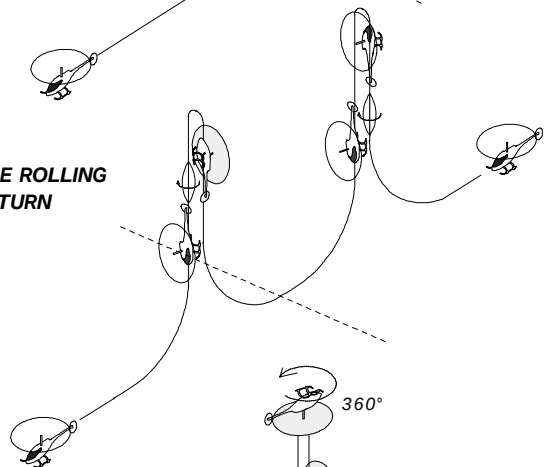
4 ROLL REVERSAL



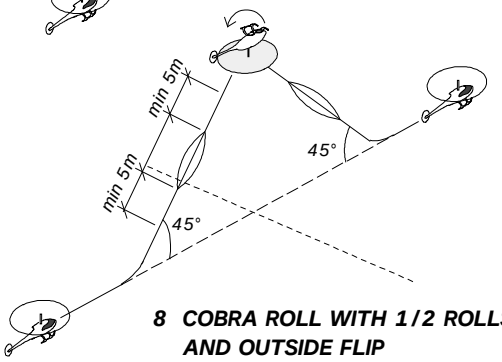
5 ONE LOOP WITH STRAIGHT ROLL



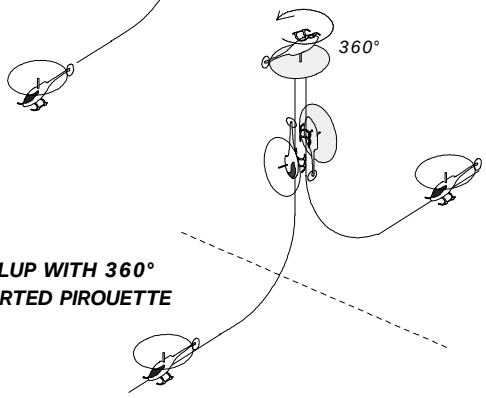
6 CUBAN EIGHT



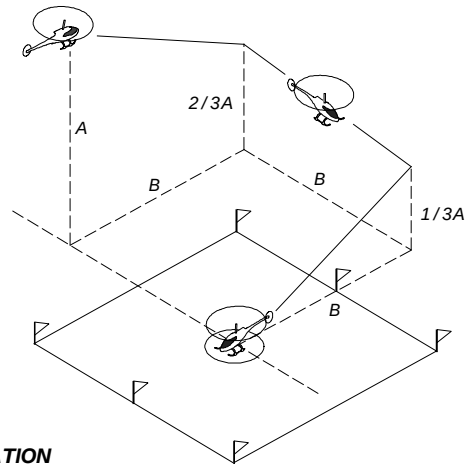
7 DOUBLE ROLLING STALL TURN



8 COBRA ROLL WITH 1/2 ROLLS AND OUTSIDE FLIP



9 PULLUP WITH 360° INVERTED PIROUETTE



10 AUTOROTATION WITH TWO 90° TURNS

ANNEX 5E

F3C JUDGES' GUIDE

5E.1 PURPOSE

The purpose of the F3C Judges' Guide is to provide an accurate description of the major judging criteria to serve as a reference for use in developing a uniformly high standard of judging.

5E.2 PRINCIPLES

The principles of judging a radio controlled model helicopter should be based on the perfection with which the model aircraft executes each manoeuvre as described in Annex 5D.

The main principles used to judge the degree of perfection are:

1) Precision of the manoeuvre.

2) Smoothness and gracefulness of the manoeuvre.

3) Positioning or display of the manoeuvre.

4) Size of the manoeuvres relative to each other.

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

5E.3 ACCURATE AND CONSISTENT JUDGING

The most important aspect of judging is consistency. Each judge must establish his standard and then maintain that standard throughout the competition. It is recommended that the contest director or Organizer hold a conference prior to the start of competition to discuss judging so that the standards are as uniform as possible. This can be accomplished with demonstration flights that 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 the defects. After the competition is started, the individual judges should not alter their standard. Judging accuracy is also very important. Being consistent, whether high or low is not sufficient if the scores awarded do not fairly reflect the performed manoeuvre.

5E.4 CRITERIA FOR JUDGING MANOEUVRES

A description of each manoeuvre is provided in Annex 5D along with a partial list of possible downgrades. Each manoeuvre should be downgraded according to:

1) The type of defect.

2) The severity of the defect.

3) The number of times a defect occurs.

4) The positioning of the manoeuvre.

5) The size of the manoeuvre relative to other manoeuvres.

A high score should be given only if no major defects are noted and the manoeuvre is accurately positioned. Whenever there is doubt a lower score should be given.

5E.5 ATTITUDE AND FLIGHT PATH

The flight path of the model aircraft is the trajectory of its centre of gravity. The attitude is the direction of the fuselage (canopy, boom, etc.) centreline in relation to the flight path. All judging should be based on flight path.

5E.6 GRADING CRITERIA FOR MANOEUVRE SEGMENTS

The following criteria are furnished to provide the judge with a guide for downgrading deviations from the defined manoeuvre segments. The segments are: Takeoffs, landings, stops, lines, rotations, loops, rolls and stall turns.

5E.6.1. TAKEOFFS

Takeoffs must start from the centre of the 1,2 metre circle to obtain maximum score. Takeoffs must be smooth and the model helicopter must ascend vertically to eye level. Takeoffs from the edge of the helipad (but with rotor shaft pointing to inside of circle when viewed from above) result in a downgrade of 1 point. Non-vertical ascents where the model helicopter moves forward or backward by half a fuselage length result in a downgrade of half a point.

5E.6.2. LANDINGS

Landings must be centred in the 1,2-metre circle (helipad) to obtain a maximum score. If a portion of the skids or landing gear is outside of the circle (but rotor shaft points to the inside of the circle when viewed from above), the downgrade is one point for that and the following manoeuvre. A landing outside of the circle (rotor shaft points to the outside of the circle when viewed from above) results in a downgrade of 2 points for that and the following manoeuvre. Non-vertical descents where the model helicopter moves forward or backward by half a fuselage length result in a downgrade of half a point. The landings must be smooth and re-positioning of the model helicopter between manoeuvres is not allowed. If the model aircraft is re-positioned the next manoeuvre will be scored zero points.

5E.6.3 STOPS

For the hovering manoeuvres the stops must be equal to or greater than 2 seconds in duration. All stops must be of the same duration. If a stop is less than 2 seconds long, a downgrade of half a point should be made. If a stop is greater than 2 seconds, no downgrade should result as long as the model aircraft does not move.

5E.6.4. LINES

For the hovering manoeuvres the lengths of the lines are for the most part defined by the 10-metre square. However, the aerobatic manoeuvres must be started and ended by horizontal lines of minimum length 10 metres. A greater length of a vertical or climbing line, resulting from the performance of the model aircraft, must not be allowed to influence a judge's score. The length of a line before and after a manoeuvre must be equal. One point should be subtracted for a recognisable difference. If there is a complete absence of a line, before or after a manoeuvre, 2 points should be subtracted.

5E.6.5. ROTATIONS

During a rotation (stationary tail rotor turn), if the model helicopter moves vertically or laterally by a noticeable amount, 1 point should be subtracted. If the vertical or lateral movement of the helicopter is significant (more than 25 cm), 2 or more points should be subtracted. During a rotation after a climb, if the model aircraft moves laterally by a noticeable amount, 1 point should be subtracted. If the model aircraft’s movement is greater than 25 cm, 2 or more points should be subtracted.

5E.6.6. LOOPS

A loop must, by definition, have a constant radius, and must be flown in a vertical plane. It starts and ends with a well-defined line, which for a complete loop will be horizontal. Every loop must be flown without segmentation. Every clearly seen segment should result in a downgrade of 1 point. If a loop is not flown entirely in a vertical plane, a minor drift should be downgraded by 1 point, while a more severe drift should be downgraded by several points.

5E.6.7. ROLLS

The roll rate must be constant. Small variations in roll rate should be downgraded by 1 point while more severe variations receive larger downgrades. Rolls (including partial rolls) must have crisp and well-defined starts and stops. If a start or stop is badly defined, 1 point is subtracted for each.

5E.6.8. STALL TURNS

The lines during this segment must describe vertical and horizontal flight paths. The model aircraft must come to a complete stop before a tail rotor turn is initiated. The tail rotor turn must be around the main rotor shaft. If there is significant horizontal displacement, 1 point should be subtracted. If the model aircraft shows a pendulum movement after the rotation, it should result in a downgrade of 1 point. The entry and exit must consist of partial loops with constant and equal radii. Partial rolls must be placed in the middle of the straight lines. The lines must be recognisable with lengths at least equal to one fuselage length.

5E.7 WIND CORRECTION

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

5E.8 POSITIONING

All aerobatic manoeuvres must be performed within the 60-degree vertical and 120 degree horizontal viewing angle. Manoeuvres that are flown off centre will be downgraded according to the displacement. The downgrade may be in the range of 1 to 4 points. If a portion of a manoeuvre is flown outside of this air space a severe downgrade will occur. If the entire manoeuvre including entry and exit is flown outside of the window it must be scored zero points. Flying so far out as to make the evaluation of a manoeuvre difficult should also be severely downgraded. The main criterion here is visibility. Manoeuvres performed on a line further out than 100 metres away but in front of the judges should be downgraded in any case because even the keenest eye begins to lose perspective at that distance.