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Radio Control Helicopters

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F3C – RC HELICOPTERS
ANNEX 5D – F3C MANOEUVRE DESCRIPTIONS
ANNEX 5E – JUDGES' GUIDE

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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

SECTION 4C – MODEL AIRCRAFT – F3C, HELICOPTERS

THIS 2006 EDITION INCLUDES THE FOLLOWING AMENDMENTS MADE TO 2004 CODE

These amendments are marked by a double line in the right margin of this edition

Paragraph	Plenary meeting approving change	Brief description of change	Change incorporated by
5.4.4.	2005	Noise limits reduced to 87, 89 dBa	FAI Secretariat
5.4.5.	2005	New contest area layout	
5.4.11.	2005	Top 15 pilots advance to fly-offs	
5.4.11.	2005	New Normalisation Scheme	
5.4.14 & 5.4.15.	2005	New ANNEX 5D (As amended at 2005 TM)	
5.4.16.	2005	Updated ANNEX 5E	
5D.3 B8	2006	**Safety amendment, effective 01/05/06: changed part of the manoeuvre**	Sub-Committee Chair

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:

(a) changes can next be agreed at the Plenary meeting 2009 for application from January 2010;

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

VOLUME F3C

PART FIVE - TECHNICAL REGULATIONS FOR RADIO CONTROLLED CONTESTS

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% 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 250dm^{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 250dm^{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 250dm^{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.

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 3m (3 metre) while the helicopter is hovering with the skids/landing gear at eye level 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 360º 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 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 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 team standings. The top 15 then compete in three fly-off rounds to determine the final individual classification. The results of the best three preliminary rounds for the top 15 (normalised to 500 points**)** will count as one score. This score, plus the three fly-off scores, provide four normalised 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 and dropping the lowest. All scores for each round will be normalised by awarding 500 points to the average scoring flight. The remaining scores are then normalised to a percentage of the 500 points as follows:

$$Points_{(X)} = \frac{Score_{(X)} \times Total_{(A)}}{Score_{(A)}} \times 500$$

Where: Points $_{(X)}$ **=** Points awarded to competitor X
Score $_{(X)}$ **=** Score of competitor X
Score $_{(A)}$ **=** Total sum of all scores of completed flights
Total $_{(A)}$ **=** Total number of pilots with completed flights

Only completed flights, where all manoeuvres are flown in the right order and without infringement of the judges' line, will be counted. When multiple flight lines are used the scores will be normalised for each flight line and each day.

If only one round is possible then the classification will be based on that one 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. 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.10.)

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 eye level (Eye Level = EL = skids/landing gear are at eye level of the pilot) and must not be rotated beyond 180º left or right relative to the competitor. If the model aircraft is rotated beyond 180º 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 in the start circle the model must be flown at EL 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.

5.4.14. MANOEUVRE SCHEDULES

FLIGHT PROGRAM

The flight program consists of manoeuvre schedules A and B for the years 2006/2007, and manoeuvre schedules A and C for the years 2008/2009. 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 EL 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 60º above the horizon and between lines 60º 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 only. Before the autorotation manoeuvre the competitor is allowed another free pass to accommodate a possible change in wind direction.

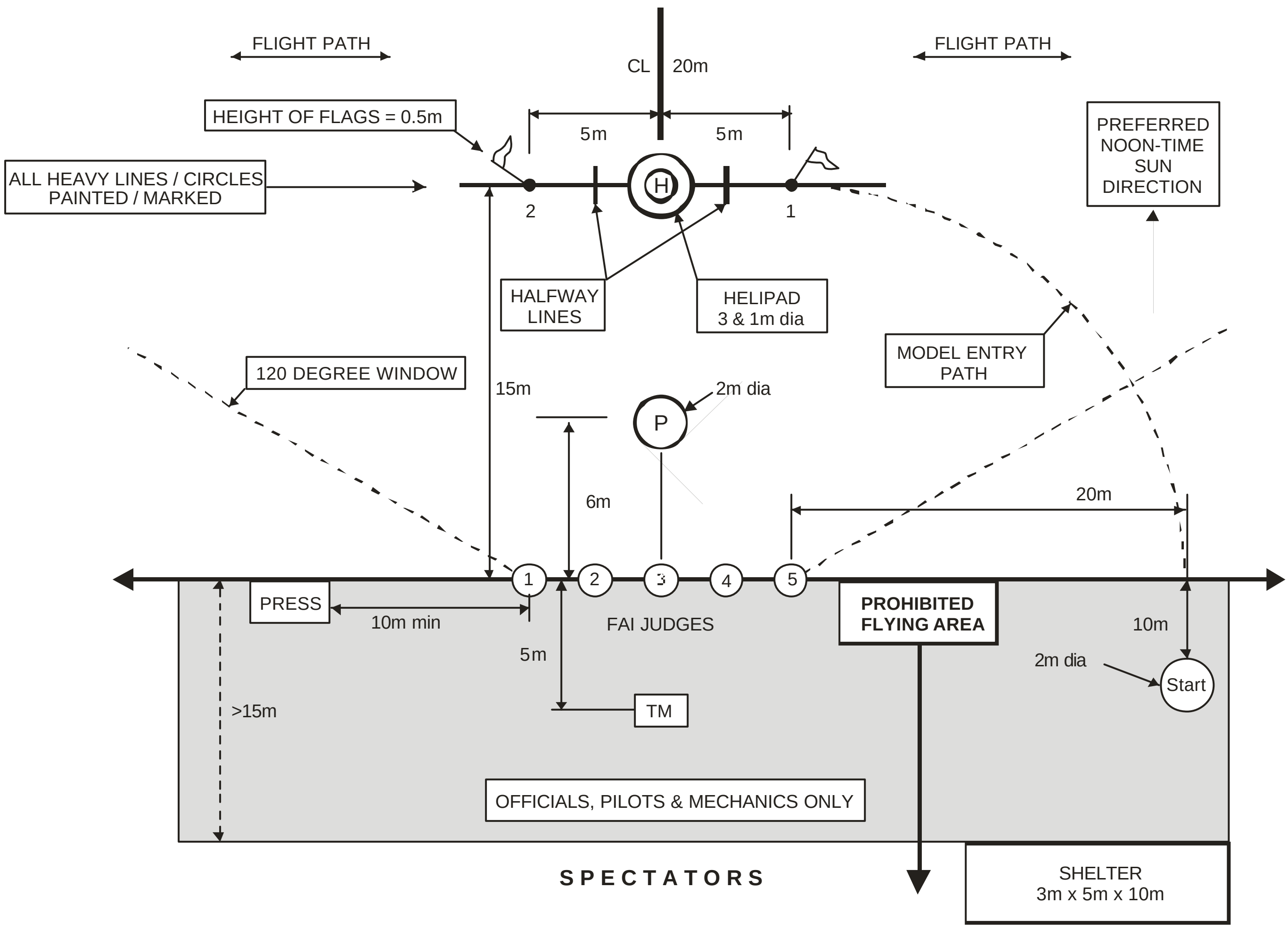
5.4.15. MANOEUVRE DESCRIPTIONS

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

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 A will be flown for the preliminary rounds 1 through 4. Manoeuvre schedule B will be flown for the Fly-Off rounds during the years 2006 and 2007. Manoeuvre schedule C will be flown for the Fly-Off rounds during the years 2008 and 2009.

SCHEDULE A (2006-2009)

A1. DIAMOND.. (UU)
A2. INVERTED TRIANGLE .... (UU)
A3. HOVERING “M”... (UU)
(FLY BY)
A4. ROLL REVERSAL .... (DD)
A5. DOUBLE ROLLING STALL TURN..................................... (UU)
A6. COBRA ROLL WITH HALF ROLLS .... (DD)
A7. FLIPPING PULLBACK .... (UU)
A8. CUBAN EIGHT.. (DD)
A9. PUSH OVER WITH 360º PIROUETTE .... (UU)
(FLY BY)
A10. AUTOROTATION WITH 180º TURN................................. (DU)

SCHEDULE B (2006-2007)

B1. HOURGLASS 1.. (UU)
B2. CIRCLE WITH TWO 360º PIROUETTES .... (UU)
B3. RECTANGLE WITH 180º PIROUETTES............................... (UU)
(FLY BY)
B4. HORIZONTAL EIGHT.. (DD)
B5. FIGURE “M” WITH 180º STALL TURNS .... (UU)
B6. COBRA ROLL + ½ ROLLS AND PUSHED FLIP..................... (DD)
B7. DUAL FLIP WITH HALF OUTSIDE LOOP............................. (UU)
B8. PULL-UP WITH 360º INVERTED PIROUETTE .... (DD)
B9. SQUARE LOOP WITH HALF ROLLS .... (UU)
(FLY BY)
B10. AUTOROTATION WITH TWO 90º TURNS.......................... (DU)

SCHEDULE C (2008-2009)

C1. HOURGLASS 2... (UU)
C2. PIROUETTING HEXAGON.. (UU)
C3. RECTANGLE WITH 4-POINT PIROUETTES .... (UU)
(FLY BY)
C4. 4-POINT ROLL .... (DD)
C5. TWO REVERSE OUTSIDE LOOPS .... (UU)
C6. KNIFE EDGE COBRA ROLL WITH 450º PIROUETTE .... (DD)
C7. FIGURE “M” WITH 540º STALL TURNS .... (UU)
C8. HORIZONTAL EIGHT WITH ROLLS .... (DD)
C9. VERTICAL SPIKE .... (UU)
(FLY BY)
C10. “S” AUTOROTATION WITH 180º PIROUETTE .... (UU)

5D.1 GENERAL

The manoeuvres are displayed in pictorial form in Figures 5D-A, 5D-B and 5D-C 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. Points will also be subtracted if a manoeuvre is not performed as described. If a manoeuvre is unrecognisable, or 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 executed 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 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 aerobatics 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 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 m. Aerobatics manoeuvres must be centred within the 120º 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-A, 5D-B and 5D-C.

5D.2 SCHEDULE A

A1. DIAMOND - UPWIND/UPWIND

The model aircraft lifts off from the helipad and hovers at eye level. The model aircraft backs up and climbs to stop and hover 2.5m AEL over flag 1(2). A 180º pirouette in either direction is performed centred on flag 1(2). The model aircraft then backs up and climbs another 2.5m to stop and hover over the helipad at a height of 5m AEL. A 360º pirouette in either direction is performed. The model aircraft then descends 2.5m and travels backward to arrive over flag 2(1) to stop and hover. A 180º pirouette in either direction is performed centred over flag 2(1). The model aircraft then descends backwards to the helipad and stops to hover at eye level. The model aircraft descends and lands on the helipad.

A2. INVERTED TRIANGLE – UPWIND/UPWIND

Model aircraft takes off vertically to eye level and hovers for 2 seconds. Model aircraft then ascends backwards at 45º, while simultaneously performing a 180º pirouette in either direction to a spot directly over flag 1(2) and stops. Model then flies horizontally while simultaneously performing a 360º pirouette in either direction to flag 2(1) and stops. Model then descends at 45º while simultaneously performing a 180º pirouette in either direction. Model hovers above helipad and descends vertically to a landing.

A3. HOVERING "M" - UPWIND/UPWIND

Model ascends vertically to eye level and stops. Model then flies backward to flag 1(2) and stops. Model then ascends vertically 5m while simultaneously performing a 360º pirouette in either direction and stops. Model then performs another 360º pirouette in the same direction while descending at a 45º angle to eye level above the helipad and stops. Model then ascends at a 45º angle while performing a 360º pirouette in the opposite direction to a point 5m AEL over flag 2(1) and stops. Model then descends to eye level while performing a 360º pirouette in the same direction and stops. Model then flies backward to the helipad and stops. Model descends vertically and lands on the helipad.

A4. ROLL REVERSAL – DOWNWIND/DOWNWIND

Model aircraft flies straight and level for a minimum of 10m. 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 upright straight segment must be centred on the centre line. The total duration of the two rolls must be four (4) seconds minimum.

A5. 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 90º followed by a half roll in either direction and followed by a vertical ascent of one fuselage length minimum. At the top, model aircraft executes a 180º pirouette so that the nose points downward. After diving, the model aircraft makes a half inside loop into another stall turn at the same altitude and executes a 180º pirouette so that the nose points downward. The model aircraft then makes a half roll in either direction. 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. Rolls were not performed at same altitude
2. Pirouettes were not performed at same altitude.

A6. COBRA ROLL WITH HALF ROLLS – DOWNWIND/DOWNWIND

Model aircraft flies straight and level for 10m and enters the manoeuvre by pulling up into a 45º climb. After a 5m minimum straight segment the model aircraft performs a half roll in either direction to the inverted position and continues to climb at 45º for 5m minimum. At this point the model aircraft performs a ¼ inside loop and enters a 45º dive inverted and after a 5m minimum straight segment performs another half roll in either direction. Model aircraft continues for 5m minimum and then recovers at starting altitude in level flight for 10m to finish manoeuvre.

Points will also be subtracted for the following reasons:

1. Straight segments before and after half rolls were not recognisable.

A7. FLIPPING PULLBACK - UPWIND/UPWIND

Model aircraft flies straight and level for 10m and enters the manoeuvre by pulling up into a vertical ascent after passing the centre line. After the model comes to a stop the model performs small backward ¼ inside loop and flies backwards and performs a travelling, centred pushed flip at constant altitude. This is followed by another small backward ¼ inside loop to a vertical nose down stop. The model then continues by descending on a path that mirrors the entry path. After the descent, model transitions to same heading and altitude as at the start of the manoeuvre. Model continues for 10m to finish the manoeuvre.

A8. CUBAN EIGHT - DOWNWIND/DOWNWIND

Model aircraft flies straight and level for a minimum of 10m and executes a 5/8 inside loop. When the model aircraft is in 45º descent and inverted it executes a ½ roll in either direction to upright and enters a ¾ inside loop. When the model aircraft is again in 45º descent and inverted it executes a second ½ 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 centred nor superimposed.

A9. PUSH OVER WITH 360º PIROUETTE - UPWIND/UPWIND

Model aircraft flies straight and level for 10m minimum and then enters a 90º vertical ascent. When model aircraft comes to a stop, model aircraft performs a ¼ pushed flip to upright position and stops. Model aircraft then executes a slow [4 sec minimum] 360º pirouette in either direction and stops. Model aircraft then performs a ¼ pushed flip to vertical (nose down) position followed by vertical descent and ¼ inside loop back to the same altitude and heading as at start of the manoeuvre. Flying straight and level for 10m minimum completes manoeuvre.

Points will also be subtracted for the following reasons:

1. Pirouette was not 360º or 4 seconds duration.

A10. AUTOROTATION WITH 180º 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 for landing: See ANNEX 5E Paragraph 5E.6.10.

5D.3 SCHEDULE B

B1. HOURGLASS 1 – UPWIND/UPWIND

Model aircraft takes off vertically from the helipad and ascends to eye level and stops. The model backs up to flag 1(2) while executing a travelling 180º pirouette in either direction and stops. A diagonal line is flown backwards across and up to 4m AEL, and stops to hover over the opposite flag 2(1). A 360º pirouette in either direction is performed while travelling at the same altitude to stop and hover over flag 1(2). A diagonal line is flown backward across and down to arrive at eye level over flag 2(1). Another 180º pirouette in either direction is performed while travelling to the centre helipad. The model stops to hover over the centre helipad then lands.

B2. CIRCLE WITH TWO 360º PIROUETTES – UPWIND/UPWIND

Model aircraft takes off vertically from helipad and stops at eye level. Model flies forward into an ascending vertical circle (5m diameter) while simultaneously executing a 360º pirouette ending at the top of the first half. At this point the pirouette switches direction for the second half of the circle stopping over the helipad at eye level. Model then descends to a landing on the helipad.

B3. RECTANGLE WITH 180º 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 flags 1(2) and stops. Model aircraft then ascends vertically 4m while performing two 180º pirouettes of opposite direction and stops. Model aircraft then flies horizontally to a point over flag 2(1) while simultaneously performing a 360º pirouette and stops. Model aircraft then descends vertically 4m while performing two 180º pirouettes of opposite direction to eye level and stops. Model aircraft flies back to centre helipad and stops. Model aircraft then descends to a landing on centre helipad.

B4. HORIZONTAL EIGHT - DOWNWIND/DOWNWIND

Model aircraft flies straight and level and executes a 5/8 inside loop. When the model aircraft is in 45º descent it enters a ¾ outside loop. When the model aircraft is again in 45º descent it executes a partial inside loop to upright horizontal attitude.

B5. FIGURE M WITH 180º STALL TURNS - UPWIND/UPWIND

Model pulls vertical and does a quarter roll so that the top of the disk is toward the pilot and continues for a minimum of 1 fuselage length. When the model stops climbing the model performs a 180º stall turn. On the way down the model does another quarter roll and performs an inside half loop. Model goes vertical again and does another quarter roll so that the top of the disk is toward the pilot and continues for a minimum of 1 fuselage length. Model does another 180º stall turn. Model does another quarter roll and pulls out at starting altitude in level flight for 10m to finish the manoeuvre.

B6. COBRA ROLL WITH ½ ROLLS AND PUSHED FLIP - DOWNWIND/DOWNWIND

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

Points will also be subtracted for the following reasons:

1. Straight segments before and after half rolls were not recognisable.

B7. DUAL FLIP WITH HALF OUTSIDE LOOP - UPWIND/UPWIND

Model aircraft flies straight and level for a minimum of 10 m. Model aircraft performs a ¼ inside loop and establishes a vertical line. At the peak of the ascent the model performs a ½ outside flip so that it points nose down. The model aircraft descends vertically and executes a ½ roll. The model aircraft then performs a ½ outside loop centred on the centre line and then ascends vertically again and at the peak of the ascent the helicopter completes a ½ inside flip so that the nose points down. The model aircraft then descends vertically and executes a ½ roll followed by a straight segment. The model aircraft then performs a ¼ inside loop to recover upright with the same altitude and direction as the entry for a minimum of 10m.

Points will also be subtracted for the following reasons:

1. Rolls were not performed at same altitude.
2. Flips were not performed at same altitude.

B8. PULL-UP WITH 360º INVERTED PIROUETTE - DOWNWIND/DOWNWIND

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

Points will also be subtracted for the following reasons:

1. Pirouette was less than 4 seconds duration.

[Note: For safety, manoeuvre B8 has been amended to change the sequence of the manoeuvre and to delete the full roll. Effective 1st May 2006]

B9. SQUARE LOOP WITH HALF ROLLS - UPWIND/UPWIND

Model aircraft flies straight and level for 10m minimum. The model aircraft then performs a ¼ inside loop followed by a straight segment. This is followed by another ¼ inside loop and a straight segment with a half roll. The model aircraft then performs a ¼ outside loop followed by a straight segment and another ¼ outside loop followed by a final straight segment with a half roll to level upright flight. The manoeuvre is completed by flying level for at least 10m.

Points will also be subtracted for the following reasons:

1. Segments of the square were not of equal length.
2. ½ rolls were not centred.

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 90º 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 for landing: See ANNEX 5E Paragraph 5E.6.10.

5D.4 SCHEDULE C

C1. HOURGLASS 2 – UPWIND/UPWIND

Model aircraft takes off vertically from the helipad and ascends to eye level and stops. Model aircraft hovers back to flag 1(2) and stops. Model ascends diagonally while simultaneously performing two 180º pirouettes in opposite directions to a point 4m above flag 2(1) and stops. Model then flies horizontally across to flag 1(2) simultaneously performing two 180º pirouettes in opposite directions and stops. The first 180º pirouette will end directly above the helipad followed by an immediate reversal of direction for the second 180º pirouette. Model then descends 4m diagonally while simultaneously performing two 180º pirouettes in opposite directions to eye level above flag 2(1) and stops. Model then flies back to the helipad and stops. Model then descends and lands on helipad.

C2. PIROUETTING HEXAGON – UPWIND/UPWIND

Model aircraft takes off vertically from helipad and stops at eye level. The model then backs up and stops to hover halfway between the helipad and flag 1(2). Helicopter executes a 90º pirouette in either direction and stops. The model then ascends sideways to 2m AEL over flag 1(2) and stops. The model then makes a 90º-pirouette in the same direction and stops. The model then ascends backwards to a point 4m AEL halfway between flag 1(2) and the helipad. At this point, the helicopter makes a third 90º pirouette in the same direction as the previous two. The model then travels sideways 5m across the top of the hexagon and stops halfway between the helipad and flag 2(1) still at 4m AEL. The model completes a 90º pirouette in the opposite direction to the last three turns. The model travels and descends backwards to 2m AEL over flag 2(1) and stops. The model performs another 90º pirouette in the same direction as the previous one and stops. The model then descends sideways to eye level to a point halfway between flag 2(1) and the helipad. The model performs another 90º pirouette in the same direction as the previous two and stops. The model backs up horizontally to hover over the central pad and stops. The model then descends to and lands on the helipad.

Points will also be subtracted for the following reasons:

1. Hexagon was not symmetrical.
2. Second three pirouettes same as first three (score =zero).

C3. RECTANGLE WITH 4-POINT 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 flags 1(2) and stops. Model aircraft then ascends in 1m increments performing a continuous 90º pirouette in either direction with a stop for each increment up to 4m above eye level. Model aircraft then flies across to the opposite flag 2(1) while simultaneously performing a 360º pirouette in either direction and stops. Model aircraft then descends in 1m increments performing a continuous 90º pirouette in either direction with a stop for each 1m increment down to eye level. Model aircraft then flies backward to the helipad, stops and descends to a landing on the helipad.

C4. FOUR-POINT ROLL - DOWNWIND/DOWNWIND

Model aircraft flies straight and level for a minimum of 10 m. Model aircraft executes a 4-point roll in either direction. The four individual segments must be recognisable and of equal length. The model must exit the manoeuvre with a straight and level segment of 10 m.

Points will also be subtracted for the following reasons:

1. Duration of segments was not equal.
2. Not all segments were recognisable.

C5. TWO REVERSE OUTSIDE LOOPS - UPWIND/UPWIND

Model aircraft enters the manoeuvre by performing a half roll to inverted flight. Model then flies straight and level for 20m and executes two upward outside loops. After the loops, model aircraft flies straight and level for 20m and executes a half roll to upright flight.

Points will also be subtracted for the following reasons:

1. Half axial rolls not at same altitude

C6. KNIFE EDGE COBRA ROLL WITH 450º PIROUETTE - DOWNWIND/DOWNWIND

Model aircraft flies straight and level for a minimum of 10 m. Model aircraft pulls up to establish a 45º line. Model then performs a ¼ roll to knife-edge with the rotor disc facing the pilot and on centre of the 45º line. The model aircraft then performs a travelling 450º pirouette in the same direction as the parabolic path while in knife-edge flight until it reaches a 45º descent. The model aircraft then executes a ¼ roll to upright, flies a straight segment and then recovers to horizontal flight of at least 10m.

Points will also be subtracted for the following reasons:

1. Pirouette not exactly 450º.
2. Knife edge not vertical.

C7. FIGURE M WITH 540º STALL TURNS - UPWIND/UPWIND

Model aircraft flies straight and level for a minimum of 10 m. Helicopter pulls vertical and establishes a vertical line. The helicopter completes a ¼ roll such that the rotor disc faces pilot and continues for a minimum of 1 fuselage length. At the top, model aircraft executes a 540º pirouette so that the nose points downward. The model aircraft descends vertically and performs a ¼ roll to an inverted attitude. The model aircraft then performs a centred inverted outside half loop and continues on a second vertical ascent. The model aircraft performs another ¼ roll so that the rotor disc again pilot and continues for a minimum of 1 fuselage length. After the model aircraft stops it performs another 540º pirouette until the nose points downward. The model aircraft then descends vertically and performs another ¼ roll. The model aircraft then performs a ¼ inside loop to recover at the same altitude as the entry.

Points will also be subtracted for the following reasons:

1. Vertical ascent after ¼ rolls not recognisable.
2. 540º pirouettes not a same altitude.

C8. HORIZONTAL EIGHT WITH ROLLS - DOWNWIND/DOWNWIND

Model aircraft flies straight and level and executes a 5/8 inside loop. When the model aircraft is in 45º descent it performs a full roll and enters a ¾ outside loop. When the model aircraft is again in 45º descent it executes another full roll and a partial inside loop to upright attitude.

Points will also be subtracted for the following reasons:

1. Crossover rolls were not centred nor superimposed.

C9. VERTICAL SPIKE - UPWIND/UPWIND

Model aircraft flies straight and level for 10m minimum. The model aircraft pulls to vertical and ascends vertically and performs a ¼ roll such that the rotor disc pilot and continues for a minimum of 1 fuselage length. After the model stops it performs a ¼ pulled flip to an inverted nose-in hover and stops. The model aircraft then hovers inverted for 3 seconds. The model then completes three 90º pirouettes pausing to hover inverted for a minimum of 1 second at each point to complete the 270º rotation. The direction of pirouette must be such that the model completes the 270º with the tail into the wind and inverted. The model then performs a ¼ pulled flip and begins to fall vertically. The model aircraft then performs a ¼ inside loop and recovers upright at the starting altitude.

C10. "S" AUTOROTATION WITH 180º PIROUETTE – UPWIND/DOWNWIND/UPWIND

The model aircraft enters the manoeuvre going upwind at a minimum altitude of 40m and some distance out. After crossing the plane upwind, and some distance out, the model makes the first 180º turn towards the pilot. As the model crosses the plane again but downwind it performs a quick 180º pirouette and enters a backward descending 180º turn toward the pilot and lands.

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

FIGURE 5D-A F3C MANOEUVRE SCHEDULE A (2006 -2009)

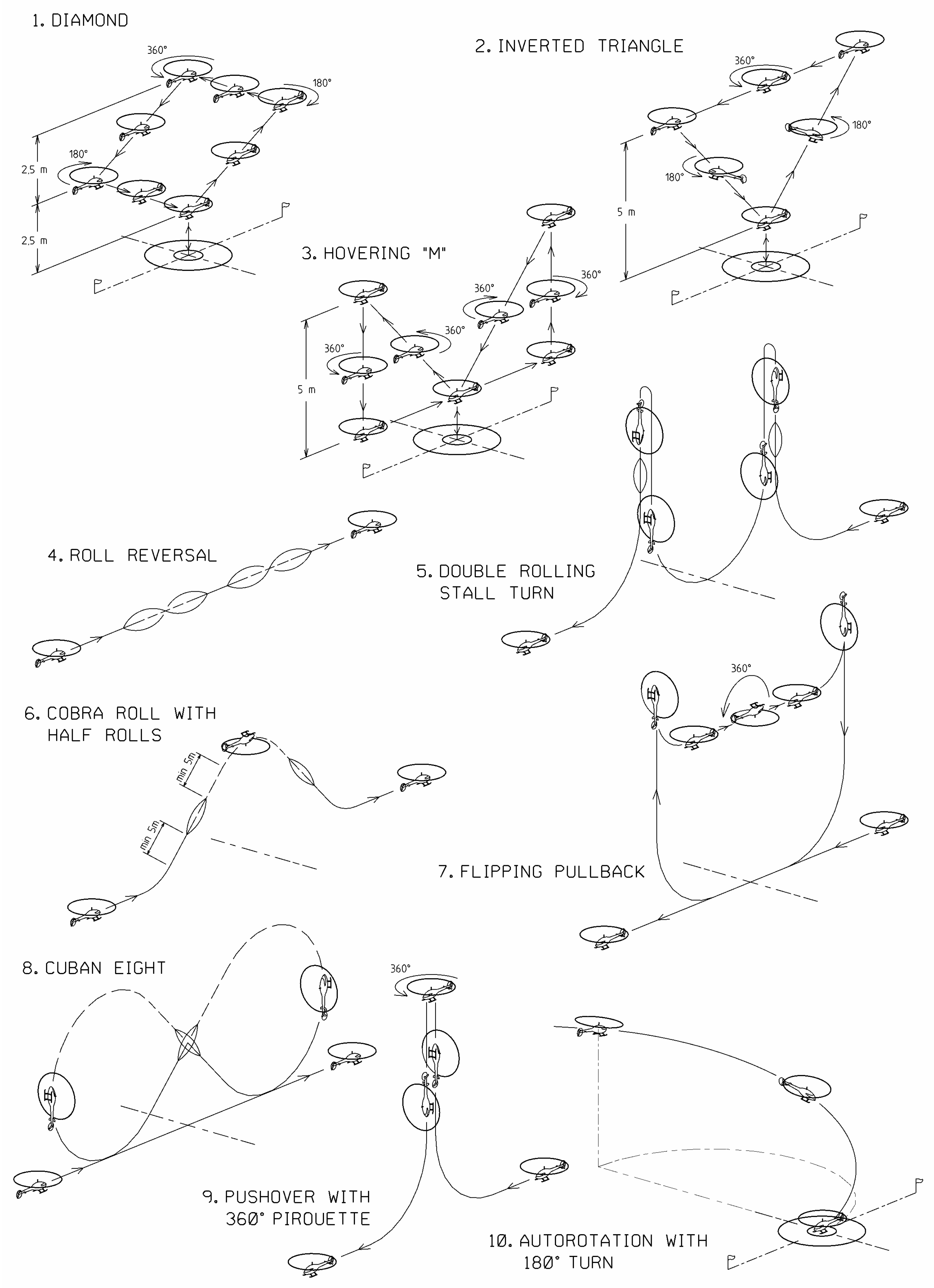


FIGURE 5D-B F3C MANOEUVRE SCHEDULE B (2006-2007)

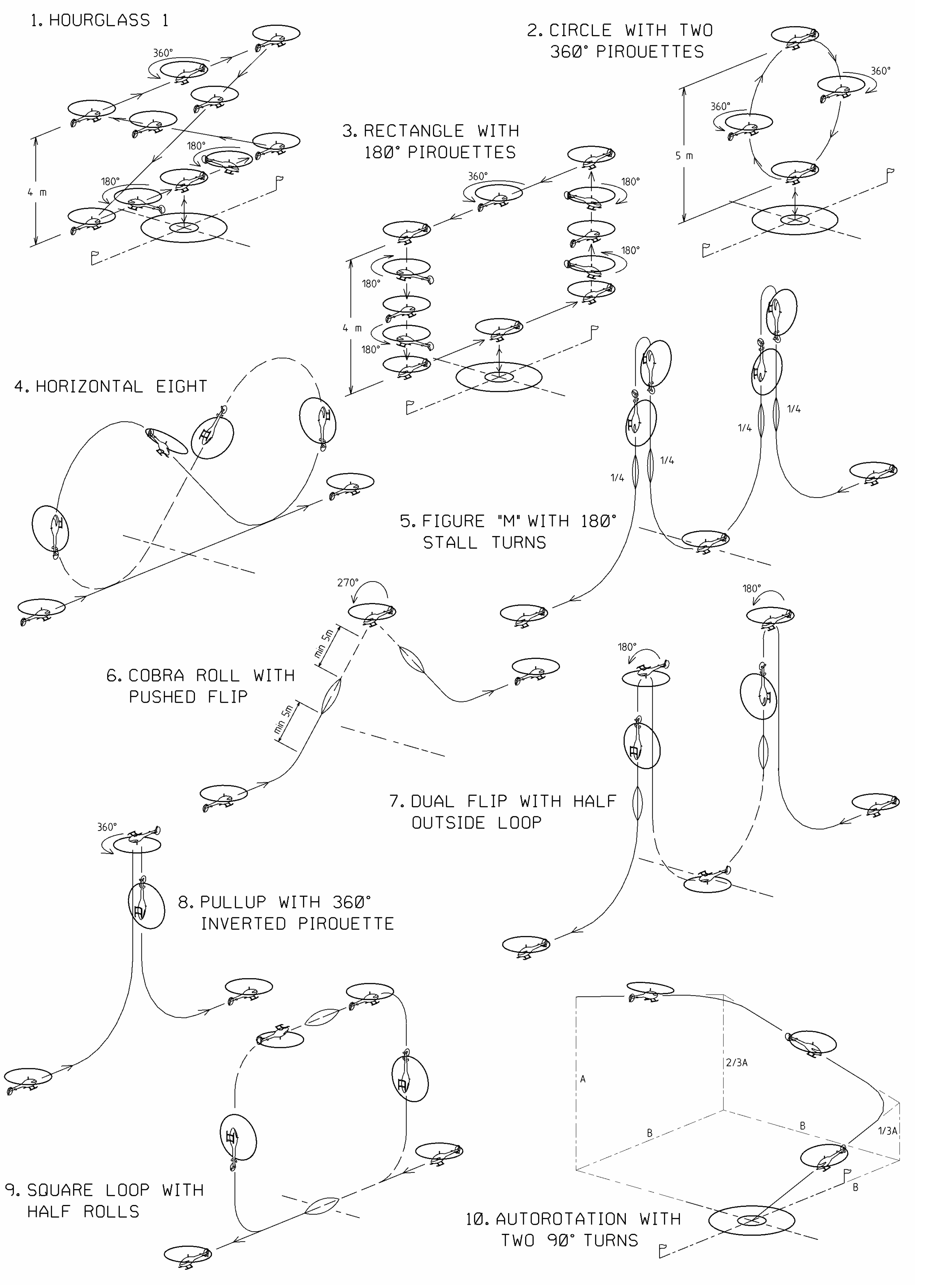
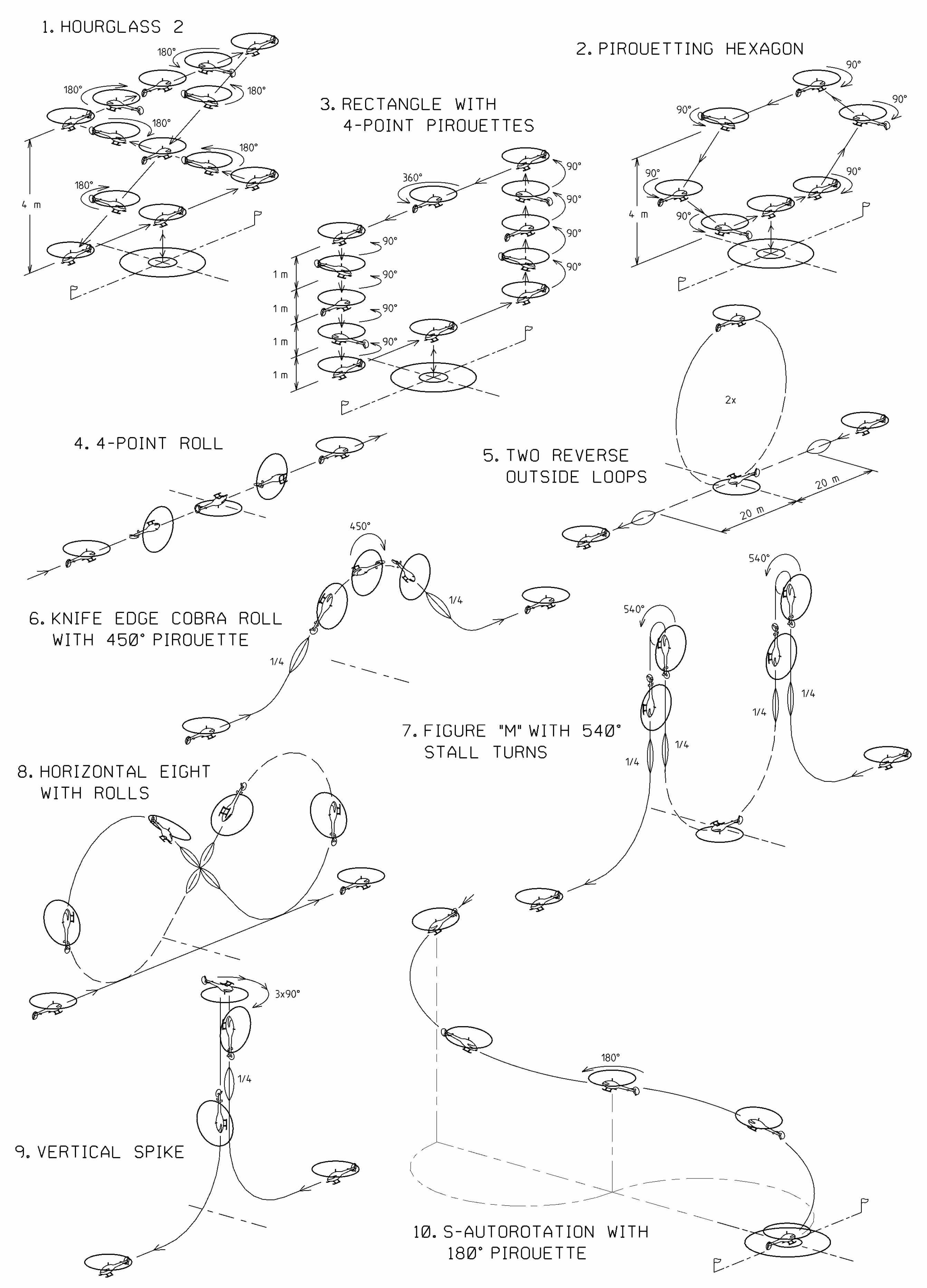


FIGURE 5D-C F3C MANOEUVRE SCHEDULE C (2008-2009)



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 organiser 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, Pirouettes, Loops, Rolls, Stall turns and Flips.

5E.6.1. TAKEOFFS

Takeoffs for the hovering manoeuvres must start from the centre of the 1m circle to obtain maximum score. Takeoffs must be smooth and the model helicopter must ascend vertically until the skids or landing gear are at eye level. Non-vertical ascents where the model helicopter moves forward or backward by half a fuselage length result in a downgrade of 1 point.

5E.6.2. LANDINGS

Landings for the hovering manoeuvres must be centred in the 1m circle of the helipad to obtain a maximum score. If a portion of the skids or landing gear is outside of a circle (but rotor shaft points to the inside of the circle when viewed from above), the downgrade is one point. A landing outside of a circle (rotor shaft points to the outside of the circle when viewed from above) results in a downgrade of 2 points. Non-vertical descents where the model helicopter moves forward or backward by half a fuselage length result in a downgrade of 1 point.

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 defined by the 10m distance between flags 1 and 2 and must be straight. Diagonal lines must be performed at the proper angle. However, the aerobatic manoeuvres must be started and ended by equal horizontal lines of minimum length 10 m. 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. 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. PIROUETTES

All pirouettes must be performed around the vertical axis. If the deviation is greater than 20º one point will be subtracted. During a hovering pirouette (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 25cm), 2 or more points should be subtracted. During an ascending pirouette, if the model aircraft moves laterally by a noticeable amount, 1 point should be subtracted. If the model aircraft's movement is greater than 25cm, 2 or more points should be subtracted. Travelling pirouettes must be synchronised with flight path. If the pirouettes are performed in the same direction for manoeuvres where pirouettes of opposite direction are prescribed, the score must be zero.

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. Duration of the rolls must meet the minimum times specified.

5E.6.8. STALL TURNS

The entry/exit lines must be horizontal and the ascending/descending lines must be vertical (parallel). The pirouettes must be symmetrical by performing half of the rotation before and after the complete stop. The pirouette 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 and full 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.6.9. FLIPS

Flips are stationary or travelling rotations about the lateral axis of the model aircraft without changing altitude. The direction of the flip is described according to the movement of the control stick (Push=Nose down, Pull=Nose up). One point should be subtracted for a deviation of more than a fuselage length from the described manoeuvre.

5E.6.10. AUTOROTATIONS

Autorotations begin when model aircraft crosses an imaginary plane that extends vertically upward from a line drawn from the centre judge out through the centre of the 1m 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. If the engine is still running at this point, the manoeuvre will be scored zero. During the manoeuvre, the forward speed and rate of descent should be constant, which means that the angle of the flight path is also constant. After landing the model must be parallel to the judges' line. If the flight path is stretched, shortened or deviated from, to reach a circle the manoeuvre must be downgraded. The original flight path gives a basic maximum score according to the description and there will be additional downgrades of 1 or 2 points depending of the severity of the deviation. For example: If the flight path clearly points to a landing close to flag 1 (2) and the path is stretched to reach a circle, the score can only be a maximum of 6 (outside the circles) and there will be an additional downgrade of 2 points for the stretch, so the score can only be a maximum of 4. If the pilot would have landed without stretching, the maximum score would have been a 6. Therefore, stretching the flight path must never lead to a higher score.

Scoring criteria for Autorotation landings:
Landing gear inside 1m circle = Maximum 10 points.
Rotor shaft points to inside of 1m circle = Maximum 9 points.
Landing gear inside 3m circle = Maximum 8 points.
Rotor shaft points to inside of 3m circle = Maximum 7 points.
Rotor shaft points to outside of 3m circle = Maximum 6 points.

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 60º vertical and 120º 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 100m 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.