4.2 - CLASS F2B - AEROBATIC MODEL AIRCRAFT

Note: The F2B Judges' Guide is at Annex 4B

Contents

The Manoeuvres

4.2.1 Introduction

a) Ruling version:
In the event of any inconsistency between the original English language version of this text and any translation, the original English language version shall prevail. The Metric values and measurements used in this text shall prevail (the Imperial units shown are for information only and are approximate only, being rounded up to the nearest whole unit).

b) Terminology and wording:
In this text all the manoeuvre descriptions have been written from the **viewing point of the pilot, not of the judges**. And although it is known that control line model aircraft actually fly in hemispherical arcs, all of the following descriptions use "two dimensional" terms because when viewed by the pilot these arcs appear to be "straight line" flight paths. In addition, the following standardised wording and phraseology has been used throughout this text:

Wording:	Definition:
i) manoeuvre:	means the full total of figures and segments necessary to complete the manoeuvre marked under a separate numbered heading with bold type. For example: the Take-off Manoeuvre (4.2.20), the Three Consecutive Inside Loops Manoeuvre (4.2.22), and The Single Four Leaf Clover Manoeuvre (4.2.33), are all referred to as a single whole manoeuvre throughout;
ii) figure:	means a shape which makes up a separate, recognisable, complete part of a whole manoeuvre. For example, the first loop of The Three Consecutive Inside Loops Manoeuvre (4.2.22) is referred to as a figure; but the first loop which makes the first half of the first complete figure eight in The Two Consecutive Overhead Eights Manoeuvre (4.2.32) is not referred to as a figure;
iii) segment:	means a specifically-defined part of a figure (or of a whole manoeuvre) in which certain particular points are detailed. For example: the first loop which makes the first half of the first complete figure eight in The Two Consecutive Overhead Eights Manoeuvre (4.2.32) is referred to as a segment;
iv) upright:	means the model flying in its "normal" attitude (that is: with it's landing gear nearest to the ground);
v) inverted:	means the model flying in an attitude which is reversed from upright flight (colloquially, the model is "flying on it's back", or is "flying upside-down");
vi) "vertical":	means at right angles (perpendicular) to the ground over which the flying takes place. This word is marked with inverted commas (quotation marks) throughout to serve as a constant reminder that the requirement is for models to fly at right angles to the ground, even if that ground is uneven and/or has a slope;
vii) "horizontal":	means parallel to the ground over which the flying takes place. This word is marked with inverted commas throughout to serve as a constant reminder that the requirement is for models to fly parallel to the ground, even if that ground is uneven and/or has a slope;
viii) "straight line":	means the closest distance between two points as seen in two dimensions. These words are marked with inverted commas throughout to serve as a constant reminder that the requirement (in all the Square and Triangular manoeuvres for example), is for a number of turns ("corners") which should be joined together with flight paths which appear to be straight lines when seen by the pilot;
ix) momentary (or momentarily):	used throughout this text in their original dictionary definition sense (that is: something which lasts only for a very brief period of time). So, for example, the very short period during which the model is required to be in a vertically-banked "knife-edge" attitude above the contestant's head during The Two Consecutive Overhead Eights Manoeuvre (4.2.32) is described in the text as "momentarily";
x) lateral reference:	means an imaginary line drawn upwards from the ground at right angles. As used in the text, this term should be used as the reference point when flying and marking the size, positioning, symmetry, and superimposing of various figures and manoeuvres. As required by the respective manoeuvres, the text may refer to a lateral reference, to a lateral reference line, or to a lateral reference point. In this last case the text also defines the specific point (height) on that line where the lateral reference point should be located;
xi) Wingover path:	means the vertical climbing and diving flight path defined as a segment of The Single Reverse Wingover Manoeuvre (4.2.21).

c) Values and Tolerances:

i) With the exception of radial values (degrees of arc), which cannot for practical purposes be measured by pilots or judges except "by eye", the values used in this text are generally given tolerances as used elsewhere within Section IV of the FAI Sporting Code. The inclusion of a tolerance against certain values in this text is intended to highlight that the requirement of the rule is that the stated value is the target value. This means that it is important that the stated value should be met and then maintained. As one example of this, the use of the plus/minus 30 cm (1ft) tolerance in manoeuvres where level flight at a height of 1.5 metres is called for means that a model being flown at 1.5 metres (5ft) high and not sharply varying it's height by more than plus or minus 30 cm (1ft) is flying according to the requirements of the manoeuvre. Therefore, in that example the manoeuvre should be scored on the basis of "perfect" flight, at least in this respect. But another model flying at, say, either 1.1 metres (approximately 3ft 7ins) or 1.9 metres (approximately 6ft 3ins) - in other words flying with a height variation of plus or minus 40 cm (approximately 1ft 3ins) - is not flying according to the requirements of the manoeuvre and so should be down-marked. As another example of the use of tolerances, in 4.2.7 (the pull test), where the load value is defined as 10 times the model weight with a tolerance of plus 0%/minus 10%, and taking a model weighing exactly 2.0 kg (4lbs 6ozs) as an example, the pull test load to be applied to this model shall be a **maximum** of 2 x 10, plus 0% (that is 20 kg – approx 44lbs 1oz), and a **minimum** of 2 x 10, minus 10% (that is 18 kg – approx 39lbs 10ozs).

ii) But other more generalised values (without tolerances) are also used in this text. An example is the allowable limit for model wingspan. Such values are expected to be measured within the accuracy of the standard hand measurement equipment generally available to non-specialists.

4.2.2 Model Definition and Specification

Powered control line aerobatic model aircraft in which all aerodynamic surfaces except the control surface/s and propeller/s remain fixed during flight (refer to the FAI Sporting Code Section IV, Section 4C Model Aircraft, Part One, General Regulations, paragraph 1.3.2). The following specification limits shall apply:

a) Maximum total flying weight (excluding fuel …..……. 3.5 kg (7lbs 11ozs), plus 1%

b) Maximum wingspan overall …….. 2.0 metres (6ft 6ins)

c) Maximum length overall ……..…. 2.0 metres (6ft 6ins)

d) Permitted power source/s shall include any power except rocket motors. Piston engine/s shall be subject to a total swept volume limitation of 35cc (2.13 ins^3) Electric power shall be limited to a maximum no-load voltage of 42 volts.

e) Minimum length of control lines shall be 15.0 metres (49ft), maximum length 21.5 metres (70ft 6ins), to be measured from the centre-line of the grip of the control handle to the centre-line of the propeller. Where models with multiple power sources are used the longitudinal centre line of the model shall be taken as the reference for measurement. Control lines shall be checked in accordance with 4.2.7 during all contests.

f) A noise limit of not exceeding 96 dB(A) with a tolerance of plus 2 dB(A) shall apply to all power sources. The noise level shall be checked in accordance with the procedure at 4.2.8.

g) Paragraph B3.1 of the FAI Sporting Code Section IV, Volume ABR, Section 4B, page 28 (the builder of the model rule) shall not apply to Class F2B.

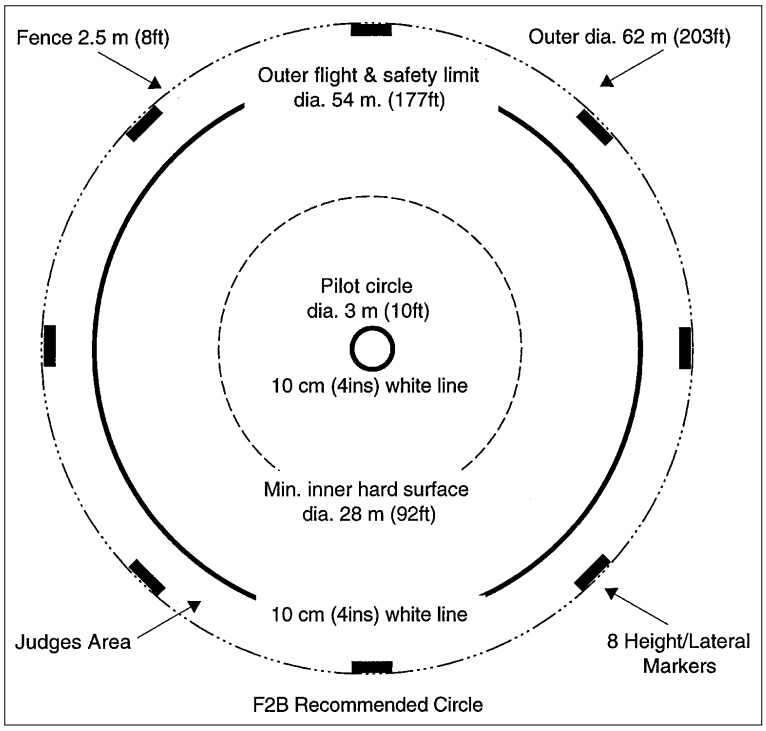
4.2.3 Flying Sites

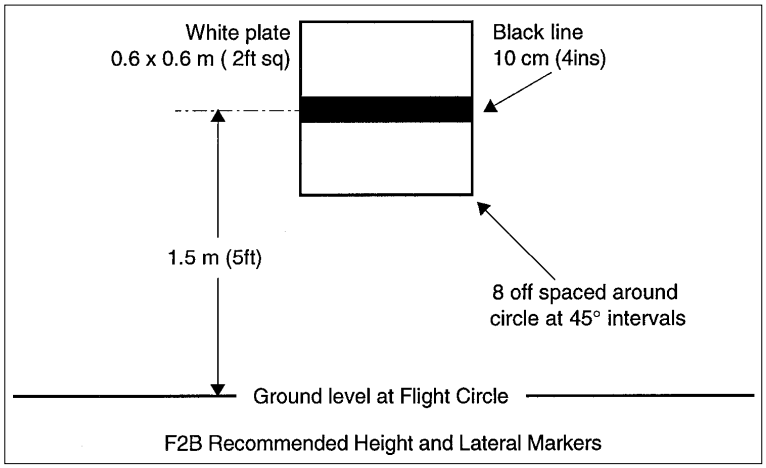
a) Contest organisers shall provide a site with Flight Circle/s which are horizontal within plus/minus 30 cm (12ins) across the entire diameter. Flight Circles shall also be flat and have smooth and ridge-free surfaces. If surfaced in tarmacadam, concrete, or similar hard material, the surface should be dust-free (that is: not packed gravel or sand, nor paved or tiled with openings between the paving material). Hard surfaces should, as a minimum, provide sufficient hard area to include at least the whole of the pilot's circle plus a "ring" for models to use during Take-off and Landing (see diagram below). During contests all grass etc, between these 2 areas shall be kept short enough not to interfere with control lines when models are on the ground.

b) If Flight Circle/s are wholly grass (or similar), the same requirements as in paragraph a) above shall apply, and also, the pilot's circle and Take-off/landing area should have an underlying surface which is free from any bumps and/or holes. The standard required shall not be that of a typical local sports field (a football field for example) but should be as close as possible to a high quality, well tended and well-drained domestic lawn. The length of grass, etc, shall be kept to a maximum of 2.5 cm (1in) over the complete Flight Circle during contests.

c) The diagrams below show recommended dimensions for F2B flying sites and the markers erected to show $^1/_8{}^{th}$ of a lap intervals and the normal level flight height (with the related height tolerance). As a minimum standard, all Flight Circle/s shall have their centre (Pilot circle) and outer diameter circles clearly marked with

lines of 10cm (4ins) width. At sites which lack fixed terrain reference points the erection of markers such as those shown below is highly recommended. The erection of a safety fence (or other suitable barrier) around the outside of all Flight Circles as shown below is also highly recommended.





d) At all World and Continental Championships, at other limited international contests, and at other contests with large numbers of contestants where the size and layout of the contest site allows, the use of "Ready Box/es" is highly recommended. These should be clearly marked, segregated off from general access by barriers, and be large enough to contain a model with full length lines attached. Ideally 2 or 3 such Ready Boxes should be provided if the contest site allows. If the contest site also allows, it is recommended that 1 "Exit Box" be provided, this to be positioned on the opposite side of the Flight Circle to the Ready Box/es, of a similar size to the Ready Box/es, and similarly marked and segregated. Refer also to the FAI Sporting Code Section IV, Volume F2, Annex 4E, Control Line Organisers Guide, 6.2.1 (page 59); and 6.5.2 (page 60); and Appendix 1 (page 66).

e) At World and Continental Championships and other limited international contests, organisers shall provide Practice Circle/s. Ideally these shall be located at the contest site itself, but in any event shall not require more than 30 minutes of normal travelling time to reach. Organisers shall provide a minimum of 1 Practice Circle for every 35 registered contestants and all Practice Circles shall be freely open and available for use by all contestants for at least the duration of the contest, ideally for a few days before the start of the contest. All Practice Circles shall be as close as possible to the standards and maintenance conditions set out at paragraphs a) and/or b) above, but except for the marking of the centre of the centre (Pilot circle) and outside diameter circles, the marking of circles as described at paragraph c) above shall not be required. However if the Practice Circle/s site is open to public access then organisers shall also erect suitable safety barrier/s and warning signs in the local language. Organisers shall not be obliged to organise flying rosters for use of Practice Circle/s.

4.2.4 Contest Staff

a) At World and Continental Championships and other limited international contests, contest organisers shall appoint the number of Judges required to function as per paragraphs 4.2.15 g) and h) below; an F2B Contest Director (hereafter "CD"); 1 or more Circle Marshall/s; a Head Judge; 1 or more persons to check control line lengths and conduct pull tests ("Pull Testers"); staff for classifying and ranking contestants ("Scores Tabulator/s"); and staff for checking the characteristics of the model/s of every registered contestant ("Model Processor/s"). At other F2B contests, organisers may, subject to the number of entries and the staff available, combine the above functions amongst the available staff. In all cases contest organisers shall be responsible for ensuring that the appointed staff have the necessary skill, training, and experience to carry out their appointed function/s, as set out in the following paragraphs.

b) The F2B CD shall have overall responsibility for the running of the F2B contest in accordance with the rules. He/she shall be directly responsible to the FAI Jury on site during the contest, including during set up and break down of the contest site. The F2B CD shall also be responsible for ensuring that the contest organiser has communicated the required detail to the FAI at the correct times, both before and after the contest, as set out in the FAI Sporting Code and the Control Line Organisers Guide (references: FAI Sporting Code Section IV, General Section, Volume ABR, Section 4B; and Section IV, Volume F2, Annex 4E, including Appendix 1). The F2B CD shall be responsible for the overall safety of the F2B contest; for ensuring that Contest Weather conditions are observed (4.2.6); for arranging and observing official noise measurement test/s (4.2.8); for arranging Re-flights (4.2.13); and in general terms, for the accuracy of Official Timing (4.2.16). He/she shall also be present at every random draw for flying order conducted by the contest organiser (refer 4.2.15, paragraphs a) and n), and 4.2.19, paragraph e).

c) The Circle Marshall/s shall be the Official Timekeeper/s for the Flight Circle/s (refer 4.2.16), and shall also be responsible for the smooth running of the contest in terms of ensuring that the contestants' flying order is published and distributed as quickly as possible; that Ready Boxes (where available) are kept filled with contestants preparing to fly; or where no Ready Boxes are available, that sufficient contestants are prepared and ready to enter the Flight Circle when Officially Called. The Circle Marshall shall be the contest official responsible for ensuring that contestants are Officially Called to enter the Flight Circle (refer 4.2.16), and for ensuring that each contestant leaves the Flight Circle immediately after completing his Official Flight (refer 4.2.10).

d) The Head Judge shall be responsible for ensuring that all judges for the contest perform their duties in accordance with 4.2.5. Also, the Head Judge shall himself be part of the judge's panel/s and shall score Official Flights. In addition, the Head Judge shall act as the single spokesman for all judges with the F2B CD in matters such as (but not limited to) general F2B organisation and safety; Contest Weather (4.2.6); Re-flights (4.2.13); and any questions which arise regarding Timing (4.2.16) or scoring of 0 (zero) points (4.2.18, paragraphs b and c). The Head Judge shall also be present at every random draw for flying order conducted by the contest organiser (refer 4.2.15, paragraphs a) and n), and 4.2.19, paragraph e). At contests where 2 Flight Circles are used the Head Judge shall appoint a Deputy in accordance with 4.2.15, paragraph h).

e) Scores Tabulator/s shall be responsible for processing the Score Sheets defined at 4.2.15, paragraph q) to enable classification and ranking of contestants in accordance with 4.2.19.

f) Pull Tester/s shall test control lines as described at 4.2.7.

g) Model Processor/s shall be responsible for checking and marking all models at World and Continental Championships and other limited international contests in accordance with the FAI Sporting Code Section IV, Volume ABR, Section 4B, paragraph B13; and Section IV, Section 4C, paragraph 2.3.

4.2.5 Judges' Duties

a) The duty of all judges is to carefully observe each manoeuvre flown by each contestant during every Official Flight, and whilst it is being flown, to compare the execution of each such manoeuvre with the respective manoeuvre description, as set out at 4.2.20 to 4.2.34 inclusive.

b) Each judge shall award points for each manoeuvre flown, the points awarded to be based solely upon the observation of each individual judge and his own opinion of the extent by which each flown manoeuvre has deviated from the respective manoeuvre description. Refer also to 4.2.11; 4.2.12; and 4.2.13.

c) At the end of each manoeuvre the points so awarded shall be legibly written by each judge on the Score Sheet forms provided by the contest organiser.

d) The judges shall also generally observe the conduct of the whole F2B contest for conformity with these rules (Volume F2, Section 4.2 of Section IV of the FAI Sporting Code), and all other relevant parts of Section IV of the FAI Sporting Code.

e) The Head Judge shall perform the duties set out at 4.2.4, paragraph d). If the contest organiser has not already done so, the complete judges panel at a contest shall jointly nominate one of their number to be Head Judge for the duration of the contest.

f) In cases where the judges panel/s is uncertain and cannot come to a common decision (such as when the number of figures flown in a manoeuvre may have been mis-counted, or when the number of intervening laps flown may have been mis-counted), the Head Judge shall be responsible for making the final decision, and for ensuring that the respective contestant's Score Sheets are correctly marked accordingly.

4.2.6 Contest Weather

a) No Official Flight (refer 4.2.10) shall be started when the wind speed is equal to or greater than 9 metres (30ft) per second, as measured at arms length for a continuous period of 30 seconds. In the event of such conditions occurring the F2B CD and Head Judge shall agree a suitable delay to the contest timetable and shall inform contestants and contest officials accordingly.

b) For safety reasons any Official Flight in progress during local electrical storm activity (thunder and/or lightning) shall be granted a Re-flight as per 4.2.13. No Official Flight shall be started when an electrical storm appears to be imminent, and if such conditions do occur the F2B CD and Head Judge shall agree a suitable delay to the contest timetable and shall inform contestants and contest officials accordingly.

4.2.7 Testing Control Lines

a) The 15.0 metres to 21.5 metres (49ft to 70ft 6ins) length of control lines, as specified at 4.2.2, paragraph e), shall be checked for each contestant at least once during every contest. When a contestant uses more than 1 model and/or 1 set of lines during a contest, all shall be checked.

b) Not less than 20 minutes before every Official Flight, a test load of 10 times the total weight of the model without fuel shall be evenly and smoothly applied to the assembled control handle, lines, and model. The load used in this test shall be accurate within a tolerance of plus 0%/minus 10% and shall be applied once only to the control handle in such a way that the test load is equally distributed between both flight lines/cables during the whole pull test.

c) If the lines are disconnected from a contestant's model after a pull test but before making the respective Official Flight then that contestant's lines and model shall again pass the pull test before making the respective Official Flight.

4.2.8 Noise Testing

a) Any contestant may, if he so desires, ask the F2B CD to arrange an unofficial noise measurement test of his own model/s. This shall be performed as per the procedure set out at paragraphs c) and d) below.

b) The noise level of any contestant's model shall be officially measured if the F2B CD, or the Head Judge, or an FAI jury member so requests. Such requests shall only be made if in the opinion of the person requesting the noise test the model concerned seems to be emitting a noise level higher than specified at 4.2.2, paragraph f) during an Official Flight (refer 4.2.10). All requests for an official noise test shall be made only to the F2B CD.

c) If an official noise measurement test is so requested the F2B CD shall arrange this. At the same time the F2B CD shall also immediately retrieve from the Head Judge all Score Sheets for the respective contestant's Official Flight in which the request for official noise test was made. If not conducting the noise test himself, the F2B CD shall officially observe the test.

d) The test procedure shall be for a noise meter to be positioned at 3.0 metres plus/minus 10 cm (10ft plus/minus 4ins) from the longitudinal centre line of the model, with the model placed on the ground over a concrete or tarmacadam surface adjacent to the Flight Circle, and with the inboard wingtip (when the model flies anti-clockwise) of the model facing towards the wind. With the motor running at it's normal Take-off setting, measurement shall be taken at 90 degrees to the flight path of the model, from the side of the model which is on the outside of the Flight Circle, and with the noise meter microphone placed on a stand 30 cm (1ft) above the ground and in line with the motor/s. No noise reflecting object shall be nearer than 3.0 metres (10ft) from the model or from the noise meter microphone when measurement is taking place. If performed on a concrete or tarmacadam surface the maximum permitted noise level shall be 96 dB(A) with a tolerance of plus 2 dB(A). If a hard surface is not available then the noise measurement may be taken over grass but in this case the grass shall not exceed 2.5 cm (1in) in length. When measuring noise over grass the maximum permitted noise level shall be 94 dB(A) with a tolerance of plus 2 dB(A).

e) The noise test shall be carried out within the shortest practicable time after the model has landed from the Official Flight during which the request for noise test was made, and apart from refuelling, no adjustment or modification of any kind shall be made to the model.

f) If the model fails the noise test the contestant shall be informed immediately and the model shall be impounded by the F2B CD until a second noise meter is brought to the Flight Circle area. The model shall then be re-tested using the second noise meter and with the same procedure as at paragraph d) above.

g) If passing the second noise test the model shall be considered to have passed the official noise measurement test and the F2B CD shall issue the respective Score Sheets to the Scores Processor/s so that the scores which were awarded for the Official Flight in which the request for noise test was made are processed as normal, in accordance with 4.2.19.

h) If failing the second noise test the F2B CD shall return the model to the contestant for modification/adjustment and shall also mark the respective Score Sheets with the remark "Discard Score - N". The Score Sheets shall then be issued to the Scores Processor/s who shall then record a score of 0 (zero) points on the Results Sheet for the respective Round (4.2.19, paragraphs c) or e), as applicable).

4.2.9 Number of Models; Number of Helpers; Number of Contestants

a) At all contests every contestant shall be entitled to enter a maximum of 2 models to be used for the duration of the contest, and shall be entitled to a maximum of 2 helpers for each Official Flight, Attempt, and Re-flight in each contest (refer 4.2.10; 4.2.11; and 4.2.13 respectively).

b) At World and Continental Championships and other limited international contests, each contestant shall be registered individually plus also registered as a member of his respective National Team. National Teams shall normally be restricted to a maximum of 3 members but in some cases 4 members shall be permitted, as provided by the FAI Sporting Code, Section IV, Volume ABR, Section 4B, paragraph B.3.5, page 28. As also provided therein, a defending World or Continental champion may also be registered, either as an individual entrant only, or also as a member of his respective National Team (see also 4.2.19, paragraph h).

4.2.10 Definition of an Official Flight

All attempts by all contestants to present a model for judging in a contest run in accordance with these rules shall be defined as an Official Flight at the moment that the model is released to start the Take-off Manoeuvre. All Official Flights shall result in a score being recorded against the respective contestant's name.

4.2.11 Definition of an Attempt and Number of Attempts Allowed

a) An Attempt at making an Official Flight shall have occurred when either of the following takes place:

i) if the contestant does not enter the Flight Circle within 2 minutes of being Officially Called to fly, or;

ii) if the contestant has entered the Flight Circle as per 4.2.16, paragraph a), but then the model does has not been released for Take-off within 2 minutes after the allowed preparation time has ended (4.2.16, paragraph c).

In either of the above cases an Attempt shall be recorded against the respective contestant's name by marking 0 (zero) points plus "A" on his Score Sheet.

b) Each contestant shall be entitled to make 2 Attempts at every Official Flight scheduled in the contest. After a first Attempt the contestant may choose to remain in the Flight Circle, in which case he shall make the second Attempt immediately. If the contestant chooses to leaves the Flight Circle after the first Attempt, he shall then be Officially Called to make the second Attempt after a maximum 30 minutes have elapsed. If however the first Attempt occurred as the last Official Flight to be scheduled at the end of a Round (see 4.2.14) then the respective contestant shall be Officially Called after a maximum of 30 minutes since his first Attempt. In either case, the second Attempt shall be subject to the conditions set out at paragraph a), items i) or ii) above.

4.2.12 Discarding marks awarded for a complete Official Flight

a) All scores awarded for an Official Flight shall be discarded if any part/s of the model become detached (intentionally or otherwise) at any time from the moment of release for the Take-off Manoeuvre until the moment that he model first touches down from the Landing Manoeuvre.

b) All scores awarded for an Official Flight shall also be discarded if a model fails the second official noise test (refer 4.2.8, paragraph h)

c) All scores awarded for an Official Flight may be discarded if:

i) wind conditions as specified at 4.2.6, paragraph a) occur during an Official Flight;

ii) an electrical storm occurs during an Official Flight (refer 4.2.6, paragraph b);

iii) in the opinion of the Head Judge and the F2B CD a safety-related incident which is outside the contestant's control occurs during an Official Flight, and if said incident could have impaired the respective contestant's ability to fly as required by 4.2.20 to 4.2.34 inclusive. For the purposes of illustration only, such a safety-related incident could be, but shall not limited to, an un-supervised child or animal wandering into the Flight Circle during an Official Flight.

4.2.13 Re-flights

a) A Re-flight shall be granted to every contestant whose propeller contacts the ground shutting down the motor due to Flight Circle ground surface conditions.

b) A Re-flight may be offered to contestants who experience any of the conditions identified at 4.2.12, paragraph c), items i), ii) and iii). The Head Judge (or his Deputy at contests with 2 Flight Circles in operation) shall ensure that the marks awarded during the Official Flight in which the incident took place are not disclosed to the contestant. All contestants accepting a Re-flight do so on the understanding that the scores awarded during the Official Flight in which the incident took place shall be discarded.

c) All Re-flights shall be scheduled in accordance with 4.2.11, paragraph b).

4.2.14 Rounds

a) All contests shall be organised on the basis of Rounds, a Round being complete when all registered contestants have completed 1 Official Flight (or 2 Attempts as per 4.2.11; or 1 Attempt and 1 Re-flight as per 4.2.13).

b) Any Round which is not completed within 1 day shall be continued on the next day of the contest and on the same Flight Circle and judges as originally scheduled.

4.2.15 Contest Procedures

Safety Note: Unsafe flying shall be grounds for disqualification from the contest.

a) At all contests organisers shall schedule the flying order of all registered contestants for each Round and Flight Circle by random draw conducted by the contest organiser before the start of all Official Flights. At World and Continental Championships and other limited international contests, all members of any single National Team shall be separated in the flying order of every Round and Flight Circle by at least one contestant from another nation. If 2 contestants from the same National Team are drawn to fly consecutively then the contest organiser shall continue to draw the respective Round but shall re-draw (and if necessary, continue to re-draw) the affected contestant/s to ensure that this requirement is met.

b) Before any Official Flights are flown at World and Continental Championships and other limited international contests, contest organisers shall make the Flight Circle/s which are to be used for the contest available to all contestants for Official Practice.

c) The Official Practice period allowed shall be 10 minutes per contestant per Flight Circle (1 Official Practice period if 1 Flight Circle is in operation, 2 Official Practice periods if 2 Flight Circles are in operation). The flying order for Official Practice shall be scheduled so that National Teams practice together. Apart from such Official Practice period/s, no contestant shall be allowed to use the Flight Circle/s at any time during the contest except when called to make an Official Flight or a Judge's Calibration Flight (paragraph m below).

d) At all contests every registered contestant shall be entitled to a minimum of 3 Official Flights but no judge shall judge more than 50 flights or perform a total of 10 hours of judging duty (whichever is the longer) within any single day of the contest. All Official Flights, Attempts, and Re-flights within each Round shall be scheduled on the basis that each contestant will require an average time of 9 minutes to complete an Official Flight (including Flight Circle entry and exit time), thus providing a short judges' break of approximately 6 minutes per hour during each Round. In addition, contest organisers shall also arrange at least 1 meal break per contest day for all judges.

e) At all contests organisers with suitable sites may arrange for Official Flights to be flown simultaneously on 2 separate Flight Circles within the same contest site. In such cases, all Official Flights flown on each Flight Circle shall be judged by a panel of judges who shall be permanently assigned to each separate Flight Circle throughout the duration of the contest (refer also paragraph f) below). The judges duty time limits set out at paragraph d) above shall also apply in this case.

f) At all contests where 2 Flight Circles are used, all registered contestants shall be entitled to a total of 4 Official Flights, 2 of which must be flown by each contestant on each separate Flight Circle. In such contests, organisers shall, at the completion of each Round, schedule all contestants to fly on the other Flight Circle for their next Official Flight.

g) Contest organisers shall appoint a panel of 3 judges (or 2 panels of 3 judges each where 2 Flight Circles are used) for all contests. At World and Continental Championships and other limited international contests, all

judges must be CIAM-listed and approved, and all judges must also be of different nationalities. However one judge may come from the nation organising the contest. At World and Continental Championships and other limited international contests with 2 Flight Circles in operation, the 3 judges appointed to each Flight Circle must all be of different nationalities, but 1 judge appointed to each Flight Circle may come from the nation organising the contest.

h) At all contests where 2 Flight Circles are used, the Head Judge shall appoint a Deputy to perform Head Judge functions at the Flight Circle where the Head Judge himself is not positioned. In the event of any requirement to contact the F2B CD and/or other officials the Deputy Head Judge shall confer with the Head Judge before proceeding.

i) At all contests where 1 Flight Circle is used, the same panel of the same 3 judges must judge all 3 Official Flights made by all registered contestants during the contest. At all contests where 2 Flight Circles are used, the panel of judges assigned to each separate Flight Circle must judge the 2 Official Flights made by every registered contestant on that Flight Circle. In exceptional circumstances (such as judge's sickness) this provision shall not apply.

j) Organisers of World and Continental Championships and other limited international contests shall provide Model Processor/s to check and mark models in accordance with 4.2.4, paragraph g).

k) The length of the control lines used by every registered contestant (4.2.2, paragraph e) shall be checked at least once during all contests, and in accordance with 4.2.7, paragraph b), a pull test shall be carried out before every Official Flight (or Attempt) and before every Re-flight by every registered contestant at all contests. As provided at 4.2.7, all such pull tests shall be performed at least 20 minutes before the respective contestant is Officially Called to fly (refer 4.2.16).

l) Organisers of World and Continental Championships and other limited international contests shall also provide 1 Circle Marshall for each Flight Circle and he shall carry out the functions detailed at 4.2.4, paragraph c). These functions shall include acting as Official Timekeeper, including providing the judges panel with visual indications of elapsed times, as detailed at 4.2.16. All these functions shall also be performed at contests other than Championships and other limited entry international contests but subject to available staff, organisers may combine the Circle Marshall functions with those of other event officials (refer 4.2.4).

m) Organisers of World and Continental Championships and other limited international contests shall provide the judges with a minimum of 1 Judges' Calibration Flight per Round (where 2 Flight Circles are in use there shall be a minimum of 1 Judges' Calibration Flight per Flight Circle per Round). All Judges' Calibration Flights shall be included within the judges' duty time limitations set out at paragraph d) above and shall include sufficient time for a judges' briefing before and debriefing after each Judges' Calibration Flight. Said briefing and debriefing shall include the complete panel/s of judges and shall be held privately, with no contest organiser, official, or contestant present. Judges' Calibration Flights shall be held before the start of every Round during the contest, or in the case of Round/s requiring more than 1 day to complete, at the start of every contest day. The provision of Judges' Calibration Flights at other contests shall be optional.

n) The contestants to fly said Judges' Calibration Flights (1 contestant per Judges' Calibration Flight) shall be selected by random draw conducted by the contest organiser before the start of Round One. However, contestants so drawn shall have the right to refuse to fly a Judges' Calibration Flight, in which case the organiser shall continue drawing until sufficient contestants who do agree to fly Judges' Calibration Flights have been selected. Alternatively, contest organisers may call on the services of a suitably experienced flier who is not registered as an F2B contestant.

o) Upon entering the Flight Circle and before placing his model at his chosen position for the Take-off Manoeuvre, each contestant may position the judges panel at any position on the edge of the Flight Circle that he feels is appropriate.

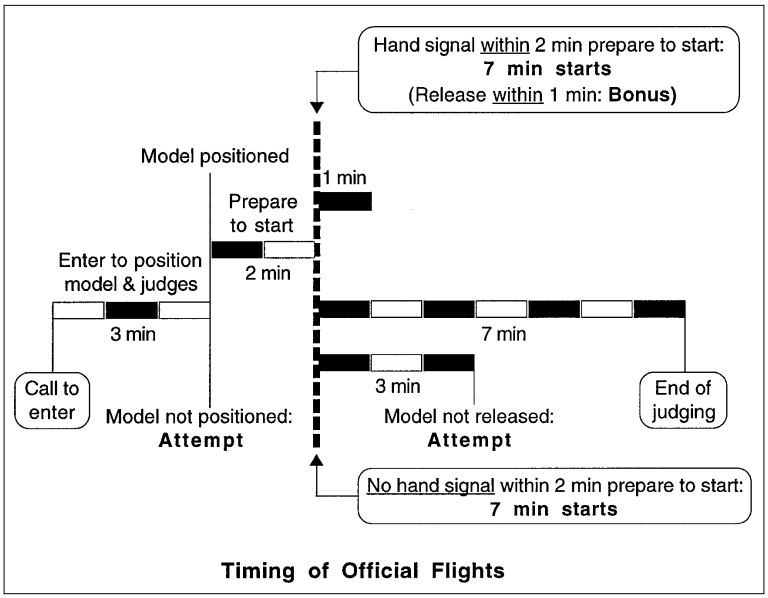
p) Once an Official Flight has begun the judges may, of their own accord, change the position that was directed by the contestant, but only by a maximum of $^1/_4$ of a lap ahead of or behind their original position at the start of that Official Flight. Judges shall only change their positions during the intervening laps flown between manoeuvres and not while any manoeuvre is being flown.

q) At all contests organisers shall provide each judge with a Score Sheet form for each Official Flight to be flown by each registered contestant. A typical sample Score Sheet is shown at 4.2.18. For contests held on multiple Flight Circles this Score Sheet shall include an indication of the Flight Circle at which the respective Official Flight was flown (for example, a Circle Number, as shown on the sample). These Score Sheets shall be issued to the judges immediately before the start of every Official Flight (or Attempt, or Re-flight) by every registered contestant. However, contest organisers shall not issue any Score Sheets to the judges for use during any Judges Calibration Flights.

r) Said Score Sheets shall be legibly completed by each judge and collected by a contest official immediately after the end of every Official Flight. All completed Score Sheets shall then be immediately processed by the Scores Tabulator/s appointed by the contest organiser, as described at 4.2.19.

s) As soon as practicable after the end of each Round at all contests, organisers shall provide each contestant with photocopies, carbon copies, or other facsimile copies of the original Score Sheets that were completed by the judges for his Official Flight. All such copy Score Sheets shall not include the names or distinguishing marks of the individual judges. At World and Continental championships and other limited international contests, organisers may issue said copies to Team Managers instead of to individual contestants.

4.2.16 Timing of Official Flights and Starting of Motor/s



Timing of Official Flights

a) From the time of being Officially Called to enter the Flight Circle each contestant shall be allowed 3 minutes to enter; to select and occupy his selected Take-off position; and to position the Judges panel accordingly (refer to 4.2.15, paragraph o). Official Timing of this 3 minutes period shall start from the moment the contestant enters the Flight Circle/passes through the Flight Circle entrance.

b) Once the contestant has placed his model on the ground Official Timing of a 2 minutes preparation for start period shall commence. The Official Timekeeper shall inform the contestant at the moment that Official Timing of his preparation period has been started.

c) A complete Official Flight (including motor/s starting plus all manoeuvres as listed at 4.2.20 to 4.2.34 inclusive) shall be completed within 7 minutes. The Official Timing of this limit will normally be started when the contestant gives a clear hand signal prior to starting his motor/s, as per paragraph d) below, but shall in no case begin later than 2 minutes after the start of Official Timing of the preparation period (paragraph b) above). If the contestant has given no clear hand signal to indicate engine start once the 2 minute preparation period has expired then the Official Timekeeper shall immediately inform both the contestant and the Judges panel that Official Timing of the Official Flight has started.

d) The contestant should give a clear hand signal prior to starting his motor/s and shall be awarded 100 bonus points by each judge if he does so and if his model is released to start its ground roll within 1 minute of signalling. No bonus points shall be awarded if the model is released to start its ground roll more than 1 minute after signalling, or if no clear hand signal is given.

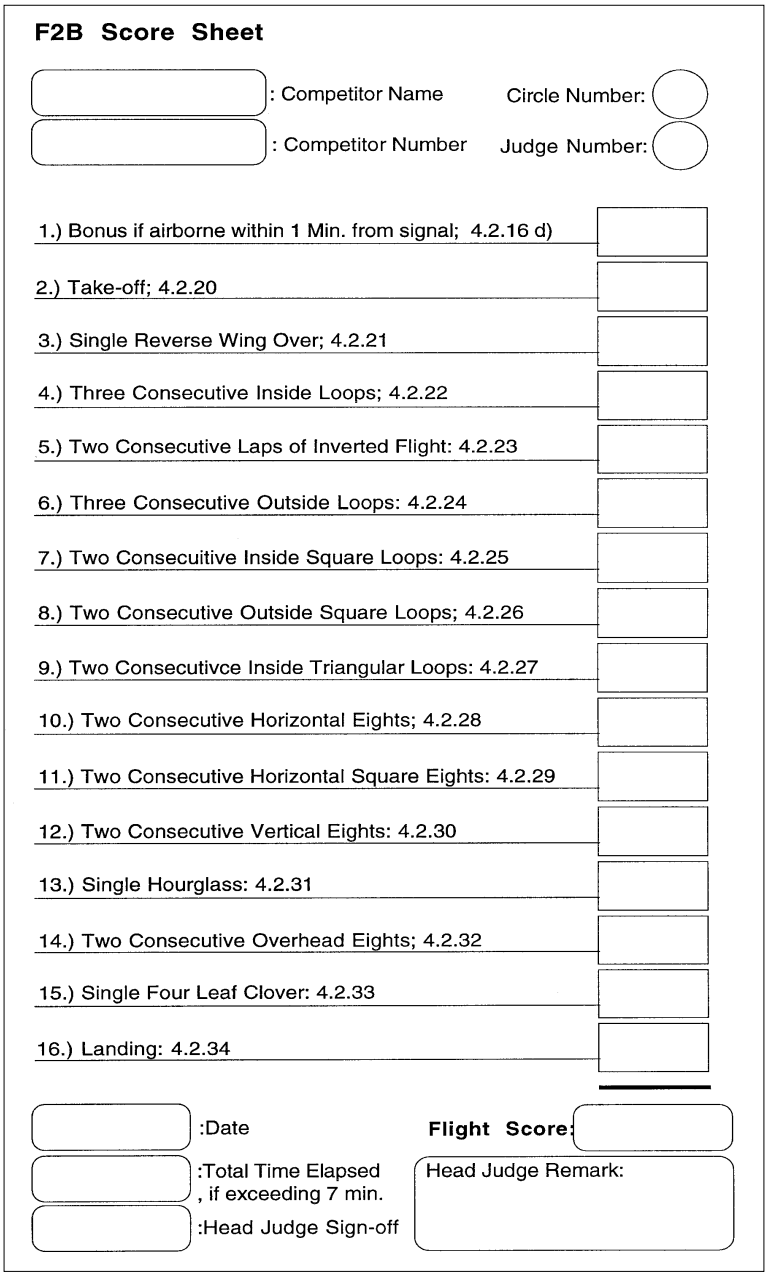
e) The timing of an Official Flight shall stop at the moment when the model has come to a full stop at the end of the ground roll which completes the Landing Manoeuvre.

f) An Attempt (4.2.11) shall be marked if the contestant fails to enter the Flight Circle and/or position his model within 3 minutes of being Officially Called; or if the model does not become airborne within 3 minutes of Official Timing of the Official Flight having been started.

4.2.17 Executing Manoeuvres

All manoeuvres must be executed in the order 4.2.20 to 4.2.34 inclusive (as also shown on the sample Score Sheet at 4.2.18). Every contestant shall leave at least $1^1/_4$ laps plus the recommended Entry and Exit procedures for each manoeuvre as a pause period between the end of one manoeuvre and the start of the next. The 1¼ intervening laps shall be flown at a height of between 1.0 and 3.0 metres (3ft to 10ft). Judges shall not however officially observe any of these pause periods but instead should use this time to enter the score awarded for the previous manoeuvre onto the contestant's Score Sheet before the next manoeuvre is started.

4.2.18 Scoring



a) Each judge shall award points for every manoeuvre flown by every registered contestant during every Official Flight. The awarding of points shall be in accordance with 4.2.5, paragraphs a), b), and c), and the number of points awarded may vary between 1 point (the minimum score for all manoeuvres which are attempted), and 100 points (the maximum score for each manoeuvre), all marks to be divided into increments of 1 point. Judges shall score each contestant's first attempt at each manoeuvre only.

b) A score of 0 (zero) points for a manoeuvre shall only be awarded by the judges for:

i) all manoeuvres which are not attempted at all;

ii) all manoeuvres which are started but not completed;

iii) all manoeuvres with an incorrect number of repeat figures (too few or too many);

iv) all manoeuvres flown out of the sequence 4.2.20 to 4.2.34 inclusive (but see also paragraph c) below);

v) all manoeuvres flown with insufficient laps between manoeuvres (refer 4.2.17);

vi) the Landing Manoeuvre under any of the conditions set out at 4.2.34, paragraph e);

vii) an Attempt as per 4.2.11, when all judges shall mark the respective Score Sheets with 0 (zero) points plus an "A").

c) All manoeuvre/s not attempted at all shall be scored 0 (zero) by all judges, as per paragraph b), item i) above, but provided that the remaining manoeuvres are attempted, and provided that they are attempted in the sequence set out at 4.2.20 to 4.2.34 inclusive, then the remaining manoeuvres shall be considered to be in the correct sequence and shall therefore be scored in accordance with paragraph a) above.

d) If a crash interrupts an Official Flight, every judge shall score all completed manoeuvres in accordance with paragraph a) above, up to and including scoring the last whole manoeuvre completed before the crash occurred. All other manoeuvres in the sequence still to be flown after the crash occurred (plus the manoeuvre in which the crash occurred), shall all be scored 0 (zero) points.

e) In all of the manoeuvre descriptions from 4.2.20 to 4.2.34 inclusive, the first numbered paragraph, *"a) Start of manoeuvre"*, is also the point at which the judges shall start officially observing the manoeuvre in order to award points; and the last numbered paragraph *" x) End of manoeuvre"* is also the point at which the judges shall stop officially observing the manoeuvre and stop awarding points.

f) All the manoeuvre descriptions from 4.2.20 to 4.2.34 inclusive also include un-numbered paragraphs marked "Recommended entry procedure" and "Recommended exit procedure". These are recommendations for pilots **only**, and judges shall not officially observe these procedures, nor shall they award any points at all for these procedures, regardless of whether performed in accordance with the recommendations or not.

g) When performed after the completion of the Cloverleaf Manoeuvre (4.2.33), other manoeuvring shall be permitted. All such manoeuvring shall not be officially observed nor scored by the judges.

4.2.19 Classification and Ranking of Contestants

At all contests the scores recorded by the judges for each Official Flight shall be processed by contest organisers as follows:

a) Score Sheet forms shall be collected from the judges immediately after the completion of each Official Flight and delivered to the Scores Tabulator/s.

b) The Scores Tabulator/s shall check each incoming batch of Score Sheet forms for legibility and completeness (including Flight Circle Number/Identifier if applicable). If necessary, any Score Sheets with queries shall be retained before processing until a convenient point in the contest to allow clarification with the judge/s concerned. The score for the respective contestant in the respective Round shall be calculated by adding all the points awarded by each of the 3 judges for each manoeuvres into a single total number of points.

c) The total points score resulting from paragraph b) above shall then be entered against the respective contestant's name onto a Results Sheet for the respective Round. As soon as practicable after the completion of that Round, copies of the completed Results Sheet for the respective Round shall be posted, plus issued to contestants and other interested parties. However no Results Sheets shall be issued to any of the judges before the end of the contest.

d) As soon as practicable after completion of the final (3rd or 4th) Round of the contest, organisers shall calculate the positions in the contest reached by all registered contestants up to that point in the contest ("placings"). When flown in 3 Rounds on 1 Flight Circle, the procedure shall consist of deleting the lowest score awarded to each contestant in a single Round and then adding his remaining 2 scores to produce the contestant's Final Result and/or Fly Off qualification (refer paragraphs e) and f) below). When flown in 4 Rounds on 2 Flight Circles, the procedure shall consist of deleting the lowest score awarded to each contestant in each Flight Circle and then adding his remaining 2 scores to produce the contestant's Final Result and/or Fly Off qualification.

e) At World and Continental Championships and other limited international contests, organisers shall arrange a Fly Off amongst the 12 contestants holding the best scores ("placings") at the end of the 3rd (or 4th) Round. The Fly-Off shall consist of 3 separate Rounds flown on the same Flight Circle with a minimum of 15 minutes and a maximum of 45 minutes break between each Round. The flying order for each Fly-Off Round shall be established by random draw conducted by the contest organiser. At contests with 1 Flight Circle in operation each Fly-Off Official Flight shall be judged and scored by all 3 judges. At contests using 2 Flight Circles all Fly-Off Official Flights shall be flown on only 1 of the 2 available Flight Circles. In this case the Head Judge and Deputy Head Judge shall confer to select 5 judges from the 6 available. The same 5 selected judges shall judge and score all 36 Fly-Off Official Flights. The score for each contestant in each Fly-off Round shall be calculated by adding all the points for each manoeuvre awarded by each of the 5 judges into a single total number of points.

f) Ranking of the 12 Fly-Off contestants shall be performed using the same principle as in paragraph d) above - namely, the lowest score of each contestant shall be discarded, with the remaining 2 scores to be totalled, so providing the Final Results scores (placings) for the 12 Fly-Off participants.

g) Subject to available time, number of entries, and any other relevant constraints, organisers of other contests may also arrange a Fly-Off in accordance with paragraphs e) and f) above.

h) At World and Continental Championships and other limited international contests only, organisers shall also rank the Final Results of all registered contestants for classification by National Teams. This shall be done by adding the position numbers ("placings") in the Final Results sheets for the members of each National Team, and shall include the results of the Fly-Off (paragraphs e) and f) above). National Teams shall be ranked by placing the lowest numerical total of each National Team member's position ("placing") in the highest National Team position, with complete (3 contestants) teams ranked ahead of teams with 2 contestants, and with 2 contestant teams ranked ahead of teams with 1 contestant. For example, the 3 members of the "Country A" team achieve 1st, 5th, and 9th places (total 15), but "Country A" shall be ranked ahead of "Country B" who achieved 2nd and 10th places (total 12) because "Country B" had only 2 team members.

Notes:

i) In accordance with the FAI Sporting Code, Section IV, Volume ABR, Section 4B, paragraph B.3.5, page 28, there are occasions when a National Team can consist of a 4th (junior) member. In this event the procedure for classifying National Teams shall be followed as above, with the 3 highest placings of the respective National Team to be used, regardless of whether or not one of these highest placings was scored by a junior.

ii) In addition, the FAI Sporting Code, Section IV, Volume ABR, Section 4B, paragraph B.3.5, page 28 provides that a currently reigning World or Continental Champion may defend his title in the next respective (World or Continental) Championship. Such participation may, subject to the provisions of paragraph B.3.5 as detailed above, be on the basis that the defending Champion is (I) a member of his respective National Team, or is (II) simply a single separate entrant. In both such cases the individual Final Results placing of the defending Champion shall be calculated in accordance with the procedure at paragraph d) above, (plus, if qualifying for the Fly-off, also in accordance with paragraphs e) and f) above). However, if such defending Champion is participating on the basis of being a single separate entry (II above) and not as a member of his respective National Team, then his Final Results placing shall not be used for National Team ranking.

i) At World and Continental championships and other limited international contests when the number of participating junior contestants is sufficient to award a separate title (such as Junior World or Junior Continental Champion), organisers shall rank all juniors both within the main Final Results sheet listing (paragraph c) above), and also as separate junior contestants within a separate Junior Final Results listing. The Junior Final Results ranking shall be calculated from the juniors' scores in accordance with paragraph d) above, with the best 3 best placing juniors to be ranked separately as 1st, 2nd, and 3rd placed junior contestants. Juniors shall not be ranked according to nation, as in paragraph h) above, but where the number of junior contestants is sufficient, it is recommended that organisers arrange a separate Fly-Off for juniors only, as per paragraphs e), and f) above. Also, according to their scores within the Results Sheets listing for all contestants in the contest, junior contestants may also participate in the Fly-off, as per the provisions of paragraphs d), e), and f) above for all other contestants.

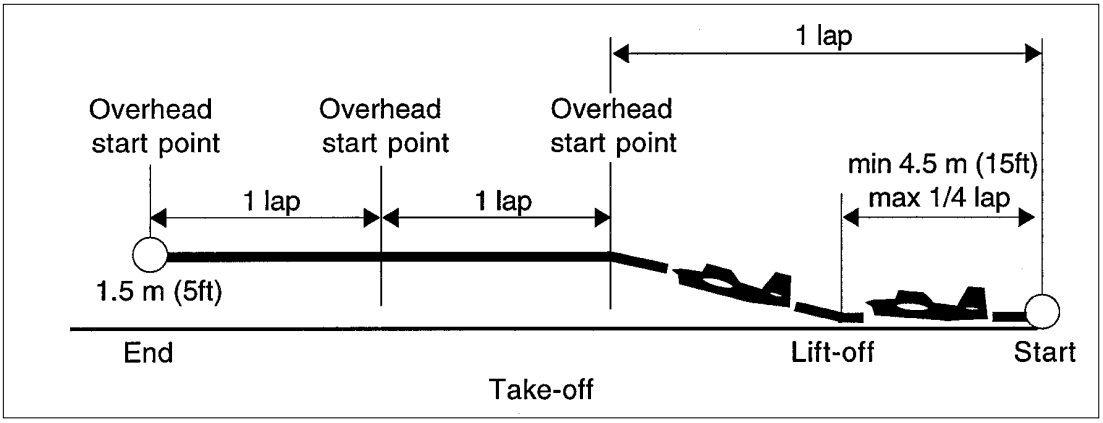
The Manoeuvres

Safety Reminder

Unsafe flying shall be grounds for disqualification from the contest

Note concerning the Manoeuvre descriptions and diagrams:
All of the following manoeuvre diagrams and descriptions, 4.2.20 to 4.2.34 inclusive, have been drawn as seen when flying the manoeuvres **from the pilot's viewing point**; and all are drawn and described for **anti-clockwise** flight**.**

4.2.20 The Take-off Manoeuvre



a) Start of manoeuvre:
At the moment when the model is released to start its ground roll.

b) Ground roll and lift off segment:
Before lifting off the model should run along the ground for a distance of not less than 4.5 metres (15ft) and not more than $^1/_4$ of a lap. The lift-off should be smooth, meaning without a "sudden jump" into the air.

c) Climb out and levelling-off segment:
The model should maintain a constant rate of climb until reaching a height of 1.5 metres (5ft). The point of changing from climbing flight to level flight should occur exactly overhead the point of release at the beginning of the Take-off ground roll. The change into upright level flight should be smooth and gentle, with no sudden change/s in attitude.

d) 2 laps of upright level flight segment:
After levelling off the model should maintain a height of 1.5 metres (5ft) and should fly 2 complete laps of stable and smooth normal upright flight, with no abrupt changes of attitude and without deviations of more than plus/minus 30 cm (1ft) throughout this segment.

e) End of manoeuvre:
At the end of the third lap, exactly overhead the point of beginning its Take-off ground roll.

Recommended exit procedure:
Continue normal upright level flight at 1.5 metres (5ft).

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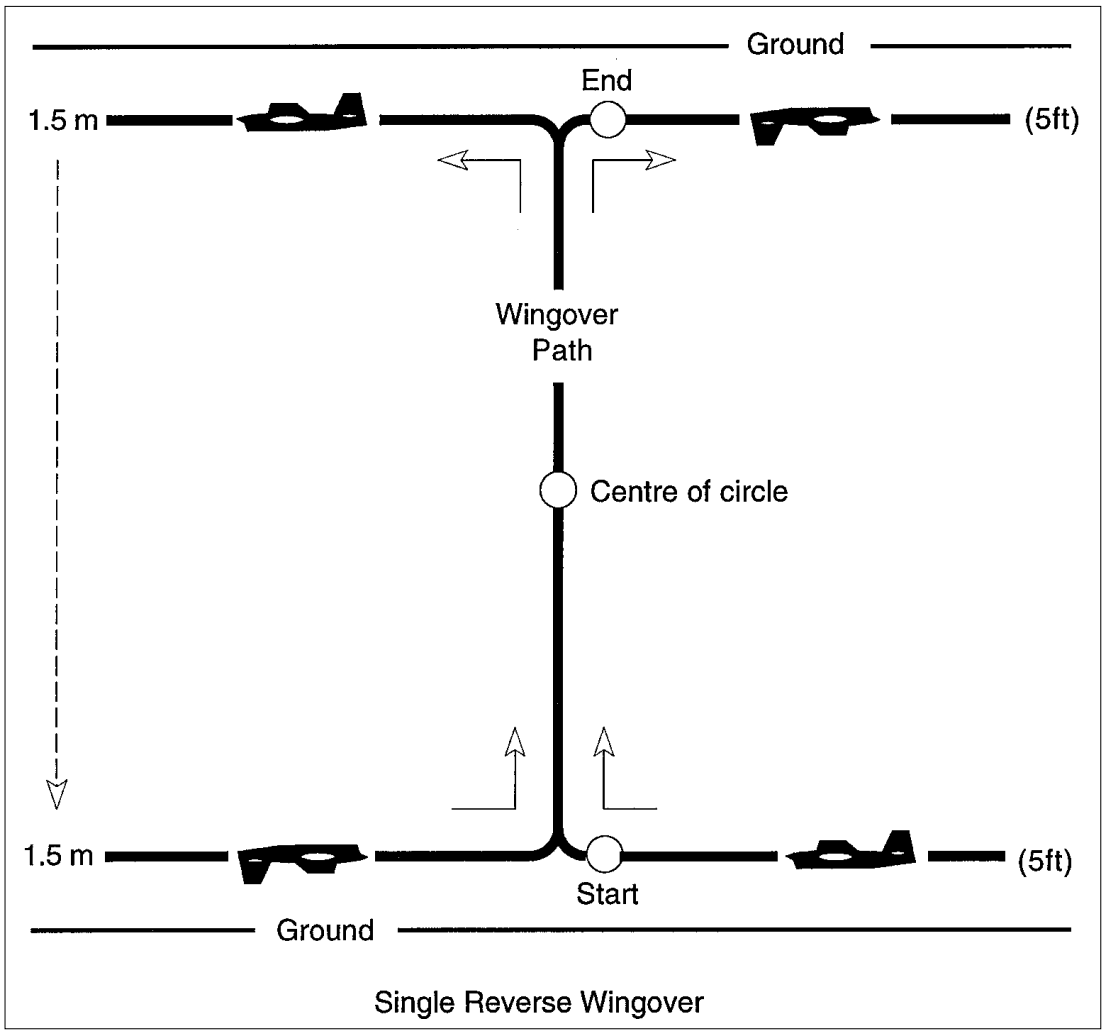
4.2.21 The Single Reverse Wing Over Manoeuvre



Note:
All turns in this manoeuvre should be between 1.5 metres (5ft) minimum radius and 2.1 metres (6ft 9ins) maximum radius.

Recommended entry procedure:
From normal upright level flight at a height of 1.5 metres (5ft).

a) Start of manoeuvre:
At the beginning of the first turn from normal upright level flight into a "vertical" climb.

b) The first "vertical" climb and dive segment:
The model should turn sharply into a “vertical” climb and should then maintain a “straight line” climb which is at right angles to the ground. It should pass directly over the flyer’s head and then change into a “straight line” dive which is also at right angles to the ground. This dive should continue until the second turn, which should sharply turn the model from its dive into normal “straight line” inverted level flight at a height of 1.5 metres (5ft), plus/minus 30 cm (1ft).

c) The inverted "horizontal" level flight segment:
After recovery from the first "vertical” dive and until the start of the turn into the second "vertical” climb, the model should fly a segment of smooth inverted level flight segment which is parallel to the ground at a height of 1.5 metres (5ft), with no height deviations of more than plus/minus 30 cm (1ft), and with no abrupt changes in attitude. The length of this segment, including turns, should be exactly $^1/_2$ a lap.

d) The second "vertical" climb and dive segment:
The model should turn sharply into a “vertical” climb and should then maintain a “straight line” climb which is at right angles to the ground. The model should pass directly over the flyer’s head and then change into a “straight line” dive which is also at right angles to the ground. This dive should continue until the fourth turn, which should sharply turn the model from its dive into normal “straight line” upright level flight at a height of 1.5 metres (5ft), that height to be met within plus/minus 30 cm (1ft). The point where the model starts its recovery turn into normal upright level flight at the end of the whole manoeuvre should be exactly opposite the point where the model first reached a "vertical" climb attitude at the start of the complete manoeuvre.

e) End of manoeuvre:
The end of the fourth turn (recovery to normal upright level flight).

Recommended exit procedure:
Continue normal upright level flight at 1.5 metres (5ft).

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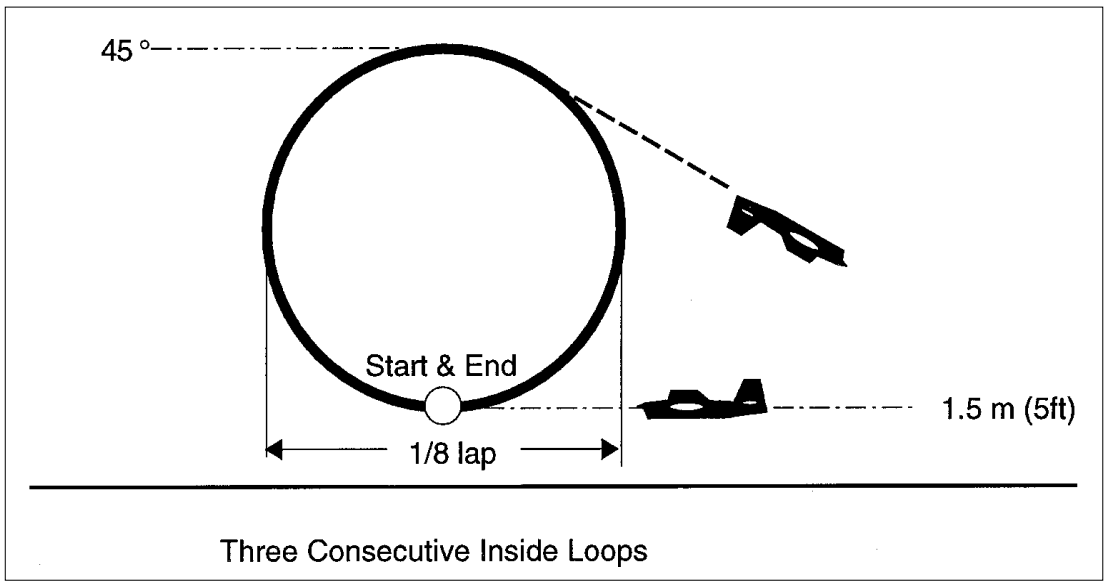
4.2.22 The Three Consecutive Inside Loops Manoeuvre



Manoeuvre size, overall:
Maximum height 45 degrees line elevation angle; maximum width $^{1}/_{8}^{th}$ of a lap.

Recommended entry procedure:
From normal upright level flight at a height of 1.5 metres (5ft).

a) Start of manoeuvre:
   At the start of the first loop, as the model departs normal upright level flight.

b) The first loop figure:
   From normal upright level flight at 1.5 metres (5ft) plus/minus 30 cm (1ft), the model should fly smoothly upwards along a circular flight path until reaching a height of line elevation angle 45 degrees. At that point the model should be inverted. Without interruption the model should continue its circular flight path downwards until passing the bottom of the loop at a height of 1.5 metres (5ft) plus/minus 30 cm (1ft), in upright flight. The whole flight path should be circular and smooth, with no deviations and no flat spots. When the model reaches a "vertical" attitude for the first time this has defined the lateral reference line for the whole manoeuvre.

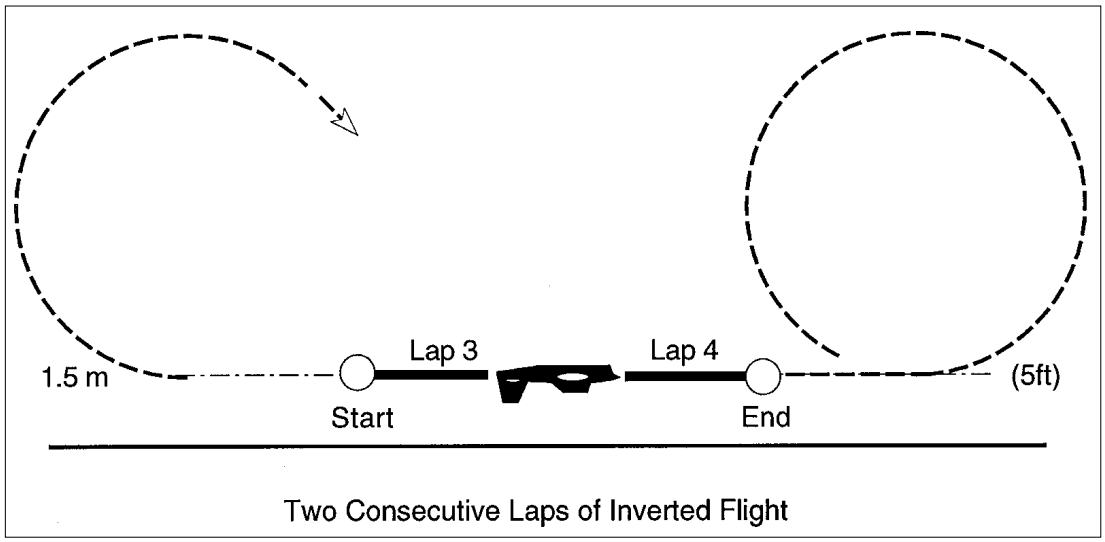
c) The second and third loop figures:
   The model should follow a flight path exactly as described above. The second and third loops should be placed in exactly the same position as the first loop, and should be of exactly the same size.

d) End of manoeuvre:
   At the end of the third loop, as the model completes recovery into normal upright level flight.

Recommended exit procedure:
The model should continue for another half loop, recovering inverted and descending to the normal inverted flight level within ½ a lap, remaining inverted at a height of 1.5 metres (5ft).

next Manoeuvre next page

4.2.23 The Two Consecutive Laps of Inverted Level Flight Manoeuvre



Two Consecutive Laps of Inverted Flight

Recommended entry procedure:
From inverted level flight at a height of 1.5 metres (5ft).

a) Start of manoeuvre:
At the start of the third lap after the exit from the previous manoeuvre.

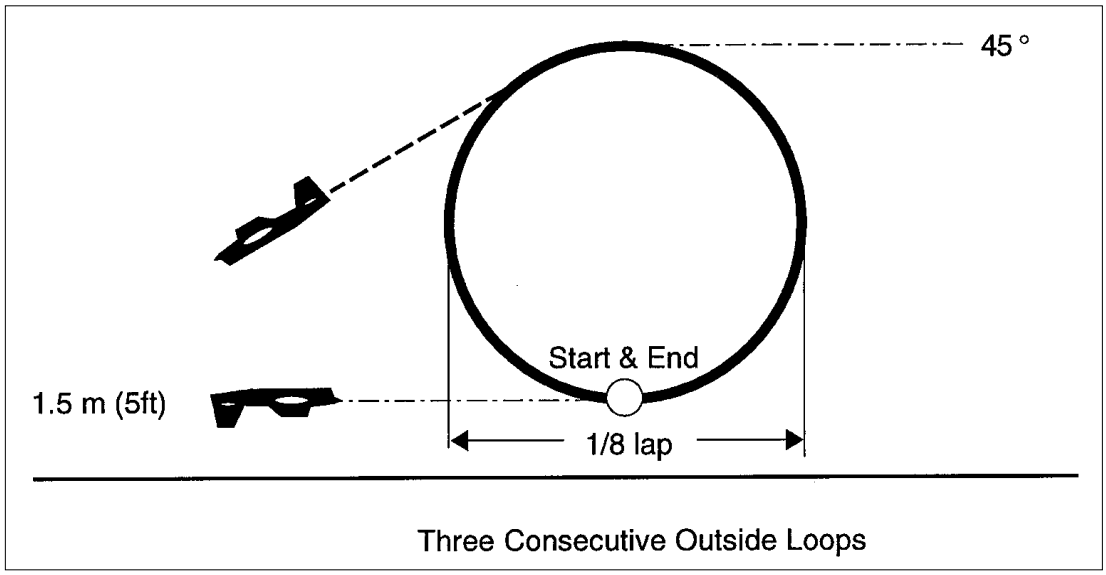
b) 2 laps of inverted flight segment:
The model should maintain 2 complete laps of smooth and stable inverted flight at a height of 1.5 metres (5ft) with no height deviations of more than plus/minus 30 cm (1ft), and with no abrupt changes of attitude.

c) End of manoeuvre:
At the end of the fourth lap after the exit from the previous manoeuvre.

Recommended exit procedure:
Continue inverted flight, remaining at the normal level flight height of 1.5 metres (5ft) until entry to the next manoeuvre.

next Manoeuvre next page

4.2.24 The Three Consecutive Outside Loops Manoeuvre



Manoeuvre size, overall:
Maximum height 45 degrees line elevation angle; maximum width $^{1}/_{8}^{th}$ of a lap.

Recommended entry procedure:
From inverted level flight at a height of 1.5 metres (5ft).

a) Start of manoeuvre:
   At the beginning of the first loop, as the model departs level inverted flight.

b) The first loop figure:
   From level inverted flight at a height of 1.5 metres (5ft) plus/minus 30 cm (1ft), the model should fly smoothly upwards along a circular flight path until reaching a height of line elevation angle 45 degrees. At that point it should be upright. Without interruption the model should continue its circular flight path downwards until passing the bottom height of 1.5 metres (5ft) plus/minus 30 cm (1ft), in inverted flight. The whole flight path should be circular and smooth, with no deviations and no flat spots. When the model reaches a "vertical" attitude for the first time this has defined the lateral reference line for the whole manoeuvre.

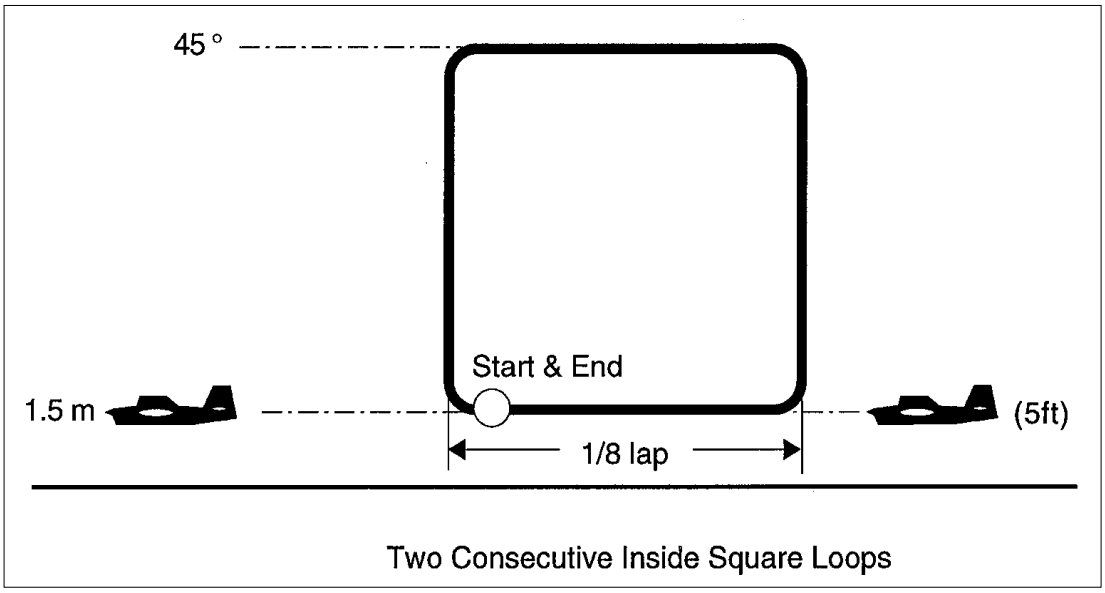
c) The second and third loop figures:
   The model should follow a flight path exactly as described above. The second and third loops should be placed in exactly the same position as the first loop, and should be of exactly the same size.

d) End of manoeuvre:
   At the end of the third loop, as the model passes a height of 1.5 metres (5ft), plus/minus 30 cm (1ft), in inverted level flight.

Recommended exit procedure:
Continue for another half loop, recovering to upright flight and then descending to the normal upright level height of 1.5 metres (5ft).

next Manoeuvre next page

4.2.25 The Two Consecutive Inside Square Loops Manoeuvre



Note:
All turns in this manoeuvre should be between 1.5 metres (5ft) minimum radius and 2.1 metres (6ft 9ins) maximum radius.

Manoeuvre size, overall:
Maximum height 45 degrees line elevation angle; maximum width $^{1}/_{8}^{th}$ of a lap.

Recommended entry procedure:
From normal upright level flight at a height of 1.5 metres (5ft).

a) Start of manoeuvre:
   At the point where the model begins its first turn into a "vertical" climb from normal upright level flight.

b) First loop figure - first turn plus "vertical" climbing segment:
   The model should sharply turn into, and then steadily maintain, a "straight line" climb which is at right angles to the ground.

c) First loop figure - second turn plus top "horizontal" segment:
   The model should turn sharply into, and then steadily maintain, "straight line" inverted level flight at a height of 45 degrees line angle elevation. The level portion of this flight path should be parallel to the ground.

d) First loop figure - third turn plus "vertical" diving segment:
   The model should sharply turn into, and then steadily maintain, a "straight line" dive which is at right angles to the ground.

e) First loop figure - fourth turn plus bottom "horizontal" segment:
   The model should sharply turn into, and then steadily maintain, a "straight line" upright level flight at a height of 1.5 metres (5ft), plus/minus 30 cm (1ft). The level portion of the flight path should be parallel to the ground and the total length of the bottom segment, including both turns, should be exactly $^{1}/_{8}^{th}$ of a lap.

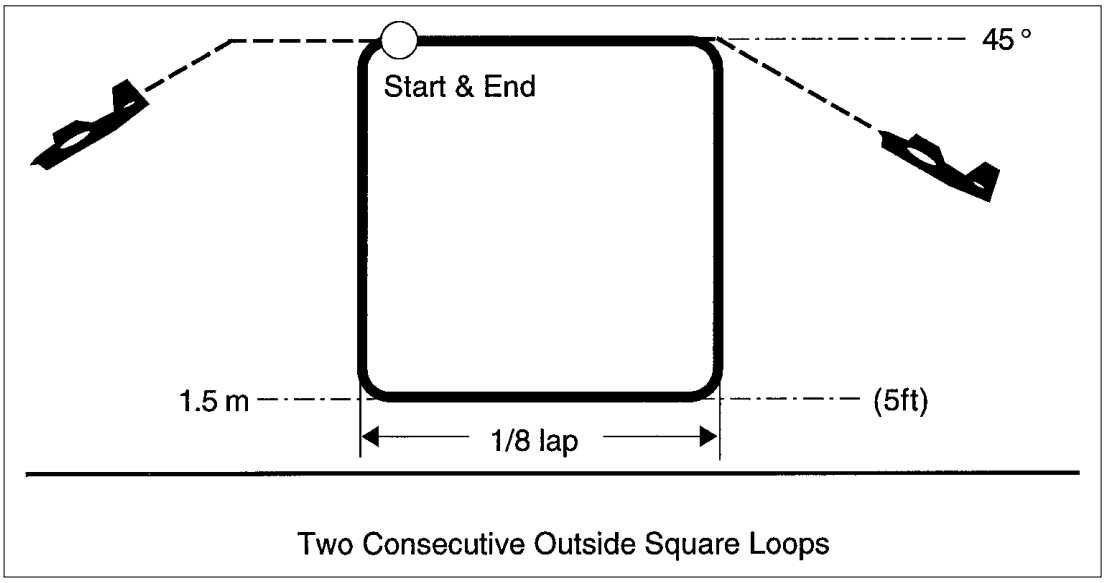
f) The second loop figure:
   The model should follow a flight path exactly as described in the segments above. The second loop should be placed in exactly the same position as the first loop, and should be of exactly the same size.

g) End of manoeuvre:
   In normal upright level flight at a height of 1.5 metres (5ft), plus/minus 30 cm (1ft), at the point where the model started its first turn into a "vertical" climb at the beginning of the complete manoeuvre.

Recommended exit procedure:
Maintain normal upright level flight at 1.5 metres (5ft).

next Manoeuvre next page

4.2.26 The Two Consecutive Outside Square Loops Manoeuvre



Note:
All turns in this manoeuvre should be between 1.5 metres (5ft) minimum radius and 2.1 metres (6ft 9ins) maximum radius.

Manoeuvre size, overall:
Maximum height 45 degrees line elevation angle; maximum width $^{1}/_{8}^{th}$ of a lap.

Recommended entry procedure:
Use ¾ of a lap to climb to a height of 45 degrees line elevation angle and maintain this height in upright level flight for $^{1}/_{8}^{th}$ of a lap.

a) Start of manoeuvre:
At the point where the model begins its first turn into a "vertical" dive from 45 degrees line elevation angle.

b) First loop figure - first turn plus "vertical" diving segment:
The model should sharply turn into, and then steadily maintain, a “straight line” dive which is at right angles to the ground.

c) First loop figure - second turn plus bottom "horizontal" segment:
The model should turn sharply into, and then maintain smooth and steady “straight line” inverted level flight at a height of 1.5 metres (5ft) without deviating by more than plus/minus 30 cm (1ft). The level portion of this flight path should be parallel to the ground and the total length of the top segment, including both turns, should be exactly $^{1}/_{8}^{th}$ of a lap.

d) First loop figure - third turn plus "vertical" climbing segment:
The model should sharply turn into, and then steadily maintain, a “straight line” climb which is at right angles to the ground.

e) First loop figure - fourth turn plus top "horizontal" segment:
The model should sharply turn into, and then steadily maintain upright “straight line” level flight at a height of 45 degrees line elevation angle. The level portion of this flight path should be parallel to the ground.

f) The second loop figure:
The model should follow a flight path exactly as described in the segments above. The second loop should be placed in exactly the same position as the first loop, and should be of exactly the same size.

g) End of manoeuvre:
In upright “straight line” level flight at a height of 45 degrees line elevation angle, at the same point where the model started its first turn at the beginning of the complete manoeuvre.

Recommended exit procedure:
Maintain upright level flight at a height of 45 degrees line elevation angle for at least 1.0 metre after the end of the manoeuvre and then descend to the normal upright level flight height (1.5 metres - 5ft) within approximately $^{1}/_{2}$ a lap.

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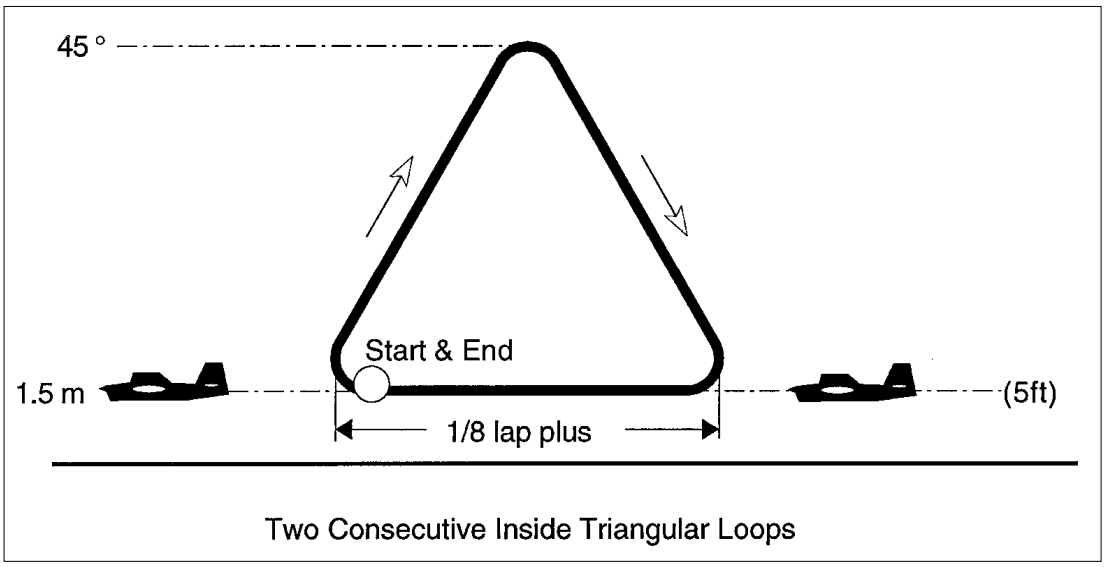
4.2.27 The Two Consecutive Inside Triangular Loops Manoeuvre



Note:
All turns in this manoeuvre should be between 1.5 metres (5ft) minimum radius and 2.1 metres (6ft 9ins) maximum radius. In each turn the model should change its angle of pitch attitude by approximately 60 degrees.

Manoeuvre size, overall:
Maximum height 45 degrees line elevation angle; maximum width slightly more than $^{1}/_{8}^{th}$ of a lap.

Recommended entry procedure:
From normal upright level flight at a height of 1.5 metres (5ft).

a) Start of manoeuvre:
From the point in normal upright level flight where the model starts its first turn.

b) First triangle figure – first turn and climb segment:
The model should turn sharply into a "straight line" inverted climb and the angle of this flight path should be at 30 degrees beyond vertical in relation to the ground. After completing the turn the model should maintain this flight path until starting the second turn.

c) First triangle figure – second turn and dive segment:
The model turn sharply into a "straight line" inverted dive and the angle of this flight path should be at 60 degrees (that is: 30 degrees less than vertical in relation to the ground). After completing the turn the model should maintain this flight path until starting the third turn. The height reached during this second turn should not be more than nor less than a line elevation angle of 45 degrees.

d) First triangle figure - third turn plus bottom "horizontal" segment:
The aircraft should sharply turn into to upright "straight line" level flight at a height of 1.5 metres (5ft), plus/minus 30 cm (1ft). The length of all 3 sides of this triangular loop (including two turns per side) should be equal, and the bottom segment, including both turns, should be slightly more than $^{1}/_{8}^{th}$ of a lap in length.

e) The second triangular loop figure:
The model should follow a flight path exactly as described in the three segments above. The second loop should be placed in exactly the same position as the first loop, and should be of exactly the same size.

f) End of manoeuvre:
With the model in normal upright level flight, at the point where the model started its first turn at the start of the complete manoeuvre.

Recommended exit procedure:
Continue normal upright level flight at 1.5 metres (5ft).

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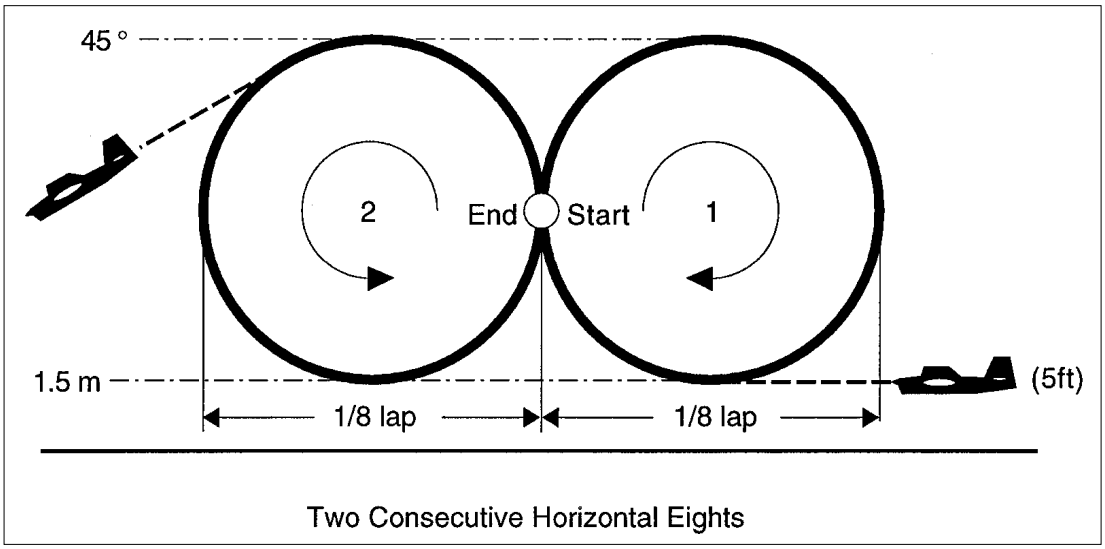
4.2.28 The Two Consecutive Horizontal Eights Manoeuvre



Two Consecutive Horizontal Eights

Manoeuvre size, overall:
Maximum height 45 degrees line elevation angle; maximum width $^1/_4$ of a lap.

Recommended entry procedure:
From normal upright level flight at a height of 1.5 metres (5ft).

a) Start of manoeuvre:
When the model passes the intersection point for the first time.
Note:
When the model reaches a "vertical" climbing attitude for the first time this has defined the intersection point for the whole manoeuvre (that is: after $^1/_4$ of the first loop of the first eight has been flown).

b) The first eight figure - first inside loop segment:
From normal upright level flight the model should fly upwards along a circular flight path to a height of line elevation angle 45 degrees, at which point it should be inverted. The model should continue its circular flight path downwards without interruption until reaching the normal upright level flight height of 1.5 metres (5ft), plus/minus 30 cm (1ft), at which point it should be upright. The model should then continue, without interruption, its circular flight path for a further $^1/_4$ of a loop until reaching the intersection point, at which point the model should be momentarily "vertical".
Note:
The intersection point first defined by the model at the beginning of this manoeuvre should be maintained throughout the whole of the manoeuvre. At the time of passing through the intersection point and transitioning to the first outside loop the model should be momentarily in a "vertical" nose up attitude but should not visibly travel in a "straight line", nor travel along a "vertical" climbing flight path.

c) The first eight figure – the outside loop segment (actually 1 complete loop from the intersection point onwards):
After passing through the intersection point the model should continue, without interruption, to fly a complete outside loop by flying upwards along a circular flight path to a height of 45 degrees line elevation angle, at which point the model should be upright. The model should continue its circular flight path downwards, without interruptions, until reaching the inverted flight height of 1.5 metres (5ft), plus/minus 30 cm (1ft), at which point it should be inverted. The model should then continue, without interruption, its circular flight path for a further $^1/_4$ of a loop until reaching the intersection point, at which point it should be momentarily "vertical".

d) The second complete eight figure:
The model should follow a flight path exactly as set out in the individual segments above. The second figure eight should be flown in exactly the same position and should be of exactly the same size as the first eight figure.

e) End of manoeuvre:
As the model completes the second eight figure, when passing the intersection point in a "vertical" climb for the fifth and last time.

Recommended exit procedure:
After passing the intersection point for the last time, continue the circular flight path for approximately a further 135 degrees of arc, then descend from this flight path in a dive of approximately 45 degrees until levelling out into normal upright level flight at 1.5 metres (5ft).

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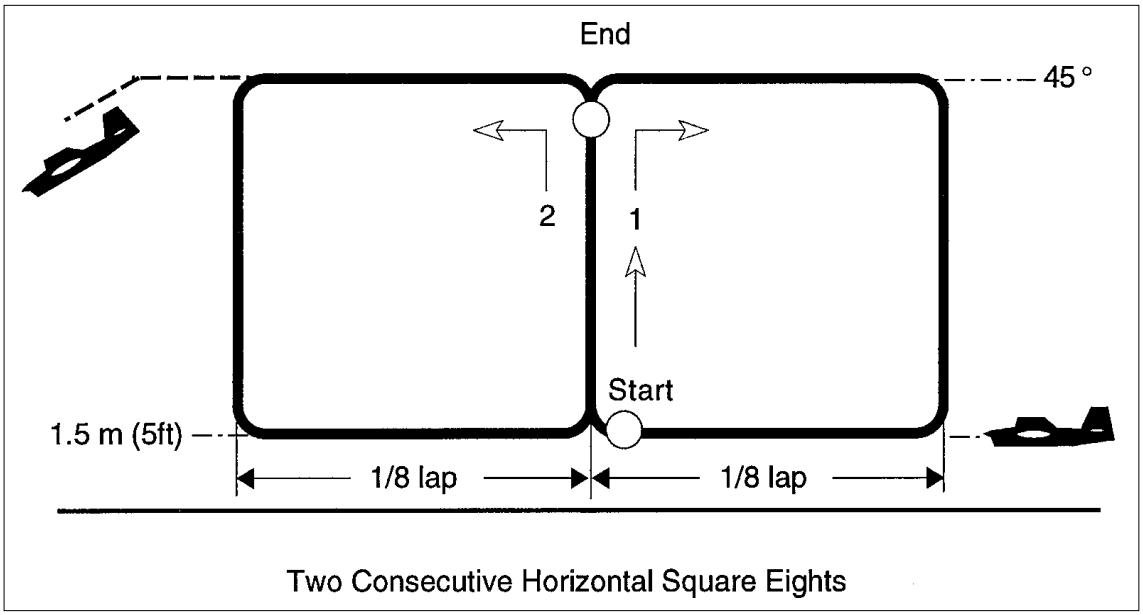
4.2.29 The Two Consecutive Horizontal Square Eights Manoeuvre



Two Consecutive Horizontal Square Eights

Note:
All turns in this manoeuvre should be between 1.5 metres (5ft) minimum radius and 2.1 metres (6ft 9ins) maximum radius.

Manoeuvre size, overall:
Maximum height 45 degrees line elevation angle; maximum width $^1/_4$ of a lap.

Recommended entry procedure:
From normal upright level flight at a height of 1.5 metres (5ft).

a) Start of manoeuvre:
With the model in normal upright level flight, from the point where the model starts its first turn upwards into a "vertical" climb for the first time.
Note:
When the model reaches a "vertical" climbing attitude for the first time, this has defined the intersection point for the whole manoeuvre.

b) The first eight figure – the first climbing turn and "vertical" climbing segment of the first (inside) square loop:
The model should turn sharply into a "vertical" climb, reaching and maintaining a "straight line" flight path which is at right angles to the ground.

c) The first eight figure - the second turn and top "horizontal" segment of the first (inside) square loop:
The model should turn sharply into "straight line" smooth inverted level flight to reach a height of 45 degrees line angle elevation as it becomes inverted. The "straight line" section should be parallel to the ground.

d) The first eight figure - the third turn and "vertical" dive segment of the first (inside) square loop:
The model should turn sharply into a "vertical" dive, reaching and maintaining a "straight line" flight path which is at right angles to the ground.

e) The first eight figure - the fourth turn and bottom "horizontal" segment of the first (inside) square loop:
The model should turn sharply into smooth upright level "straight line" flight, and this section should be parallel to the ground at a height of 1.5 metres (5ft), plus/minus 30 cm (1ft). The length of the whole bottom segment, including both turns, should be exactly $^1/_8$th of a lap.

f) The first eight figure - the first climbing turn and "vertical" climb segment of the second (outside) square loop:
At the end of the previous segment (paragraph e) above), the model should turn sharply into a "vertical" climb, reaching and maintaining a "straight line" flight path which is at right angles to the ground. This flight path should be in exactly the same position as defined by the model at the beginning of the manoeuvre (paragraph a) above).

g) The first eight figure - the second turn and top "horizontal" segment of the second (outside) square loop:
The model should turn sharply into "straight line" upright level flight to reach a height of 45 degrees line elevation angle as it becomes level. The top segment should be flown with the flight path parallel to the ground.

h) The first eight figure - the third turn "vertical" dive segment of the second (outside) square loop:
The model should turn sharply into a "vertical" dive, reaching and maintaining a "straight line" flight path which is at right angles to the ground.

i) The first eight figure - the fourth turn and bottom "horizontal" segment of the second (outside) square loop:
The model should turn sharply into inverted smooth "straight line" level flight, and this section should be parallel to the ground at a height of 1.5 metres (5ft) plus/minus 30 cm (1ft). The length of the whole bottom segment, including both turns, should be exactly $^{1}/_{8}^{th}$ of a lap.

j) The second eight figure:
The model should follow a flight path exactly as set out in the individual segments above. The second eight figure should be flown in exactly the same position and should be of exactly the same size as the first eight figure.

k) The final turn and last "vertical" climb exit from manoeuvre segment:
At the end of the second bottom "horizontal" segment of the fourth loop the model should again turn sharply into a "vertical" climb, reaching and maintaining a "straight line" flight path which is at right angles to the ground. This flight path should be in exactly the same position as defined by the model at the start of the manoeuvre (paragraphs a) and b) above).

l) End of manoeuvre:
At the end of the last vertical climb segment, before turning into normal upright exit flight at 45 degrees line angle.

Recommended exit procedure:
Complete a further 90 degrees turn into "straight line" upright level flight at a height of 45 degrees line angle. Maintain this level flight path parallel to the ground until clear of the left hand side of the left hand loop by approximately 5.0 metres (16ft), then make a turn into a dive of approximately 45 degrees nose down attitude. Recover into normal upright level flight at 1.5 metres (5ft).

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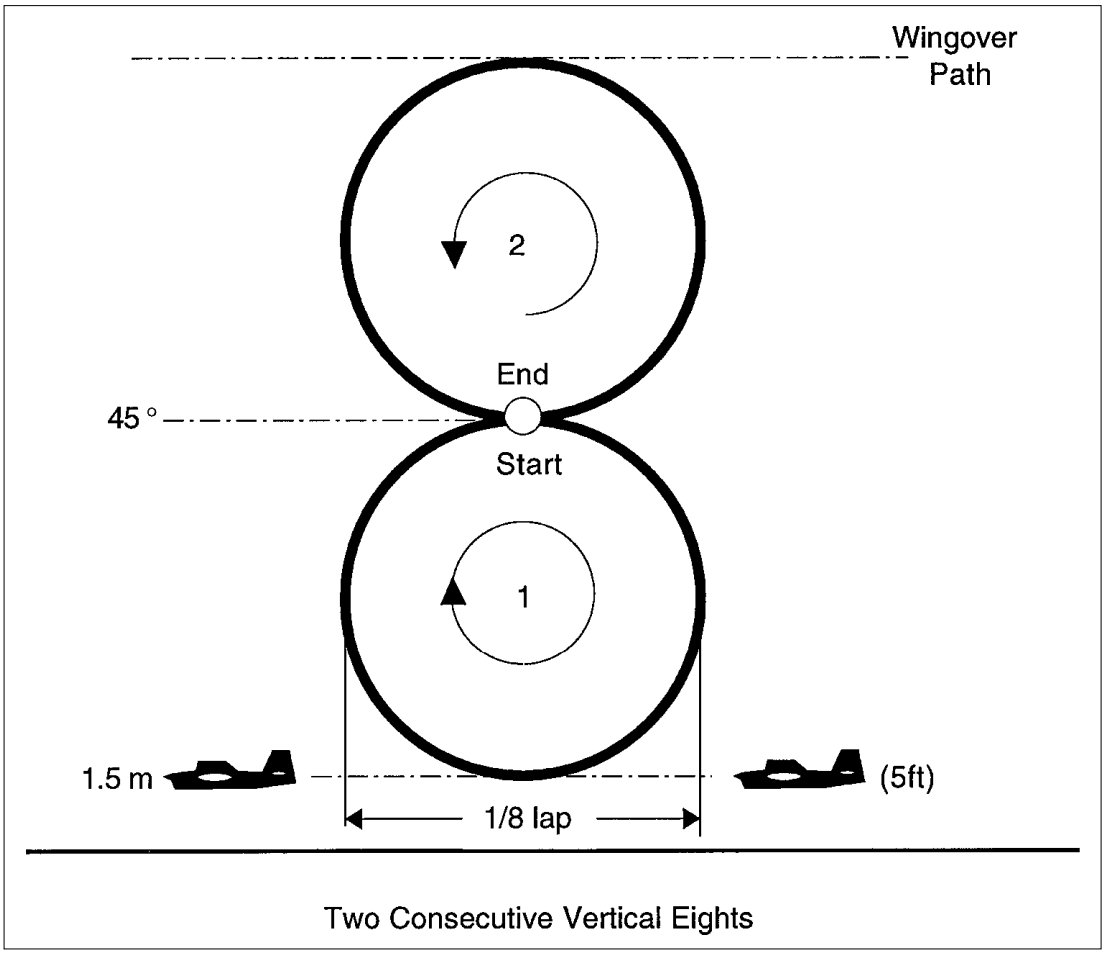
4.2.30 The Two Consecutive Vertical Eights Manoeuvre



Two Consecutive Vertical Eights

Manoeuvre size, overall:
Maximum height 90 degrees line elevation angle; maximum width $^{1}/_{8}^{th}$ of a lap.

Recommended entry procedure:
From normal upright level flight at a height of 1.5 metres (5ft), fly upwards along a circular flight path to a height of line elevation angle 45 degrees. At this point the model should be inverted.

a) Start of manoeuvre:
After the model has flown the first half of an inside loop, as it passes through the intersection point for the first time.
Note:
The intersection of the whole manoeuvre is defined when the model passes through inverted level flight at a height of 45 degrees line elevation angle for the first time.

b) The first eight figure - the first (inside loop) segment:
As the model passes through the intersection point for the first time it should continue to fly a completely circular inside loop with no flat spots or deviations. The bottom of this loop should be at a height 1.5 metres (5ft), plus/minus 30 cm (1ft). The loop should be completed by the model continuing this circular flight path until reaching an inverted attitude at a height of 45 degrees line elevation angle.

c) The first eight figure - the second (outside loop) segment:
As it passes through the intersection point the model should continue without interruption, flying a completely circular outside loop without flat spots or deviations. The bottom of this second loop should be at a height of 45 degrees line elevation angle and the top should be at 90 degree line elevation.
Note:
The flight path of this second loop should touch the intersection point, and this intersection point should be maintained throughout the entire manoeuvre. At the time of passing through the intersection point and then transitioning into the second (outside) loop, the model should be momentarily in a level inverted flight attitude but should not visibly follow a “straight line” flight path. Neither should the model climb nor dive during this momentary period of inverted flight. In addition, the centres of both loops should be positioned on an imaginary line drawn upwards from the ground at right angles.

d) The second eight figure:
The model should follow a flight path exactly as set out in the individual segments above. The second figure eight should be flown in exactly the same position and should be of exactly the same size as the first eight figure.

e) End of manoeuvre:
As the model completes the second eight figure, at the moment when it reaches inverted level flight at a height of 45 degrees line elevation angle.

Recommended exit procedure:
Continue for a further half inside loop until the model is upright at a height of 1.5 metres (5ft), and then continue in normal level upright flight at a height of 1.5 metres (5ft).

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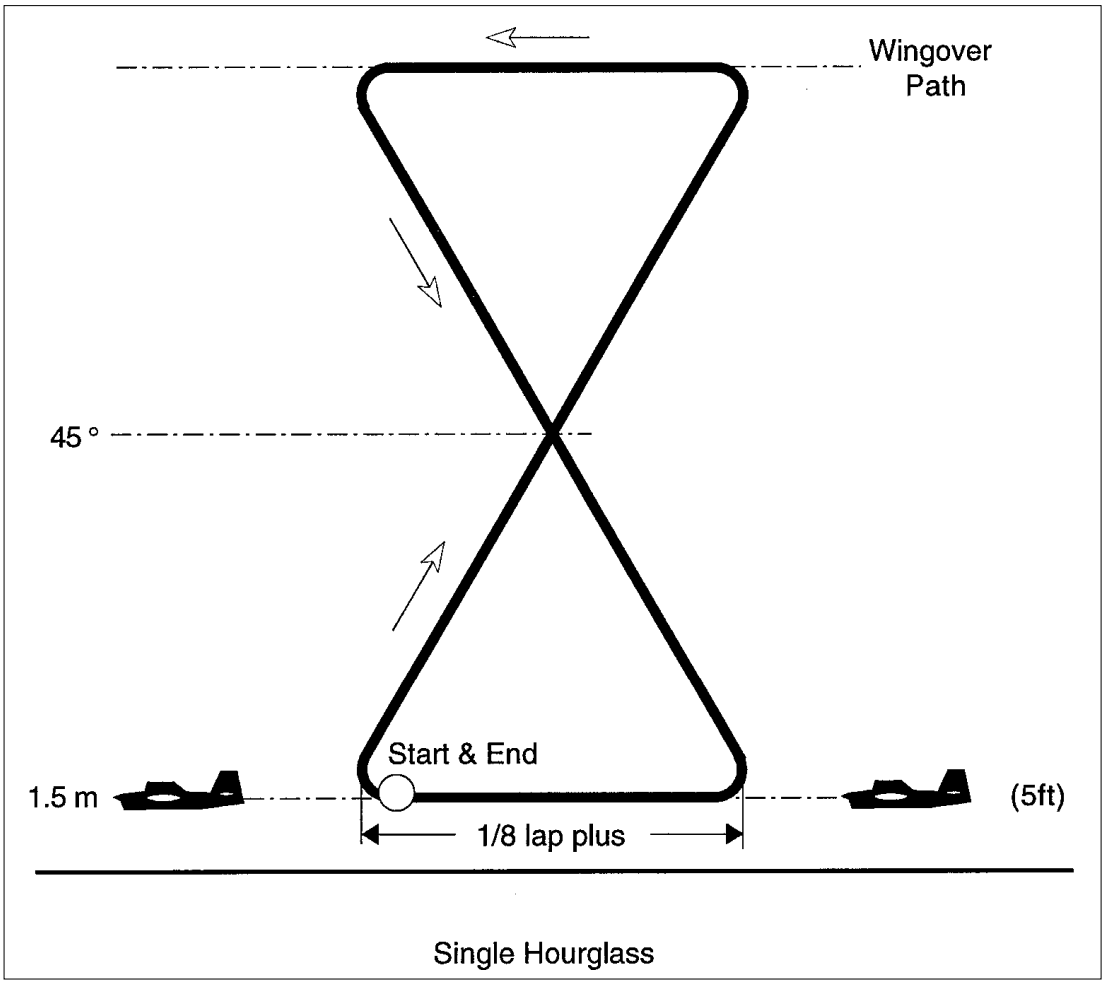
4.2.31 The Single Hourglass Manoeuvre



Note:
All turns in this manoeuvre should be between 1.5 metres (5ft) minimum radius and 2.1 metres (6ft 9ins) maximum radius. In each turn the model should change its angle of pitch attitude by approximately 60 degrees.

Manoeuvre size, overall:
Maximum height 90 degrees line elevation angle; maximum width slightly more than $^{1}/_{8}^{th}$ of a lap.

Recommended entry procedure:
From normal upright level flight at a height of 1.5 metres (5ft).

a) Start of manoeuvre:
From the point where the model starts its first turn into a climb for the first time.

b) The first turn and inverted climb segment:
The model should sharply turn into, and then maintain an inverted climb with a "straight line" flight path angled at approximately 30 degrees past right angles (relative to the ground). The climb should be continued until a sharp outside turn which then results in the model following the Wingover manoeuvre flight path. That Wingover flight path should be positioned at 90 degrees to the centre line axis of the whole manoeuvre and the middle point of this flight path should be positioned directly above the centre of the circle.

c) The overhead second turn, Wingover, and third turn segment:
The "straight line" overhead Wingover flight path should be positioned at 90 degrees to the centre line axis of the whole manoeuvre and the mid point of the flight path should be positioned directly over the centre of the circle. The length of this segment, including its two turns, should be slightly more than $^{1}/_{8}^{th}$ of a lap. This segment should be finished with a sharp outside turn through approximately 60 degrees into an inverted dive.

d) The inverted dive segment:
The model should turn sharply into, and then maintain, an inverted dive with a "straight line" flight path angled at approximately 60 degrees relative to the ground.

e) The intersection:
The intersection of the "straight line" climb and the "straight line" dive flight paths should be at a height of 45 degrees line elevation angle.

f) The fourth turn and bottom level flight segment:
The model should sharply turn into normal upright level flight at a height of 1.5 metres (5ft), plus/minus 30 cm (1ft). The length of this segment, including two turns, should be slightly more than $^{1}/_{8}^{th}$ of a lap.

g) Symmetry of the complete manoeuvre:
The figure should be flown symmetrically in relation to its "vertical" centre line axis, and this centre line axis should be at right angles to the ground.

h) End of manoeuvre:
At exactly the same point as the model started its first turn at the start of the complete manoeuvre.

Recommended exit procedure:
Continue in normal upright level flight at 1.5 metres (5ft).

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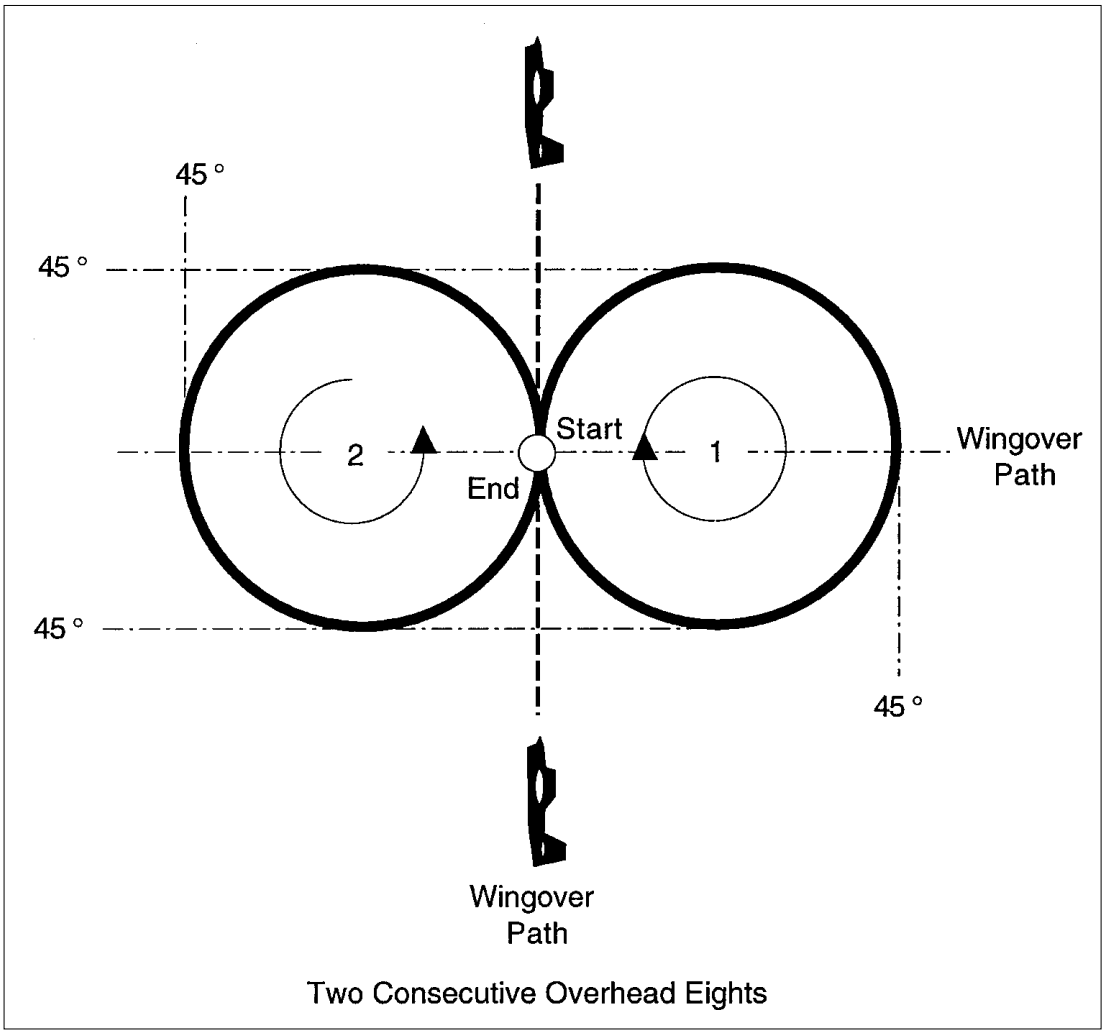
4.2.32 The Two Consecutive Overhead Eights Manoeuvre



Two Consecutive Overhead Eights

Manoeuvre size, overall:
Loop diameters $^{1}/_{8}^{th}$ of a lap; lowest points of both loops at 45 degrees line elevation angle.

Recommended entry procedure:
From normal upright level flight the model should climb in a Wingover flight path to a point directly over the centre of the circle.

a) Start of manoeuvre:
As the model aircraft passes through the overhead point for the first time.
Note:
The intersection point of the complete manoeuvre should be directly over the centre of the circle and should be maintained throughout this entire manoeuvre.

b) The first complete (inside loop) segment:
From the overhead position the model should fly a completely circular inside loop, returning to the overhead/intersection point. The front, right, and rear bottoms of this loop should all be at a height of 45 degrees line elevation angle. This loop should be positioned symmetrically on an imaginary line on the face of the flying hemisphere which is drawn upwards at 90 degrees to the axis of the model's Wingover climb to the intersection point.

c) The passage through the intersection point and transition into the second (outside) loop segment:
As the model passes through the intersection/overhead point, it should smoothly transition into the second (outside) loop without flat spots or deviations. At the point of flying directly above the centre of the circle the model should be momentarily in a "knife edge" position with a line elevation angle of 90 degrees.

d) The second complete (outside loop) segment:
From the overhead position the model should transition smoothly into the second completely circular (outside) loop, completing this loop when it has again returned to the overhead/inter-section point. The front, left, and rear bottoms of this loop should be all at a height of 45 degrees line elevation angle. Those bottoms should also all be positioned symmetrically on an imaginary line on the face of the flying hemisphere which is drawn upwards at 90 degrees to the axis of the model's climb to the intersection point (paragraph c) above).

e) The second eight figure:
The model should fly the second eight figure exactly as set out in the individual segments above and this second eight figure should be flown in exactly the same and should be of exactly the same size as the first eight figure

f) End of manoeuvre:
At the end of the second (outside) loop of the second eight figure, as the model passes through the intersection point.

Recommended exit procedure:
Continue by completing most of the second (diving) half of the Wingover flight path which was used to start the manoeuvre. Then recover into normal upright level flight at 1.5 metres (5ft).

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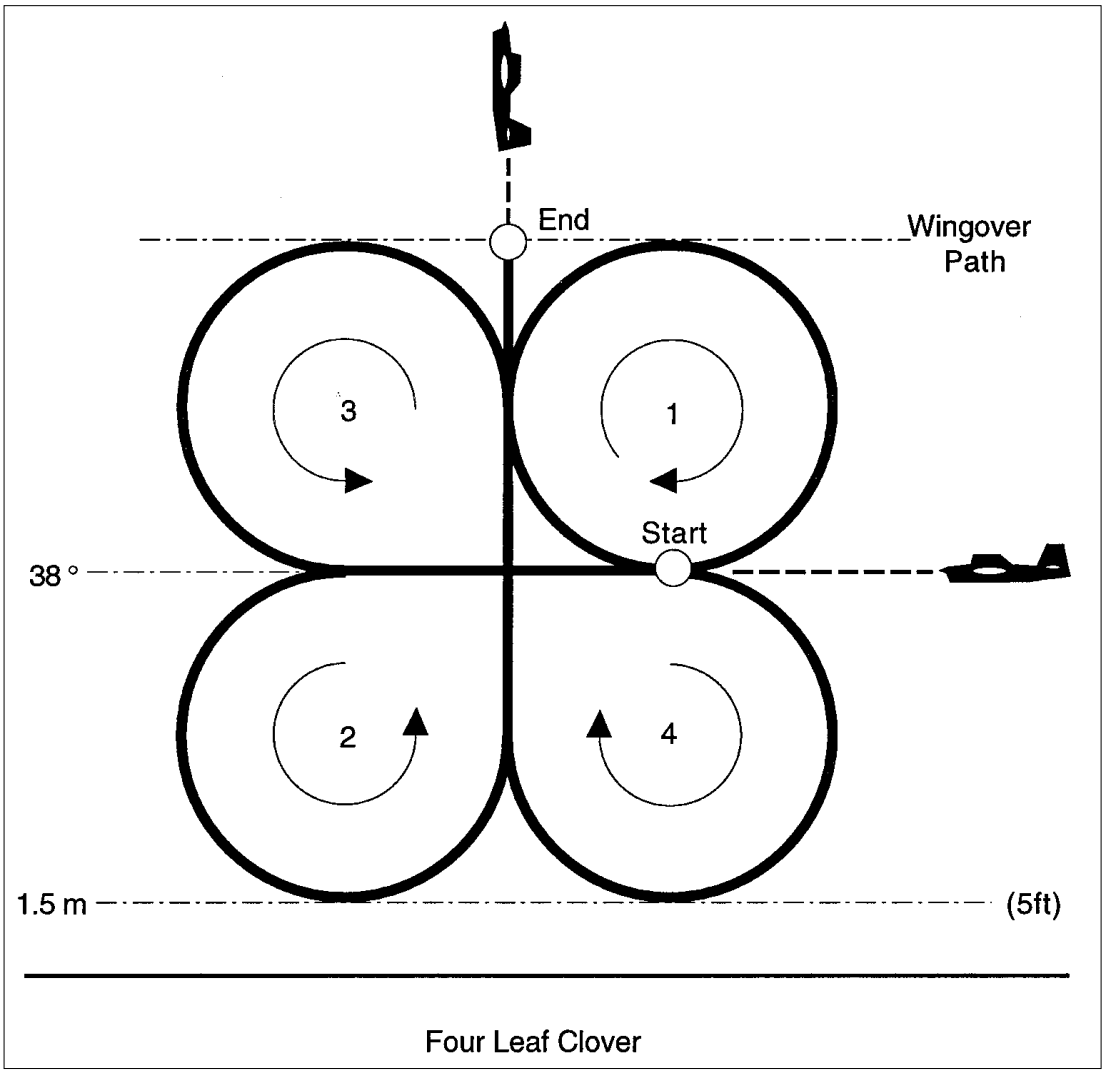
4.2.33 The Single Four Leaf Clover Manoeuvre



Manoeuvre size, overall:
Maximum height 90 degrees line elevation angle; maximum width ¼ lap.

Recommended entry procedure:
Use ¾ of a lap to climb to a height of 38 degrees line elevation angle and maintain this height in upright level flight for $^{1}/_{8}^{th}$ of a lap.

a) Start of manoeuvre:
At the point of entry into the first (inside) loop.

b) The first complete (inside) loop figure:
Note:
"Complete loop" (above) means a full circular loop of 360 degrees.
The top of this first loop should be tangential to the Wingover path located at 90 degrees to the centre line axis of the whole manoeuvre. The model should recover into upright level flight at a height of 38 degrees line elevation angle. This loop should be positioned tangentially to an imaginary "vertical" line drawn upwards at right angles from the ground. The lateral position of this line is determined when the model reaches a "vertical" attitude for the first time and this imaginary line then becomes the lateral reference for the whole manoeuvre.

c) The upright level flight at 38 degrees line elevation angle segment:
At 38 degrees line elevation angle the model should fly a "straight line" upright level flight path which is parallel to the ground. The length of this segment should be equal to the diameter of the first loop.

d) The second (outside) ¾ of a loop segment:
Note:
" $^{3}/_{4}$ of a loop" (above) means a circular arc of 270 degrees.
This ¾ loop should be flown as a true arc without visible deviations from a circular flight path and the bottom should be at a height of 1.5 metres (5ft), plus/minus 30 cm (1ft). This ¾ loop should end with the model

entering a “vertical” climb whose flight path is the same as the great circle line resulting from flying the first loop.

e) The first “vertical” climb segment:
The model should climb “vertically” at right angles to ground and the length of this segment should be equal to the diameter of the first loop.

f) The third (outside) ¾ loop segment:
Note:
" $^{3}/_{4}$ of a loop" (above) means a circular arc of 270 degrees.
This ¾ loop should be flown as a true arc without visible deviations from a circular flight path and the bottom should be at a height of 38 degrees line elevation. This ¾ loop should end with the model recovering to inverted level flight at a height of 38 degrees line elevation angle.

g) The inverted level flight at 38 degrees line elevation angle segment :
The model should follow a “straight line” inverted flight path which is parallel to the ground. The length of this segment should be equal to the diameter of the first loop.

h) The fourth (inside) ¾ loop segment:
Note:
The term " $^{3}/_{4}$ of a loop" (above) means a circular arc of 270 degrees.
This ¾ loop should be flown as a true arc without visible deviations from a circular flight path and the bottom should be at a height of 1.5 metres (5ft), plus/minus 30 cm (1ft). This ¾ loop should end with the model entering a “vertical” climb whose flight path is the same as the great circle line resulting from flying the first loop.

i) The second “vertical” climb segment:
The model should climb “vertically” at right angles to ground and the length of this segment should be such that the model flies through the complete clover leaf figure.

j) End of manoeuvre:
At the end of the last “vertical” climb, as the model passes through a point directly above the centre of the circle.

Recommended exit procedure:
Continue the Wingover path from the last vertical climb (paragraph i) above) into a “vertical dive, then recover into normal upright level flight at 1.5 metres (5ft). Other manoeuvring after completion of the Cloverleaf is permitted.

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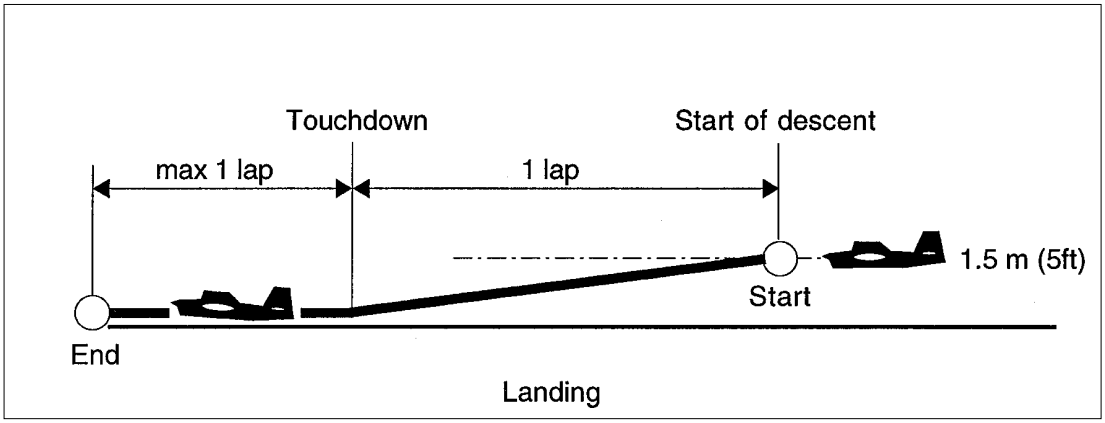
4.2.34 The Landing Manoeuvre



Recommended entry procedure:
From normal upright level flight at a height of 1.5 metres (5ft).

a) Start of manoeuvre:
As the model leaves a height of 1.5 metres (5ft), plus/minus 30 cm (1ft), and with the motor/s stopped (gliding flight).

b) The descent segment:
The model should fly for 1 full gliding lap (engine/s out), measured from the start of the descent at the 1.5 metres plus/minus 30 cm (1ft) height, until the point of touchdown. The rate of descent should remain constant throughout this whole gliding lap, from the moment that it leaves the 1.5 metres (5ft) height until the moment that it touches down. The touch down itself should be smooth and either a "2 point" or a "3 point" touch down shall be judged as being equally correct.

c) End of manoeuvre:
When the model comes to a complete stop after touching down at the end of the ground roll which is clearly in a forwards direction and in line with its normal flight motion. The length of the ground roll shall not exceed one lap.

d) End of timing:
Official timing of the complete flight shall stop at the moment that the model completes the Landing Manoeuvre (that is, when the model comes to a complete stop at the end of the ground roll, as per c) above).

e) Excess time and "irregular" Landing Manoeuvres:
The mark 0 (zero) shall be awarded for this complete manoeuvre if the Official Timekeeper confirms that the model comes to a complete stop at the end of the ground roll after the 7 minutes total time allowed for an Official Flight has expired (refer 4.2.16). The mark 0 (zero) points shall also be awarded for this complete manoeuvre if:

i) the model crashes;

ii) the model lands on its belly;

iii) the model lands upside-down;

iv) the model is fitted with a retractable landing gear and if this was not fully extended at the time of touch down, and/or if the retractable landing gear is apparently fully extended but if it collapses when touching down.;

v) the model flips over at the moment of touching down (but the mark zero (0) points shall not be awarded for this complete manoeuvre if the model flips over during the ground rollout phase and if, in the opinion of the judges, the flip over was due to adverse wind conditions, or due to poor ground surface conditions affecting what would be predictable as the model's normal ground roll after touching down).

End