# FAI Sporting Code

## Section 4 – Aeromodelling

# Volume F3
# Radio Control Aerobatics

2012 Edition

Effective 1st January 2012

F3A - R/C AEROBATIC POWER MODEL AIRCRAFT
F3M - LARGE R/C AEROBATIC POWER MODEL AIRCRAFT
F3P - INDOOR R/C AEROBATIC POWER MODEL AIRCRAFT
F3S - JET R/C AEROBATIC POWER MODEL AIRCRAFT
ANNEX 5A - F3A DESCRIPTION OF MANOEUVRES
ANNEX 5B - F3 R/C AEROBATIC POWER MODEL AIRCRAFT MANOEUVRE EXECUTION GUIDE
ANNEX 5G - F3A UNKNOWN MANOEUVRE SCHEDULES
ANNEX 5L - F3M DESCRIPTION OF MANOEUVRES
ANNEX 5M - F3P DESCRIPTION OF MANOEUVRES
ANNEX 5X - F3S DESCRIPTION OF MANOEUVRES
ANNEX 5N - F3A WORLD CUP RULES

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1 FAI Statutes, Chapter 1, para. 1.6

2 FAI Sporting Code, General Section, Chapter 3, para 3.1.3

3 FAI Statutes, Chapter 1, para 1.8.1

4 FAI Statutes, Chapter 2, para 2.1.1; 2.4.2 ; 2.5.2 ; 2.7.2

5 FAI Bylaws, Chapter 1, para 1.2.1

6 FAI Statutes, Chapter 2, para 2.4.2.2.5

7 FAI Bylaws, Chapter 1, para 1.2.3

8 FAI Statutes, Chapter 5, para 5.1.1; 5.5 ; 5.6

9 FAI Sporting Code, General Section, Chapter 3, para 3.1.7

10 FAI Sporting Code, General Section, Chapter 1, paras 1.2. and 1.4

11 FAI Statutes, Chapter 5, para 5.6.3

12 FAI Bylaws, Chapter 1, para 1.2.2

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# VOLUME F3 AEROBATICS

## SECTION 4C – MODEL AIRCRAFT – F3 – RADIO CONTROL AEROBATICS

**Part Five – Technical Regulations for Radio Controlled Contests**

**THIS 2012 EDITION INCLUDES THE FOLLOWING AMENDMENTS MADE TO THE 2011 CODE**

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

| Para graph | Plenary meeting approving change | Brief description of change | Change incorporated by |
|---|---|---|---|
| 5.1.1 | 2011 | Variable thrust direction not allowed | Michael Ramel S-C Chairman |
| 5.1.2 | | Propulsion shut-off/idle at R/C failure | |
| 5.1.2 | | Battery charging for sound re-test | |
| 5.1.2 | | Exception of R/C open loop definition | |
| 5.1.2 | | Additional restrictions for control functions | |
| 5.1.5 | | Clarification of propulsion failure | |
| 5.1.8 | | Clarification of marking procedure | |
| 5.1.8 | | Re-definition of manoeuvring zone | |
| 5.1.8 | | Re-definition reasons for forced landing | |
| 5.1.9 | | Precision of procedures | |
| 5.1.10 | | Precision of procedures | |
| 5.1.11 | | Reduction of number of models processed for teams | |
| 5.1.11 | | Precision of procedures | |
| 5.1.11 | | Procedure for voltage check | |
| 5.1.11 | | Procedure for connecting/disconnecting electric power | |
| 5.1.11 | | Flight time split in 2min starting time, 8min flying time | |
| 5.1.12 | | Precision of procedures | |
| 5.1.13 | | Introduction of Advanced Schedules A-12, A-14 | |
| 5.1.13 | | Implementation of Preliminary Schedules P-13, P-15 | |
| 5.1.13 | | Implementation of Semi-final/Final schedules F-13, F15 | |
| Annex 5A | | Manoeuvre description A-12, A-14 | |
| Annex 5A | | Manoeuvre description P-13, P-15 | |
| Annex 5A | | Manoeuvre description F-13, F-15 | |
| Annex 5B | | Introduction of Manoeuvre Execution Guide | |
| Annex 5G | | Computer composition of Unknown Schedules possible | |
| Annex 5G | | Increased challenges in Unknown Schedules | |
| Annex 5G | | Additional Unknown Manoeuvres | |
| 5.10.3 | | Noise level limit raised | |
| 5.10.14 | | Implementation of Known Schedule 2012-2013 | |
| Annex 5L | | Description of Known Schedule 2012-2013 | |
| 5.9.1, 2, 9, 11 | n/a | Rationalisation of commonality with F3A in part. | |
| 5.9.5, 6, 7, 8, | n/a | Rationalisation of commonality with F3A entirely | |
| 5.9.1 | 2011 | Variable thrust direction not allowed, except for F3P-AFM | |
| 5.9.8 | | Redefinition of manoeuvring area, precision of procedures | |
| 5.9.9 – 5.9.12 | | Precision of procedures | |
| 5.9.13 | | Preliminary Schedule F3P-AP-13 | |
| AP-13.06 | n/a | Added missing words "¼ roll down" | |

***2012 Amendments**/cont…*

*cont/…**2012 Amendments***

| | | | |
|---|---|---|---|
| 5.9.13 | 2011 | Final Schedule F3P-AF-13 | Michael Ramel S-C Chairman |
| AF-13.06 | n/a | Added missing word “Upright”. | |
| 5.9.14 | | Consequential change: deleted as now part of the fully amended Annex 5B. | |
| Annex 5M | 2011 | Manoeuvre descriptions of F3P-AP-13, F3P-AF-13 | |
| Annex 5N | | Five (5) judges per panel, TBL mandatory for World Cup Competition | |
| Annex 5 N | n/a | Corrected the F3 Aerobatic Sub-committee name | Jo Halman Technical Secretary |
| 5.12 | 2011 | New class F5S - Jets | |
| Throughout | n/a | “Security line” changed to “Safety line”. | |
| | | Added section headers for clarity | |

| **Four-Year Rolling Amendments for Reference** | | | |
|---|---|---|---|
| Rule Freeze | 2010 | New text to clarify rule change cycles. Consequential change for ABR reference from A.12 to A.13. | Jo Halman Technical Secretary |
| 5.10.9 | n/a | Split the paragraph into a) to i) for clarity | |
| No changes were made to the F3 Aerobatics classes at the 2010 Plenary Meeting | | | |
| Front page, page 5 | n/a | Consequential changes regarding 5.9 & 5.10 as official classes | Jo Halman Technical Secretary |
| Page 9 | | Updated the rule freeze paragraph | |
| Page 11 | | Corrected title | |
| 5.1.3 | 2009 | Specified requirements for disabled competitors | Michael Ramel S-C Chairman |
| 5.1.5 | | Simplified definition of an attempt | |
| 5.1.11 | | Precision of time keeping | |
| 5.1.11 | | Correction of reference | |
| 5.1.12 | | Precision of execution of manoeuvres | |
| 5.1.13 | | Correction of manoeuvre description | |
| Annex 5A | n/a | Deleted obsolete manoeuvre schedules and diagrams P.09 & F.09 | Michael Ramel S-C Chairman |
| Annex 5A: P-11.01 | | Rationale correction: deleted “up” | |
| P-11.07, | | Rationale correction: “complete” to “perform” add “with” | |
| P-11.08 | | Rationale correction: delete “in either direction” | |
| P-11.13 | | Rationale correction: delete “to complete”; insert “through” and amend text in Judging Notes 2nd bullet point | |
| P-11.16 | | Rationale correction: delete “to complete”; insert “through” | |
| P-11.17 | | Corrected text for clarification; changed “Spin” to “Turn” in Judging Notes 3rd bullet point | |
| F-11.02 | | Rationale correction: delete “to complete”; insert “through” | |
| F-11.05 | | Corrected to correspond to the Judges Guide | |
| F-11.09 | | Rationale correction: delete “to complete”; insert “through” | |
| F-11.16 | | Added Judging notes as corresponding manoeuvre in F3A | |

**Four-year Rolling Amendments for Reference**…/cont

| Four-Year Rolling Amendments for Reference | | | |
|---|---|---|---|
| Annex 5 G | n/a | Amended title to follow protocol | Jo Halman Technical Secretary |
| 5.10 | 2009 | F3M from Provisional (Annex 5L) to Official class 5.10. Rules renumbered and relocated; (late correction). | |
| 5.10.10 | n/a | Corrected normalisation formula | |
| 5.10.13 | | Corrected for English | |
| 5.10.14 | | Deleted unnecessary date & corrected cross-reference | |
| 5.10.15 | | Amended title to follow rationale | |
| Annex 5L | | Amended title for clarity & protocol; added note at end | |
| 5.9 | 2009 | F3P from Provisional (Annex 5M) to Official class 5.9 | |
| 5.9.9 | n/a | Deleted erroneous “semi-finals” | Jo Halman Technical Secretary |
| 5.9.10 c) | | Inserted omitted text | |
| 5.9.10 e) | | Deleted erroneous “unknown” | |
| 5.9.10 f) | | Corrected cross reference | |
| 5.9.11 | | Corrected cross reference | |
| 5.9.13 | | AP-07 corrected to “half roll down” | Michael Ramel S-C Chairman |
| 5.9.13 | | AP-08 corrected to “centre manoeuvre” | |
| 5.9.14 | | Amended title to follow protocol | |
| 5.9.8, 5.9.12 c), e), g), j), l, 5.9.13, Annex 5M | | All occurrences and references to “AeroMusicals” are now “Aerobatics Freestyle to Music and “AM” are now “AFM” | |
| Annex 5M | | Amended titles to follow protocol | |
| Annex 5M, AP10 | | AP-10 amended Judging Notes to specify “distance from”; added notes regarding location of manoeuvre descriptions. | Michael Ramel S-C Chairman |
| Annex 5N.3b | 2009 | Redefinition of World Cup scores | |
| 5.1.11 | n/a | Corrected reference. | Technical Secretary |
| 5.1.13 | | P-11.14 deleted erroneous “inverted text” | Bob Skinner S-C Chairman |
| Annex 5L.1.10 | | Deleted erroneous “S” from the formula | |
| 5L.1.14 | 2008 | Added 2009-2010 manoeuvre schedules list & K factors | |
| Annex 5L. Appendix 1 | | Added 2009-2010 description of the manoeuvres and Aresti diagrams | |
| Annex 5M.1.2 | | Increased maximum weight to 300g | |
| Annex 5M.1.9 | | Additional rules regarding the new F3P-AP & F3P-AF schedules | |
| Annex 5M.1.10 | | Additional judging rules; added sub-paragraph number for clarity | |
| Annex 5M.1.12 | n/a | Consequential change reference F3P-AP & F3P-AF | Technical Secretary |
| Annex 5M.1.3 | 2008 | Added explanation of F3P-AP & F3P-AF and the lists of manoeuvres and K factors; added references to the four new appendices required by the new schedules | Bob Skinner S-C Chairman |
| Annex 5M.1.14 | n/a | Delete “Description” and added reference to F3P-AF | Technical Secretary |
| Annex 5M. Appendices 1,2 | 2008 | Added two new appendices for F3P-AP manoeuvre descriptions and diagrams | Bob Skinner S-C Chairman |
| Annex 5M. Appendices 3,4 | | Added two new appendices for F3P-AF manoeuvre descriptions and diagrams | |
| 5M.1.14 & 15 | | Added class designation to the title for clarity. | |
| 5M Appendix 1 | n/a | Added appendix title | Bob Skinner S-C Chairman |

## RULE FREEZE FOR THIS VOLUME

With reference to paragraph A.13 of Volume ABR:

In all classes, the two-year rule for no changes to model aircraft/space model specifications, manoeuvre schedules and competition rules will be strictly enforced. For Championship classes, changes may be proposed in the year of the World Championship of each category.

For official classes without Championship status, the two-year cycle begins in the year that the Plenary Meeting approved the official status of the class. For official classes, changes may be proposed in the second year of the two-year cycle.

a) changes for F3A, F3M, and F3P can next be agreed at the Plenary meeting 2013 for application from January 2014;

b) provisional classes are not subject to this restriction.

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

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# VOLUME F3 AEROBATICS

# PART FIVE – TECHNICAL REGULATIONS FOR RADIO CONTROLLED CONTESTS

## 5.1. CLASS F3A – AEROBATIC POWER MODEL AIRCRAFT

### 5.1.1. Definition of a Radio Controlled Aerobatic Power Model Aircraft

A model aircraft, but not a helicopter, which is aerodynamically manoeuvred in attitude, direction, and altitude by a pilot on the ground using radio control. Variable thrust direction of the propulsion device(s) is not allowed.

### 5.1.2. General Characteristics of Radio Controlled Aerobatic Power Models:

Maximum overall span .....2000mm

Maximum overall length .....2000mm

Maximum total weight, with batteries .....5000g

A tolerance of 1% will be allowed for possible inconsistencies in measurement instruments for size, weight, and voltage unless otherwise stated.

Propulsion device limitations: Any suitable propulsion device may be utilised. Propulsion devices that are not permitted are those requiring solid expendable propellants, gaseous fuels (at room temperature and atmospheric pressure), or liquefied gaseous fuels. Electric powered model aircraft are limited to a maximum of 42.56 volts for the propulsion circuit**,** measured off load, and prior to flight while the competitor is in the ready box.

The propulsion device(s) must automatically shut-off or fully idle at the moment a R/C signal failure occurs.

Paragraph B.3.1.a) of Section 4B (Builder of Model aircraft) is not applicable to class F3A.

The maximum sound/noise level of the model aircraft and its propulsion device, shall be 94 dB(A) measured at 3m from the centre line of the model aircraft with the model aircraft placed on the ground over concrete, macadam, grass, or bare earth at the flight line.

The tolerance of the sound/noise level measurement is the specified tolerance of the manufacturer of the measuring instrument.

With the propulsion device running at full power, the measurement will be taken 90 degrees on the right-hand side, with the nose of the model aircraft pointing into the wind. The Class 1 SLM (Sound Level Meter) microphone shall be placed on a stand 30cm above the ground in line with the propulsion device Other than the helper restraining the model aircraft, and the sound steward, no persons or sound/noise reflecting or sound absorbing objects shall be nearer than 3m to the model aircraft or the microphone. The sound/noise measurement shall be made immediately prior to each flight. The sound test area must be located in a position that does not create a safety hazard to officials and other competitors.

The flight time will be interrupted while the sound/noise test at the flying site is being made. The competitor shall not be delayed more than 30 seconds for this sound test.

In the event of a model aircraft failing the sound/noise test, no indication of the result or the reading shall be given to the competitor, or his team, or the judges, and both the transmitter and the model aircraft shall be impounded by the flight line official immediately following the flight. No modification or adjustment to the model aircraft shall be permitted (other than refuelling or battery recharging). The competitor and his equipment shall remain under supervision of the flight line director while the propulsion battery is fully recharged. The model aircraft shall be re-tested within 90 minutes by a second noise steward using a second Sound Level Meter, and in the event that the model aircraft fails the re-test, the score for the preceding flight shall be zero. The score for the flight may be tabulated but not made public until the result of the re-test is communicated to the tabulators.

Radio equipment shall be of the open loop type (ie no electronic feedback from the model aircraft to the ground except for the stipulations in Volume ABR B.11.2). Auto-pilot control utilising inertia, gravity or any type of terrestrial reference is prohibited. Automatic control sequencing (pre-programming) or automatic control timing devices are prohibited.

Example: Permitted:

1. Control rate devices that are manually switched by the pilot.
2. Any type of button or lever, switch, or dial control that is initiated or activated and terminated by the competitor.
3. Manually operated switches or programmable options to couple and mix control functions.

**Not** permitted:

1. Snap roll buttons with automatic timing mode.
2. Pre-programming devices to automatically perform a series of commands.
3. Auto-pilots or gyros for automatic wing levelling or other stabilisation of the model aircraft.
4. Automatic flight path guidance.
5. Propeller pitch change with automatic timing mode.
6. Any type of voice recognition system.
7. Conditions, switches, throttle curves, or any other mechanical or electronic device that will prevent or limit sound level of the propulsion device during the sound/noise test.
8. Any type of learning function involving manoeuvre to manoeuvre or flight to flight analysis.

5.1.3. **Definition and Number of Helpers**

A helper may be a Team Manager, another competitor, or an officially registered supporter. Each competitor is permitted one helper (usually the caller) during the flight. Two helpers may be present and assist during the starting of the motor(s). One person, either a helper, or the team manager, or the caller, may place the model aircraft for take-off and retrieve the model aircraft following the landing. In exceptional circumstances, another helper may join the competitor and caller/helper during the flight, but only to hold a sun-shield as protection from direct sunlight. These protection devices must not interfere with the judges' vision of the manoeuvres. Physically disabled competitors requiring an additional helper and/or caller or other assistance, must request permission with full details, with their entry, from the organiser of a championship. This additional assistance must be provided by the competitor, must not give him an unfair advantage over other competitors, and must not unduly delay or interfere with the running of the competition. Except for communication between the caller and the competitor, no other performance-enhancing communication with helpers is permitted during the flight.

5.1.4. **Number of Flights**

Competitors have the right to the same number of preliminary, semi-final, or finals flights. Only completed rounds will be counted. Only when all competitors in the preliminary, semi-final, and final rounds, have had the opportunity to complete the same number of rounds, can the results of the rain-interrupted (or other delay) competition be determined.

5.1.5. **Definition of an Attempt**

There is an attempt when the competitor is given permission to start.

If the propulsion device fails after the take-off has begun, the attempt will be deemed complete.

5.1.6. **Number of Attempts**

Each competitor is entitled to one attempt for each official flight.

**Note:** An attempt can be repeated at the contest director's discretion only when any unforeseen reason beyond the control of the competitor, causes the model aircraft to fail to start (eg there is radio interference). Similarly, in a flight that is interrupted by any circumstance beyond the control of the competitor, the competitor is entitled to a reflight, with the entire schedule being flown and judged, but only the affected manoeuvre and the unscored manoeuvres that follow will be tabulated. This reflight should take place within 30 minutes of the first flight, in front of the same set of judges, or be the first flight after the judges' break, or, if it involves a protest, as soon as the FAI Jury has deliberated and communicated the outcome of the protest to the contest director. The result of the reflight will be final.

5.1.7. **Definition of an Official Flight**

There is an official flight when an attempt is made whatever the result.

5.1.8. **Marking**

Each judge has to assess each manoeuvre and any other relevant action of the competitor individually and independently from the other judges. The criteria for judging are contained in the Description of Manoeuvres (Annex 5M) and in the Manoeuvre Execution Guide (Annex 5B)

Each manoeuvre may be awarded marks, in whole numbers, between 10 and 0 by each of the judges during the flight. During tabulation, these marks are multiplied by a coefficient (K-Factor) which relates to the difficulty of the manoeuvre.

Any manoeuvre not completed, or flown out of sequence with the stated schedule shall be scored zero (0). Zero scores need not be unanimous, except in cases where an entirely wrong manoeuvre was performed. Judges must confer after the flight in these cases, bringing it to the attention of the flight line director/contest director on site.

Take-off and landing procedures are not judged and are not scored.

The manoeuvring zone is vertically spread in front of and at a distance of approximately. 150 m from the pilot. It is laterally limited by two virtual vertical planes above the extension of two lines on the ground each at an angle of 60 degrees left and right from the intersection of a centre line with the safety line. The centre line is positioned on the ground perpendicular to the safety line on the ground which is parallel to the runway. The upper limit of the manoeuvring zone is defined by the virtual plane stretching up 60 degrees from the ground at the intersection of all ground lines.

The pilot is normally placed on the intersection of all ground lines.

Manoeuvres must be performed where they can be seen clearly by the judges. If a judge, for some reason beyond the control of the competitor, is not able to follow the model aircraft through the entire manoeuvre, he may set the “Not Observed” (N.O.) mark. In this case, the judge’s mark for that particular manoeuvre will be the average of the numerical marks given by the other judges, rounded to the nearest whole number. If no such average is achievable, the competitor has the right for a reflight as per paragraph 5.1.6.

Centre manoeuvres should be performed in the centre of the manoeuvring zone while turn around manoeuvres should not extend past the lateral limits. Vertical height should not exceed the upper limit. Also, manoeuvres should be performed along a line of flight approximately 150m in front of the security line. Infractions of this rule will be cause for downgrading by each judge individually and in proportion to the degree of infraction. Exceptions to this rule are the horizontal circle manoeuvres which, of necessity, may deviate from the 150m distance of flight.

The manoeuvring zone shall be clearly marked with white (or contrasting colour to the background) vertical poles, approximately 100mm in diameter and approximately 4m high, placed on centre and 60 degrees each side of centre on a line 150m in front of the competitor’s position. Flags, streamers, or boards of contrasting colour to the background, should be mounted on the poles to improve visibility. White (or contrasting) lines, originating at the competitor’s position and extending outward at least 50m, shall also be used to mark the centre and extreme limits (60 degrees left and right of centre) of the manoeuvring zone. Audible and visual signals to indicate violations of the manoeuvring zone must not be used.

The judges shall be seated not more than 10m, and not less than 7m behind the competitor’s position (the apex of the 60 degree lines) and within an area described by the extension of the 60 degree lines to the rear of the competitor. The judges must be seated abreast, usually separated by 2m, with scribes or score secretaries separating them.

At the conclusion of the flight, each judge must independently consider if the in-flight sound level of the model aircraft is too loud. If a majority of the judges consider the in-flight sound level of the model aircraft to be too loud, then the flight score will be penalised by 10 points for each counting judge on that panel during the flight. If, during a flight, the sound level of the model aircraft increases perceptibly as a result of an equipment malfunction, or of a condition initiated by the competitor, the flight line director may request a sound re-test. If an equipment malfunction during the flight (such as mechanical failure of the exhaust/muffler system) causes excessive noise, the flight line director may request the competitor to land his model aircraft, and scoring will cease from the point of malfunction.

If a model aircraft is, in the opinion of the judges, unsafe or being flown in an unsafe or inappropriate manner, they may bring this to the attention of the flight line director, who may instruct the pilot to land.

*cont/…*

The individual manoeuvre scores given by each judge for each competitor must be made public at the end of each round of competition. The team manager must be afforded the opportunity to check that the scores on each judge's score sheet correspond to the tabulated scores (to avoid data capture errors). The score board must be located in a prominent position at the flight line, in full view of the competitors and the public.

All flight results before the completion of a round must be ranked alphabetically, or by country, or by contestant number, but not in order of performance or placing.

5.1.9. **Classification**

For World and Continental Championships, each competitor will have four preliminary (Schedule P) flights, with the best three normalised scores counting to determine the preliminary ranking. The top one third, but not more than 30 competitors, will then have two additional semi-final flights flying the known finals schedule. The total of the best three preliminary flights (normalised again to 1000 points) will count as one score along with the two semi-finals scores to provide three scores, the best two to count for semi-finals classification.

The top ten competitors of the semi-finals of a World or Continental Championship where there is an entry of more than 40 competitors, will then have four additional flights to determine the individual winner. For a World or Continental Championship with less than 40 competitors, the top five competitors will advance to the finals. Two final flights will be the current known finals schedule (F) and two will be unknown schedules (two different schedules, UK1 and UK2) (see 5.5). The known and unknown schedules must be flown in alternating sequence, starting with the known finals schedule (F). The best score from the known schedule will be combined with the score**s** from both unknown schedules for final classification. In the case of a tie the semi-final score will be used to decide the higher classification.

The team classification is established at the end of the competition (after the finals) by adding the numerical final placing of the best three team members of each nation. Teams are ranked from the lowest numerical scores to the highest, with complete three-competitor teams, ahead of two-competitor teams, which in turn are ranked ahead of one-competitor teams. In the case of a tie, the best individual placing decides the team ranking.

For World and Continental Championships, the scores for all rounds, preliminary, semi-finals and finals, will be computed using the Tarasov-Bauer-Long (TBL) statistical averaging scoring system. Only computer tabulation systems containing the TBL algorithm and judge analysis programs that have been approved by the CIAM Bureau can be used at World and Continental Championships.

All scores for each round, preliminary, semi-final and finals, will then be normalised as follows. When all competitors have flown in front of a particular group of judges (ie a round) the highest score shall be awarded 1000 points. The remaining scores for that group of judges are then normalised to a percentage of the 1000 points in the ratio of actual score over winner's score.

$$\text{Points}_X = \frac{S_X}{S_W} \times 1000$$

$\text{Points}_X$ = points awarded to competitor X

$S_X$ = score of competitor X

$S_W$ = score of winner of round

Note 1: Final and semi-final flights to determine the individual winner are usually only required for World and Continental Championships. For open international events, national championships, and domestic competitions, the total of the three best preliminary flights out of four or the best two out of three may be used to determine the individual winner and team placing. Flights of Schedule F may be incorporated depending on local circumstances and the time available.

In the event of adverse weather conditions where no further flying is possible, the preliminary classification may be determined as follows:

One round/flight completed by each competitor: round/flight to count

Two rounds/flights completed by each competitor: best round/flight to count

Three rounds/flights completed by each competitor: best two rounds/flights to count

Four rounds/flights completed by each competitor: best three rounds/flights to count.

*cont/…*

**Note 2:** The TBL score tabulation system can only be applied for events with at least 5 competitors and 5 judges. For those smaller events that are not scored with the TBL system, the highest and lowest marks for each manoeuvre will be discarded if four or more judges are used.

5.1.10. **Judging**

For World Championships the organiser must appoint four panels of five judges each (a total of twenty judges). The judges must be of different nationalities and must be selected from a current list of FAI International Judges. Those selected must reflect the approximate geographical distribution of teams participating in the previous World Championship with the final list approved by the CIAM Bureau. At least one third, but not more than two thirds of the judges must not have judged at the previous World Championships. Judge assignment to the four panels will be by random draw.

The invited judges for a World or Continental Championship, must be selected from the current list of FAI International Judges and must have had a reasonableamount of F3A judging experience of both current P and F schedules, and must submit a résumé of his judging experience to the organiser during the nomination process. The organiser must in turn submit the résumés to the CIAM Bureau for approval.

For the semi-final rounds of a World Championship the judges will be arranged in two groups of ten judges. Assignment to the two groups will be by random draw.

For a World Championship with fewer than 72 competitors, and for a Continental Championship with 40 or more competitors, the organiser must appoint two panels of five judges each (a total of ten judges). The judges must be of different nationalities and must be selected from a current list of FAI International Judges. Judge assignment to the two panels will be by random draw.

For Continental Championships with fewer than 30 competitors, the organiser must appoint a single panel of five judges, with the same selection criteria as above.

For World Championships with fewer than 72 competitors, and for a Continental Championships with 30 or more entries, two panels of five judges may be used for the preliminary and semi-final rounds, and one panel of ten judges may be used for the final rounds. For a Continental Championship with fewer than 40 competitors, one panel of five judges may be used for preliminary, semi-final, and final rounds.

For open international events**,** where the TBL statistical averaging scoring system is not used, the highest and lowest marks for each manoeuvre may be discarded, but only where four or more judges are used. It is recommended that this is applied at national championships, and domestic competitions, too.

For the final rounds of a World Championship with 72 or more competitors, the twenty judges will be arranged in three groups, a left hand group of five judges to judge only the left turn-around manoeuvres, a centre group of ten judges to judge only the centre manoeuvres and a right hand group of five judges to judge only the right turn-around manoeuvres. Judge assignments to the three groups will be by random draw for rounds one and two (one known and one unknown round) with a second draw for rounds three and four, except a judge will not serve in the same group as in the previous draw. For each competitor, the score from the three groups (following TBL computation) will be combined for a total score for the flight.

Before every World or Continental Championship, there shall be a briefing for the judges, followed by training flights by non-competitors. Also, warm-up flights for the judges should be flown by non-competitors before the first official preliminary flight each day. For the semi-finals the highest placing non-semi-finalists and for the finals the highest placing two non-finalists should be awarded the honour of performing the warm-up flights. Warm-up flights should be judged but under no circumstances should they be tabulated. Any deviations from the above procedures must be stated in advance by the organisers and must have prior approval of the CIAM or the CIAM Bureau.

5.1.11. **Organisation for Radio Controlled Aerobatics Contests**

Members of a National team, who have processed only one model aircraft each, may make use of the second model aircraft processed by another member of the same team. However, once that model has been used by a team member in that competition, it may not be used by any other competitor. If that team member did not process the model aircraft in the first place, then it must be re-registered and re-marked appropriately. This is the responsibility of the team manager.

For transmitter and FM frequency control see Section 4B, paragraph B.11.

The draw for flight order will be done for each flight line, so that FM frequencies are separated with two competitors in between. Team members will not be drawn to fly directly after each other. Team members on separate flight lines will be separated by at least two competitors. Competitor identification numbers will only be assigned after this flight order draw, by competitor group, and in numerical ascending order.

For flights two, three and four of the preliminary rounds the flight order will start ¼, ½ and ¾ down the flight order respectively. Organisers must take care to avoid a flight draw which will cause competitors to fly at approximately the same time each day.

The flight order for the first semi-finals round will also be by random draw. The second semi-finals flight will start ½ down the semi-finals flight order.

The flight order for the first round of the finals will be established by a random draw as above. The flight order for flights two, three and four will start ¼, ½ and ¾ down the finals flight order with decimals rounded-up.

During the flight the competitor must stay in the proximity of the judges and under the supervision of the Flight Line Director.

Competitors must be called by a flight line official at least five minutes before they are required to occupy the starting area.

If the FM frequency is clear the competitor or his team manager will be allowed to collect the FM transmitter from the transmitter pound. The competitor and his helper(s) then occupy the starting area so that a radio check can be performed to verify the correct functioning of the radio control equipment. If there is a FM frequency conflict, the competitor must be allowed a maximum of one minute for a radio check before the beginning of the starting time.

The time keeper will audibly notify the competitor when the minute is finished and immediately begin timing the starting time.

According to paragraph 5.1.2., the voltage of the propulsion battery of electric powered models, must be checked by an official in the preparation area before the starting time is started.

For electric powered models, the electric power circuit(s) must not be physically connected, before the starting time is begun and must be physically disconnected immediately after landing.

A competitor is allowed **t**wo (2) minutes of starting time and eight (8) minutes of flying time for each flight. The timing of a flight starts with the starting time when the contest director, or timekeeper, gives an instruction to the competitor to start. The openly displayed timing device/clock will be stopped when the competitor is ready to take the sound measurement. The helpers who place the model aircraft, must ensure that the model aircraft is positioned as per paragraph 5.1.2. If the model aircraft is not placed correctly for the sound test before/at the 2-minute-mark, the contest director/time keeper will advise the competitor and helper that the flight may not proceed. The flight shall score zero points. When the contest director/sound steward is satisfied that he has obtained a reading from the SLM, he will indicate this to the competitor, and the timing device will be re-activated to start the 8-minute flying time. With the expiry of the 8-minute flying time, the scoring will cease except for the in-flight sound assessment, which is judged after the model aircraft has landed, irrespective of the time. The contest director/time keeper will advise the pilot, helper, and the judges of the expiry of the 8-minute flying time. The clock will be stopped when the wheels of the model aircraft touch the ground for landing, as proof to the competitor of the recorded time.

The competitor may not start his model aircraft unless he has been instructed by a flight line official to do so. Deliberate starts at the flight line during official flying to check the propulsion device will be subject to disqualification from that round. No public address or commentary should be made during flights.

During the flight, the pilot and his helper/caller (if required) must stay in the designated position in front of the judges, at the convergence of the ground lines and under the supervision of the flight line director**.** The pilot must wear or display his identification/start number.

5.1.12. **Execution of Manoeuvres**

The manoeuvres must be executed during an uninterrupted flight in the order in which they are listed in the schedule. The competitor may make only one attempt at each scored manoeuvre during the flight.

The model aircraft must take-off and land unassisted, that is, no hand launched flights. If any part of the model aircraft is jettisoned during the flight, scoring will cease at that point and the competitor must be instructed by the flight line director to immediately land his model aircraft. Usually, the judges will be able to determine when a part has been jettisoned from the model aircraft. They should bring this to the attention of the flight line director on site.

*cont/…*

The direction of the first manoeuvre or the landing may be different from that of the take-off.

After take-off, only turn-around manoeuvres, and not more than two (2), are allowed before starting the first manoeuvre of the schedule.

5.1.13. **Schedule of Manoeuvres**

For 2012 Schedule A-12 is recommended to be flown in local competitions so as to offer advanced pilots a suitable way to achieve skills to step-up to P-13 Schedules.

For 2013-2014 Schedule A-14 is recommended to be flown in local competitions so as to offer advanced pilots a suitable way to achieve skills to step-up to P-15 Schedules.

For 2012-2013 Schedule P-13 will be flown in the preliminaries. Schedule F-13 will be flown in the semi-finals, as well as in the finals, alternating with unknown schedules.

For 2014-2015 Schedule P-15 will be flown in the preliminaries. Schedule F-15 will be flown in the semi-finals, as well as in the finals, alternating with unknown schedules.

| **Advanced Schedule A-12 (2012)** | **K-Factor** |
|---|---|
| A-12.01 Half Clover Leaf | K 3 |
| A-12.02 Stall Turn | K 3 |
| A-12.03 Roll Combination with consecutive two ¼ rolls, two ¼ rolls in opposite direction | K 4 |
| A-12.04 Half Square Loop with ½ roll | K 3 |
| A-12.05 Triangle with roll | K 4 |
| A-12.06 Split S with ½ roll | K 2 |
| A-12.07 45° Upline with 1 snap roll | K 5 |
| A-12.08 Reverse Top Hat with ¼ roll down, ¼ roll up | K 4 |
| A-12.09 Spin with 3 turns | K 4 |
| A-12.10 Pull-Push-Pull Humpty-Bump with ¼ roll up, ¼ roll down (Option: Two ¼ rolls up) | K 3 |
| A-12.11 Cuban 8 with roll. | K 5 |
| A-12.12 Half Loop | K 1 |
| A-12.13 Square Loop | K 5 |
| A-12.14 Figure 9 | K 3 |
| A-12.15 Roll Combination with consecutive two rolls in opposite directions | K 4 |
| A-12.16 Half Square Loop on Corner | K 3 |
| A-12.17 Figure Z with ½ roll | K 4 |
| | --- |
| Total | K 60 |

| **Advanced Schedule A-14 (2013-2014)** | **K-Factor** |
|---|---|
| A-14.01 Golf Ball | K 3 |
| A-14.02 Half Square Loop on Corner | K 3 |
| A-14.03 Double Immelman with ½ roll, roll | K 5 |
| A-14.04 Half Square Loop with ½ roll | K 2 |
| A-14.05 Stall Turn with ¼ roll up, ¼ roll down | K 5 |
| A-14.06 Reverse Cuban 8 with ½ roll | K 2 |
| A-14.07 Roll Combination with consecutive three ¼ rolls, three ¼ rolls in opposite direction | K 5 |
| A-14.08 Pull-Push-Pull Humpty-Bump with ¼ roll up, ¼ roll down (Option: ½ roll up) | K 4 |
| A-14.09 Top Hat Spin with 3 turns | K 4 |
| A-14.10 Pull-Pull-Push Humpty-Bump with ½ roll down | K 4 |
| A-14.11 Reverse Cuban 8 with roll, ½ roll | K 4 |
| A-14.12 Figure 9 with roll up | K 3 |
| A-14.13 Hour-Glass | K 4 |

*cont/...*

| | |
|---|---|
| A-14.14 Stall Turn with ½ roll down | K 3 |
| A-14.15 45° Upline with slow roll | K 4 |
| A-14.16 Split S with ½ roll | K 1 |
| A-14.17 Avalanche with snap roll on top | K 4 |
| Total | K 60 |

| **Preliminary Schedule P-13 (2012-2013)** | **K-Factor** |
|---|---|
| P-13.01 Half Clover Leaf with horizontal roll | K 3 |
| P-13.02 Stall Turn with ¼ roll up, ¼ roll down | K 3 |
| P-13.03 Roll Combination with consecutive three ¼ rolls, three ¼ rolls in opposite direction | K 4 |
| P-13.04 Half Square Loop with consecutive two ½ rolls in opposite directions | K 3 |
| P-13.05 Triangle with roll in each line | K 4 |
| P-13.06 Split S with roll | K 2 |
| P-13.07 45° Upline with 1½ snap roll | K 5 |
| P-13.08 Reverse Top Hat with ¼ roll down, ¾ roll up | K 4 |
| P-13.09 Spin with 2½ turns, 2½ turns in opposite direction | K 4 |
| P-13.10 Pull-Push-Pull Humpty-Bump with ¼ roll up, ¼ roll down (Option: Consecutive two ¼ rolls up) | K 3 |
| P-13.11 Cuban 8 with integrated rolls on top 90° of both part loops. | K 5 |
| P-13.12 Half Loop | K 1 |
| P-13.13 Square Loop with ½ roll in each line | K 5 |
| P-13.14 Figure 9 with consecutive two ½ rolls | K 3 |
| P-13.15 Roll Combination with consecutive ½ roll, roll, ½ rolls in opposite directions | K 4 |
| P-13.16 Half Loop on Corner with ¼ roll, ¼ knife-edge loop, ¼ roll | K 3 |
| P-13.17 Figure Z with consecutive four ⅛ rolls | K 4 |
| Total | K 60 |

| **Preliminary Schedule P-15 (2014-2015)** | **K-Factor** |
|---|---|
| P-15.01 Golf Ball with two ½ rolls | K 3 |
| P-15.02 Half Square Loop on Corner with ½ roll | K 3 |
| P-15.03 Double Immelman with two knife-edge flights | K 5 |
| P-15.04 Half Square Loop with ½ roll | K 2 |
| P-15.05 Stall Turn with 1¼ roll up, ¾ roll down | K 5 |
| P-15.06 Reverse Cuban 8 with ½ roll | K 2 |
| P-15.07 Roll Combination with consecutive three 1/6 rolls, three 1/6 rolls in opposite direction | K 5 |
| P-15.08 Pull-Push-Push Humpty-Bump with ¾ roll up, ¾ roll down (Option: ½ roll up, ½ roll down) | K 4 |
| P-15.09 Top Hat Inverted Spin with 2½ turns | K 4 |
| P-15.10 Pull-Knife-Edge-Push Humpty-Bump with ½ roll down | K 4 |
| P-15.11 Reverse Cuban 8 with consecutive two ¼ rolls, consecutive two ½ rolls in opposite directions | K 4 |
| P-15.12 Figure 9 with consecutive four ¼ rolls up | K 3 |
| P-15.13 Hour-Glass with ½ roll, roll, ½ roll | K 4 |
| P-15.14 Stall Turn with consecutive two ¼ rolls down | K 3 |
| P-15.15 45° Upline with consecutive two rolls in opposite directions | K 4 |
| P-15.16 Split S with ½ roll | K 1 |
| P-15.17 Avalanche with snap roll on top | K 4 |
| Total | K 60 |

*cont/…*

| **Semi-Final and Final Schedule F-13 (2012-2013)** | **K-Factor** |
|---|---|
| F-13.01 Humpty-Bump with ¾ roll up, ½ knife-edge loop, ¾ roll down | K 4 |
| F-13.02 Half Square Loop with consecutive ½ roll, roll in opposite direction | K 3 |
| F-13.03 Loop with consecutive four ½ rolls in opposite directions integrated | K 6 |
| F-13.04 Figure 6 with stall turn, consecutive two ¼ rolls down | K 4 |
| F-13.05 Roll Combination with consecutive ¼ roll, two snap rolls in opposite directions, ¼ roll | K 6 |
| F-13.06 Shark Fin with roll up, consecutive two ¼ rolls down | K 3 |
| F-13.07 Horizontal Circle 8 with consecutive two rolls | K 5 |
| F-13.08 Pull-Push-Pull Humpty-Bump with consecutive four ¼ rolls up, 1½ roll down | K 3 |
| F-13.09 45° Upline with consecutive four ⅛ rolls, 1½ snap roll in opposite direction | K 5 |
| F-13.10 Reverse Top Hat with ¾ roll down, ¼ rolls up (Option: roll down, consecutive two ¼ rolls up) | K 3 |
| F-13.11 Clown Dance with ½ loop, inverted spin, 2½ turns, consecutive two ¼ rolls down | K 5 |
| F-13.12 Fighter Turn with two ¼ rolls | K 4 |
| F-13.13 Knife-Edge Loop with integrated roll on top 90° | K 4 |
| F-13.14 Reverse Cuban 8 with snap roll up | K 4 |
| F-13.15 Triangle with consecutive two ¼ rolls in each line | K 4 |
| F-13.16 Half Loop with roll integrated | K 3 |
| F-13.17 45° Downline with consecutive two ⅛ roll, roll, two ⅛ roll in opposite directions | K 4 |
| | --- |
| Total | K 70 |

| **Semi-Final and Final Schedule F-15 (2014-2015)** | **K-Factor** |
|---|---|
| F-15.01 Double Immelman with ½ rolls in both ½ loops integrated, two consecutive two ¼ rolls in opposite direction to integrated rolls. | K 4 |
| F-15.02 Stall Turn with consecutive three ¼ rolls up, 1 ¼ snap rolls down | K 3 |
| F-15.03 Golf Ball with two ¾ roll up, knife-edge loop with snap roll, ¾ roll down | K 5 |
| F-15.04 Half Square Loop with consecutive two snap rolls in opposite directions | K 4 |
| F-15.05 Loop with consecutive two ½ rolls in opposite directions integrated | K 4 |
| F-15.06 Inverted Spin with 2½ turns, ½ roll down | K 3 |
| F-15.07 Horizontal Triangular Circle with ¼ roll, ½ outside rolls in each corner integrated | K 6 |
| F-15.08 Top Hat with consecutive two ¼ rolls up, snap roll down (Option: Consecutive three ¼ rolls up, 1¼ snap roll down) | K 4 |
| F-15.09 Vertical Cuban 8 with consecutive four ⅛ rolls up, consecutive two ½ rolls down | K 4 |
| F-15.10 Half Square Loop on Corner with ½ roll integrated in ¼ loop | K 4 |
| F-15.11 Horizontal Hour-Glass with consecutive two ¼ rolls, two ¼ rolls in opposite direction consecutive two ¾ rolls in opposite directions | K 4 |
| F-15.12 Half Square Loop with consecutive two ½ rolls | K 3 |
| F-15.13 Figure 9 with consecutive four ¼ rolls up, ¾ loop with roll integrated in top 180° | K 6 |
| F-15.14 Split S with 1½ snap roll | K 3 |
| F-15.15 Roll Combination with consecutive four rolls in opposite directions | K 5 |
| F-15.16 Pull-Pull-Push Humpty-Bump with two ½ roll in opposite direction up, roll down | K 3 |
| F-15.17 Stall Turn with consecutive six ⅛ rolls up, 1¾ snap roll down | K 5 |
| | --- |
| Total | K 70 |

# ANNEX 5A

# F3A – RADIO CONTROLLED AEROBATIC MODEL AIRCRAFT

# DESCRIPTION OF MANOEUVRES

**ADVANCED SCHEDULE A-12 (2011/2012)**

**A-12.01 Half Clover Leaf**

From upright, pull through a ¼ loop into a vertical upline, push through a ¾ loop into a horizontal line, push through a ¾ loop into a vertical downline, pull through a ¼ loop, exit upright.

**A-12.02 Stall Turn**

From upright, pull through a ¼ loop into a vertical upline, perform a stall turn into a vertical downline, pull through a ¼ loop, exit upright.

**A-12.03 Roll Combination with consecutive two ¼ rolls, two ¼ rolls in opposite direction**

From upright, perform consecutively two ¼ rolls, ¼ rolls in opposite direction, exit upright.

**A-12.04 Half Square Loop with ½ roll**

From upright, pull through a ¼ loop into a vertical upline, perform a ½ roll, push through a ¼ loop, exit upright.

**A-12.05 Triangle with roll**

From upright, push through a ⅛ loop into a 45° downline, push through a 3/8 loop into a horizontal line, perform a roll, push through a 3/8 loop into a 45° upline, push through a ⅛ loop, exit upright.

**A-12.06 Split S with ½ roll**

From upright, perform a ½ roll and immediately pull through a ½ loop, exit upright.

**A-12.07 45° Upline with 1 snap roll**

From upright, pull through a ⅛ loop into a 45° upline, perform a snap roll, push through a ⅛ loop, exit upright.

**A-12.08 Reverse Top Hat with ¼ roll down, ¼ roll up**

From upright, push through a ¼ loop into a vertical downline, perform a ¼ roll, push through a ¼ loop into a horizontal line, push through a ¼ loop into a vertical upline, perform a ¼ roll, push through a ¼ loop, exit upright.

**A-12.09 Spin with 3 turns**

From upright, perform a upright spin with 3 turns, perform a vertical downline, pull through a ¼ loop, exit upright.

**A-12.10 Pull-Push-Pull Humpty-Bump with ¼ roll up, ¼ roll down (Option: Two ¼ rolls up)**

From upright, pull through a ¼ loop into a vertical upline, perform a ¼ roll, push through a ½ loop into a vertical downline, perform a ¼ roll, pull through a ¼ loop, exit upright.

Option: From upright, pull through a ¼ loop into a vertical upline, perform two consecutive ¼ rolls, push through a ½ loop into a vertical downline, pull through a ¼ loop, exit upright.

**A-12.11 Cuban 8 with roll.**

From upright, pull through a ⅝ loop into a 45° downline, push through a ¾ loop into another 45° downline, perform a roll, pull through a ⅛ loop, exit upright.

**A-12.12** Half **Loop**

From upright, pull through a ½ loop, exit inverted.

**A-12.13 Square Loop**

From inverted, pull through a ¼ loop into a vertical downline, pull through a ¼ loop into a horizontal line, pull through a ¼ loop into a vertical upline, pull through a ¼ loop into a horizontal line, exit inverted.

**A-12.14 Figure 9**

From inverted, push through a ¾ loop into a vertical downline, pull through a ¼ loop, exit upright.

**A-12.15 Roll Combination with consecutive two rolls in opposite directions**

From upright, perform consecutively a two rolls in opposite directions, exit upright.

**A-12.16** Half **Square Loop on Corner**

From upright pull through a ⅛ loop into a 45° upline, pull through a ¼ loop into a 45° upline, pull through a ⅛ loop, exit inverted.

**A-12.17 Figure Z with ½ roll**

From inverted, pull through a 3/8 loop into a 45° downline, perform a ½ roll, pull through a 3/8 loop, exit upright.

**ADVANCED SCHEDULE A-14 (2013-2014)**

**A-14.01 Golf Ball**

From upright, pull through a ⅛ loop into a 45° upline, pull through a ¾ loop into a 45° downline, pull through a ⅛ loop, exit upright.

**A-14.02** Half **Square Loop on Corner**

From upright, pull through a ⅛ loop into a 45° upline, pull through a ¼ loop into a 45° upline, pull through a ⅛ loop, exit inverted.

**A-14.03 Double Immelman with ½ roll, roll**

From inverted pull through a ½ loop immediately followed by a ½ roll, perform a horizontal line, push through a ½ loop immediately followed by a roll, perform a horizontal line, exit upright.

**A-14.04 Half Square Loop with ½ roll**

From upright push through a ¼ loop into a vertical downline, perform a ½ roll, pull through a ¼ loop, exit upright.

**A-14.05 Stall Turn with ¼ roll up, ¼ roll down**

From upright, pull through a ¼ loop into a vertical upline, perform a ¼ roll, perform a stall turn into a vertical downline, perform a ¼ roll down, pull through a ¼ loop, exit upright.

**A-14.06 Reverse Cuban 8 with ½ roll**

From upright pull through a ⅛ loop into a 45° upline, perform a ½ roll, pull through a ⅝ loop, exit upright.

**A-14.07 Roll Combination with consecutive three ¼ rolls, three ¼ rolls in opposite direction**

From upright, perform consecutively three ¼ rolls, three ¼ rolls in opposite direction, exit upright.

**A-14.08 Pull-Push-Pull Humpty-Bump with ¼ roll up, ¼ roll down (Option: ½ roll up)**

From upright, pull through a ¼ loop into a vertical upline, perform a ¼ roll, push through a ½ loop into a vertical downline, perform a ¼ roll, pull through a ¼ loop, exit upright.

Option: From upright, pull through a ¼ loop into a vertical upline, perform a ½ roll, push through a ½ loop into a vertical downline, pull through a ¼ loop, exit upright.

**A-14.09 Top Hat Spin with 3 turns**

From upright pull through a ¼ loop into a vertical upline, push through a ¼ loop into a horizontal line, perform an upright spin with 3 turns, perform a vertical downline, pull through a ¼ loop, exit upright.

**A-14.10 Pull-Pull-Push Humpty-Bump with ½ roll down**

From upright, pull through a ¼ loop into a vertical upline, perform a ¼ roll, pull through a ½ loop into a vertical downline, perform a ¼ roll, push through a ¼ loop, exit inverted.

**A-14.11 Reverse Cuban 8 with roll, ½ roll**

From inverted, push through a ⅛ loop into a 45° upline, perform a roll, pull through a ¾ loop into another 45° upline, perform a ½ roll, pull through a ⅝ loop, exit upright.

**A-14.12 Figure 9 with roll up**

From upright, pull through a ¼ loop into a vertical upline, perform a roll, push through a ¾ loop, exit inverted.

**A-14.13 Hour-Glass**

From inverted, push through a ⅛ loop into a 45° upline, push through a 3/8 loop into a horizontal line, push through a 3/8 loop into a 45° downline, pull through a 3/8 loop into a horizontal line, pull through a 3/8 loop into a 45° upline, pull through a ⅛ loop, exit inverted.

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**A-14.14 Stall Turn with ½ roll down**

From inverted, push through a ¼ loop into a vertical upline, perform a stall turn into a vertical downline, perform a ½ roll, pull through a ¼ loop, exit upright.

**A-14.15 45° Upline with slow roll**

From upright, pull through a ⅛ loop into a 45° upline, perform a slow roll, push through a ⅛ loop, exit upright.

**A-14.16 Split S with ½ roll**

From upright, perform a ½ roll and immediately pull through a ½ loop, exit upright.

**A-14.17 Avalanche with snap roll on top**

From upright, pull through a loop while performing a snap roll on the top of the loop, exit upright.

**PRELIMINARY SCHEDULE P-13 (2012-2013)**

**P-13.01 Half Clover Leaf with horizontal roll**

From upright, pull through a ¼ loop into a vertical upline, push through a ¾ loop into a horizontal line, perform a roll, push through a ¾ loop into a vertical downline, pull through a ¼ loop, exit upright.

**P-13.02 Stall Turn with ¼ roll up, ¼ roll down**

From upright, pull through a ¼ loop into a vertical upline, perform a ¼ roll, perform a stall turn into a vertical downline, perform a ¼ roll, push through a ¼ loop, exit inverted.

**P-13.03 Roll Combination with consecutive three ¼ rolls, three ¼ rolls in opposite direction**

From inverted, perform consecutively three ¼ rolls, three ¼ rolls in opposite direction, exit inverted.

**P-13.04 Half Square Loop with consecutive two ½ rolls in opposite directions**

From inverted, push through a ¼ loop into a vertical upline, perform consecutively two ½ rolls in opposite directions, push through a ¼ loop, exit upright.

**P-13.05 Triangle with roll in each line**

From upright, push through a ⅛ loop into a 45° downline, perform a roll, push through a 3/8 loop into a horizontal line, perform a roll, push through a 3/8 loop into a 45° upline, perform a roll, push through a ⅛ loop, exit upright.

**P-13.06 Split S with roll**

From upright, perform a roll and immediately push through a ½ loop, exit inverted.

**P-13.07 45° Upline with 1½ snap roll**

From inverted, push through a ⅛ loop into a 45° upline, perform 1½ snap roll, push through a ⅛ loop, exit upright.

**P-13.08 Reverse Top Hat with ¼ roll down, ¾ roll up**

From upright, push through a ¼ loop into a vertical downline, perform a ¼ roll, push through a ¼ loop into a horizontal line, push through a ¼ loop into a vertical upline, perform a ¾ roll, push through a ¼ loop, exit upright.

**P-13.09 Spin with 2½ turns, 2½ turns in opposite direction**

From upright, perform a upright spin with 2½ turns immediately followed by another 2½ turns in the opposite direction, perform a vertical downline, pull through a ¼ loop, exit upright.

**P-13.10 Pull-Push-Pull Humpty-Bump with ¼ roll up, ¼ roll down (Option: Consecutive two ¼ rolls up)**

From upright, pull through a ¼ loop into a vertical upline, perform a ¼ roll, push through a ½ loop into a vertical downline, perform a ¼ roll, pull through a ¼ loop, exit upright.

Option: From upright, pull through a ¼ loop into a vertical upline, perform consecutively two ¼ rolls, push through a ½ loop into a vertical downline, pull through a ¼ loop, exit upright.

**P-13.11 Cuban 8 with integrated rolls on top 90° of both part loops.**

From upright, pull through a ⅝ loop into a 45° downline while performing an integrated roll in the top 90° of the loop, push through a ¾ loop into another 45° downline while performing an integrated roll in the top 90° of the loop, pull through a ⅛ loop, exit upright.

*cont/...*

**P-13.12** Half **Loop**

From upright, pull through a ½ loop, exit inverted.

**P-13.13 Square Loop with ½ roll in each line**

From inverted, pull through a ¼ loop into a vertical downline, perform a ½ roll, push through a ¼ loop into a horizontal line, perform a ½ roll, pull through a ¼ loop into a vertical upline, perform a ½ roll, push through a ¼ loop into a horizontal line, perform a ½ roll , exit inverted.

**P-13.14 Figure 9 with consecutive two ½ rolls**

From inverted, push through a ¾ loop into a vertical downline, perform consecutively two ½ rolls, pull through a ¼ loop, exit upright.

**P-13.15 Roll Combination with consecutive ½ roll, roll, ½ rolls in opposite directions**

From upright, perform consecutively a ½ roll, a roll in opposite direction, a ½ roll in opposite direction, exit upright.

**P-13.16** Half **Loop on Corner with ¼ roll, ¼ knife-edge loop, ¼ roll**

From upright pull through a ⅛ loop into a 45° upline, perform ¼ roll, perform ¼ knife-edge loop into 45° upline, perform ¼ roll, pull through a ⅛ loop, exit inverted.

**P-13.17 Figure Z with consecutive four ⅛ rolls**

From inverted, pull through a 3/8 loop into a 45° downline, perform consecutively four ⅛ rolls, pull through a 3/8 loop, exit upright.

**PRELIMINARY SCHEDULE P-15 (2014-2015)**

**P-15.01 Golf Ball with two ½ rolls**

From upright, pull through a ⅛ loop into a 45° upline, perform a ½ roll, push through a ¾ loop into a 45° downline, perform a ½ roll, pull through a ⅛ loop, exit upright.

**P-15.02 Half Square Loop on Corner with ½ roll**

From upright, pull through a ⅛ loop into a 45° upline, pull through a ¼ loop into a 45° upline, perform a ½ roll, push through a ⅛ loop, exit upright.

**P-15.03 Double Immelman with two knife-edge flights**

From upright push through a ½ loop immediately followed by a ¼ roll, perform a horizontal knife-edge flight, perform a ¼ roll and immediately pull through a ½ loop immediately followed by a ¼ roll, perform a horizontal knife-edge flight, perform a ¼ roll, exit upright.

**P-15.04 Half Square Loop with ½ roll**

From upright push through a ¼ loop into a vertical downline, perform a ½ roll, pull through a ¼ loop, exit upright.

**P-15.05 Stall Turn with 1¼ roll up, ¾ roll down**

From upright, pull through a ¼ loop into a vertical upline, perform a 1¼ roll, perform a stall turn into a vertical downline, perform a ¾ roll down, pull through a ¼ loop, exit upright.

**P-15.06 Reverse Cuban 8 with ½ roll**

From upright pull through a ⅛ loop into a 45° upline, perform a ½ roll, pull through a ⅝ loop, exit upright.

**P-15.07 Roll Combination with consecutive three 1/6 rolls, three 1/6 rolls in opposite direction**

From upright, perform consecutively three 1/6 rolls, three 1/6 rolls in opposite direction, exit upright.

**P-15.08 Pull-Push-Push Humpty-Bump with ¾ roll up, ¾ roll down (Option: ½ roll up, ½ roll down)**

From upright, pull through a ¼ loop into a vertical upline, perform a ¾ roll, push through a ½ loop into a vertical downline, perform a ¾ roll, push through a ¼ loop, exit inverted.

Option: From upright, pull through a ¼ loop into a vertical upline, perform a ½ roll, push through a ½ loop into a vertical downline, perform a ½ roll, push through a ¼ loop, exit inverted.

**P-15.09 Top Hat Inverted Spin with 2½ turns**

From inverted push through a ¼ loop into a vertical upline, pull through a ¼ loop into a horizontal line, perform an inverted spin with 2½ turns, perform a vertical downline, pull through a ¼ loop, exit upright.

**P-15.10 Pull-Knife-Edge-Push Humpty-Bump with ½ roll down**

From upright, pull through a ¼ loop into a vertical upline, perform a ½ loop in knife-edge flight into a vertical downline, perform a ½ roll, push through a ¼ loop, exit inverted.

**P-15.11 Reverse Cuban 8 with consecutive two ¼ rolls, consecutive two ½ rolls in opposite directions**

From inverted, push through a ⅛ loop into a 45° upline, perform consecutively two ¼ rolls, push through a ¾ loop into another 45° upline, perform consecutively two ½ rolls in opposite directions, pull through a ⅝ loop, exit upright.

**P-15.12 Figure 9 with consecutive four ¼ rolls up**

From upright, pull through a ¼ loop into a vertical upline, perform consecutively four ¼ rolls, push through a ¾ loop, exit inverted.

**P-15.13 Hour-Glass with ½ roll, roll, ½ roll**

From inverted, push through a ⅛ loop into a 45° upline, push through a 3/8 loop into a horizontal line, perform a ½ roll, pull through a 3/8 loop into a 45° downline, perform a roll, push through a 3/8 loop into a horizontal line, perform a ½ roll, pull through a 3/8 loop into a 45° upline, pull through a ⅛ loop, exit inverted.

**P-15.14 Stall Turn with consecutive two ¼ rolls down**

From inverted, push through a ¼ loop into a vertical upline, perform a stall turn into a vertical downline, perform consecutively two ¼ rolls, pull through a ¼ loop, exit upright.

**P-15.15 45° Upline with consecutive two rolls in opposite directions**

From upright, pull through a ⅛ loop into a 45° upline, perform consecutively two rolls in opposite directions, push through a ⅛ loop, exit upright.

**P-15.16 Split S with ½ roll**

From upright, perform a ½ roll and immediately pull through a ½ loop, exit upright.

**P-15.17 Avalanche with snap roll on top**

From upright, pull through a loop while performing a snap roll on the top of the loop, exit upright.

**SEMI-FINAL AND FINAL SCHEDULE F-13 (2012-2013)**

**F-13.01 Humpty-Bump with ¾ roll up, ½ knife-edge loop, ¾ roll down**

From upright, pull through a ¼ loop into a vertical upline, perform a ¾ roll, perform a ½ loop in knife-edge flight into a vertical downline, perform a ¾ roll, push through a ¼ loop, exit inverted.

**F-13.02 Half Square Loop with consecutive ½ roll, roll in opposite direction**

From inverted, push through a ¼ loop into a vertical upline, perform consecutively a ½ roll, a roll in opposite direction, pull through a ¼ loop, exit inverted.

**F-13.03 Loop with consecutive four ½ rolls in opposite directions integrated**

From inverted, pull through a loop while performing consecutively four ½ rolls in opposite directions, integrated in each 90° of the loop, exit inverted.

**F-13.04 Figure 6 with stall turn, consecutive two ¼ rolls down**

From inverted, pull through a ¾ loop into a vertical upline, perform a stall turn into a vertical downline, perform consecutively two ¼ rolls, pull through a ¼ loop, exit upright.

**F-13.05 Roll Combination with consecutive ¼ roll, two snap rolls in opposite directions, ¼ roll**

From upright, perform consecutively a ¼ roll, a snap roll, another snap roll in opposite direction, and a ¼ roll, exit upright.

**F-13.06 Shark Fin with roll up, consecutive two ¼ rolls down**

From upright, pull through a ⅛ loop into a 45° upline, perform a roll, push through a 3/8 loop into a vertical downline, perform consecutively two ¼ rolls, pull through a ¼ loop, exit upright.

*cont/…*

**F-13.07 Horizontal Circle 8 with consecutive two rolls**

From upright, perform a ¼ horizontal circle while performing the first ¼ of consecutive two rolls to the outside, then while continuing the rolling (¼ of the rolls per ¼ of the circles), perform immediately another (full) circle in the opposite direction, then, while continuing the rolling accordingly finish the remaining ¾ of the first circle, exit upright.

**F-13.08 Pull-Push-Pull Humpty-Bump with consecutive four ¼ rolls up, 1½ roll down**

From upright, pull through a ¼ loop into a vertical upline, perform consecutively four ¼ rolls, push through a ½ loop into a vertical downline, perform a 1½ roll, pull through a ¼ loop, exit upright.

**F-13.09 45° Upline with consecutive four ⅛ rolls, 1½ snap roll in opposite direction**

From upright, pull through a ⅛ loop into a 45° upline, perform consecutively four ⅛ rolls, and 1½ snap roll in opposite direction, push through a ⅛ loop, exit upright.

**F-13.10 Reverse Top Hat with ¾ roll down, ¼ rolls up (Option: roll down, consecutive two ¼ rolls up)**

From upright, push through a ¼ loop into a vertical downline, perform a ¾ roll, push through a ¼ loop into a horizontal line, push through a ¼ loop into a vertical upline, perform a ¼ roll, push through a ¼ loop, exit upright.

Option: From upright, push through a ¼ loop into a vertical downline, perform a roll, push through a ¼ loop into a horizontal line, push through a ¼ loop into a vertical upline, perform consecutively two ¼ rolls, push through a ¼ loop, exit upright.

**F-13.11 Clown Dance with ½ loop, inverted spin, 2½ turns, consecutive two ¼ rolls down**

From upright, pull through a ½ loop into a horizontal line, perform an inverted spin with 2½ turns, perform a vertical downline, perform consecutively two ¼ rolls, pull through a ¼ loop, exit upright.

**F-13.12 Fighter Turn with two ¼ rolls**

From upright, pull through a ⅛ loop into a 45° upline, perform a ¼ roll, push through ½ circle, to a 45° downline, perform a ¼ roll, pull through a ⅛ loop, exit upright.

**F-13.13 Knife-Edge Loop with integrated roll on top 90°**

From upright, perform a ¼ roll, perform a loop in knife-edge flight while performing a roll integrated in the top 90° of the loop, perform a ¼ roll, exit upright.

**F-13.14 Half Reverse Cuban 8 with snap roll up**

From upright, pull through a ⅛ loop into a 45° upline, perform a snap roll, push through a ⅝ loop, exit inverted.

**F-13.15 Triangle with consecutive two ¼ rolls in each line**

From inverted, push through a 3/8 loop into a 45° upline, perform consecutively two ¼ rolls, pull through a ¼ loop into a 45° downline, perform consecutively two ¼ rolls, push through a 3/8 loop into a horizontal line, perform consecutively two ¼ rolls, exit upright.

**F-13.16** Half **Loop with roll integrated**

From upright, pull through a ½ loop, while performing a roll integrated, exit inverted.

**F-13.17 45° Downline with consecutive two ⅛ roll, roll, two ⅛ roll in opposite directions**

From inverted, pull through a ⅛ loop into a 45° downline, perform consecutively two ⅛ rolls, a roll in opposite direction, and another consecutive two ⅛ rolls in opposite direction, pull through a ⅛ loop, exit upright.

**SEMI-FINAL AND FINAL SCHEDULE F-15 (2014-2015)**

**F-15.01 Double Immelman with ½ rolls in both ½ loops integrated, two consecutive two ¼ rolls in opposite direction to integrated rolls.**

From upright, pull through a ½ loop while performing a ½ roll integrated, immediately followed by consecutive two ¼ rolls in opposite direction to the integrated roll, perform a horizontal line, pull through a ½ loop while performing a ½ roll integrated, immediately followed by consecutive two ¼ rolls in opposite direction to the integrated roll, exit upright.

**F-15.02 Stall Turn with consecutive three ¼ rolls up, 1¼ snap rolls down**

From upright, pull through a ¼ loop into a vertical upline, perform consecutively three ¼ rolls, perform a stall turn into a vertical downline, perform 1¼ snap roll, push through a ¼ loop, exit inverted.

**F-15.03 Golf Ball with two ¾ roll up, knife-edge loop with snap roll, ¾ roll down**

From inverted, push through a ⅛ loop into a 45° upline, perform a ¾ roll, perform a ¾ loop in knife-edge flight with a snap roll on top into a 45° downline, perform a ¾ roll, pull through a ⅛ loop, exit upright.

**F-15.04** Half **Square Loop with consecutive two snap rolls in opposite directions**

From upright, pull through a ¼ loop into a vertical upline, perform consecutively two snap rolls and in opposite directions, pull through a ¼ loop, exit inverted.

**F-15.05 Loop with consecutive two ½ rolls in opposite directions integrated**

From inverted, pull through a loop while performing a ½ roll integrated in the first 180° of the loop and another ½ roll in opposite direction integrated in the second 180° of the loop, exit inverted.

**F-15.06 Inverted Spin with 2½ turns, ½ roll down**

From inverted, perform an inverted spin with 2½ turns, perform a vertical downline, perform a ½ roll, pull through a ¼ loop, exit upright.

**F-15.07 Horizontal Triangular Circle with ¼ roll, ½ outside rolls in each corner integrated**

From upright, perform a ¼ roll in the centre, perform a horizontal triangular circle of equal side lengths while performing a ½ roll to the outside in each corner integrated, perform a ¼ roll in the centre, exit upright.

**F-15.08 Top Hat with consecutive two ¼ rolls up, snap roll down (Option: Consecutive three ¼ rolls up, 1¼ snap roll down)**

From upright, pull through a ¼ loop into a vertical upline, perform consecutively two ¼ rolls, pull through a ¼ loop into a horizontal line, pull through a ¼ loop into a vertical down line, perform a snap roll, pull through a ¼ loop, exit upright.

Option: From upright, pull through a ¼ loop into a vertical upline, perform consecutively three ¼ rolls, pull through a ¼ loop into a horizontal line, pull through a ¼ loop into a vertical down line, perform a 1¼ snap roll, pull through a ¼ loop, exit upright

**F-15.09 Vertical Cuban 8 with consecutive four ⅛ rolls up, consecutive two ½ rolls down**

From upright, pull through a 3/8 loop into a 45° upline, perform consecutively four ⅛ rolls, pull through a ¾ loop into a 45° downline, perform consecutively two ½ rolls, push through a 3/8 loop, exit inverted.

**F-15.10** Half **Square Loop on Corner with ½ roll integrated in ¼ loop**

From inverted, push through a ⅛ loop into a 45° upline, push through a ¼ loop into a 45° upline, while performing a ½ roll integrated in the ¼ loop, pull through a ⅛ loop, exit inverted.

**F-15.11 Horizontal Hour-Glass with consecutive two ¼ rolls, two ¼ rolls in opposite direction, consecutive two ¾ rolls in opposite directions**

From inverted, pull through a ¼ loop into a vertical downline, pull through a 3/8 loop into a 45° upline, perform consecutively two ¼ rolls, two ¼ rolls in opposite direction, push through a 3/8 loop into a vertical downline, push through a 3/8 loop into a 45° upline, perform consecutively two ¾ rolls in opposite directions, pull through a ⅛ loop, exit inverted.

**F-15.12 Half Square Loop with consecutive two ½ rolls**

From inverted, pull through a ¼ loop into a vertical downline, perform consecutively two ½ rolls, pull through a ¼ loop, exit upright.

**F-15.13 Figure 9 with consecutive four ¼ rolls up, ¾ loop with roll integrated in top 180°**

From upright, pull through a ¼ loop into a vertical upline, perform consecutively four ¼ rolls, pull through a ¾ loop while performing a roll integrated in the top 180° of the ¾ loop, exit upright.

**F-15.14 Split S with 1½ snap roll**

From upright, perform 1½ snap roll and immediately pull through a ½ loop, exit upright

**F-15.15 Roll Combination with consecutive four rolls in opposite directions**

From upright, perform consecutively four rolls in opposite directions, exit upright.

**F-15.16 Pull-Pull-Push Humpty-Bump with two ½ roll in opposite direction up, roll down**

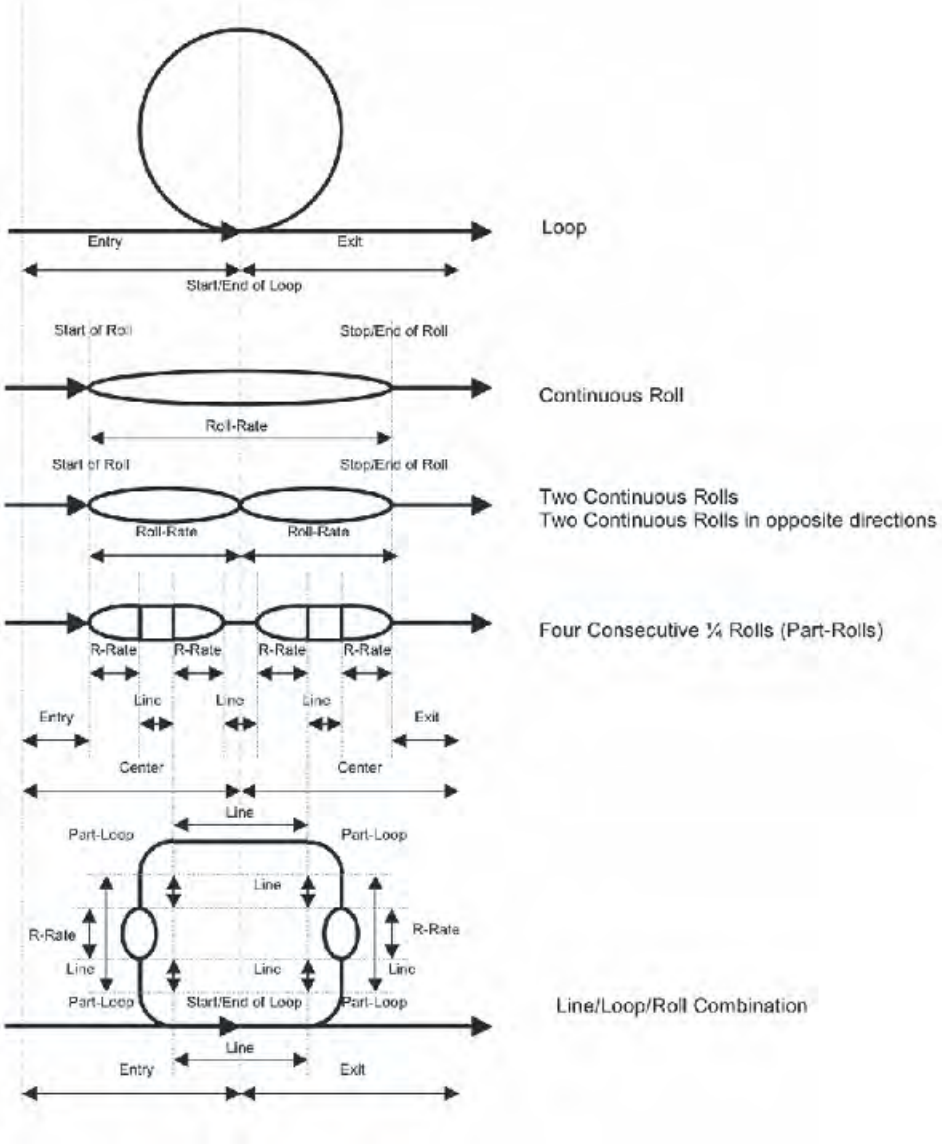
From upright, pull through a ¼ loop into a vertical upline, perform consecutively two ½ rolls in opposite directions, pull through a ½ loop into a vertical downline, perform a roll, push through a ¼ loop, exit inverted.

**F-15.17 Stall Turn with consecutive six ⅛ rolls up, 1¾ snap roll down**

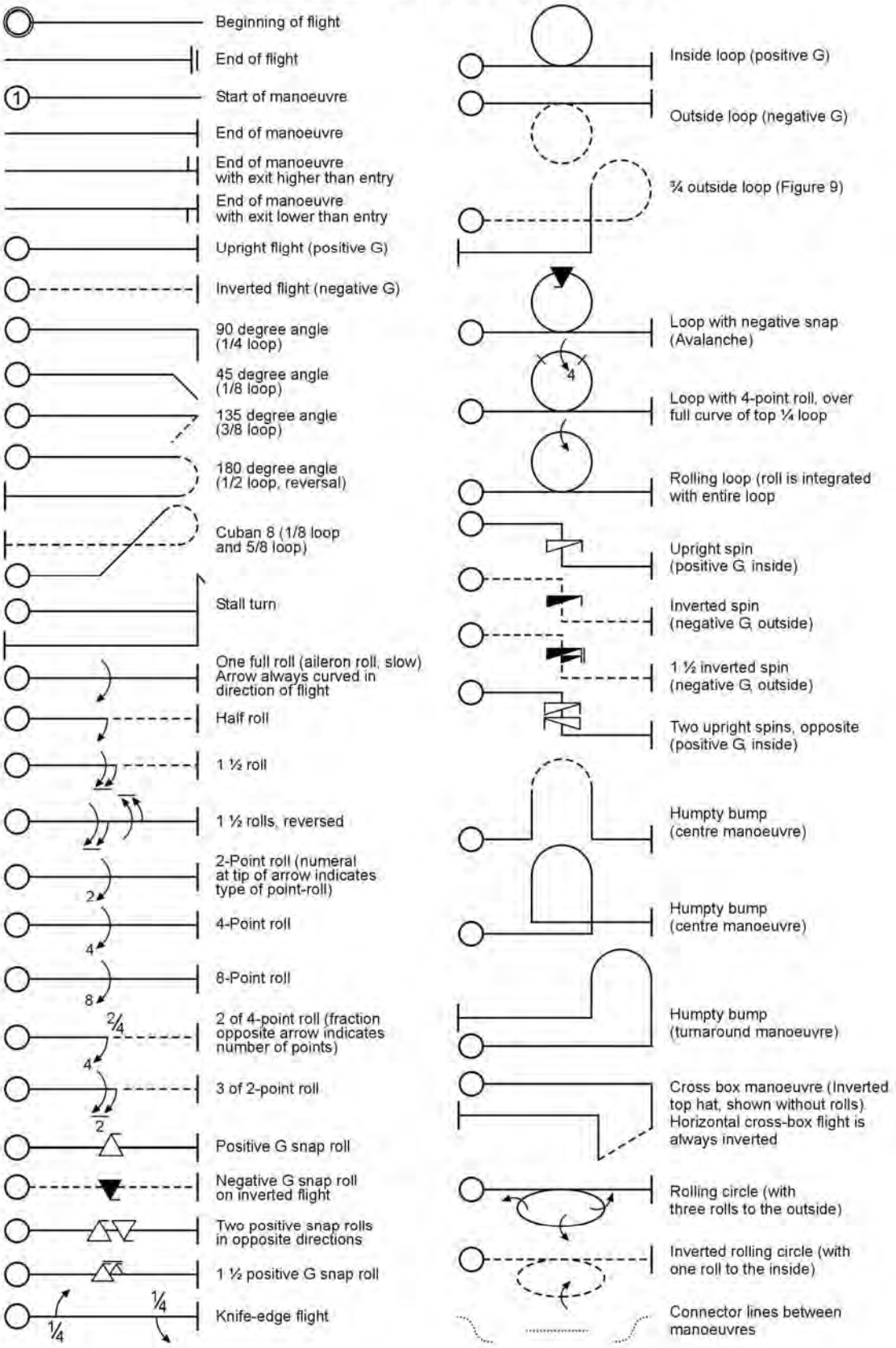
From inverted, push through a ¼ loop into a vertical upline, perform consecutively six ⅛ rolls, perform a stall turn into a vertical downline, perform 1¾ snap roll, pull through a ¼ loop, exit upright.

For the Manoeuvre Execution Guide, see Annex 5B.

# EXAMPLES OF TERMINOLOGY



# EXPLANATION OF ARESTI SYMBOLS



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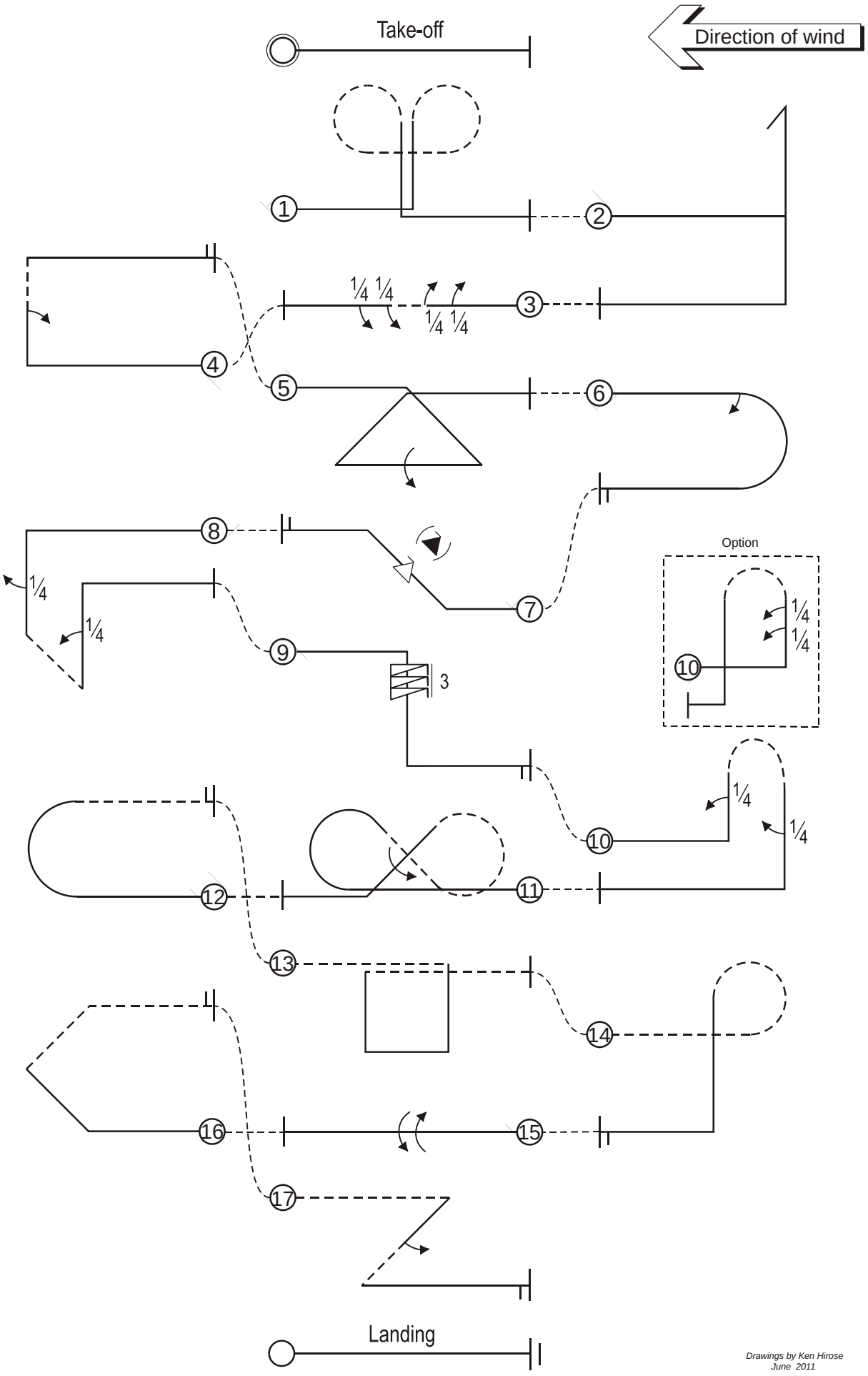
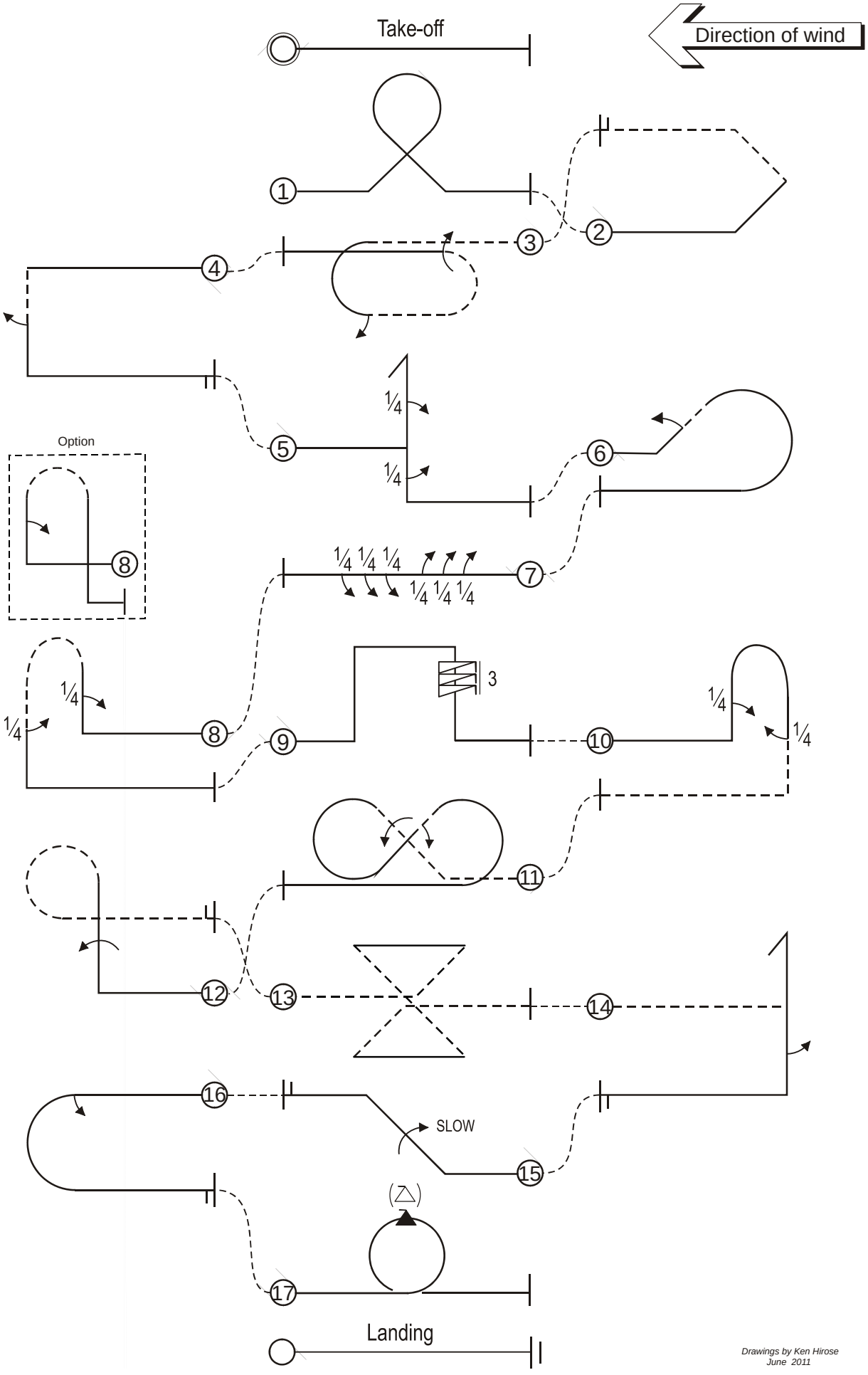



*Drawings by Ken Hirose*
*June 2011*

# ADVANCED SCHEDULE A-14 (2013-2014)



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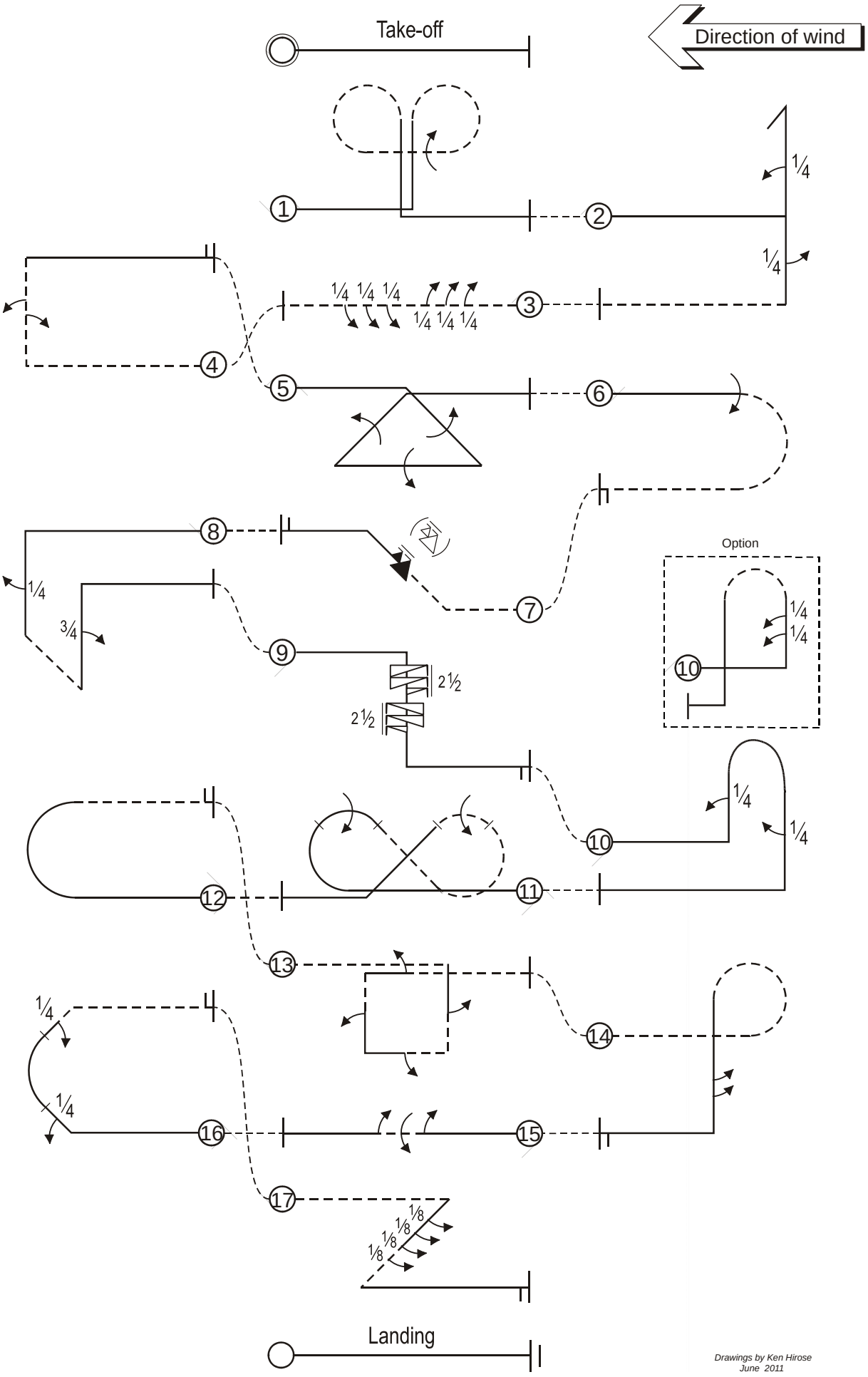
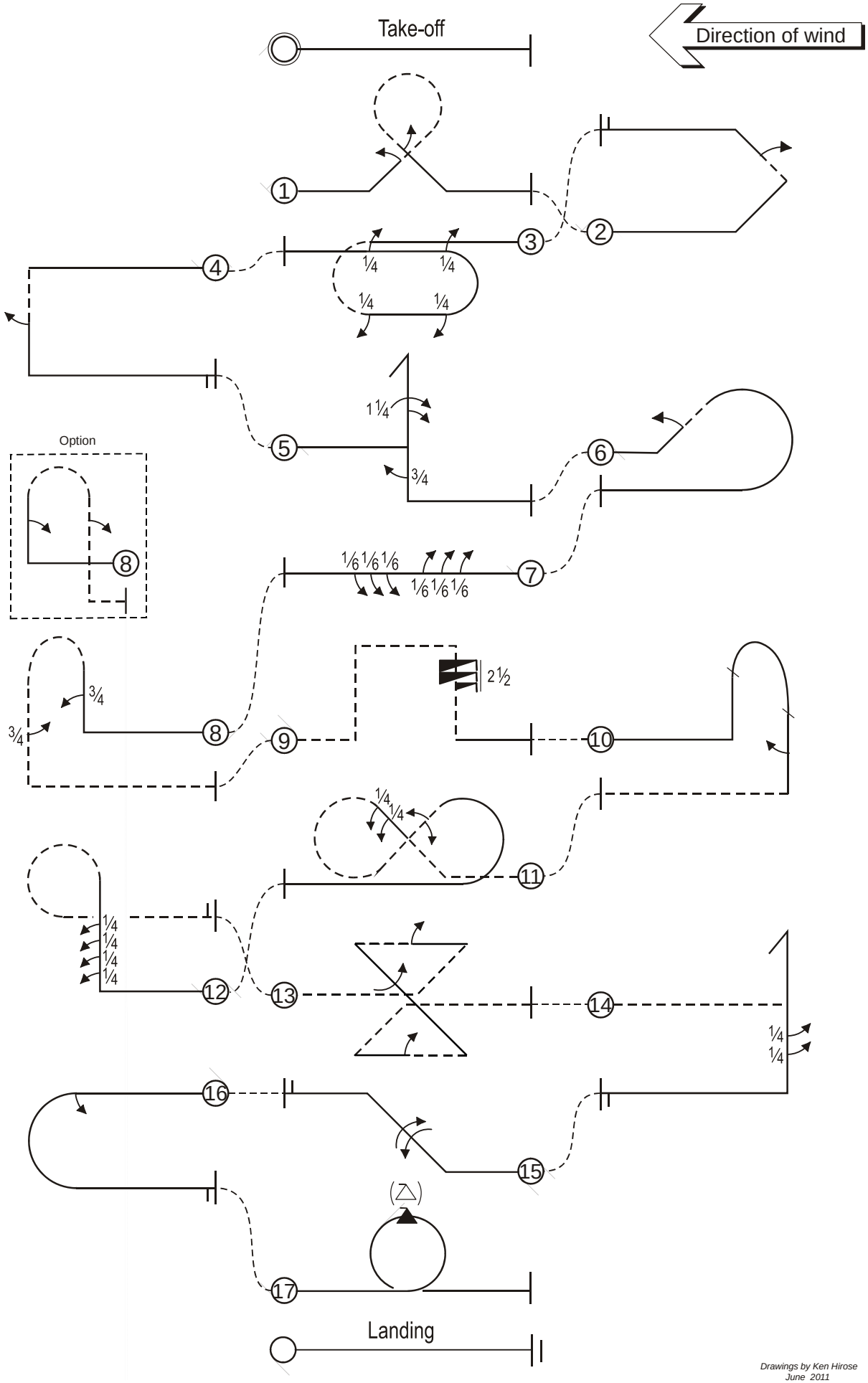


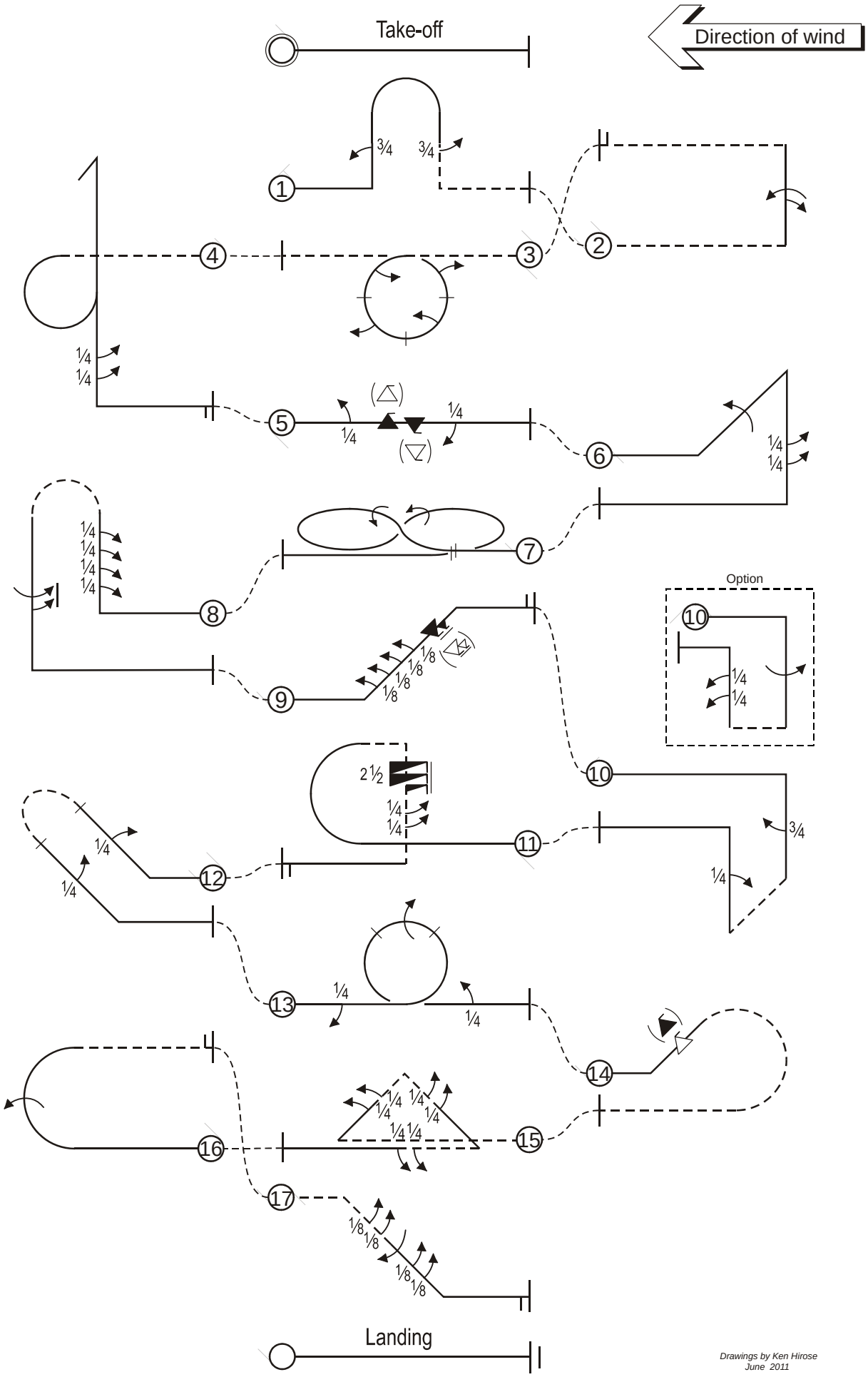

*Drawings by Ken Hirose*
*June 2011*

# PRELIMINARY SCHEDULE P-15 (2014-2015)




*Drawings by Ken Hirose*
*June 2011*

# SEMI-FINAL AND FINAL SCHEDULE F-13 (2012-2013)



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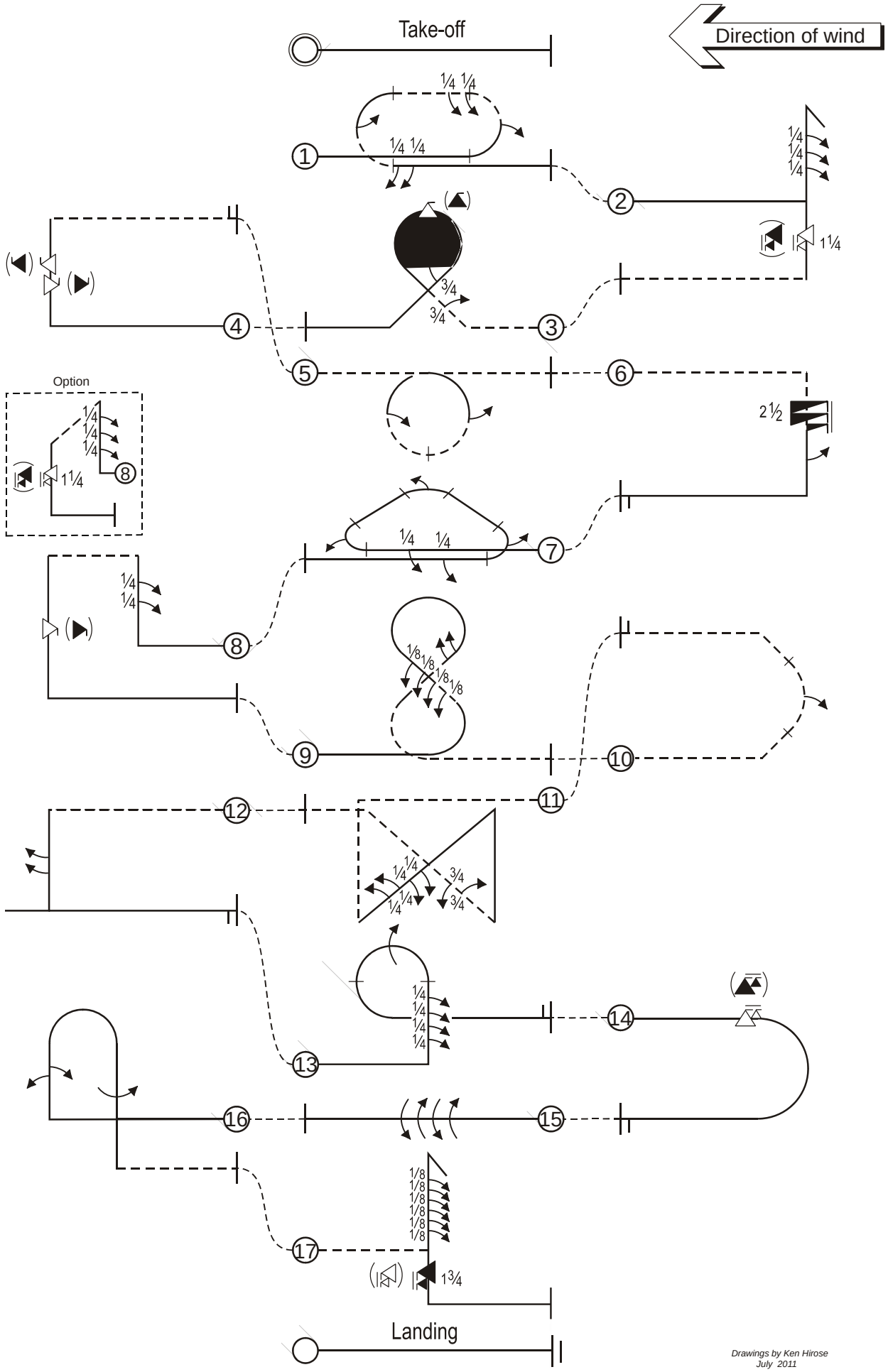

# ANNEX 5B

# F3 R/C AEROBATIC POWER MODEL AIRCRAFT

# MANOEUVRE EXECUTION GUIDE

## 5B.1. PURPOSE

The purpose of the Manoeuvre Execution Guide is to give accurate guidelines for the proper execution of aerobatic manoeuvres to both judges and competitors.

Note that this guide may not be all-inclusive.

## 5B.2. GENERAL

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

## 5B.3. ACCURATE AND CONSISTENT JUDGING

The most important aspect of consistent judging is for each judge to establish his standard and then maintain that standard throughout the competition. It is advisable for the jury president, in conjunction with the contest director and the championship organiser to hold a conference prior to the start of the competition, in order to discuss judging and make the standards as uniform as possible. This is further augmented by some practice flights which all judges score simultaneously and privately. After these flights, the defects in each manoeuvre should be discussed by all judges and agreement reached about the severity of the defects. Once the contest is started, the individual judge must not alter his standard under any influence.

An accurate standard of judging is also very important. Being a consistent judge, whether high or low, is not good if the scores awarded are not a fair reflection of the manoeuvre performed.

A judge must not, under any circumstances, favour a competitor, or a national team, or a particular flying style, or brand of equipment, or propulsion method. Judges must only look at the lines described in the sky. Conversely, acts of negative bias towards a competitor, or a national team, or a flying style, or brand of equipment, or a propulsion method, must be viewed in a serious light, and corrective action may be necessary.

The performance of the model aircraft or its propulsion device, must not be allowed to influence a judge's mark.

## 5B.4. PRINCIPLES

The principles of judging the performance of a competitor in a R/C Aerobatic competition is based on the perfection with which the competitor's model aircraft executes the aerobatic manoeuvres as described in Annex 5A. The main principles used to judge the degree of perfection are:

1. Geometrical accuracy of the manoeuvre; (weighting approximately 50%).
2. Smoothness and gracefulness of the manoeuvre; (weighting approximately 25%).
3. Positioning of the manoeuvre within the manoeuvring zone; (weighting approximately. 12,5%).
4. Size of the manoeuvre; (weighting approximately 12,5%).
5. Proportion of the manoeuvre outside of the manoeuvring zone (in addition to the above).

## 5B.5. DOWNGRADING SYSTEM FOR JUDGING MANOEUVRES

In Annex 5A a description of each manoeuvre is given. With reference to above principles each manoeuvre must be downgraded according to:

1. The type of defect.
2. The severity of the defect.
3. The number of times any one defect occurs, as well as the total number of defects.

Each judge gives a mark for each manoeuvre during a flight. Assuming the highest mark 10 at the start of each manoeuvre, every defect is subject to downgrade of the mark in whole numbers. A high score should remain only if no substantial, severe or multiple defects are found.

## 5B.6. ATTITUDE AND FLIGHT PATH

The flight path of a model aircraft is the trajectory of its centre of gravity. The attitude is the direction of

the fuselage centre-line in relation to the flight path.

If not otherwise stated, all judging is based on flight path.

5B.7. **WIND CORRECTION**

All manoeuvres are required to be wind corrected in such a way that the shape of the manoeuvre, as described in Annex 5A, is preserved in the model aircraft's flight path. The exceptions to this criterion are in the snap-rolls, stall turns, and spins, where the model aircraft is in a stalled condition.

5B.8. 1. **GEOMETRICAL ACCURACY OF THE MANOEUVRE**

As a guide for downgrading deviations from the defined manoeuvre geometry, the manoeuvres are divided into their different components: lines, loops, rolls, snap-rolls, horizontal circles, line/loop/roll/horizontal circle combinations, stall turns, and spins.

5B.8.2. **THE 1 POINT PER 15 DEGREE RULE**

This basic rule provides a general guide for downgrading deviations from defined manoeuvre geometry. 1 point must be subtracted for each approximate 15 degrees deviation. In general, lines must be judged more critically than deviations in yaw or roll.

5B.8.3. **LINES**

All aerobatic manoeuvres are entered and exited by a horizontal line of recognisable length. When no horizontal line is flown between two manoeuvres, the just-completed manoeuvre must be downgraded by 1 point and the upcoming manoeuvre must be downgraded by 1 point. Horizontal flying between manoeuvres which is not considered part of the exit or entry line, must be observed, but not judged for quality.

The total length of a vertical or up/downline, as dictated by the performance of the model aircraft, is not a downgrading criterion.

All lines within a manoeuvre have a start and an end which define their length. They are preceded and followed by part loops. The length of a line should only be graded when a manoeuvre contains more than one line with a given relationship to each other ie as in a square loop. If there is a minor mis-relation, 1 point is subtracted, and more points are subtracted for greater deviations.

5B.8.4. **LOOPS**

A loop must have by definition, a constant radius, and must be performed in the vertical plane throughout. It is entered and exited by a well defined line which, for a complete loop, is horizontal. For a part-loop, however, such lines may be in any other plane of flight as required by the particular manoeuvre.

Loops and part-loops within one manoeuvre must have the same radius. Each occurrence of a slight difference in radius must downgrade the manoeuvre by 1 point, while more severe deviations may downgrade it by 2 or 3 points for each occurrence. The radius of the first loop or part-loop, determines the radii of subsequent loops or part-loops within one manoeuvre.

Every loop or part-loop must be performed without interruption to the circular flight path. Every visible segmentation must be downgraded by 1 point.

If the loop is not performed entirely in the vertical plane ie it drifts closer or further from the judges, minor drift must be downgraded by 1 point, while more severe drift must be downgraded by several points.

In three-, four-, six-, and eight-sided loops, The main criteria are that the loop must have the sides at the same lengths/correct angles for the defined number of times, and all part-loops must have the same radius.

5B.8.5. **ROLLS**

Rolls and part-rolls may be performed as individual manoeuvres, or as parts of other manoeuvres. The following applies to all continuous rolls and part-rolls as well as to consecutive continuous rolls and part-rolls:

a) They must be performed on a constant flight path.

b) The roll-rate must be constant. Small variations in roll-rate must be downgraded by 1 point, while more severe variations must receive a downgrade of 2 or more points. Slowing down (or speeding up) the roll-rate towards the end of a roll must be downgraded using the 1 point per 15 degree rule.

c) The start and stop of the rotation must be crisp and well-defined. If a start or stop is badly defined, 1 point is subtracted for each.

d) In all manoeuvres which have more than one continuous roll, the continuous rolls must have the same roll-rate. In all manoeuvres which have more than one part-roll, the part-rolls must have the same roll rate. Lines between consecutive part-rolls must be short and of equal length. Between consecutive

continuous rolls or part-rolls in opposite direction there must be no line. Where there are continuous rolls and part-rolls within one manoeuvre, the roll-rate for the part- rolls does not necessarily have to be the same as the roll-rate for the continuous rolls.

Particular attention has to be paid where the manoeuvre description requires continuous rolls or part- rolls to be performed in opposite directions. For a roll or part-roll performed in the wrong direction, a zero score must be given for the entire manoeuvre.

### 5B.8.6. SNAP-ROLLS

A snap-roll is a rapid auto-rotative roll where the model aircraft is in a stalled attitude, with a continuous high angle of attack.

Snap-rolls are judged in the same way as axial rolls as far as the constant flight path throughout the snap-roll, the start and stop of the rotation, and the roll direction is concerned.

At the start of a snap-roll, the fuselage attitude must show a definite stall-break and attitude separation from the flight path, before the rotation is started, since the model aircraft is supposed to be in a stalled condition throughout the snap-roll. If the stall-break does not occur and the model aircraft barrel-rolls around, the manoeuvre must be severely downgraded (more than 5 points). Similarly, axial rolls disguised as snap-rolls must be severely downgraded (more than 5 points).

Snap-rolls can be flown in both positive and negative attitudes. The attitude (positive or negative) is at the pilot's discretion. If the model aircraft returns to an unstalled condition during the snap-roll, the manoeuvre is downgraded using the 1 point per 15 degree rule.

### 5B.8.7. HORIZONTAL CIRCLES

Horizontal circles are performed in a horizontal plane and mostly used as centre manoeuvres. They may be positioned at a higher or lower altitude. Horizontal circles are mainly judged about the circular flight path, constant altitude of the circle, and by constant rates of roll, and integration of the continuous rolls or part-rolls with the circle, if applicable.

The circular flight path should be maintained throughout the manoeuvre and there must be no deviation in altitude. At low level it may be more difficult for judges to determine the roundness of the circle. The 150m distance requirement is waived for horizontal circles, and a downgrade should only be applied if the far side of the circle exceeds approximately 350m. Deviations from geometry should be downgraded as in loops and using the 1 point per 15 degree rule. Depending on the distance from the pilot at the entry, horizontal circles may be performed away from, or towards, the pilot and are at the pilot's discretion.

Other horizontal manoeuvres as combinations of horizontal circles or part-circles with lines etc have to be judged accordingly

### 5B.8.8. LINE/LOOP/ROLL/HORIZONTAL CIRCLE COMBINATIONS

These are very diversified, but all are combinations of lines, loops, part-loops, continuous rolls, part-rolls, snap-rolls, horizontal circles, and horizontal part-circles. The judging of all these components applies as described above.

Whenever a continuous roll, part-roll, snap roll, or a consecutive combination of these is placed on a line, the length of the line before and after the roll or the combination of consecutive rolls must be equal. 1 point is subtracted for a minor difference, and 2 points for a major difference. If there is a complete absence of a line before or after the roll, 3 points are subtracted.

Exceptions are all Immelman Turn and Split-S manoeuvres where rolls are always performed immediately before or after or part-loop, which means, the rolls always begin with the start of the lines and stop with the end of the lines. A visible line in-between the two components or rolls and not completely before or after the part-loop, must downgrade the manoeuvre.

Flight paths of continuous rolls or part-rolls that are integrated with loops or horizontal circles should be smooth, continuous, and of constant radius. Where an integrated roll is required, quick-rolling should be downgraded using the 1 point per 15 degree rule.

Particular attention has to be paid where the manoeuvre description requires a continuous roll or part-roll to be performed to the inside or the outside of a horizontal circle. For a continuous roll or part-roll performed in the wrong direction, a zero must be given for the manoeuvre.

### 5B.8.9. STALL-TURNS

The criteria in this manoeuvre are mainly about lines. The lines must have exactly vertical and horizontal flight paths.

The model aircraft must pivot around its centre of gravity (CG) in the yaw axis for the manoeuvre to receive a high score. If the model aircraft does not pivot on the CG, but within a radius of a half-wingspan, one point is subtracted. For a radius of pivot up to one wingspan, 2 to 3 points are subtracted and if the radius exceeds 1½ wingspans, the manoeuvre must be downgraded 4 to 5 points. A

radius of pivot of 2 wingspans or more is considered a wing-over and a zero must be given. If the model aircraft should "torque-off" during the stall turn, a downgrade must be applied using the 1 point per 15 degree rule. If the model aircraft flops forward or backward in a stall turn, a zero score must be given.

If the model aircraft shows a pendulum movement after the pivot, the manoeuvre is downgraded by 1 point. Similarly, if the model aircraft should "skid" before reaching the stall turn (early application of rudder), the manoeuvre is downgraded by 1 point. Drift of the model aircraft during the stalled condition must be ignored, provided the model aircraft does not drift outside the manoeuvring zone.

5B.8.10. **SPINS**

All spins are entered and exited with horizontal lines. In order to spin, the model aircraft must be stalled. The entry is flown in a horizontal flight path with the nose-up attitude increasing as the speed decreases. Drift of the model aircraft from the flight path at this point should not be downgraded, since it is in a near-stalled condition. However, severe yawing or weathercocking during the near-stalled condition, should be downgraded by 1 point per 15 degrees. A climbing flight path just prior to the spin must be downgraded, using the 1 point per 15 degree rule. The nose then drops as the model aircraft stalls. Simultaneously as the nose drops, the wing also drops in the direction of the spin. Drift during the rotation of the spin should not be downgraded since the model aircraft is in a stalled condition, provided the model aircraft does not drift outside the manoeuvring zone.

If the model aircraft does not stall or if the model aircraft is snap-rolled or spiral-dived into the spin, the manoeuvre is zeroed. If the model aircraft slides into the spin (is loath to spin), the manoeuvre must be downgraded by using the 1 point per 15 degree rule. Forcing the model aircraft to spin in the opposite direction as the initial rotation must be severely downgraded. Forcing the model aircraft to spin from a high angle of attack with down (or up) elevator, should be downgraded by 4 or 5 points. Judges must carefully observe the stalled attitude, which is not necessarily a complete stop, especially in no-wind conditions. This is no reason for downgrading.

After the defined number of turns, the stop of rotation is judged in the same manner as for a roll, downgraded 1 point per 15 degree deviation of heading. The spin rotation should stop parallel to the flight line. "Unloading", or stopping the spin rotation early and then applying only aileron to roll the model aircraft to the desired attitude, should be downgraded using the 1 point per 15 degree rule.

A vertical downward line of visible length must be held after the rotation stops. The pull- or push-out is judged like a part-loop and if followed by a part-roll, should be separated by a well-defined line of straight flight. Different models spin in different attitudes, and the attitude is not to be taken into consideration, as long as the model aircraft is stalled. Any reversals in direction must be immediate, and if the model aircraft returns to an unstalled condition during the spin, the manoeuvre is severely downgraded. The rate of rotation during a reversed spin may be slightly different, without a downgrade, but if the difference is significant, 1 point is subtracted.

5B.9 **SMOOTHNESS AND GRACEFULNESS OF THE MANOEUVRE**

Concerns the harmonic appearance of an entire manoeuvre. Ie maintaining a constant flight speed throughout the various manoeuvre components, like in climbing and descending sections contributes significantly to smoothness and gracefulness. Radii performed very tight or very loose, though being of equal size within one manoeuvre may be subject for downgrading Smoothness and Gracefulness.

5B.10. **POSITIONING OF THE MANOEUVRE WITHIN THE MANOEUVRING ZONE**

The entire flight must be within the manoeuvring zone to avoid being penalised.

A centre manoeuvre must be flown so that it is centred on the centre line indicated by the centre flag. If the manoeuvre is flown off-centre, it must be downgraded according to the misplacement. This may be in the range of 1 to 4 points subtracted. The centre of a centre manoeuvre is in the middle between its start and its end.

Flying so far out as to make evaluation of a manoeuvre difficult should be severely downgraded. The main criterion here is *visibility*. For a large, highly visible model aircraft, a line of flight approximately 175m in front of the pilot may be appropriate, while a smaller less visible model aircraft might have to be flown at say 140 to 150m. Manoeuvres performed on a line greater than approximately 175m in front of the pilot must be downgraded by at least 1 point.. Manoeuvres performed on a line greater than 200m in front of the pilot must be downgraded more severely (in the order of 2 to 3 points).

In general, turn-around manoeuvres are positioning manoeuvres. Therefore, entry and exit altitude need not be the same if the pilot wishes to make an altitude adjustment.

If any part of a manoeuvre is performed beyond the safety line, the manoeuvre will be zeroed. Repeated infringements of the safety line may result in the competitor being asked by the flight line director to terminate the flight, due to safety reasons.

## 5B.11. SIZE OF THE MANOEUVRE

The size of a manoeuvre is scored by its matching size relative to the size of the manoeuvring zone and relative to the size of the other manoeuvres performed throughout a schedule.

## 5B.12. PROPORTION OF THE MANOEUVRE OUTSIDE OF THE MANOEUVRING ZONE

Downgrades for flying a manoeuvre partially out of the zone should be in proportion to the degree of infraction, ie a small part of the manoeuvre (10%) flown past a 60 degree line would call for a downgrade of 1 point, while more of the manoeuvre (30%, 40%, 50% …) flown past a 60 degree line must be downgraded accordingly by 3, 4, 5… points. If an entire manoeuvre including entry and exit is flown out of the manoeuvring zone, it consequently must be zeroed. However, violations of a 60 degree line that occur near the 150 metre line (ie approximately over a 60 degree flag) should be seen less severely than violations along a line further out and more distant from the judges.

## 5B.13. EXAMPLES

An avalanche is entered in a slight climb, the flight path turns 15 degrees to one side after the snap and a wing is 15 degrees low during the exit. 10 – 1 – 1 – 1 = 7 points.

Consecutive four ¼ rolls are started late and end up slightly off-centre and there is no stop/line between the second ¼ roll and the third ¼ roll. 10 – 2 – 6 (1 point per 15 degrees) = 2 points.

Consecutive eight ⅛ rolls are started late and end up slightly off-centre, and there is no stop/line between the first ⅛ roll and the second ⅛ roll. 10 – 2 – 3 = 5 points.

An Immelmann turn is not well-rounded, the half roll is started before the model aircraft reaches the top of the loop, with the wing 15 degrees low and the flight path of the model aircraft 20 degrees off heading. 10 – 1 – 2 – 1 – 2 = 4 points.

A snap-roll on a 45 degree downline appears to be nothing more than an axial roll with a wiggle of the tail of the model aircraft. All other components are perfect. 10 – 6 = 4 points.

During a humpty-bump, a snap roll on a vertical downline appears to be a barrel roll, and the exit radius is noticeably smaller in radius than the other two part-loops. 10 – 6 – 1 = 3 points.

A square loop with half rolls has the first leg climbing 100 degrees. The model aircraft gallops in elevation across the top, stops the vertical downward half roll 15 degrees too early, is corrected, and the last half roll ends up 10 degrees to one side of the centre-line. 10 – 1 – 2 – 1 – 1 = 5 points.

On a top hat with ¼ rolls, the model aircraft is accidentally rolled in the wrong direction and the horizontal flight is performed upright instead of inverted. 10 – 10 = 0 points.

In the middle of a double Immelmann, which may be manoeuvre number 12, a competitor experiences an engine cut and the manoeuvre is not completed. 10 – 10 = 0 points. The rest of the manoeuvres are also awarded zero points.

An otherwise flawless two-turn spin is about 45 degrees off-centre. This must be considered as a severe misplacement. 10 – 4 = 6 points.

During a stall turn in dead-calm conditions, the flight path of the model aircraft is exactly vertical, but the model aircraft is “skidded” 15% in the upline to ensure a turn. The model aircraft shows a pendulum movement after the stall turn, and the half roll in the downline is performed directly before the part-loop exit. 10 – 1 – 1 – 3 = 5 points.

A loop with an integrated roll on top has the roll performed rapidly with no attempt by the pilot to integrate the roll with the top 90 degree quadrant of the loop. 10 – 6 = 4 points.

A half reverse Cuban eight is started too late, and the pilot squeezes the manoeuvre together by flying a 60 degree upline and making no line after the half roll. The manoeuvre still gets about halfway (50%) out of the zone. 10 – 1 – 3 – 5 (misplacement, going out of the zone) = 1 point.

During an inverted spin entered flawlessly, the model aircraft unstalls and makes the final 90 degree of rotation as a vertical axial roll. 10 – 6 = 4 points.

A pilot flies flawlessly consecutive eight ⅛ rolls. 10 – 0 = 10 points. You will not see too many of these in a competition but a manoeuvre should be awarded a 10 if there are no detectable flaws that would otherwise downgrade it to a 9.

A pilot performs a near-perfect split-S, and the only flaw is a very slight, barely visible low wing on exit. 10 – 0 = 10 points. In some cases, an error may be so slight that a judge may want to consider giving a score of 10, rather than wait for the perfect manoeuvre to arrive.

A pilot performs a manoeuvre other than that stated on the score sheet. 10 – 10 = 0 points.

After this incident, the pilot performs the rest of the manoeuvres out of sequence, and no manoeuvres correspond to the manoeuvres stated on the score sheet, in the order in which they are listed. All manoeuvres affected in this way score 0 points.

During a figure M, the model aircraft disappears from view behind a low cloud, or in the sun, which is directly in the background, so that only one stall turn is visible. Every judge scores N/O. The competitor will be awarded a reflight with the entire schedule being judged, but only the mark for the affected manoeuvre used to complete the tabulation.

During an avalanche, a judge fails to notice the snap-roll at the top of the manoeuvre. Score = N/O. The score tabulators will enter the numerical average of the other judges' scores, rounded to the nearest whole number.

After the last flying manoeuvre in a preliminary schedule, an official calls "time". The competitor lands his aircraft after expiry of the time limit. No penalty.

# ANNEX 5G
# F3A RADIO CONTROLLED AEROBATIC MODEL AIRCRAFT
# UNKNOWN MANOEUVRE SCHEDULES FOR FINAL FLIGHTS

5G.1. Unknown manoeuvre schedules shall be used in two of the four final flights for World or Continental Championships and shall be composed by the finalists or by Subcommittee approved computer software.. The composition of any unknown schedule shall be completed no less than 12 hours before the commencement of finals flights for unknown schedules.

5G.2. If the composition of the unknown manoeuvre schedules is done by the finalists, each finalist nominates in turn an appropriate centre or turn-around manoeuvre from the approved and published list of manoeuvres. This nomination and selection of manoeuvres may be either manual or computer-aided. The order of selection will be determined following the random flight draw with the order repeating until the manoeuvre schedule is complete. The nominated and selected manoeuvres must conform to the following general criteria:

1. The entry of one manoeuvre must be matched to the exit of the previous manoeuvre, for entry altitude, entry attitude (level upright or level inverted flight), size of manoeuvres (wide as in a horizontal eight or narrow as in a stall turn) and direction of flight.
2. No duplication of manoeuvres.
3. No duplication of centre manoeuvres from the same manoeuvre group with the exclusion of group 23 manoeuvres.
4. Spins are entered into the wind.
5. Three manoeuvres of each schedule must have K = 6.
6. Four manoeuvres of each schedule must have K = 5.
7. 17 manoeuvres per unknown schedule:
   a) 9 centre manoeuvres (5 upwind, 4 downwind).
   b) 8 turn-around manoeuvres (4 left and 4 right).
8. The summary of K-factors must be at least 74.

If the composition of the unknown schedules is done by computer software, then criteria 1 - 8 apply accordingly.

5G.3. Once an unknown schedule has been composed and checked for correctness it must receive the final approval of the Jury and the contest director. Printed copies, showing the Aresti pictograms and manoeuvre lists**,** shall then be distributed to team managers, finalists, judges, jury members, and non-finalists who are scheduled to perform warm-up flights. A sufficient number shall be made available by the organisers for spectators.

5G.4. The judges shall receive instructions after the composition of the unknown schedule covering the unknown manoeuvres to ensure that they are fully aware of the sequence of manoeuvres.

5G.5. Aresti drawings of the unknown schedules must be provided to finalists and judges.

5G.6. Finalists may not attempt practice flights of an unknown schedule between its composition and the finals flights either with a model aircraft or via electronic flight simulator. Evidence of such practice shall be deemed cheating and shall lead to disqualification from the championships. Hand-held stick models are permitted.

5G.7. In addition to the warm-up flight for the finals known schedule, at least two warm-up flights must be arranged for the unknown schedule. The unknown warm-up flights may be observed by the finalists and must be judged. Under no circumstances should the flight scores of any warm-up flights be tabulated.

5G.8. List of manoeuvres for composition of unknown schedules

5G.8.1. **Centre manoeuvres**

(Only one manoeuvre from each number group per schedule)

1.1 Rolling loop with one roll (from bottom) (K5)
1.2 Rolling loop with one roll (from bottom) inverted entry (K5)
1.3 Loop with 8-point roll (from bottom) (K5)
1.4 Loop with 8-point roll (from bottom) inverted entry (K5)
1.5 Loop with 4-point roll (from bottom (K5)

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1.6 Loop with 4-point roll (from bottom) inverted entry (K5)
1.7 Knife-edge loop (K6)
1.8 Knife-edge loop, inverted entry and exit (K6)
1.9 Knife-edge loop from top (K6)
1.10 Knife-edge loop from top, inverted entry and exit (K6)
1.11 Knife-edge loop with snap roll on top (K6)
1.12 Knife-edge loop with snap roll on top, inverted entry and exit (K6)
2.1 Two loops with half rolls at top (from bottom) (K3)
2.2 Two loops with half rolls at top (from bottom) inverted entry (K4)
2.3 Two loops with half rolls at bottom (from top) (K4)
2.4 Two loops with half rolls at bottom (from top) inverted entry (K3)
2.5 Two loops with full roll first top, half roll second (from bottom) (K4)
2.6 Two loops with full roll first top, half roll second, inverted entry (from bottom) (K4)
2.7 Two loops with half roll first top, full roll second (from bottom) (K4)
2.8 Two loops with half roll first top, full roll second, inverted entry (from bottom) (K4)
2.9 Two loops with full roll first bottom, half roll second (from top) (K4)
2.10 Two loops with full roll first bottom, half roll second (from top) inverted entry (K4)
2.11 Two loops with half roll first bottom, full roll second (from top) (K4)
2.12 Two loops with half roll first bottom, full roll second (from top) inverted entry (K4)
3.1 Avalanche with full snap (from bottom) (K3)
3.2 Avalanche with full snap (from bottom) inverted entry (K3)
3.3 Avalanche with 1½ snap (from bottom) (K4)
3.4 Avalanche with 1½ snap, inverted entry (from bottom) (K4)
3.5 Avalanche with 1 negative snap (from top) (K4)
3.6 Avalanche with 1 positive snap (from top) inverted entry (K3)
4.1 Triangular loop with full roll (from bottom) (K4)
4.2 Triangular loop with full roll (from bottom) inverted entry (K4)
4.3 Triangular loop with 2/2pt roll (from bottom) (K4)
4.4 Triangular loop with 2/2pt roll (from bottom) inverted entry (K4)
4.5 Triangular loop with 2/4pt roll (from bottom) (K4)
4.6 Triangular loop with 2/4pt roll (from bottom) inverted entry (K4)
4.7 Triangular loop with snap roll (from bottom) (K4)
4.8 Triangular loop with snap roll (from bottom) inverted entry (K4)
4.9 Triangular loop with 1½ snap roll (from bottom) (K4)
4.10 Triangular loop with 1½ snap roll (from bottom) inverted entry (K4)
4.11 Triangular loop with 1/2 rolls (from bottom) (K3)
4.12 Triangular loop with 1/2 rolls (from bottom) inverted entry (K3)
4.13 Triangular loop (base at bottom) with half rolls in 45 degree legs (K3)
4.14 Triangular loop (base at bottom) with half rolls in 45 degree legs, inverted entry (K3)
4.15 Triangular loop (base at bottom) with 2/4pt rolls in 45 degree legs (K4)
4.16 Triangular loop (base at bottom) with 2/4pt rolls in 45 degree legs, inverted entry(K4)
4.17 Triangular loop (base at bottom) with 2/2pt rolls in 45 degree legs (K4)
4.18 Triangular loop (base at bottom) with 2/2pt rolls in 45 degree legs, inverted entry (K4)
4.19 Triangular loop from top (base at top) with half rolls in 45 degree legs (K4)
4.20 Triangular loop from top (base at top) with half rolls in 45 degree legs, inverted entry (K4)
4.21 Triangular loop from top (base at top) with 2/4pt rolls in 45 degree legs (K4)
4.22 Triangular loop from top (base at top) with 2/4pt rolls in 45 degree legs, inverted entry (K4)
4.23 Triangular loop from top (base at bottom) with half rolls in 45 degree legs (K4)
4.24 Triangular loop from top (base at bottom) with half rolls in 45 degree legs, inverted entry (K4)
4.25 Triangular loop from top (base at bottom) with 2/4pt rolls in 45 degree legs (K4)
4.26 Triangular loop from top (base at bottom) with 2/4pt rolls in 45 legs, inverted entry (K4)
4.27 Triangular loop from top (base at bottom) with 2/4pt roll at bottom (K4)
4.28 Triangular loop from top (base at bottom) with 2/4pt roll at bottom, inverted entry (K4)
4.29 Triangular loop from top (base at bottom) with full roll (K4)
4.30 Triangular loop from top (base at bottom) with full roll, inverted entry (K4)
4.31 Knife-edge triangular loop (base at top) (K6)
4.32 Knife-edge triangular loop (base at top), inverted entry and exit (K6)
4.33 Knife-edge triangular loop (base at top), snap roll on horizontal leg (K6)
4.34 Knife-edge triangular loop (base at top), snap roll on horizontal leg, inverted entry and exit (K6)
4.35 Knife-edge triangular loop (base at top), roll on horizontal leg (K6)
4.36 Knife-edge triangular loop (base at top), roll on horizontal leg, inverted entry and exit (K6)
5.1 Square loop with half rolls (K5)
5.2 Square loop with half rolls, inverted entry (K5)
5.3 Square loop with 2/4pt rolls (K5)

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5.4 Square loop with 2/4pt rolls, inverted entry (K5)
5.5 Square loop with full snap over top (K4)
5.6 Square loop with full snap over top, inverted entry (K4)
5.7 Square loop from top with half rolls (K5)
5.8 Square loop from top with half rolls, inverted entry (K5)
5.9 Square loop from top with 2/4pt rolls (K5)
5.10 Square loop from top with 2/4pt rolls, inverted entry (K5)
5.11 Square loop from top with full snap at bottom (K4)
5.12 Square loop from top with full snap at bottom, inverted entry (K4)
6.1 Square loop on corner (K3)
6.2 Square loop on corner, inverted entry (K3)
6.3 Square loop on corner with half rolls in legs 1 & 3 (K4)
6.4 Square loop on corner with half rolls in legs 1 & 3, inverted entry (K4)
6.5 Square loop on corner with full roll in leg 1, half roll in leg 3 (K4)
6.6 Square loop on corner with full roll in leg 1, half roll in leg 3, inverted entry (K4)
6.7 Square loop on corner with four half rolls (K5)
6.8 Square loop on corner with four half rolls, inverted entry (K5)
6.9 Square loop on corner from top (K3)
6.10 Square loop on corner from top , inverted entry (K3)
6.11 Square loop on corner from top with half rolls in legs 1 & 3 (K4)
6.12 Square loop on corner from top with half rolls in legs 1 & 3, inverted entry (K4)
6.13 Square loop on corner from top with full roll in leg 1, half roll in leg 3 (K4)
6.14 Square loop on corner from top with full roll in leg 1, half roll in leg 3, inverted entry (K4)
6.15 Square loop on corner from top with four half rolls (K5)
6.16 Square loop on corner from top with four half rolls, inverted entry (K5)
7.1 Six sided loop (K4)
7.2 Six sided loop, inverted entry (K4)
7.3 Six sided loop from top (K4)
7.4 Six sided loop from top , inverted entry (K4)
8.1 Cobra roll with 2/4pt rolls (K3)
8.2 Cobra roll with 2/4pt rolls, inverted entry (K3)
8.3 Cobra roll with 2/2pt rolls (K3)
8.4 Cobra roll with 2/2pt rolls, inverted entry (K)3
8.5 Cobra roll from top with half rolls (K3)
8.6 Cobra roll from top with half rolls, inverted entry (K3)
8.7 Cobra roll from top with 2/4pt rolls (K3)
8.8 Cobra roll from top with 2/4pt rolls, inverted entry (K3)
8.9 Cobra roll from top with 2/2pt rolls (K3)
8.10 Cobra roll from top with 2/2pt rolls, inverted entry (K3)
9.1 Golf ball (45 degrees up, 3/4 inside loop, 45 degrees down, pull to level), (K3)
9.2 Golf ball, inverted entry (K3)
9.3 Golf ball with half rolls (K3)
9.4 Golf ball with half rolls, inverted entry (K3)
9.5 Golf ball with 2/4pt rolls (K3)
9.6 Golf ball with 2/4pt rolls, inverted entry (K3)
10.1 Cuban eight with 2/4pt rolls (K3)
10.2 Cuban eight with 2/4pt rolls, inverted entry (K3)
10.3 Cuban eight with full rolls (K4)
10.4 Cuban eight with full rolls, inverted entry (K4)
10.5 Reverse cuban eight (from bottom) with 2/4pt rolls (K4)
10.6 Reverse cuban eight (from bottom) with 2/4pt rolls, inverted entry (K4)
10.7 Reverse cuban eight (from bottom) with full rolls (K4)
10.8 Reverse cuban eight (from bottom) with full rolls, inverted entry (K4)
10.9 Cuban eight from top with half rolls (K3)
10.10 Cuban eight from top with half rolls, inverted entry (K3)
10.11 Cuban eight from top with 2/4pt rolls (K4)
10.12 Cuban eight from top with 2/4pt rolls, inverted entry (K4)
10.13 Cuban eight from top with full rolls (K4)
10.14 Cuban eight from top with full rolls, inverted entry (K4)
10.15 Reverse cuban eight from top with half rolls (K3)
10.16 Reverse cuban eight from top with half rolls, inverted entry (K3)
10.17 Reverse cuban eight from top with 2/4pt rolls (K4)
10.18 Reverse cuban eight from top with 2/4pt rolls, inverted entry (K4)
10.19 Reverse cuban eight from top with full rolls (K4)

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10.20 Reverse cuban eight from top with full rolls, inverted entry (K4)
10.21 Knife-edge Cuban eight (K6)
10.22 Knife-edge Cuban eight, inverted entry and exit (K6)
10.23 Knife-edge Cuban eight with full rolls (K6)
10.24 Knife-edge Cuban eight with full rolls, inverted entry and exit (K6)
10.25 Knife-edge reverse Cuban eight (K6)
10.26 Knife-edge reverse Cuban eight, inverted entry and exit (K6)
10.27 Knife-edge reverse Cuban eight with full rolls (K6)
10.28 Knife-edge reverse Cuban eight with full rolls, inverted entry and exit (K6)
11.1 45 degree down with full snap roll (K3)
11.2 45 degree down with full snap roll, inverted entry (K3)
11.3 45 degree down with 1½ snap roll (K3)
11.4 45 degree down with 1½ snap roll, inverted entry (K3)
11.5 45 degree down with two 2/4-point rolls reversed (K4)
11.6 45 degree down with two 2/4-point rolls reversed, inverted entry (K4)
11.7 45 degree down with two 4/8-point rolls reversed (K4)
11.8 45 degree down with two 4/8-point rolls reversed, inverted entry (K4)
11.9 45 degree up with 1½ snap roll (K4)
11.10 45 degree up with 1½ snap roll, inverted entry (K4)
11.11 45 degree up with full snap roll (K3)
11.12 45 degree up with full snap roll, inverted entry (K3)
11.13 45 degree up with two 2/4-point rolls reversed (K4)
11.14 45 degree up with two 2/4-point rolls reversed, inverted entry (K4)
11.15 45 degree up with two 4/8-point rolls reversed (K4)
11.16 45 degree up with two 4/8-point rolls reversed, inverted entry (K4)
12.1 Figure Z with half roll up (K3)
12.2 Figure Z with half roll up, inverted entry (K3)
12.3 Figure Z with 2/4pt roll up (K4)
12.4 Figure Z with 2/4pt roll up, inverted entry (K4)
12.5 Figure Z with 2/2pt roll up (K4)
12.6 Figure Z with 2/2pt roll up, inverted entry (K4)
12.7 Figure Z from top with half roll down (K3)
12.8 Figure Z from top with half roll down, inverted entry (K3)
12.9 Figure Z from top with 2/4pt roll down (K4)
12.10 Figure Z from top with 2/4pt roll down, inverted entry (K4)
12.11 Figure Z from top with 2/2pt roll (K4)
12.12 Figure Z from top with 2/2pt roll, inverted entry (K4)
13.1 Hourglass (K4)
13.2 Hourglass, inverted entry (K4)
13.3 Hourglass with half rolls up and down (K4)
13.4 Hourglass with half rolls up and down, inverted entry (K5)
13.5 Hourglass with 2/4pt rolls up and down (K5)
13.6 Hourglass with 2/4pt rolls up and down, inverted entry (K5)
13.7 Hourglass (middle entry, top first) (K4)
13.8 Hourglass (middle entry, top first) inverted entry (K4)
13.9 Hourglass (middle entry, top first), half roll down (K4_
13.10 Hourglass (middle entry, top first) half roll down, inverted entry (K4)
13.11 Hourglass (middle entry, top first) 2/4pt roll down (K5)
13.12 Hourglass (middle entry, top first) 2/4pt roll down, inverted entry (K5)
13.13 Hourglass (middle entry, bottom first) (K4)
13.14 Hourglass (middle entry, bottom first), inverted entry (K4)
13.15 Hourglass (middle entry, bottom first) half roll up (K4)
13.16 Hourglass (middle entry, bottom first) half roll up, inverted entry (K4)
13.17 Hourglass (middle entry, bottom first) 2/4pt roll up (K4)
13.18 Hourglass (middle entry, bottom first) 2/4pt roll up, inverted entry (K4)
13.19 Hourglass (top entry) (K4)
13.20 Hourglass (top entry), inverted entry (K4)
13.21 Hourglass (top entry) with half rolls down and up (K5)
13.22 Hourglass (top entry) with half rolls down and up, inverted entry (K5)
13.23 Hourglass (top entry) with 2/4pt rolls down and up (K5)
13.24 Hourglass (top entry) with 2/4pt rolls down and up, inverted entry (K5)
14.1 Vertical eight (from bottom) (K3)
14.2 Vertical eight (from bottom) inverted entry (K3)
14.3 Vertical eight (from bottom) with half rolls (K4)

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14.4 Vertical eight (from bottom) with half rolls, inverted entry (K4)
14.5 Vertical eight (from bottom) with half roll after first half loop (K4)
14.6 Vertical eight (from bottom) with half roll after first half loop, inverted entry (K4)
14.7 Vertical eight (from middle) (K3)
14.8 Vertical eight (from middle) inverted entry (K3)
14.9 Vertical eight (from middle) with half roll (K3)
14.10 Vertical eight (from middle) with half roll, inverted entry (K3)
14.11 Vertical eight (from top) (K3)
14.12 Vertical eight (from top) inverted entry (K3)
14.13 Vertical eight (from top) with half rolls (K4)
14.14 Vertical eight (from top) with half rolls, inverted entry (K4)
14.15 Vertical eight (from top) with half roll after first half loop (K4)
14.16 Vertical eight (from top) with half roll after first half loop, inverted entry (K4)
14.17 Vertical knife-edge eight (K6)
14.18 Vertical knife-edge eight, inverted entry and exit (K6)
14.19 Vertical knife-edge eight with two half roll (K6)
14.20 Vertical knife-edge eight with two half roll, inverted entry and exit (K6)
14.21 Vertical knife-edge eight, middle entry and exit, top first (K6)
14.22 Vertical knife-edge eight, middle entry and exit, top first (K6)
15.1 Square horizontal eight (K5)
15.2 Square horizontal eight, inverted entry (K5)
15.3 Square horizontal eight (from top) (K5)
15.4 Square horizontal eight (from top) inverted entry (K5)
15.5 Square vertical eight (from bottom) (K5)
15.6 Square vertical eight (from bottom) inverted entry (K5)
15.7 Square vertical eight (from bottom) with half rolls (K5)
15.8 Square vertical eight (from bottom) with half rolls, inverted entry (K5)
15.9 Square vertical eight (from middle) (K5)
15.10 Square vertical eight (from middle) inverted entry (K5)
15.11 Square vertical eight (from middle) with half roll (K5)
15.12 Square vertical eight (from middle) with half roll, inverted entry (K5)
15.13 Square vertical eight (from top) (K5)
15.14 Square vertical eight (from top) inverted entry (K5)
15.15 Square vertical eight (from top) with half rolls (K5)
15.16 Square vertical eight (from top) with half rolls, inverted entry (K5)
16.1 Figure M with 3/4 rolls (K5)
16.2 Figure M with 3/4 rolls, inverted entry (K5)
16.3 Figure M with 3/4-point rolls (K5)
16.4 Figure M with 3/4-point rolls, inverted entry (K5)
16.5 Figure M with 3/4pt rolls up, 1/4 rolls down (K5)
16.6 Figure M with 3/4pt rolls up, 1/4 rolls down, inverted entry (K5)
Centre half-loop is always flown negative (inverted)
17.1 Top hat with 2/4pt rolls (K4)
17.2 Top hat with 2/4pt rolls, inverted entry (K4)
17.3 Top hat with 2/2pt rolls (K4)
17.4 Top hat with 2/2pt rolls, inverted entry (K4)
17.5 Top hat from top with 2/4pt rolls (K4)
17.6 Top hat from top with 2/4pt rolls, inverted entry (K4)
17.7 Top hat from top with 2/2pt rolls (K4)
17.8 Top hat from top with 2/2pt rolls, inverted entry (K4)
18.1 Humpty bump, half roll up, 2/4pt roll down (K4)
18.2 Humpty bump, 1/2 roll up, 2/4pt roll down, inverted entry (K4)
18.3 Humpty bump, 2/4pt roll up, full snap down (K5)
18.4 Humpty bump, 2/4pt roll up, full snap down, inverted entry (K5)
18.5 Humpty bump from top, half roll down, 2/4pt roll up (K4)
18.6 Humpty bump from top, half roll down, 2/4pt roll up, inverted entry (K4)
18.7 Humpty bump from top, 2/4pt roll down, full roll up (K4)
18.8 Humpty bump from top, 2/4pt roll down, full roll up, inverted entry (K4)
19.1 2½ turn spin, inverted exit (K3)
19.2 2½ turn spin, inverted entry, upright exit (K3)
19.3 2 turn opposite spin (K4)
19.4 Two turn opposite spin, inverted entry (K4)
19.5 Three turn spin (K3)
19.6 Three turn spin, inverted entry (K3)

*cont/…*

19.7 2½ turn spin, half roll exit (K3)
19.8 2½ turn spin, half roll exit, inverted entry (K3)
20.1 Stall turn 3/4 roll up, 3/4pt roll down (K3)
20.2 Stall turn, 3/4 roll up, 3/4pt roll down, inverted entry (K3)
20.3 Stall turn 3/4 roll up, 3/4-point roll down, inverted exit (K3)
20.4 Stall turn, 3/4 roll up, 1¼ snap roll down (K5)
20.5 Stall turn, 3/4 roll up, 1¼ snap roll down, inverted entry (K5)
20.6 Stall turn, 3/4 roll up, 1¼ snap roll down, inverted exit (K5)
20.7 Stall turn, 3/4pt roll up, 1¼ snap roll down (K5)
20.8 Stall turn, 3/4pt roll up, 1¼ snap roll down, inverted entry (K5)
20.9 Stall turn, 3/4pt roll up, 1¼ snap roll down, inverted exit (K5)
21.1 Double Immelmann with half rolls (K3)
21.2 Double Immelmann with half rolls, inverted entry (K3)
21.3 Double Immelmann with half roll first, full roll second (K4)
21.4 Double Immelmann with half roll first, full roll second, inverted entry (K4)
21.5 Double Immelmann with full rolls (K3)
21.6 Double Immelmann with full rolls, inverted entry (K3)
21.7 Double Immelmann from top, half rolls (K3)
21.8 Double Immelmann from top, half rolls, inverted entry (K3)
21.9 Double Immelmann from top, half roll first, full roll second (K4)
21.10 Double Immelmann from top, half roll first, full roll second, inverted entry (K4)
21.11 Double Immelmann from top with full rolls (K4)
21.12 Double Immelmann from top with full rolls, inverted entry (K4)
22.1 Rolling circle with one roll inside (K5)
22.2 Rolling circle with one roll inside, inverted entry (K5)
22.3 Rolling circle with one roll outside (K5)
22.4 Rolling circle with one roll outside, inverted entry (K5)
22.5 Rolling circle with 2 rolls inside (K5)
22.6 Rolling circle with 2 rolls inside, inverted entry (K5)
22.7 Rolling circle with 2 rolls outside (K5)
22.8 Rolling circle with 2 rolls outside, inverted entry (K5)
22.9 Rolling circle with 4 rolls inside (K5)
22.10 Rolling circle with 4 rolls inside, inverted entry (K5)
22.11 Rolling circle with 4 rolls outside (K5)
22.12 Rolling circle with 4 rolls outside, inverted entry (K5)

(More than one manoeuvre from the following group is allowed, but not two of the same manoeuvre with only the entry changed)

23.1 1½ rolls reversed (K4)
23.2 1½ rolls reversed, inverted entry (K4)
23.3 Two rolls reversed (K4)
23.4 Two rolls reversed, inverted entry (K4)
23.5 Four point roll (K4)
23.6 Four point roll, inverted entry (K4)
23.7 Eight point roll (K4)
23.8 Eight point roll, inverted entry (K4)
23.9 Two 3/4-point rolls reversed (K4)
23.10 Two 3/4-point rolls reversed, inverted entry (K4)
23.11 Two 2/2-point rolls reversed (K4)
23.12 Two 2/2-point rolls reversed, inverted entry (K4)
23.13 Two 2/4-point rolls reversed (K4)
23.14 Two 2/4-point rolls reversed, inverted entry (K4)
23.15 Slow roll (K3)
23.16 Slow roll, inverted entry (K3)
23.17 Knife-edge flight (K4)
23.18 Knife-edge flight, inverted entry (K4)
23.19 Reverse knife-edge flight (K5)
23.20 Reverse knife-edge flight, inverted entry (K5)
23.21 One horizontal snap roll (K3)
23.22 One horizontal snap roll, inverted entry (K4)
23.23 Two snap rolls reversed (K5)
23.24 Two snap rolls reversed, inverted entry (K5)
23.25 2/2pt roll, full snap roll opposite (K5)
23.26 2/2pt roll, full snap opposite, inverted entry (K5)

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23.27 2/4pt roll, 1½ snap roll opposite (K5)
23.28 2/4pt roll, 1½ snap roll opposite, inverted entry (K5)
24.1 Double key: pull into vertical upline, ¾-point roll up, 5/8 knife-edge loop towards the back, ¾ roll down, pull into 45°upline, ¾.roll up, 5/8 knife-edge loop towards the back, ¾-point roll down, pull to exit upright (K6)
24.2 Double key: from inverted push into vertical upline, ¾-point roll up, 5/8 knife-edge loop towards the back, ¾ roll down, pull into 45° upline, ¾ roll, 5/8 knife-edge loop towards the back, ¾-point roll down, push to exit inverted (K6)
24.3 Double key: pull into a vertical upline, ¾-point roll up, 5/8 knife-edge loop towards the back, ¾ roll down, push into a 45° upline, ¾ roll up, 5/8 knife-edge loop towards the back, ¾-point roll down, pull to exit upright (K6)
24.4 Double key: from inverted push into vertical upline, ¾-point roll up, 5/8 knife-edge loop towards the back, ¾ roll down, push into 45° upline, ¾ roll up, 5/8 knife-edge loop towards the back, ¾-point roll down, push to exit inverted (K6)
25.1 Horizontal eight with one roll integrated in each loop (K6)
25.2 Horizontal eight with one roll integrated in each loop, inverted entry and exit (K6)
25.3 Horizontal eight with two rolls integrated in each loop (K6)
25.4 Horizontal eight with two rolls integrated in each loop, inverted entry and exit (K6)
25.5 Horizontal eight with four rolls integrated in each loop (K6)
25.6 Horizontal eight with four rolls integrated in each loop, inverted entry and exit (K6)

### 5G.8.2. Turnaround manoeuvres

(maximum of two manoeuvres from each group per schedule)

A.1 Half square loop (K1)
A.2 Half square loop, inverted entry (K1)
A.3 Half square loop with half roll up (K2)
A.4 Half square loop with half roll up, inverted entry (K2)
A.5 Half square loop with 2/4pt roll up (K2)
A.6 Half square loop with 2/4pt roll up, inverted entry (K2)
A.7 Half square loop with 2/2pt roll up (K2)
A.8 Half square loop with 2/2pt roll up, inverted entry (K2)
A.9 Half square loop with full roll up (K2)
A.10 Half square loop with full roll up, inverted entry (K2)
A.11 Half square loop from top (K1)
A.12 Half square loop from top, inverted entry (K1)
A.13 Half square loop from top, half roll down (K2)
A.14 Half square loop from top, half roll down, inverted entry (K2)
A.15 Half square loop from top, 2/4pt roll down (K2)
A.16 Half square loop from top, 2/4pt roll down , inverted entry (K2)
A.17 Half square loop from top, 2/2pt roll down (K2)
A.18 Half square loop from top, 2/2pt roll down, inverted entry (K2)
A.19 Half square loop from top, full roll down (K2)
A.20 Half square loop from top, full roll down, inverted entry (K2)
A.21 Half square loop from top, full snap down (K3)
A.22 Half square loop from top, full snap down, inverted entry (K3)
B.1 Half loop (K1)
B.2 Half outside loop, inverted entry (K1)
B.3 Half outside loop from top (K1)
B.4 Half loop from top, inverted entry (K1)
C.1 Split “S” (half roll, half loop from top) (K2)
C.2 Half inside loop, half roll, from top, inverted entry (K2)
C.3 Half outside loop, full roll, from top (K2)
C.4 Half inside loop, full roll, from top, inverted entry (K2)
D.1 Immelmann turn (K2)
D.2 Immelmann turn, inverted entry (K2)
D.3 Immelmann turn, full roll (K2)
D.4 Immelmann turn, full roll, inverted entry (K2)
E.1 Figure 9 from bottom (K1)
E.2 Figure 9 from bottom, inverted entry (K1)
E.3 Figure 9 from bottom, half roll up (K2)
E.4 Figure 9 from bottom, half roll up, inverted entry (K2)
E.5 Figure 9 from bottom, 2/4pt roll up (K2)
E.6 Figure 9 from bottom, 2/4pt roll up, inverted entry (K2)

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E.7 Figure 9 from bottom, 2/2pt roll up (K2)
E.8 Figure 9 from bottom, 2/2pt roll up, inverted entry (K2)
E.9 Figure 9 from bottom, full roll up (K2)
E.10 Figure 9 from bottom, full roll up, inverted entry (K2)
E.11 Figure 6 from middle (bottom first) (K1)
E.12 Figure 6 from middle (bottom first), inverted entry (K1)
E.13 Figure 6 from middle (bottom first), half roll up (K2)
E.14 Figure 6 from middle (bottom first), half roll up, inverted entry (K2)
E.15 Figure 6 from middle (bottom first), 2/4pt roll up (K2)
E.16 Figure 6 from middle (bottom first), 2/4pt roll up, inverted entry (K2)
E.17 Figure 6 from middle (bottom first), 2/2pt roll up (K2)
E.18 Figure 6 from middle (bottom first), 2/2pt roll up, inverted entry (K2)
E.19 Figure 6 from middle (bottom first), full roll up (K2)
E.20 Figure 6 from middle (bottom first), full roll up, inverted entry (K2)
E.21 Figure 9 from middle (top first) (K1)
E.22 Figure 9 from middle (top first), inverted entry (K1)
E.23 Figure 9 from middle (top first), half roll down (K2)
E.24 Figure 9 from middle (top first), half roll down, inverted entry (K2)
E.25 Figure 9 from middle (top first), 2/4pt roll down (K2)
E.26 Figure 9 from middle (top first), 2/4pt roll down, inverted entry (K2)
E.27 Figure 9 from middle (top first), 2/2pt roll down (K2)
E.28 Figure 9 from middle (top first), 2/2pt roll down, inverted entry (K2)
E.29 Figure 9 from middle (top first), full roll down (K2)
E.30 Figure 9 from middle (top first), full roll down, inverted entry (K2)
E.31 Figure 9 from middle (top first), full snap down (K3)
E.32 Figure 9 from middle (top first), full snap down, inverted entry (K3)
E.33 Figure 6 from top (K1)
E.34 Figure 6 from top, inverted entry (K1)
E.35 Figure 6 from top, half roll down (K2)
E.36 Figure 6 from top, half roll down, inverted entry (K2)
E.37 Figure 6 from top, 2/4pt roll down (K2)
E.38 Figure 6 from top, 2/4pt roll down, inverted entry (K2)
E.39 Figure 6 from top, 2/2pt roll down (K2)
E.40 Figure 6 from top, 2/2pt roll down, inverted entry (K2)
E.41 Figure 6 from top, full roll down (K2)
E.42 Figure 6 from top , full roll down, inverted entry (K2)
E.43 Figure 6 from top, full snap down (K3)
E.44 Figure 6 from top, full snap down, inverted entry (K3)
F.1 Half cuban eight (K2)
F.2 Half cuban eight, inverted entry (K2)
F.3 Half cuban eight, 2/4pt roll (K2)
F.4 Half cuban eight, 2/4pt roll, inverted entry (K2)
F.5 Half cuban eight, 2/2pt roll (K2)
F.6 Half cuban eight, 2/2pt roll, inverted entry (K2)
F.7 Half cuban eight with full roll (K2)
F.8 Half cuban eight with full roll, inverted entry (K2)
F.9 Half cuban eight with full snap roll (K3)
F.10 Half cuban eight with full snap roll, inverted entry (K3)
F.11 Half cuban eight with 1½ snap roll (K3)
F.12 Half cuban eight with 1½ snap roll, inverted entry (K3)
F.13 Half cuban eight from top (K2)
F.14 Half cuban eight from top, inverted entry (K2)
F.15 Half cuban eight from top, 2/4pt roll up (K2)
F.16 Half cuban eight from top, 2/4pt roll up, inverted entry (K2)
F.17 Half cuban eight from top, 2/2pt roll up (K2)
F.18 Half cuban eight from top, 2/2pt roll up, inverted entry (K2)
F.19 Half cuban eight from top, full roll up (K2)
F.20 Half cuban eight from top, full roll up, inverted entry (K2)
F.21 Half reverse cuban eight (K2)
F.22 Half reverse cuban eight, inverted entry (K2)
F.23 Half reverse cuban eight, 2/4pt roll (K2)
F.24 Half reverse cuban eight, 2/4pt roll, inverted entry (K2)
F.25 Half reverse cuban eight, 2/2pt roll (K2)
F.26 Half reverse cuban eight, 2/2pt roll, inverted entry (K2)

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F.27 Half reverse cuban eight with full roll (K2)
F.28 Half reverse cuban eight with full roll, inverted entry (K2)
F.29 Half reverse cuban eight with full snap roll (K3)
F.30 Half reverse cuban eight with full snap roll, inverted entry (K3)
F.31 Half reverse cuban eight with 11/2 snap roll (K3)
F.32 Half reverse cuban eight with 11/2 snap roll, inverted entry (K3)
F.33 Half reverse cuban eight from top (K2)
F.34 Half reverse cuban eight from top, inverted entry (K2)
F.35 Half reverse cuban eight from top, 2/4pt roll down (K2)
F.36 Half reverse cuban eight from top, 2/4pt roll down, inverted entry (K2)
F.37 Half reverse cuban eight from top, 2/2pt roll down (K2)
F.38 Half reverse cuban eight from top, 2/2pt roll down, inverted entry (K2)
F.39 Half reverse cuban eight from top, full roll down (K2)
F.40 Half reverse cuban eight from top, full roll down, inverted entry (K2)
G.1 Two turn spin (K2)
G.2 Two turn spin, inverted entry (K2)
G.3 2 1/2 turn spin (K2)
G.4 2 1/2 turn spin, inverted entry (K2)
H.1 Stall turn, half rolls (K2)
H.2 Stall turn, half rolls, inverted entry (K2)
H.3 Stall turn, half roll up, 2/4pt roll down (K2)
H.4 Stall turn, half roll up, 2/4pt roll down, inverted entry (K2)
H.5 Stall turn, full roll up, half roll down (K2)
H.6 Stall turn, full roll up, half roll down ,inverted entry (K2)
H.7 Stall turn, 2/4pt roll up, half roll down (K2)
H.8 Stall turn, 2/4pt roll up, half roll down, inverted entry (K2)
H.9 Stall turn, 2/2pt roll up, 2/4pt roll down (K2)
H.10 Stall turn, 2/2pt roll up, 2/4pt roll down, inverted entry (K2)
H.11 Stall turn, half roll up, full snap down (K4)
H.12 Stall turn, half roll up, full snap down, inverted entry (K4)
H.13 Stall turn, 3/4pt roll up, 1/4 roll down (K3)
H.14 Stall turn, 3/4pt roll up 1/4 roll down, inverted entry (K3)
H.15 Stall turn, 3/4 roll up, 1¼ snap down (K4)
H.16 Stall turn 3/4 roll up, 1¼ snap down, inverted entry (K4)
J.1 Top hat, 3/4 roll up, 1/4 roll down (K2)
J.2 Top hat, 3/4 roll up, 1/4 roll down, inverted entry (K2)
J.3 Top hat, 3/4pt roll up, 3/4 roll down (K2)
J.4 Top hat, 3/4pt roll up, 3/4 roll down, inverted entry (K2)
J.5 Top hat, 3/4pt roll up, 3/4-point roll down, inverted exit (K2)
J.6 Top hat, 3/4pt roll up, 3/4pt roll down, inverted entry and exit (K2)
J.7 Top hat, 1/4 roll up, 1/4 roll down (K2)
J.8 Top hat, 1/4 roll up, 1/4 roll down, inverted entry (K2)
J.9 Top hat, 1/4 roll up, 1/4 roll down, inverted exit (K2)
J.10 Top hat, 1/4 roll up, 1/4 roll down, inverted entry and exit (K2)
J.11 Top hat from top, 3/4 roll down, 3/4pt roll up (K3)
J.12 Top hat from top, 3/4 roll down, 3/4pt roll up, inverted entry (K3)
J.13 Top hat from top, 3/4 roll down, 1/4 roll up (K2)
J.14 Top hat from top, 3/4 roll down, 1/4 roll up, inverted entry (K2)
J.15 Top hat from top, 1/4 roll down, 3/4pt roll up (K2)
J.16 Top hat from top, 1/4 roll down, 3/4pt roll up, inverted entry (K2)1¼
Horizontal (cross-box) flight is always flown inverted.
K.1 45 degree up, 2/4pt roll, half loop (inside or outside), full roll down (K3)
K.2 45 degree up, 2/4pt roll, half loop (inside or outside), full roll down, inverted entry (K3)
K.3 45 degree up, 2/2pt roll, half loop (inside or outside), 2/4pt roll down (K3)
K.4 45 degree up, 2/2pt roll, half loop (inside or outside), 2/4pt roll down, inverted entry (K3)
K.5 45 degree up, full roll, half loop (inside or outside), 2/4pt roll down (K3)
K.6 45 degree up, full roll, half loop (inside or outside), 2/4pt roll down, inverted entry (K3)
K.7 45 degree up, 2/2pt roll, half loop (inside or outside), full snap roll down (K4)
K.8 45 degree up, 2/2pt roll, half loop (inside or outside), full snap roll down, inverted entry (K4)
L.1 Humpty bump (pull, pull, push) half roll up, 2/4pt roll down (K3)
L.2 Humpty bump (push, push, pull) half roll up, 2/4pt roll down, inverted entry (K3)
L.3 Humpty bump (pull, pull, pull) half roll up, 2/2pt roll down (K3)
L.4 Humpty bump (push, push, push) half roll up, 2/2pt roll down, inverted entry (K3)
L.5 Humpty bump (pull, pull, push) 2/4pt roll up, half roll down (K3)

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L.6 Humpty bump (push, push, pull) 2/4pt roll up, half roll down, inverted entry (K3)
L.7 Humpty bump (pull, pull, push, or pull, push, push) 1/4 roll up, 3/4 roll down (K3)
L.8 Humpty bump (push, pull, pull, or push, push, pull) 1/4 roll up, 3/4 roll down inverted entry (K3)
L.9 Humpty bump (pull, pull, pull) 3/4pt roll up, 1/4 roll down (K3)
L.10 Humpty bump (push, pull, pull) 3/4pt roll up, 1/4 roll down, inverted entry (K3)
L.11 Humpty bump with roll options, (half roll up or 1/4 roll up and down) (K2)
L.12 Humpty bump with roll options, (half roll up or 1/4 roll up and down) inverted entry (K2)
M.1 Humpty bump from top, half roll down (push, push, push) (K3)
M.2 Humpty bump from top, half roll down, inverted entry (pull, pull, pull) (K2)
M.3 Humpty bump from top, 2/4pt roll down, half roll up (push, push, pull) (K3)
M.4 Humpty bump from top, 2/4pt roll down, half roll up, inverted entry (pull, pull, push) (K3)
M.5 Humpty bump from top, 2/4pt roll down, 2/2pt roll up (push, push, push) (K3)
M.6 Humpty bump from top, 2/4pt roll down, 2/2pt roll up, inverted entry (pull, pull, pull) (K3)
M.7 Humpty bump from top, 1/4 roll down, 3/4 roll up (push, push, push) (K3)
M.8 Humpty bump from top, 1/4 roll down, 3/4 roll up, inverted entry (pull, push, push) (K3)
M.9 Humpty bump from top, 1/4 roll down, 3/4 roll up, inverted entry and exit (pull, push, pull) (K3)
M.10 Humpty bump from top, 1/4 roll down, 3/4 roll up, inverted exit (push, push, pull) (K3)