2004 REVISION CHECKLIST

Remove and discard

❑ All pages and all tabs

Insert

❑ New pages

❑ New tab pages at the beginning of each appropriate Chapter

❑ Judge's quick reference for power and glider in front of rule book for easy reference

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This section is intended to be a summary of point deductions for the most commonly seen errors and a quick reference guide to the applicable rules for those deductions. In case of confusion or disagreements, the current edition of the *IAC Official Contest Rules* is definitive. Where Glider rules might differ they are marked with an asterisk. Before judging gliders, refer to the *Glider Judging Quick Reference* for a glider refresher.

Zero a figure 7.3 & others

Omitted figure	
Added figure	
Wrong figure	
Wrong direction (X axis)	
Accumulation of more than 45° in errors	
Figure started behind Judges	
Tailslide less than 1/2 fuselage length or wrong way	8.5 Family 6*
No pause in hesitation roll	8.5 Family 9.2-9.8
No stall in spins and snaps	8.5 Family 9.9-9.10 + 9.11-9.12

Errors in aircraft attitude or flight path From 7.1.3

Deduct one (1) point for every five (5) degrees error in the following (0.5 point for 2.5 degrees):

Horizontal flight	Judge flight path, not attitude	7.1.3*
Climb or descent	Projected angle from horizontal	7.1.3
Vertical flight	Attitude +/- angle from zero lift axis	7.1.3
45° lines	Attitude +/- angle from zero lift +/- 45°	7.1.3*
Heading	Direction of fuselage	7.1.3
Bank angle	Deviation from wings level (plane of flight)	7.1.3

Unequal radius in part loops 8.4.2

Deduct 0.5 points or more

Omitting a line between figures 7.2.3 & 8.4.1a

Deduct two (2) points - one (1) point from each figure

Errors in line lengths within a figure	8.4.1*
Visible Variation	1 point
1:2 variation	2 points
1:3 variation or more	3 points
No line before or after roll	4 points
No line before and after roll	2 points
No line before roll and any line after roll	4 points
Any line before roll and no line after roll	4 points

Added line	8.4.2(c)
Line between roll and loop or between loop and roll (e.g., Split S or Immelmann)	at least 1 point

Roll rate changes	8.5 Family 9
Roll rate change	1 point each occurrence
Roll stoppage	zero figure (Family 9.1 only)

Turns/Rolling turns	8.5 Family 2
Turn or roll rate change	Not more than 1 point
Roll stoppage	1 point

Hammerhead pivot	8.5 Family 5

** Glider rules vary. Consult the IAC Official Contest Rules.*

JUDGE'S QUICK REFERENCE - GLIDER

This quick reference guide is intended as a refresher for grading judges at contests incorporating gliders. All judges, Chief Judges, and contest officials should refer to the current *IAC Official Contest Rules* for the complete set of rules governing glider competition. Generally, glider rules are identical to power, but wherever glider rules or criteria do differ, those differences are marked with a glider icon in the margin of the *Official Contest Rules* book. In all cases of confusion or disagreements, the current edition of the *IAC Official Contest Rules* is definitive.

Aerobatic Box 4.11

Upper Limit:	4,000' AGL for all categories
Lower Limit:	
Sportsman	1,500' AGL
Intermediate	1,200' AGL
Unlimited	600' AGL

Tow and Release 4.24

The glider may execute turns to reposition after release and before beginning the flight program.

Free Programs 6.8

Intermediate gliders *may* repeat a basic figure (catalog number) if the repeated basic figure is used in combination with different complementary rolls. Unlimited gliders may not repeat any catalog numbers *except* for Families 1.1.x and 9.1.x.x.

General Grading

HINT

Once you visually acquire a glider in-bound to the aerobatic box, do not look away. It is extremely easy to lose visual contact with a glider and once lost, there is no engine noise to guide you back!

Horizontal Flight 8.1.4

For gliders, "horizontal" flight may be any line of reasonable angle, ascending or descending. The angle of the horizontal line into a figure may be different than the angle of the exit line from the same figure, but in all cases the angle of the line between figures must be constant (i.e., the exit angle of a figure must equal the entry angle of the subsequent figure). Level altitude figures, such as horizontal rolls and turns, may be flown at a constant (usually descending) angle to the horizon. If

the angle of the line between figures or within a figure, such as horizontal rolls or turns, is not constant, a deduction for each and every change of angle will be applied.

45 Degree lines 8.1.5
45 degree lines are flown and judged as 30 degree lines in glider Sportsman and Intermediate categories only.

Snap Roll 8.4.1(e)
Snap rolls need never be centered on their lines. However, there must be at least a visible line segment both before and after any snap roll.

Slow Rolls 8.4.1(e)
Slow rolls must always be centered on their lines.

Super Slow Roll 7.3.1(i)
The grading judge should only be concerned with the quality of the roll. The Chief Judge is responsible for the timing of super slow rolls.

Specific Grading Criteria

Wingover 8.5 Family 0.0
Review criteria Chapter 8.

Quarter-Clover 8.5 Family 0.1
Review criteria Chapter 8.

Hammerheads 8.5 Family 5
A small amount of wing slide is common. Wing slide is not an automatic zero and should receive a deduction proportionate to the severity.

Tailslides 8.5 Family 6
Expect extremely small amounts of tail slide and little or no penduluming after the slide. No deduction if the slide is visible.

Rolls 8.5 Family 9
All rolls, including snap and super slow rolls, are judged on exactly the same criteria as power rolls.

OFFICIAL CONTEST RULES

2004

International Aerobatic Club, Inc.

A Division of the
Experimental Aircraft Association and
National Aeronautic Association

P.O. Box 3086
Oshkosh, WI 54903-3086
U.S.A.

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Original Design

Minkus & Associates

FOREWORD

The International Aerobatic Club's *Official Contest Rules* were originally written in 1970 and, since that first year, have been continually revised and refined to permit the most well run and well judged aerobatic competitions in the world. Each year, the IAC Rules Committee meets to review these rules in their entirety and to incorporate suggested changes where necessary. As an IAC member, you are encouraged to submit rules proposals to the IAC Rules Chairperson.

In accordance with the policy of the Board of Directors, the following rules change schedule has been established and members are asked to adhere to this timetable in order to permit an orderly process.

This schedule will be observed each year:

***April 1**- The annual deadline for the Rules Committee to receive proposed contest rules changes and Known program sequences for the following contest year. The Rules Committee will meet after this deadline and publish their recommendations to the membership for comment. The deadline for member comment is October 1. The Board of Directors will then act on the proposals and comments at the Fall IAC Board meeting. Any rule changes and Known program sequences approved by the Board will take effect on January 1 of the year after they were approved.*

Contest years begin on January 1. IAC contests are run uniformly for all categories and these regulations apply to all categories from Primary through Unlimited. IAC sanctions all contests held in the United States of America but encourages those who wish to use these rules anywhere in the world to do so.

The IAC, its officers, directors, agents, servants, employees, and/or membership shall not be liable for any acts or omissions of the individual Chapter holding the contest (or its officials, directors, agents, servants, or employees), and any contest (or related activities) shall be conducted solely at the risk of the sponsoring Chapter.

All Chapter contest activities shall be insured as may be prescribed from time to time by the IAC, or in the absence of such prescription, to insure against all reasonable and probable liability which may result from said activities, as otherwise provided herein.

As a condition of any sanction granted by the IAC for a Chapter contest, and in consideration of the granting thereof, the sponsoring Chapter and/or its officers, directors, agents, servants, employees (or their administrators, heirs, or assigns) agree to forever hold harmless and defend the IAC and/or its officers, directors, agents, servants, or employees from any and all liability of any nature, whether due to negligence or intention, act, or omission.

REVISION RECORD CHART	
REV. #	**DATE**
9	***1 January 1999***
10	***1 January 1998***
11	***1 January 2000***
12	***1 January 2001***
13	***1 January 2002***
14	***1 January 2003***
15	***1 January 2004***
16	
17	
18	

CONVENTIONS USED

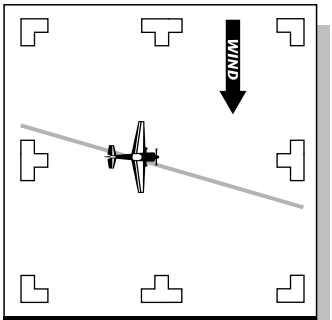


Fig 8.3.1

- *Gray line represents aircraft flight path.*

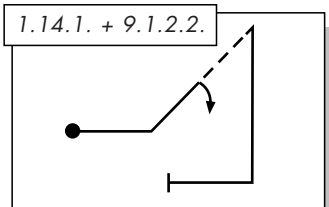


Fig 8.5.1

- *Whenever actual figures are used, the FAI Catalogue number(s) accompany the illustration.*

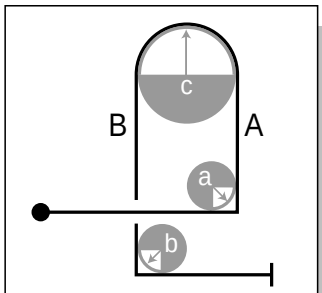


Fig 8.5.5

- *symbol refers to radii of part loops.*
- *Radii references are lower case letters; i.e; a, b, c.*
- *Line references are upper case letters; i.e; A, B, C.*

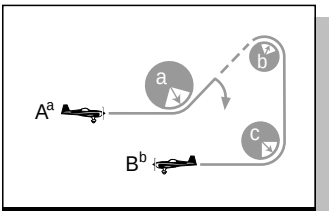


Fig 8.5.3

- *Entrance altitude references are A[a]*
- *Exit altitude references are B[b]*

1.1.1. + 9.9.3.4.

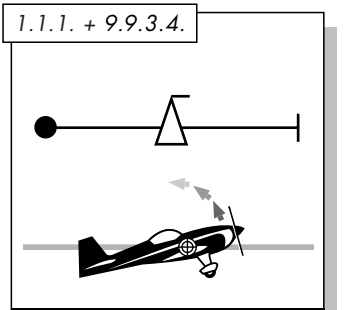


Fig 8.5.16

- *Motion of aircraft is indicated by gradated arrows.*

FIGURE SYMBOLOGY

❷ *K-Factor values.*

Compulsory Half-Roll

Optional Roll

Optional Vertical Roll

Optional Spin and/or Vertical Rolls

MARGIN SYMBOLOGY

- *Indicates subject matter unique to gliders.*
- *Areas of particular importance to review in preparation to judge at a contest.*

GLOSSARY AND DEFINITIONS

45°Attitude - The zero lift axis plus or minus 45°.

Advanced - The fourth of the five categories of aerobatic competition. Advanced competitors fly three programs: a Known Compulsory program which changes each year, a Free Program of their own design, and an Unknown Program. There is no Advanced category in Glider competition.

Aerobatic Box - A clearly marked area 1,000 meters square (approximately 3,300') in which all figures of a contest sequence must be flown to avoid penalty points. The upper limit of the box is 3,500' (3,280' for Unlimited) and the lower limit varies from 1,500' to 328' depending on the category flying. Also see "X Axis" and "Y Axis".

Aileron Roll - One of two types of rolls as defined by the *FAI Aerobatic Catalogue*. Aileron rolls include only two subtypes: "slow rolls" and "hesitation rolls".

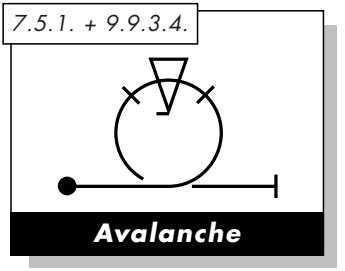
Angle-of-Attack - The angle at which the wings of an airplane meet the relative airflow. Can be either positive or negative.

Angle-of-Incidence - The angle at which the wing is physically mounted to the aircraft's fuselage. If this angle is other than zero, the aircraft fuselage will not appear to be in a vertical attitude when the zero lift axis is flown.

Aresti - A catalog, notation and scoring system developed by José Luis Aresti of Spain in 1961. Using the Aresti system, every variation of every aerobatic figure may be depicted using just a few different symbols.

Aresti Aerobatic Catalogue, FAI - The catalogue used by all FAI member nations to depict competition aerobatic figures in a systematic way. Each figure is assigned to one of nine families and given a unique catalogue number and difficulty factor ("K"). A figure must be listed in the *FAI Aresti Aerobatic Catalogue* to be legal for competition, except for the Unlimited Power 4-Minute Free Program.

Avalanche - Common name given to a full loop with a Family 9 snap roll maneuver centered at the 180 degree point of the loop.



Basic Figure - Any figure found in Families 1 through 8 of the *FAI Aerobatic Catalogue.*

Bow tie, Half - Any of the Family 1.28 - 1.35 figures.

Break - A term used interchangeably with program interruption. *See also, "Optional Break".*

Catalogue Number - A way of uniquely identifying each figure in the *FAI Aerobatic Catalogue.* For Families 1 - 8, the number takes the form of FAMILY.ROW.COLUMN. For Family 9, the number takes the form of FAMILY.ROLL TYPE.ROW.COLUMN.

Category, Competition - Any of the five competitive skill levels: Primary, Sportsman, Intermediate, Advanced, and Unlimited. Glider competition includes only three categories: Sportsman, Intermediate, and Unlimited.

Character of a Figure - Defined by the nature of the entry/exit lines (upright or inverted) and by the nature of the internal part loops, i.e., positive or negative angle-of-attack.

Championships, U. S. National Aerobatic - The contest held annually in Denison, Texas, to determine the "U.S. [_____] Aerobatic Champion" in each category, Sportsman through Unlimited (power only). The Unlimited winner will be designated "U.S. National Aerobatic Champion".

Championships, U.S. National Glider - The contest held annually to determine the "U.S. [_____] Glider Aerobatic Champion" in each glider category, i.e., Sportsman, Intermediate, and Unlimited. The Unlimited winner in Gliders will also be designated "U.S. National Glider Aerobatic Champion". This contest may be held as a stand-alone event or in conjunction with one of IAC's other major championships, at the discretion of the Board of Directors.

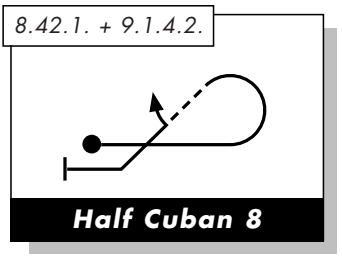
CIVA - The FAI International Aerobatics Commission or, in French, the Commission Internationale de Voltige Aerienne. One of several FAI "air sports commissions", its responsibility is to govern the sport of aerobatic competition worldwide. CIVA activities center around International, Continental, and World Aerobatic Championships and do not extend to U.S. national competitions.

Complementary Figure - Any rotational element from Family 9 of the *FAI Aerobatic Catalogue.* Complementary figures must always be combined with a basic figure, i.e., they never stand alone.

Contest, Sanctioned - An aerobatic competition sanctioned by IAC, insured through IAC's approved insurance agent, and conducted in accordance with current IAC rules.

Crabbing - The action of a pilot to displace the aircraft heading slightly, while maintaining wings-level flight, to either counteract the affect of wind or to move laterally through the Aerobatic Box. If detected by the judge, a penalty of 1 point for each 5 degrees of crab will be assessed. See also, "Heading" and (*Fig 8.3.2).*

Cuban 8, Half - Common name given to a Family 8 figure beginning with a 5/8th loop followed by a one-half slow roll on the 45° line. See also, "Reverse Cuban 8".



Deadline - The line established by the FAA in the contest waiver to separate the public from the flight performances.

Direction of Flight - Set by the Chief Judge based on the prevalent winds, this is the "left" or "right" direction relative to the judges which defines which Form, B or C, will be definitive. Compulsory programs always begin with the first figure flown in the direction of flight. Free and Unknown programs can be started in any direction on either the X-axis or Y-axis, as noted on the respective Forms B and C.

EAA - The Experimental Aircraft Association, Inc., the parent organization of the IAC.

FAI - The Fédération Aéronautique Internationale. Based in Lausanne, Switzerland, this organization was founded in 1905 and it has about 100 member nations. The FAI is responsible for all aviation sporting disciplines throughout the world.

Family - A group of related figures from the *FAI Aerobatic Catalogue.* There are eight Families (1 - 8, with Family 4 currently not used) of basic figures and one Family (9) of complementary figures.

Figure - Each individual component of an aerobatic sequence, which may contain one or more maneuvers in combination. Figures always start and end with a horizontal line, either upright or inverted. (A Judge assigns a grade to the entire figure, not the individual maneuvers in the combination.)

Flick Roll - Another name for a snap roll. This term is primarily used in CIVA competition.

Flight path - The trajectory of the airplane's center of gravity when compared with the true horizon.

Flimsies - Drawings showing the continuity of figures in an aerobatic sequence, i.e., Forms B and C.

Form A - The contestant's scoresheet which includes for each figure: the *FAI Aerobatic Catalogue* symbol, number, and K- Factor for each maneuver comprising the figure, as well as the total K-Factor for each figure and the total K-Factor for the entire sequence.

Form B - The sequence drawing showing consecutive figures as flown with the official wind direction from the Judges' right to left.

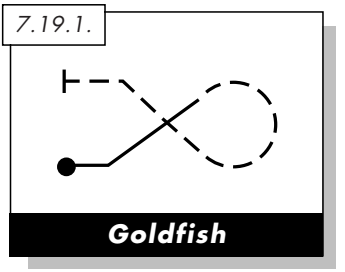
Form C - The sequence drawing showing consecutive figures as flown with the official wind direction from the Judges' left to right.

Four Minute Free Program, Unlimited Power - A separate, optional trophy event for Unlimited pilots. The selection of figures for this program need not be made with reference to the *FAI Aerobatic Catalogue.* Other than remaining in the Aerobatic Box and altitude limits, most other contest restrictions are removed as well. A totally distinct set of grading criteria is used to evaluate these flights.

Free Program - A sequence of figures designed by the pilot using rules set forth in the *IAC Official Contest Rules.* Free programs are optional for the powered Sportsman category and mandatory for Intermediate through Unlimited. Free programs may be reused year-to-year subject to any applicable rule changes.

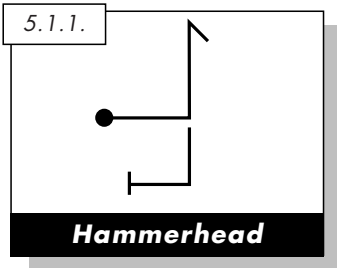
GAF - Abbreviated way of referring to the *FAI Catalogue of Glider Aerobatic Figures*. The GAF is a subset of the full FAI Catalogue and lists only figures which may be flown by gliders in aerobatic competition.

Goldfish - Common name given to any of the figures from sub-families 7.19 to 7.22.



Grade - The number assigned by each Judge to each figure in a sequence indicating their judgment of the quality of the figure as flown. Grades may range from 10 (perfect) to zero in one-half point increments.

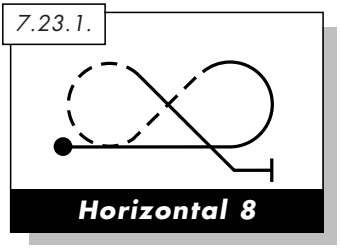
Hammerhead - Any of the Family 5 figures. Also called a "stall turn".



Heading - Compass direction in which an airplane is pointed. In a competition, the aircraft's heading must always be parallel to either the X or Y axes to avoid point deductions.

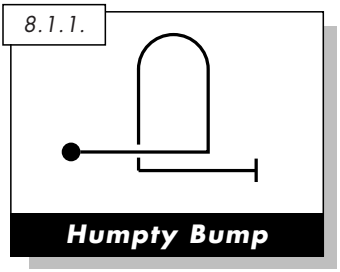
Hesitation Roll - A subtype of aileron roll where rotation is momentarily stopped a set number of times during the roll. Hesitation rolls may be broken into 2, [3 (glider only)], 4, and 8 equal segments and may have a total rotation of 90 degrees to 720 degrees. Also referred to as "point rolls".

Horizontal 8 - Common name given to any of the figures from sub-families 7.23. to 7.30. Also called a "lay-down eight."

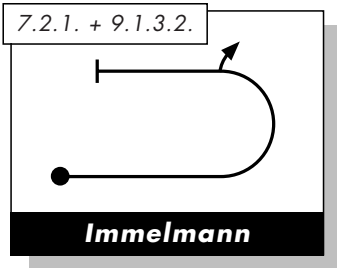


Horizontal Line - The flight path of an aircraft when flown on a constant heading at a constant altitude. In the case of gliders, the horizontal line will not always be of constant altitude.

Humpty Bump - Common name given to any of the figures from sub-families 8.1. to 8.28. Also simply called a "humpty".



IAC - The International Aerobatic Club, Inc., a division of the National Aeronautic Association and the Experimental Aircraft Association. The sole organization responsible for the administration, management, and promotion of the sport of aerobatics in the United States under the auspices of the Fédération Aéronautique Internationale (FAI).



Immelmann - Common name given to a Family 7 figure consisting of an inside half-loop up followed immediately by a half slow roll to upright.

Inside - Same as "positive". Used primarily to describe positive looping figures and snap rolls.

Intermediate - The third of the five categories of aerobatic competition. Intermediate competitors fly three programs: a Known Compulsory program which changes each year, a Free Program of their own design, and an Unknown Program.

Interruption, Program - An interruption in the normal, unbroken sequence of flying each figure of a contest flight. A program interruption may be intentionally taken by a pilot (e.g., to gain altitude) or unintentionally incurred through pilot error (e.g., turning the wrong way on the x-axis). In all cases, a program interruption will result in penalty points being assessed against the pilot's total score for the flight.

Judges, IAC Approved List of - A list of current and approved Judges maintained by IAC. Only Judges from this list, or another organization approved by the IAC, can be used at IAC sanctioned competitions.

Judges, National - The highest level of IAC Judges. National judges may judge at any IAC contest including the U.S. National Aerobatic Championships.

Judges, Regional - The first level of IAC Judges. Regional judges may judge at any IAC contest except the U.S. National Aerobatic Championships.

K-Factor - The difficulty factor for each maneuver taken from the *FAI Aerobatic Catalogue,* which, when added together, becomes the "K" for a figure. The higher the K-Factor, the more difficult the maneuver.

Known Compulsory Program - A different sequence of figures for each category, Sportsman through Unlimited, published at the beginning of each contest year. The first Known Compulsory is a qualification flight. *(See 5.2)*

Lay-down 8 - Same as "Horizontal 8".

Maneuver - Any one of the basic aerobatic movements which may be combined to make a figure (e.g., a half-loop plus a half slow roll are two maneuvers combined to make the Immelmann figure).

Multiple Rolls - Any linked roll of more than 360° rotation or any two unlinked rolls of any amount of rotation in the same or opposite direction.

NAA - The National Aeronautic Association, based in Washington, D. C., is the representative of the FAI in the United States. It, in turn, delegates specific powers to various sport aviation disciplines in the USA. Authority for aerobatics is delegated to the IAC.

Negative - A condition of flight when the wing's angle-of-attack is less than zero. During negative flight the pilot will experience the force of gravity acting opposite of normal, i.e., in a direction from foot to head. Negative flight does not imply any particular attitude of the aircraft relative to the ground and is depicted in Aresti diagrams with a dashed line.

Negative Snap Roll - Also called an "outside snap", this figure incurs negative G-forces and the wing is stalled negatively. *(Fig 8.5.36)*

Optional Break - A preplanned interruption to a sequence. The Contest Jury, in advance of a flight, allows the optional break when less than optimum ceilings exist. It is designed to allow the pilot to interrupt the sequence without penalty, and regain altitude before continuing the sequence. The location of the optional break within the sequence is identified by each pilot on Forms B and C of their Free program and by the Contest Jury for Knowns and Unknowns.

Outside - Same as "negative". Used primarily to describe negative looping figures and snap rolls.

Performance Zone - The airspace in which a pilot presents an Unlimited 4-Minute Free program to the judges. The term is used because the normal aerobatic box boundaries and X - Y axes do not exist for the Unlimited 4-Minute Free.

Point Roll - See "Hesitation Roll".

Presentation Grade - A grade (0-10) given by each judge to indicate how well the pilot presented the sequence within the aerobatic box.

Positive - A condition of flight when the wing's angle-of-attack is more than zero. During positive flight, the pilot will experience the force of gravity acting normally, i.e., in a direction from head to foot. Positive flight does not imply any particular attitude of the aircraft relative to the ground and is depicted in Aresti diagrams with a solid line.

Positive Snap Roll - Also called an "inside snap", this figure incurs positive G-forces and the wing is stalled positively. *(fig 8.5.35)*

Primary - Both the entry level category of aerobatic competition and the category of choice for certain aircraft types which could not otherwise compete at higher levels. The Primary category sequence does not change year to year. There is no Primary category in Glider competition.

Quarter-Clover - A figure (Family 0.1 and 0.2) which may be flown in the Glider Sportsman and Glider Intermediate categories only. *(See 5.1.10)*

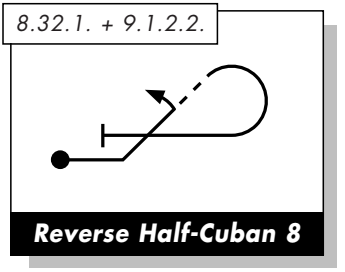
Relative - As used in reference to judging, any person connected to a competitor by family or marriage. Unless a scarcity

of judges demands otherwise, "relative" should also include "significant others."

Repetition - The use of the identical catalogue number from the *FAI Aerobatic Catalogue* more than once within the same Free sequence.

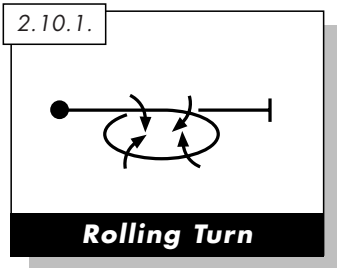
R & C Exam - An abbreviation for the IAC "Judge's Revalidation and Currency Examination" which is used to bring Regional and National Judges up-to-date on changes to the rules. Each judge must pass the R & C Exam annually to be included on the "Approved Judges List" for that contest year.

Reverse Cuban 8, Half - A "Half Cuban 8" flown with the 45° line first followed by the 5/8th loop.



Rolling Turn - Any of the figures from sub-families 2.3. to 2.20. which combine aileron rolls with turning flight. Also called a "Rolling Circle," primarily in CIVA competitions.

Safty Check Maneuver - A two-point roll, with a longer than normal hesitation between points, performed before entering the aerobatic box to check the integrity of seat belts and inverted fuel and oil systems. The Chief Judge will state the allowed location of the Safety Check Maneuver (usually on base leg entering the box) at the pilots' briefing.



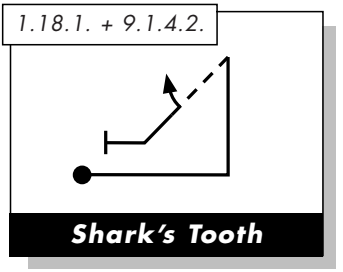
Score, Raw - The result of multiplying a Judge's grade times the "K" of the figure.

Score, Total Raw - The addition of all figure raw scores plus presentation from the Form A.

Sequence - A grouping of aerobatic figures which constitutes one flight program, e.g., the Free Program.

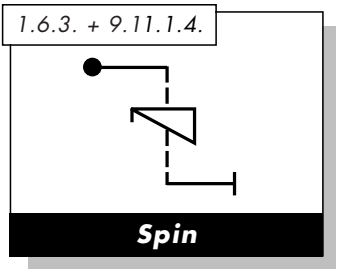
Shark's Tooth - Common name for any of the figures from sub-families 1.12. to 1.19.

Slow Roll - A subtype of aileron roll characterized by continuous rotation ranging from 90 degrees to 720 degrees.



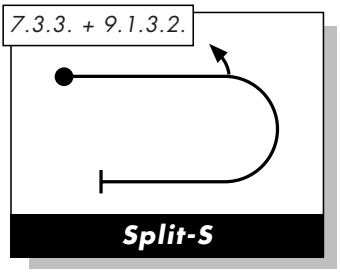
"Slow" does not imply a particular rate of rotation which may, in fact, be very fast.

Snap Roll - One of two types of rolls as defined by the *FAI Aerobatic Catalogue.* Snap rolls may either be "positive" or "negative". Also called "Flick Rolls".



Spin - Any of the spin elements from Family 9.11 or 9.12 combined with any of the basic figures from Family 1 or Family 8 as marked in the *FAI Aerobatic Catalogue* with the optional spin symbol.

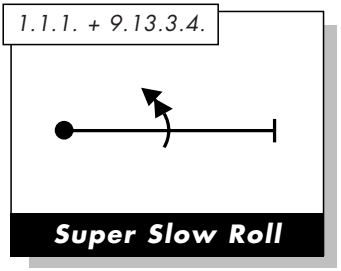
Split-S - Common name given to a Family 7 figure consisting of a half slow roll to inverted followed immediately by an inside half-loop down.



Sportsman - The second of the five categories of aerobatic competition. Sportsman competitors fly two programs: a Known Compulsory program which changes each year and, optionally, may either repeat the Known program or fly a Free program of their own design. In Glider competition, two different Known Compulsory programs are flown.

Stall Turn - Another name for a hammerhead, primarily used in CIVA competition.

Super Slow Roll - A glider-only slow roll which must have at least a 10 second per 360 degree rate of rotation.



Supplementary Rules - These rules are published by Contest Directors to augment the "IAC Official Contest Rules". They describe local conditions and problems and assist in applying IAC rules to a specific contest. They cannot contradict IAC rules except as approved by the IAC President under "waivers".

Tailslide - Any of the Family 6 figures. (*Fig 8.5.13 + 8.5.14)*

TBLP - An acronym for Tarasov-Bauer-Long-Penteado, the four developers of the statistical averaging scoring system used in final score computing. TBLP helps to remove any inconsistency or bias from the final scores.

Track - The same as flight path.

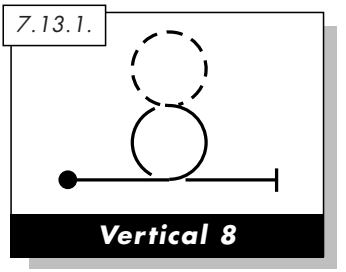
Unknown Program - A sequence of figures provided by IAC Headquarters to the Contest Director for the Intermediate through Unlimited categories. Unknown programs may not be practiced by the competitors prior to being flown and must be disseminated at least 18 hours before their flight.

Unlimited - The highest level of the five categories of aerobatic competition. Unlimited competitors fly three programs: a Known Compulsory program which changes each year, a Free Program of their own design, and an Unknown Program. In Glider competition, a second (different) Known Program is added for a total of four programs.

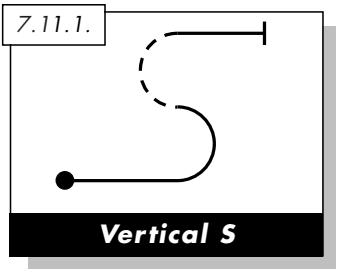
USAF - The United States Aerobatic Foundation. The mission of the United States Aerobatic Foundation is to provide optimum levels of funding, organization and administration to develop, support and sustain highly competitive U.S. Aerobatic Teams for World Competitions.

Vertical Attitude - The zero lift axis which is the attitude causing the path of an airplane's center of gravity to travel exactly 90° up or down relative to the true horizon in zero wind.

Vertical 8 - Common name given to any of the figures from sub-families 7.13. to 7.18.



Vertical S - Common name given to any of the figures from sub-families 7.11. to 7.12.



Waiver, Airspace - A document issued by the Federal Aviation Administration (FAA) that waives certain Federal Aviation Regulations in order to conduct a competition. These are applied for through local FAA Flight Standards District Offices (FSDO's) on FAA Form 7711-2.

Waiver, Rules - A letter from the IAC President relieving the contest of observing certain IAC rules. Such a waiver should be applied for in writing at the time of application for sanction. Waivers are not granted if safety is compromised but only to solve local problems that are not safety-related.

Warm-up Flight - A competition sequence (Known, Free, or Unknown, as appropriate) flown by a non-competing pilot to allow the judges to "warm-up" their evaluation skills before the first "real" competitor flies. Normally, warm-up flights are only flown at Championship contests.

Wedge - Same as "Shark's Tooth".

Wingover - A pseudo-aresti figure (Family 0.0) which may be flown in the glider Sportsman, and glider Intermediate categories only. *(Fig 8.5.1)*

Working and Non-Working Hours - These are hours established by the Contest Director in the supplementary rules that officially prescribe the times of day the contest is in operation. The purpose of these hours is to "stop the clock" on the protest period after which this clock may resume the next day.

X Axis - The central axis of the Aerobatic Box oriented perpendicular to the judges' line-of-sight. The direction of figures flown parallel to the X axis is mandated by the Forms B and C. *(Fig 4.11.1)*

Y Axis - The central axis of the Aerobatic Box oriented parallel to the judges' line-of-sight. The direction of figures flown parallel to the Y axis is at the pilot's option. *(Fig 4.11.1)*

Zero Lift Axis - See "Vertical Attitude".

Zeros, Soft or Mathematical - These are zeros (0's) given when deductions reflecting the imperfect execution of a figure lead to a value lower than the score of 0.5.

Zeros, Hard or Mechanical - These are zeros (0's) assessed by Judges when a pilot has clearly not performed the figure as prescribed by judging criteria. Examples include the performance of a 2-point roll instead of a 4-point, a $1\frac{1}{4}$-turn spin instead of a $1\frac{3}{4}$-turn spin, 4 rolls in a rolling circle instead of 3, and so on.

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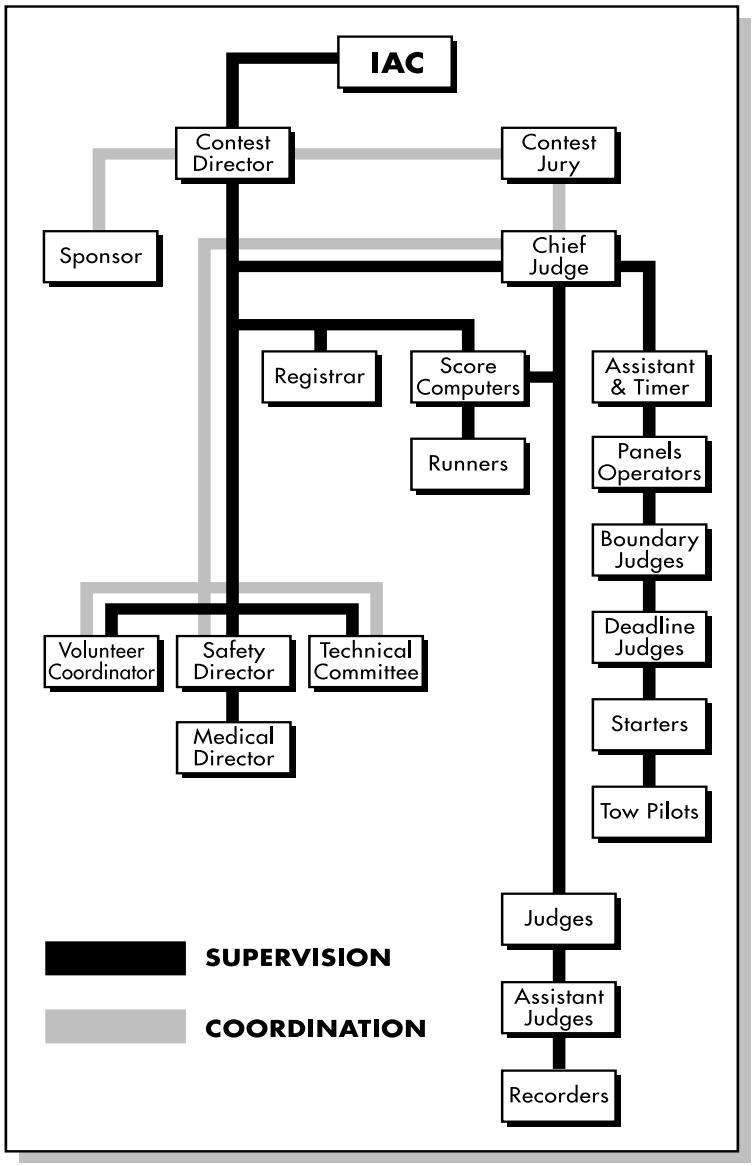
CHAPTER 1 CONTEST JOB DESCRIPTIONS

1.1 TABLE OF ORGANIZATION



1.2 *SPONSOR*

The sponsor of an aerobatic contest may be an IAC Chapter, a civic organization, a company, or an individual. The sponsor is the party responsible for application to IAC for a contest sanction and all subsequent administrative and financial matters.

1.3 *CONTEST DIRECTOR*

Safety will, at all times, be the primary consideration of the Contest Director. The Contest Director will act as the general manager of the event and will be responsible for the following:

(a) Conducting the contest in accordance with the *IAC Official Contest Rules.*

(b) Appointing contest officials.

(c) Obtaining airspace waiver.

(d) Securing insurance and notification of IAC.

(e) Obtaining an IAC sanction.

(f) Coordinating with sponsors, airport and FAA officials.

(g) Designating landing and take-off areas for competition and transient aircraft.

(h) Designating and marking of Aerobatic Box.

(i) Placing field markings.

(j) Making restrooms available.

(k) Setting up public address system.

(l) Closing the field to non-competitors as required.

(m) Receiving protests.

(n) Supervising the Scoring Director and posting of scores.

(o) Appointing the Contest Jury.

(p) Excluding any competitor for reasons of safety.

(q) Excluding any person for unsportsmanlike conduct.

(r) Presenting awards and/or prize money.

(s) Certifying scores. *(see 3.16.1)*

(t) Filing "Official Results and Final Standings" and "Judges Certification List" as required in the "Aerobatic Contest Planning Guide".

(u) Arranging for towplanes and towpilots.

1.4 *CONTEST JURY*

The Contest Jury will consist of a chairperson and four additional members appointed by the Contest Director. The Contest Director will appoint alternate jurors when required to replace a juror involved in a protest or when a juror is unable to serve for whatever reason (including a conflict of interest).

1.4.1

The IAC Board of Directors will appoint the Contest Jury for the U.S. National Aerobatic Championships. Their duties will be carried out in accordance with the "IAC Policy and Procedures Manual".

1.4.2

The Contest Jury is the arbitration body of aerobatic events and shall be responsible for:

(a) Interpreting the general rules, the judging rules and the general regulations of the contests.

(b) Resolving protests.

(c) Approving modifications to Unknown sequences for the purpose of maintaining safety. Modifications and reasons for modifications will be reported with the contest results.

(d) If any Jury member determines that the contest is being run in violation of IAC Official Contest Rules, he/she will contact the category Chief Judge and advise him/her of the problem. If the problem is not corrected, the Jury member will consult with the remainder of the Jury. The Jury is authorized to stop the contest until the deviation is corrected or resolved. The contest can then proceed with the permission of the Contest Jury.

1.4.3

Decisions made by the Contest Jury are final and not subject to change or further protest.

1.4.4

The Contest Jury is not authorized to change any rule set forth in this manual.

1.4.5

Jury members are to keep the proceedings, discussions, and voting of the Contest Jury strictly confidential.

1.5 *CHIEF JUDGE*

Safety will be the primary consideration of the Chief Judge at all times. There will be a Chief Judge for each category. A Chief Judge may serve in that capacity in more than one category. The Chief Judge will be responsible for the following:

(a) Calling Judges' conferences when necessary.

(b) Supervising Judges, Assistant Judges, Recorders, Boundary Judges, Timers, Panel Flippers, Starter, and Deadline Judges.

(c) If necessary, performing the duties of a regular Judge except at the U.S. National Aerobatic Championships.

(d) Appointing substitutes, with the concurrence of the Contest Director, for any officials who are unable to perform their duties.

(e) Approving substitution of aircraft.

(f) Setting the "Official Wind Direction" which determines whether Form B or C will be used for flight programs.

(g) Authorizing changes in the pilot order of flight.

(h) Disqualifying any competitor for reasons of safety with the concurrence of a majority of Judges working that category.

(i) Excluding any person for unsportsmanlike conduct.

(j) Conducting the pilot briefing, or designating an alternate.

(k) Conducting briefings for all Judges, Assistants, Recorders, Boundary and Deadline Judges, and Panel Flippers.

(l) Serving as a member of the Technical Committee.

(m) Debriefing all Judges and Assistants.

(n) Removing any Judge for reasons of incompetency.

(o) Certifying Achievement Award applications.

(p) Reviewing each Free Program form to insure that all forms (A, B, and C) bear the name, date, and signature of a current Judge as having been checked for legality. This check does not have to have been within the current contest year if there were no rules changes that would affect the program's legality.

(q) Certifying of scores. *(see 3.16.1)*

(r) Providing clearance before any competition aircraft enters the Aerobatic Box.

1.6 *SAFETY DIRECTOR*

The Safety Director will report directly to the Contest Director and is responsible for the following:

(a) Flight safety - assisted by the Chief Judge and Technical Committee.

(b) Notification of Flight Service concerning NOTAMS.

(c) Ground safety - assisted by the Starter.

(1) Flight Line control.

(2) Crowd control.

(3) Arranging for parking of competition and transient aircraft.

(d) Review of safety items at contest briefings.

1.7 *MEDICAL DIRECTOR*

The Medical Director will work in conjunction with the Safety Director concerning:

(a) Acquisition and placement of emergency equipment.

(b) Securing of medical personnel as required by the FAA waiver, i.e.: physician, paramedic, or emergency medical technicians.

(c) Provisions for access and exit of emergency vehicles.

1.8 *VOLUNTEER COORDINATOR*

A Volunteer Coordinator may be appointed at the discretion of the Contest Director and will assist in the smooth function of the contest by obtaining volunteers for all contest positions. This is always done under the direction and with the consent of the Contest Director. The goal of the Volunteer Coordinator is to have obtained consent of volunteers to fill each and every contest position prior to the first pilot briefing. The Volunteer Coordinator will:

(a) Maintain a list of all contest volunteer positions.

(b) Obtain commitments from volunteers to serve in all positions under the guidance of the Contest Director.

(c) Maintain liaison at all times with the Contest Director and Chief Judge.

(d) At registration, finalize all positions and staff the unfilled positions.

(e) Prepare an amended list of volunteers for the Contest Director, Chief Judges, and other officials as necessary.

(f) Coordinate with Judges, Assistants, Recorders, Boundary Judges, Deadline Judges and others in preparation for each category change to minimize time loss during changes from one category to the next.

1.9 *TECHNICAL COMMITTEE*

Each contest will have a Technical Committee for the primary purpose of assisting pilots in discovering potential safety hazards in

their aircraft.

The Technical Committee will verify competitor possession of required certificates and aircraft documents.

1.9.2

The Technical Committee will consist of the Contest Director, a Chief Judge and the Chief Technical Monitor who is appointed by the Contest Director. Additional Technical Committee members may be appointed by the Contest Director or Chief Technical Monitor as needed.

1.9.3

In the event of an interruption of a flight due to an alleged mechanical problem, the Technical Committee will investigate the malfunction and determine whether or not it was a failure beyond the control of the competitor *(See 4.20).*

1.10 *REGISTRAR*

The Registrar shall be responsible for:

(a) Ensuring each competitor completes all current IAC standard entry forms before accepting them as official entrants.

(b) Accepting published entry fees.

(c) Determining that each competitor is a current member in good standing of IAC or other approved aerobatic organization.

(d) Accepting membership fees for IAC.

(e) Determining that each Unlimited competitor has a valid FAI Sporting License.

(f) Obtaining the signature of all competitors on the waiver.

(g) Drawing for order of flight.

(h) Issuing as many copies of the order of flight to contest officials as are required.

(i) Providing Chief Judges with appropriate paperwork.

(j) Such other duties as requested by Contest Director or the Chief Judge.

1.11 *SCORING DIRECTOR*

The Scoring Director shall be responsible to the Chief Judge and the Contest Director for the prompt and accurate computations of all scores of competition flights.

1.12 *STARTER*

Safety will be the primary consideration of the Starter at all times. The Starter is responsible for final briefings, checking each competitor to determine that all safety belts and parachutes are properly fastened, reviewing safety items such as direction of flight and local traffic procedures.

1.12.1

The Starter is responsible to the Chief Judge for the timely release of each competitor in order to take off at intervals set by the Chief Judge.

1.12.2

In the event of an aircraft malfunction prior to take off, the Starter will advise the Chief Judge of the change in the order of flight and will launch the next competitor.

1.12.3

In the event of a mechanical abort after airborne, the Starter will meet the returning aircraft and call the Chief Technical Monitor or alternate. The Starter will advise the competitor to stay with the aircraft until the Technical Committee has investigated the malfunction.

1.12.4

In the event of a weather related abort, the Starter will meet returning aircraft and obtain the competitor's observations. The Starter will relay these to the Chief Judge, who will subsequently advise the Starter of the Judges' decision on a repeated flight.

1.13 *JUDGES*

Judges will be selected from the current IAC "Approved List of Judges", a copy of which is sent to each Contest Director. Judges whose names do not appear on this list can be utilized if their credentials are verified by the IAC Judges Certification Chairperson after this list was printed. Judges are responsible for all aspects of grading the figures and the presentation score of each contest flight. Judges are responsible for the performance of the Assistant Judges and Recorders assigned to them.

1.13.1

Judges are required to attend the Judges' briefing at the beginning and debriefing at the end of each category of flights.

1.13.2

A competitor may serve as a Judge only if the competitor can attend every Judges' briefing and debriefing session for the category he or she wishes to judge.

1.14 *ASSISTANT JUDGES*

One Assistant Judge is assigned to each Judge. The Assistant is responsible for helping the Judge determine the proper sequence of figures, direction of flight and other duties deemed necessary by the Judge.

1.14.1

One or more Assistant Judges may be assigned to the Chief Judge for the purpose of assuring the correct "Chief Judge's Penalty Form & Final Computation Worksheet" and appropriate Forms A, B & C are ready and in proper order. The Assistants will fill these forms out under the direction of the Chief Judge.

1.14.2

Assistants to the Chief Judge shall have additional responsibilities such as timing of all Unlimited Power 4-Minute Free flights, timing of super slow rolls in Gliders, traffic safety, radio communications, and such other duties required by the Chief Judge.

1.15 *RECORDERS*

One Recorder is assigned to each Judge to record all grades and such comments as time permits on the competitor's Form A (score-sheet). The Recorder maintains possession of the clipboard with Forms A, B & C in the proper order of flight.

1.15.1

The Recorder hands the next pilot's Form B or C in Free programs to the Judge and Assistant Judge. After the flight is complete, the Recorder ensures the Judge gives a Presentation score and confirms that every figure has a grade. The Recorder passes Form A to the Judge for a review of the comments and grades before it is released to the runner.

1.16 *BOUNDARY AND DEADLINE JUDGES*

Boundary and Deadline Judges are assigned and located to record and report each infringement of the Aerobatic Box and the FAA

Deadline. These Judges are required at each IAC contest unless IAC Headquarters waives their use under a Supplementary Rule request approval *(See 3.5)*. In such cases, protests regarding boundary or deadline penalties will not be accepted. Boundary and Deadline Judges may be called upon to verify their records of infringement in the event a protest is filed.

1.16.1

Boundary Judges will be briefed by the Chief Judge or his designee to report and record each excursion of the aircraft completely outside the Aerobatic Box buffer zone *(See 4.11)*. A visual sighting device will be used by Boundary Judges to determine each aircraft excursion from and return back into the Aerobatic Box.

1.16.2

The Boundary Judge will record each figure flown outside the Aerobatic Box during the excursion. Radio reports of each boundary crossing will be given to the Chief Judge as they occur. Boundary infringement records will be turned into the Chief Judge or designee when the flight program is complete.

1.16.3

Deadline Judges will be briefed by the Chief Judge or designee to monitor each excursion of the aircraft completely across the deadline. Radio reports will be given as these excursions occur as well as the return back across the deadline.

1.17 *TOWPILOT DUTIES*

The towpilots will be responsible for the safe tow of competition gliders into the Aerobatic Box and signaling the gliders on tow when they are cleared to release and perform, or release and land. These pilots will also make observations of turbulence, precipitation, visibility, and ceilings.

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CHAPTER 2 *QUALIFICATIONS*

2.1 *COMPETITOR QUALIFICATIONS*

Each competitor must possess at least a Recreational Pilot certificate with rating appropriate for the class of aircraft to be flown (power or glider) and a current medical certificate to be registered in the contest. These certificates must be shown to contest officials on request.

Those glider pilots not possessing a valid Medical Certificate from the FAA or its national counterpart must attest to freedom from uncorrected inner ear, nervous, or cardiovascular disorders which render the pilot at risk in flying glider aerobatics and must be willing to submit to examination by the Medical Director.

Competitors must be current members of the IAC or an organization recognized by IAC for aerobatic competitions. Unlimited competitors must possess a current FAI Sporting License.

2.2 *SAFETY PILOTS*

The competitor will be the sole occupant of the aircraft during competition flights except in Primary through Intermediate categories wherein "safety pilots" are authorized as passengers. The competitor has the sole responsibility for determining the qualifications of an individual to act as a Safety Pilot in the competitor's make and model aircraft.

Intermediate competitors who are also acting as Safety Pilot for another Intermediate competitor must have already flown the Unknown program before acting as a Safety Pilot in the Intermediate Unknown Program.

2.3 *AIRCRAFT AND EQUIPMENT ENTRANCE REQUIREMENTS*

Compliance with the following aircraft and equipment documentation and safety standards is required for participation in an IAC contest and shall be verified by the Technical Committee. Copies are allowed for the purposes of registration only. However, this does not relieve the competitor from carrying documents required by governing agencies. Technical Inspectors will use the IAC Technical Inspection Checklist when performing technical inspections for contest registration. The items listed on the checklist are those required for admittance. The IAC Technical Inspection Checklist form is provided as part of the official IAC contest package.

(a) Airworthiness Certificate.
(b) Aircraft Registration Certificate.
(c) Aircraft operating limitations.
(d) Current aircraft weight and balance.

(e) Copies of entries from Aircraft and Engine Log Books, appropriate to the aircraft's Airworthiness Certificate.

(f) Certificate of Insurance verifying coverage of $1,000,000 property damage and $100,000 single limit bodily injury minimum.

(g) Aircraft must not have obvious physical damage or potential structural problems as would be indicated by wrinkles in metal or fabric coverings or loose structural members.

(h) Complete freedom of movement of the controls is required.

(i) Aircraft must be free of foreign and loose objects.

(j) On cabin-type aircraft, the cabin door release mechanism must be operative and free of corrosion.

(k) Dual seat belts with separate attach points and a shoulder harness are mandatory for Advanced and Unlimited categories. The same equipment is strongly recommended for Primary, Sportsman, and Intermediate categories but is not mandatory except when IAC Technical Monitors deem them necessary for the sequence being flown in these categories.

(l) Dual seat belts and a shoulder harness are mandatory only for the Glider Unlimited category but are strongly recommended for Glider Sportsman and Glider Intermediate categories.

(m) Hazardous conditions in the engine compartment such as cracked exhaust, fuel leaks, or excessive oil leaks which can be observed through cowl openings and service doors will be brought to the pilot's attention and, if uncorrected, are grounds to deny registration of the aircraft.

(n) Propeller shall not have any apparent physical damage.

(o) Parachute will be in good general condition and will be currently packed in accordance with FAA regulations.

(p) Aircraft Structural Standards - Experimental (Amateur-built and Exhibition): The IAC cannot and does not purport or attempt to regulate or require aircraft structural standards for participation in the sport of aerobatics. Each competitor is solely responsible for insuring that his or her aircraft is structurally and mechanically safe and capable of performing whatever maneuver the competitor intends to fly. The Technical Committee shall promote conformity to FAA standards of construction and maintenance.

(q) Aircraft other than Experimental (Acrobatic): Structural standards for other than experimental aircraft are the responsibility of the controlling government agency. These aircraft must comply with the IAC entrance requirements. Aircraft will not be permitted to fly any maneuvers restricted by the licensing agency.

(r) A radio capable of transmitting and receiving common VHF frequencies.

(s) Motorgliders are permitted to compete in Glider competition, provided they are towed into the box and the engine is not used.

(t) The use of a helmet is strongly recommended for all competitors and safety pilots, but is not mandatory.

(u) The use of a flight suit and gloves composed of at least a single layer of fire-retardant fabric is strongly recommended for all competitors and safety pilots, but is not mandatory.

2.4 *CHIEF TECHNICAL MONITOR*

If possible, the Chief Technical Monitor will hold an Airframe and Powerplant Mechanic's license and be familiar with the special operational demands of aerobatic aircraft. If an A & P is not available, the Contest Director may appoint the most qualified person available as Chief Technical Monitor.

2.5 *CHIEF JUDGES*

Chief Judges are appointed by the Contest Director.

(a) Chief Judges must be current members of the IAC or an organization recognized by the IAC for aerobatic competition.

(b) Whenever available, Chief Judges will be of National rating; however, in the absence of a National Judge, the Contest Director will appoint the most experienced Regional Judge as Chief Judge.

(c) Chief Judges will be selected from the current "IAC Approved List of Judges".

2.6 *JUDGES*

An approved list of current Judges is maintained by IAC Headquarters. This list includes three classifications: Regional Judges, National Judges, and those eligible to act as a Chief Judge but not current as a grading Judge. Judges must be current members of the IAC or an organization recognized by IAC. Relatives of competitors may not judge in categories wherein their relatives are competing.

2.6.1 *New Applicants For Regional Judge May Be Certified and Added To The List After:*

(a) Attending an approved IAC "Introduction to Aerobatic Judging" judge's school.

(b) Passing the current IAC Regional Judge Exam with a minimum score of 80% within the previous 18-month period prior to application for a Regional Judge rating.

(c) Performing the duties of Assistant to a grading Judge (recording does not suffice) in no less than 40 flights, of which 10 are Advanced or Unlimited, within the previous 18-month period prior to application for a Regional Judge rating.

(d) Filling out a current Judge's Application Form.

(e) Following successful completion of the approved judge's school and passing the Regional Judge Exam with a minimum score of 80%, requesting a current National Judge to select another current Judge to jointly administer an oral/written Practical Exam, to be accomplished in person at a time and place mutually agreeable between the applicant and examining Judges. The applicant must present their signed IAC Judge Log or a copy of the official IAC judging records to verify completion of the judge's assistant flights per paragraph (c), above. The applicant must also present a copy of their graded Regional Judge Exam answer sheet along with the question booklet to the examining Judges, who will, as part of this Practical Exam, review with the applicant all incorrect responses.

Upon satisfactory completion of the Practical Exam, both examining Judges will print and sign their names on the application and include their IAC number and the date the Practical Exam was completed.

(f) Forwarding the signed application to the IAC Judges Certification Chairperson who will verify that official IAC records agree with the application. The IAC Judges Certification Chairperson will certify and forward the applicant's name to IAC Headquarters for addition to the current "IAC Approved List of Judges". IAC Headquarters will also issue a Regional Judge patch.

2.6.2 *New Applications For National Judge May Be Certified After:*

(a) Serving as a Regional Judge in at least three (3) contests while grading no less than eighty (80) flights of which 25 are Advanced or Unlimited, and serving as the Assistant to a Chief Judge for a minimum of ten (10) flights, all within the previous thirty (30) months preceding the date the application is received.

(b) Passing the National Judge Exam with a minimum score of 80%. The applicant may obtain this test from the Judges Certification Chairperson. After completion, the applicant must submit the answer sheet for grading to the address included with the test

material. The Judges Certification Chairperson will return the answer sheet to the applicant with any missed questions and the final score noted.

(c) Attending a Judge's Recurrency or Advanced Judging Criteria Seminar within 18 months preceding the date the application is received.

(d) Filling out the current Judge's Application Form.

(e) Following successful completion of the approved judge's seminar and passing the National Judge Exam with a minimum score of 80%, requesting a current National Judge to select another current National Judge to jointly administer an oral/written Practical Exam, to be accomplished in person at a time and place mutually agreeable between the applicant and examining Judges. The applicant must present a copy of the official IAC judging records to verify completion of the required number of flights judged within the allotted time period, per paragraph (a), above. The applicant must also present a copy of their graded National Judge Exam answer sheet along with the question booklet to the examining Judges, who will, as part of this Practical Exam, review with the applicant all incorrect responses.

Upon satisfactory completion of the Practical Exam, both examining Judges will print and sign their names on the application and include their IAC numbers and the date the Practical Exam was completed.

(f) Forwarding the signed application to the IAC Judges Certification Chairperson, who will verify official IAC records agree with the application. The IAC Judges Certification Chairperson will certify and forward the applicant's name to IAC Headquarters for addition to the current "IAC Approved List of Judges". IAC Headquarters will also issue a National Judge patch and a copy of the "Guidelines for Chief Judges" pamphlet.

2.6.3 *Currency Requirements For Regional and National Judges:*

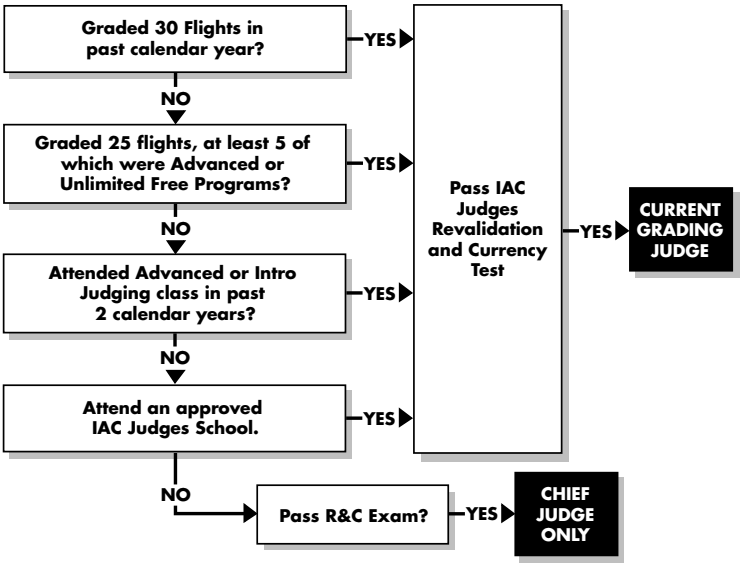
(a) In order to remain on the "IAC Approved List of Judges", each Judge must pass the current *IAC Judges Revalidation and Currency Examination* and have been a grading Judge for thirty (30) flights within the previous calendar year in IAC sanctioned contests. Equally acceptable will be judging twenty-five (25) flights provided at least 5 flights were Advanced or Unlimited Free Programs.

(b) If the Judge did not serve as a grading Judge for thirty (30) flights (or alternative of 25 per 2.6.3(a)) within the previous calendar year but has attended an Advanced Judging Criteria Seminar or the recurrency portion of an Introduction to Aerobatic Judging class in the past two (2) calendar years, currency may be retained by passing the current *IAC Judges Revalidation and Currency Examination.*

(c) If the Judge did not serve as a grading Judge for thirty (30) flights (or alternative of 25 per 2.6.3(a)) within the previous calendar year and has not attended an Advanced Judging Criteria Seminar or the recurrency portion of an Introduction to Aerobatic Judging class in the past two (2) calendar years, the Judge may become current by attending an approved IAC Judges School and passing the current *IAC Judges Revalidation and Currency Examination.*

(d) A judge who does not meet the experience requirements of paragraphs (a), (b), or (c), must still pass the current *IAC Judges Revalidation and Currency Examination* to be eligible to serve as a Chief Judge Only.

Fig 2.6.1



(e) In addition, a National Judge must attend a Judge's Recurrency or Advanced Judging Criteria Seminar at least once every three (3) calendar years. If a National Judge does not meet this recurrency requirement, they will revert back to a Regional Judge until the requirements of this paragraph are met.

(f) A minimum score of 80% is required to successfully pass the current IAC Judges Revalidation and Currency Examination.

2.7 *ASSISTANT JUDGES*

Assistant Judges are not required to be chosen from the current "IAC Approved List of Judges", but must have the ability to fluently read aerobatic competition sequences, look up *FAI Aerobatic Catalogue* numbers, and follow the judge's instructions. Additionally, it is preferred that they have:

(a) Attended an approved IAC Judges School, or

(b) Completed the IAC Regional Judge Exam, or

(c) Previous competition aerobatic experience.

2.8 *RECORDERS*

Recorders are not required to be chosen from the current "IAC Approved List of Judges". Recorders must have the ability to listen for a Judge's grades and comments and enter them rapidly and clearly on the competitor's Form A as instructed by the Judge.

2.9 *BOUNDARY AND DEADLINE JUDGES*

Boundary and Deadline Judges are not required to be chosen from the current "IAC Approved List of Judges". They must have good eyesight, the ability to clearly report excursions by the aircraft from the Aerobatic Box by radio and record these excursions on boundary control sheets.

2.10 *APPROVED LIST OF JUDGES*

The IAC Board of Directors has the responsibility for establishing procedures and delegating the authority for maintaining the current "IAC Approved List of Judges".

(a) A Judge who is determined by the Board of Directors to have exercised considerable misjudgment or prejudice will receive a reprimand from the Board.

(b) In case a Judge subsequently repeats similar failures, the Board may drop the Judge's classification or remove his or her name from the "IAC Approved List of Judges".

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CHAPTER 3 *ADMINISTRATION OF THE CONTEST*

3.1 *AIRSPACE WAIVERS*

An airspace waiver must be obtained if required by government regulation for all sanctioned contests. The Contest Director will contact the controlling agency well in advance of the contest date. In the United States this agency is the local FAA Flight Standards District Office (FSDO).

3.2 *SANCTIONING BY IAC*

3.2.1

All sanctioned contests shall be conducted under the rules as set forth in this manual. Any sanction granted under these rules shall immediately and automatically terminate without notice upon the breach, by contest officials, of any of the rules set forth in this manual. The sanction shall be requested at least thirty (30) days in advance of the contest.

3.2.2

No one may use the name or logo of the IAC, EAA, NAA, or FAI, either directly or indirectly, without sanctioning. Application for sanction will be made with IAC on official forms provided by IAC Headquarters.

3.3 *CONTEST INSURANCE*

In order to be sanctioned, an aerobatic contest must be covered by an airmeet liability policy that includes the International Aerobatic Club, the Experimental Aircraft Association, and the National Aeronautic Association as named insureds. Written verification of coverage must arrive at IAC Headquarters seven (7) days prior to the event. For all information on insurance coverage, the IAC Sanctions Director should be contacted.

3.4 *NUMBER OF JUDGES*

3.4.1

The use of five (5) grading Judges is standard for each category, however, four (4) or three (3) judges per category may be used when five (5) current Judges are not available.

3.4.2

The use of more than five (5) Judges is acceptable with an odd number preferred, but not required.

3.5 *SUPPLEMENTARY RULES AND WAIVERS OF RULES*

3.5.1

The Contest Director may, within the scope of these rules and pending a check by the IAC Sanctions Director, issue supplementary rules that clarify organizational details and which deal with local conditions and problems. These supplementary rules will also establish "working" and "non-working hours". Such proposed supplementary rules must be attached to the application for sanction.

3.5.2

No waivers of established rules will be authorized under an official sanction without approval of the IAC President. Any requests for waiver of rules should be requested in writing at the time application for sanction is made.

3.5.3

Supplementary rules and approved waivers will be published and made available to competitors.

3.5.4 ***Towplanes***

The organizers must provide an adequate number of towplanes equipped with two-way radios and capable of safe towing of all gliders registered in the contest. The availability of a back-up towplane is encouraged.

3.6 *REFUSAL OF ENTRY AND LATE ARRIVALS*

3.6.1

Pilots and aircraft not meeting the requirements of 2.1 and 2.3 will be refused entry.

3.6.2

Competitors arriving late will be refused entry unless they arrive in time to complete registration, technical inspection, be briefed and on the line ready to fly before the previously registered competitors in that category have completed their Known flights.

3.6.3

The Contest Jury has the right to allow a late competitor to fly all flights if they determine that the late arrival was due to conditions outside the competitor's control. If the Jury's decision is that the competitor arrived late due to conditions within the competitor's control, the competitor will be given a zero for completed flights and will be allowed to fly the remaining flights.

3.7 *WITHDRAWAL OF ENTRY*

3.7.1

A competitor may withdraw from a contest at any time.

3.7.2

If a competitor withdraws prior to the beginning of the first competition flight in his or her category, the entry fee will be returned.

3.8 *COMPETITORS PER CATEGORY*

The minimum number of competitors to comprise a category is two. Competitors will not be allowed to enter more than one category in a contest. However, competitors may also enter a lower category for record only in order to secure an Achievement Award with "Stars", but not in competition for trophies. This does not preclude a competitor from entering a different category at another contest or from entering both a power and a glider category at the same contest.

3.9 *TROPHIES AND AWARDS*

3.9.1

Awards shall be given to category winners under the following guidelines at all sanctioned contests:

Number of Competitors	Number of Awards
2	1st & 2nd Place
3 or more	1st, 2nd & 3rd Place

3.9.2

An award also will be given to the highest placing first time Sportsman competitor.

3.9.3

Appropriate recognition of all participants is encouraged.

3.9.4

Appropriate recognition will also be given to the Contest Director, Chief Judges and all Judges.

3.10 *CHAPTER TEAM TROPHY*

Chapter Team Trophies may be awarded at all IAC sanctioned contests at the option of the Contest Director. It will be presented to the IAC Chapter whose top three members, regardless of category, achieve the highest average score. This score will be derived by using the percent of possible points achieved by these three competitors and averaging them. All flight programs flown at the completion of the contest will be counted, with the exception of the Unlimited Power 4-Minute Free. In the event of a tie, those Chapters' next highest placing competitor's scores will be used. Any perpetual trophy will be retained by the winning chapter for one year.

3.11 *PRIZE MONEY*

Prize money may be awarded at the discretion of Contest officials.

3.12 *CANCELLATION OR POSTPONEMENT OF THE CONTEST*

No contest shall be canceled or postponed unless conditions clearly exist beyond the control of the Contest Director. In such cases, all reasonable notice to known potential participants must be given.

3.13 *ENTRY FEES*

The amount of the entry fee will be determined by the Contest Director and collected by the Registrar.

3.14 *ENTRY AND OTHER FORMS*

3.14.1

By signing the "IAC Official Contest Entry Form", each entrant agrees to comply with and be bound by these rules as revised from time to time.

3.14.2

An entrant must pay the entry fee and submit completed standard IAC forms as follows:

(a) Official Contest Entry Form.

(b) As many copies of Free Program Forms A, B and C as required by the Contest Director.

3.14.3

All competitors must sign the FAA waiver thereby signifying that they understand and will comply with all of its provisions.

3.15 *PRACTICE FLYING*

Practice flights are prohibited after a time designated by the Contest Director. If not otherwise designated, the prohibition begins immediately following the initial contest briefing. In no case will practice flights be flown by a pilot in a given category, once that category has begun competition. Any such flight will result in disqualification of the competitor from the contest. This rule may be waived by the Contest Jury under special circumstances.

3.16 *OFFICIAL SCORES AND FINAL STANDINGS*

3.16.1

The Contest Director and Chief Judge shall review the computation of all scores and then certify the scores as official by affixing their signatures and the time of signing.

3.16.2

The Contest Director shall then post these scores with time of posting affixed on the sheet. The protest period begins at the time of posting and continues until two (2) hours of "working time" has elapsed.

3.16.3

The scores and standings will not be final until the two (2) hour protest period has expired.

3.16.4

Once a pilot has received scores for any contest flight, those scores must be entered into the scoring system and that pilot's scores must never be deleted from the scoring system, even in the case of a disqualification or withdrawal. Disqualification and withdrawals will be handled in accordance with 7.5.4(c) and (d), respectively.

3.17 *PROTESTS*

Competitors and Judges are eligible to file a protest using the following procedure:

3.17.1

Protests will be submitted in writing to the Contest Director, either directly or through any member of the Jury.

3.17.2

The protest will be accompanied by a fee of $25.00 per grievance which will be returned if the protest is upheld. However, Judges may file protests for any category in which they are serving as a Judge without a fee.

3.17.3

Protests cannot be filed later than two (2) hours after the occurrence, decision, or publication of results which causes the protest to be made. "Non-working hours", as defined in the supplementary rules, will not be counted. The jury can accept a protest after the protest period expires if the filer was a volunteer whose commitments preventing filing during the protest period.

3.17.4

The hearing of the protest will be conducted as follows:

(a) The hearing shall be conducted as soon as possible after the receipt of the protest.

(b) The grievant(s) is entitled to be present at the hearing and to call witnesses and present evidence. Persons not directly involved with the protest will be excluded from the hearing.

(c) The Jury Chairperson will preside over the meetings of the Contest Jury. The Chairperson will question each juror about his or her impartiality prior to the hearing and will replace any juror who has a conflict of interest. At least three (3) members of the Jury must be present to hear protests.

(d) The grievant shall be notified in writing of the Contest Jury's decision as soon as possible.

3.17.5

The decision of the Contest Jury is final and may not be protested.

3.17.6

A copy of all protests and Contest Jury decisions must be forwarded to IAC Headquarters with the Official Contest Results.

3.18 *CONTEST RECORDS*

3.18.1

The "Official Results and Final Standings" and the "Judges Certification List" will be filed by the Contest Director with the IAC Sanctions Director as required in the "Aerobatic Contest Planning Guide".

3.18.2

The Contest Director will retain all contest paperwork until Official Results and Final Standings are posted and the protest period has expired. *(See 3.17.3)* After that time, Forms A can be distributed to competitors. However, the Contest Director will retain the applications for entry into the contest for a period of one year.

3.18.3

A complete copy of all files from the IAC scoring program should be sent to the IAC Sanctions Office after the contest is finished. The media used shall be supplied by the contest organization.

3.18.4

A copy of the files from the IAC scoring program for any contest should be available to any participant or official, upon request. The media used for that copy should be supplied by the requester and has to be compatible with the computer being used by the contest administration. A fee of $25 will be charged for the copy of all data.

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CHAPTER 4 *CONTEST OPERATION PROCEDURES*

4.1 *PUBLIC ADDRESS SYSTEM*

A public address system is permitted at the contest with these restrictions:

(a) No comment shall be made on the quality of figures being performed.

(b) No derogatory remarks about competitors or officials will be allowed.

4.2 *DISQUALIFICATION OF COMPETITORS*

4.2.1

Any violation of the safety regulations currently in force and under which the contest is held will render the offending competitor subject to disqualification.

4.2.2

A competitor shall be disqualified if it is determined by the Contest Jury that the competitor has violated any of the following regulations or prohibited activities. The Contest Jury will rely and act upon the recommendations of the Contest Director, Chief Judge, Judges, Safety Officer and/or Technical Committee in these matters. To disqualify a competitor who has already flown, refer to 7.5.4(c) for the proper scoring program procedure.

(a) Unsportsmanlike conduct.

(b) Pilot briefing - no competitor may fly without a complete pilot briefing.

(c) Unauthorized practice - any flight not otherwise approved by the Contest Jury after the initial contest briefing has been completed.

(d) Radios - any use of radios for competition flight other than as briefed by the Chief Judge is prohibited.

(e) Smoke systems - the use of smoke systems during competition flight is prohibited with the exception of the Unlimited Power 4-Minute Free Program Trophy Event.

(f) Parachutes during contest flights - all competitors and safety pilots must wear a parachute that is currently certificated and packed according to FAA regulations.

(g) Mechanical condition - operation of a competition aircraft with a known mechanical defect that renders the aircraft not airworthy.

(h) Aircraft limitations - performing a maneuver prohibited by the aircraft's Pilot Operating Handbook.

(i) Fuel and oil - in accordance with the current FAA exemption issued to IAC. This does not apply to gliders.

(j) Reckless flying - any violation of traffic patterns, unscheduled aerobatic maneuvers, or operation of an aircraft in an unsafe manner or in such a manner that would create an unsafe situation or cast an image of recklessness on the IAC. The competitor shall not be allowed any subsequent flying except for the removal of his aircraft from the contest location.

(k) Alcohol - no alcoholic beverages will be permitted at the contest site during the period of practice and competition flying. Use of these beverages by persons associated with the contest in ANY capacity is strictly prohibited during this period. Violation of this rule could affect future sanction.

(l) Scuba diving - competitors shall not participate in scuba diving within a 24-hour period prior to participation in a contest.

(m) Medical condition - sudden unpredictable deterioration in physical condition which renders further aerobatic flight unsafe shall require immediate cessation of that flight. Preventable physical incapacitation shall be grounds for disqualification for that flight.

(n) Drugs - the use of drugs or alcohol in such a manner that could subject the competitor to a government violation.

(o) Unauthorized presence on the judging line, boundary judging positions or deadline judging position.

(p) Providing false information on any contest entry forms; knowingly giving materially false information on any matter to any other person; misconduct; harassment or intimidation of officials.

(q) Practicing of any Unknown figure by any participant; however, this does not preclude the flying of any normal competition sequence prior to the Unknown.

(r) Alteration of Free Program forms after a Judge's certification without obtaining recertification or forging any Judge's signature on any official forms.

(s) Entering a "hot box" is mandatory disqualification for that flight.

(t) Failure to respond to the recall signal.

(u) Ethics - bribery or attempted bribery of any contest official or another competitor or acceptance of a bribe.

4.3 *TEMPORARY COMPETITOR INCAPACITATION*

4.3.1

In the event of temporary incapacitation before the start of a flight, the pilot will notify the Starter.

4.3.2

Medical evaluation must be performed by the Medical Director before the Contest Jury will consider the possibility of a subsequent or make up flight.

4.3.3

The Jury will rely heavily upon the Medical Director's opinion, which may be supplemented by consultation with medical specialists of the Medical Director's choice.

4.3.4

The Contest Jury will have the final authority to decide whether there will be a repetition or resumption of contest flights by that competitor.

4.4 *SCHEDULE OF FLIGHT PROGRAMS*

4.4.1

The schedule will be determined and published by the Contest Director.

4.4.2

Changes to the schedule of flight programs must be approved by the Contest Jury and posted in sufficient time to notify all personnel affected by the change.

4.4.3

If the planned number of flight programs cannot be flown in the time available, the Contest Director may, with the approval of the Contest Jury, restrict the number of contest flight programs. Equal treatment to all categories is paramount.

4.5 *ORDER OF FLIGHT*

4.5.1

The order of competition flights within each category's flight programs will be determined by secret lot held by the Registrar and a competitor from that category.

4.5.2

The order chosen by lot may be modified before publication by the Registrar where conflicts arise from more than one competitor using the same aircraft, or if a competitor has accepted volunteer duties in a category prior to his/her flight that day of the contest.

4.5.3

The order of flight may be altered after the program begins by the Starter or Chief Judge if required by special circumstances.

4.6 *BRIEFING*

This briefing is mandatory for all contest officials and competitors. Notification of time and place will be given in advance.

4.6.1

The briefing will be conducted by the Chief Judge or his representative. The briefing will include in the following order:

(a) Roll call and order of flight.

(1) Pilots must answer roll call in person. Missing roll call will require a special and individual briefing following the regular briefing and will incur penalties for the flight as follows:

$50 Special Briefing Fee

(2) If the special briefing fee has not been paid by the time the competitor flies, the competitor will be assessed the following penalty points:

Primary	10 points
Sportsman	25 points
Intermediate	50 points
Advanced	75 points
Unlimited	100 points

(3) The Contest Jury has the right to waive penalties if missing roll call was not due to the competitor's negligence. This would be determined at a hearing convened for the purpose of hearing a protest over the penalties being imposed by the Chief Judge.

(b) Introduction of Judges, Starter, Contest Jury, and other contest officials.

(c) Introduction of FAA officials.

(d) Weather forecast and winds aloft.

(e) Direction of flight for Known and Unknown programs. Official wind direction for Free Programs.

(f) Description of the Aerobatic Box and FAA Deadline.

(g) Starting procedures.

(1) Taxi, take-off, and holding procedures.

(2) Traffic pattern for competitors.

(3) Aborts by competitors on the ground and in the air.

(h) Radio procedures and frequencies. If radio will be the sole means of controlling box entry, any radio failure, transmit or receive, prior to box entry requires an immediate return to landing.

(i) Recall signals. Briefing of the recall signal shall include the phrasing that will be used in the event of a recall, and the types of instruction that will be given in the event of a traffic conflict. If Hot Box panels are not in use, the location and color of the recall smoke bomb shall be briefed.

(j) Tow and release procedures from towplanes.

(k) Optional safety check maneuver.

(l) Official contest "working hours"

(m) Scheduling flying of low altitude lines and warm-up figures.

(n) Designation of warm-up pilots. Warm-up flights will be required for all categories and all flights at the U.S. Nationals, if circumstances allow.

(o) Personnel permitted on the judging line.

(p) Review of grading criteria for figures and positioning, as required.

4.7 *BRIEFING FOR BOUNDARY AND DEADLINE JUDGES*

This briefing will be conducted by the Chief Judge or his designee in sufficient time to allow these personnel to be in position when the

flight program begins. The briefing will include the duties of Boundary and Deadline Judges, radio channels and procedures, and written records.

4.8 *JUDGES' BRIEFING*

4.8.1

The Judges' briefing may be held at contest headquarters or on the judging line. This briefing is mandatory for all Judges, Assistant Judges, Recorders, and Hot Box Panel Operators.

4.8.2

It will be conducted by the Chief Judge of the category and will include:

(a) Assistant Judge duties.
(b) Recorder duties.
(c) Judge's signals when problems exist.
(d) Range of grades.
(e) Criteria for grading individual figures.
(f) Criteria for grading presentation.
(g) Low and high altitude limits and appropriate Form A comments.
(h) Zeros.
(i) Conferences.
(j) Average grade for unseen figures.
(k) Debriefing time and place.
(l) Cell phones of all judging line personnel shall be turned off or set to silent-ring.

4.9 *STARTING LINE PROCEDURES*

4.9.1

A competitor must be in or at his or her aircraft in sufficient time prior to competitive flight. This ensures that both the pilot and the Contest Starter will have adequate time to perform their pre-flight duties and the contest remains on schedule.

4.9.2

After receiving permission from the Starter, the competitor will bring the aircraft to the starting line where the Starter will check that lap belts, shoulder harness, and parachute are secure.

4.9.3

The Starter will brief the competitor as to the official direction of flight or official wind direction for Free Programs as a final reminder. Only after receiving take-off clearance from the Starter or Runway Flagman will the competitor depart for the competition area.

4.9.4

Failure of the competitor to observe proper starting procedures or to comply with the Starter's instructions subjects the competitor to possible disqualification.

(a) If a competitor misses his starting position according to the category's order of flight, that competitor will be assessed penalty points according to the schedule given in 4.6.1(a)(2), and will be assigned a new starting position by the Chief Judge.

(b) The Contest Jury has the right to remove penalty points if missing order of flight was due to conditions outside the competitor's control. This would be determined at a Contest Jury hearing convened for the purpose of reviewing a protest over any such penalty points imposed by the Chief Judge.

4.9.5

A fire extinguisher must be readily available on the starting line.

4.10 *OFFICIAL WIND DIRECTION, DIRECTION OF FLIGHT*

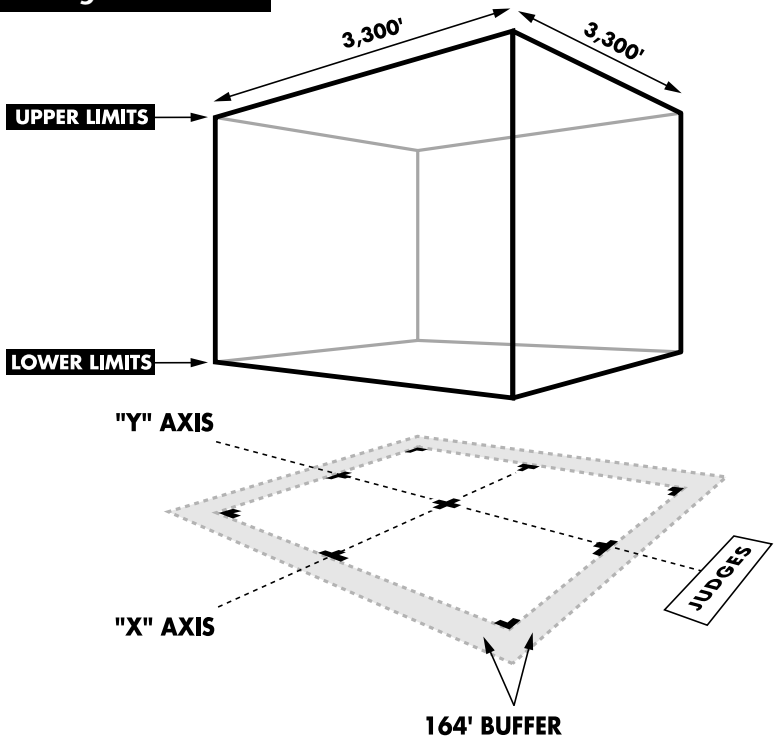
4.10.1

The Official Wind Direction, in relation to the judges (i.e., right to left or left to right), will be determined by the Chief Judge. In turn, the Official Wind Direction determines whether Form B or C will be used for judging the flight. If the Official Wind Direction must be changed during the flight program, then a fifteen (15) minute notice must be given to all remaining competitors.

4.10.2

Competitors will note on their Free Program Forms B and C the direction in which they intend to start the sequence in relation to the officially briefed wind direction.

Fig 4.11.1



POWER HEIGHT LIMITATIONS		
CATEGORY	**UPPER LIMITS**	**LOWER LIMITS**
PRIMARY	**3,500' AGL**	**1,500' AGL**
SPORTSMAN	**3,500' AGL**	**1,500' AGL**
INTERMEDIATE	**3,500' AGL**	**1,200' AGL**
ADVANCED	**3,500' AGL**	**800' AGL**
UNLIMITED	**3,280' AGL**	**328' AGL**

GLIDER HEIGHT LIMITATIONS		
CATEGORY	**UPPER LIMITS**	**LOWER LIMITS**
SPORTSMAN	**4,000' AGL**	**1,500' AGL**
INTERMEDIATE	**4,000' AGL**	**1,200' AGL**
UNLIMITED	**4,000' AGL**	**600' AGL**

4.11 *AEROBATIC BOX*

The flight program will be flown within a clearly marked area of 1,000 meters (approximately 3,300 feet) square whose central point will be the intersection of the main (X) and secondary (Y) axes. The Judges will be located between 150 meters (approximately 500 feet) and 250 meters (approximately 800 feet) from the edge of the box on an extension of the Y axis. The FAA Deadline normally will be a minimum of 500 feet from the boundary of the box but this is specified in the special provisions of the waiver. Boundary Judges are stationed such that there is a 50 meter (164 feet) buffer zone before boundary infringement penalties are noted. The Aerobatic Box in all sanctioned contests will be over or adjacent to a suitable landing area. *(Fig 4.11.1)*

4.12 *SIGNALING FOR INTERRUPTION AND RESUMPTION OF PROGRAM*

4.12.1

Program interruption is defined as:

(a) Correcting a heading deviation of 90 degrees or more between figures *(See 7.2.1)*.

(b) Regaining height, in the case of altitude difficulties.

(c) Adding a figure to a sequence to correct a heading or attitude. (Example: the addition of a roll from inverted to upright to correct the attitude for the next and subsequent figures.)

4.12.2

Competitors who decide to interrupt their programs should rock their wings distinctly.

4.12.3

The competitor will signal intent to resume the program with distinct wing rocks and may commence with either the figure that preceded the interruption or the figure subsequent to the point of interruption.

4.12.4

Judges will resume grading with the first full figure after the interruption.

4.12.5

The Chief Judge, or the Assistant Chief Judge will record each interruption and assess the proper penalty.

4.12.6

The glider pilot will receive a zero score for that flight if he or she gains altitude through intentional thermaling during an interruption.

4.13 *INFRINGEMENT OF THE FAA DEADLINE*

4.13.1

Safety of the spectators is the primary consideration in establishing the FAA Deadline. It is established by the special provisions of the waiver, if applicable. The Deadline will be designated by the FAA in accordance with these special provisions.

4.13.2

Any figure or portion of a figure flown across the Deadline will cause that figure to be given a zero. Applicable boundary infringements will also be applied. All of these penalties are recorded and applied at the Chief Judge's Station.

4.14 *HEIGHT LIMITATIONS*

(See Fig 4.11.1)

4.15 *PENALTIES FOR INFRINGEMENT OF ALTITUDE LIMITS, BOUNDARIES, AND INTERRUPTIONS.*

4.15.1

The Primary category is not subject to boundary infringements, however, any part of the sequence flown under 1,500 feet will result in a zero for the entire flight.

4.15.2

In order for penalties to be assessed, infringements of altitude limits must be observed by a majority of the Judges. Judges must clearly indicate on Form A the individual figure(s) in which the infringement occurred and the extent of any low altitude infringements, i.e. 1-200 feet low (referred to as a "low" call) or more than 200 feet low (referred to as a "low-low" call).

PENALTIES - POWER
Table 4.15.1

CATEGORY	*Primary*	*Sportsman*	*Intermediate*	*Advanced*	*Unlimited*
BOUNDARY INFRINGEMENT	*NA*	*5*	*10*	*20*	*30*
PROGRAM INTERRUPTION	*5*	*5*	*15*	*50*	*90*
LOW ALTITUDE INFRINGEMENT (each figure)					
1-200 ft. low (0-164 ft. - Unl.)	*"0" Entire Program*	*"0" Entire Program*	*60*	*100*	*150*
More than 200 ft. low (More than 164 ft. - Unl.)	*"0" Entire Program*	*"0" Entire Program*	*"0" Entire Program*	*"0" Entire Program*	*"0" Entire Program*
HIGH ALTITUDE INFRINGEMENT	*5*	*5*	*10*	*20*	*30*

PENALTIES - GLIDER
Table 4.15.2

CATEGORY	*Sportsman*	*Intermediate*	*Unlimited*
BOUNDARY INFRINGEMENT	*5*	*10*	*20*
PROGRAM INTERRUPTION	*5*	*15*	*70*
LOW ALTITUDE INFRINGEMENT (each figure)			
1-200 ft. low (0-164 ft. - Unl.)	*"0" Entire Program*	*60*	*100*
More than 200 ft. low (More than 164 ft. - Unl.)	*"0" Entire Program*	*"0" Entire Program*	*"0" Entire Program*

4.15.3

Each boundary infringement will be reported via radio to the Chief Judge's Station and recorded by the Boundary Judge as it occurs.

(a) A boundary infringement is considered to have occurred if the entire aircraft is seen outside of the sighting device. Only one boundary infringement penalty will be assessed per figure.

(b) Each figure flown outside the box will incur a boundary infringement penalty.

4.16 *HOT BOX SIGNALS - PANELS AND RADIO*

4.16.1

It is mandatory that positive control of the Aerobatic Box be maintained at all times. Positive control means not only providing clearance to enter the box, but also ensuring that primary and secondary methods exist to initiate an emergency recall of a pilot already occupying the box.

Two-way radio communication shall be the primary means of controlling the Aerobatic Box and issuing a recall order.

4.16.2

All competitors must be able to receive and transmit VHF radio messages on a pre-briefed frequency. Total or partial radio failure will be handled in accordance with 4.16.3 and 4.16.4, below.

4.16.3

Contest officials may elect to use radio as the sole means of controlling entry into the Aerobatic Box. In this case, the contest briefing will make clear that radio failure, transmit or receive, prior to box entry requires the competitor to remain outside the Aerobatic Box and land as soon as practicable. Any radio problem will be handled in accordance with section 4.20, Mechanical Defects. The Technical Committee will determine if the radio failure was beyond the competitor's control and authorize a reflight if the radio can be repaired.

4.16.4

Hot Box panels may be used in conjunction with radio if contest officials desire an alternate form of controlling entry into the Aerobatic Box in the case of total or partial radio failure. (However, it is highly recommended that no aircraft be allowed in the box without at least a receive capability.) If Hot Box panels are used as an alternate means of controlling entry into the Aerobatic Box, the following procedures are used:

4.16.5

(a) Pilots will be specifically briefed as to what to expect and how to respond should they encounter radio failure after becoming airborne.

(b) Whenever the Aerobatic Box is occupied or the Judges are not ready, the Hot Box panels will remain "all orange".

(c) When the Aerobatic Box is empty and judges ready, the Chief Judge will order the Hot Box panels changed to "all white."

(d) The competitor will acknowledge the clearance to enter the box with a radio response (transmitter operational), or by distinctly rocking the wings (transmitter inoperable).

(e) After the first figure is begun, the Chief Judge will instruct the panel operators to change the panels to "all orange."

(f) Hot Box panels will remain "all orange" throughout the competitor's flight and until such time as the Judges are ready for the next competitor.

(g) If the competitor takes an interruption during a sequence, the panels will remain "all orange". The competitor who took the interruption is cleared to re-enter the Aerobatic Box while the Hot Box panels are still "all orange".

4.17 *OPTIONAL SAFETY CHECK MANEUVER*

4.17.1

Competitors are authorized to perform an optional horizontal two-point roll from upright with a reasonable hesitation at inverted to check safety belts and inverted oil and fuel systems.

4.17.2

This optional horizontal two-point roll is the only approved safety check maneuver and must be performed at the location and time specified by the Chief Judge at the pilot's briefing. This does not apply to gliders.

4.18 *SIGNALING START AND END OF A SEQUENCE*

4.18.1

(a) Each competitor should signal readiness and intent to start a sequence by distinctly rocking the wings three (3) times.

(b) The pilot may start and/or finish the wing rocks either inside or outside the aerobatic box and they may be performed on a horizontal, climbing or descending flight path. If the first figure of the program begins in inverted flight, any wing rocks must be performed in inverted flight. The competitor may change his flight attitude from normal to inverted only by a half roll prior to the first wing rock.

(c) Should any wing rock fail to follow the criteria of paragraph (b) above, a penalty equal to a Program Interruption for the category in question *(See Table 4.15.1)* shall be assessed.

4.18.2

The same signal, rocking the wings three (3) times, should be used to signal the completion of the program and intent to leave the Aerobatic Box.

4.19 *RECALL SIGNALS*

4.19.1

The radio operated by the Chief Judge will be the primary recall control and recall will be on the pre-briefed frequency.

4.19.2

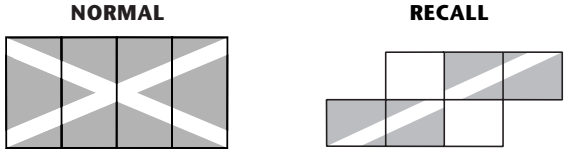
Recall procedures shall be described at the pilot's briefing.

4.19.3

An alternate method of recall in case of radio failure shall be provided. Acceptable alternatives are: Hot Box panels or smoke bomb.

4.19.4

If Hot Box panels are in use, the panels are used as a recall system as shown below.



4.19.5

If Hot Box panels are not in use, a smoke bomb (smoke color shall be briefed at the pilot's briefing) will be readily available to the Chief Judge for use as a recall signal.

4.19.6

Competitors should note that recall is the most extreme safety action used in contest aerobatics and demands continuing alertness and immediate response from the competitors for preservation of life and aircraft. Recall, by whatever means, requires a break from the sequence, look around, return to airport and land. There are no exceptions.

4.20 *MECHANICAL DEFECTS*

4.20.1

In the event of mechanical difficulties before the start of a flight, the competitor will notify the Starter and remain with the aircraft until an inspection by the Technical Committee is made. The Chief Judge may permit the competitor to use another aircraft or the same aircraft if repair can be accomplished before the conclusion of the flight program then in progress. In the event of a technical fault (including loose objects in the cockpit) occurring during a contest flight, the competitor will break off the flight, land and report to the Starter.

4.20.2

If the Technical Committee is satisfied that the reason for abandoning the flight was due to a technical fault, the competitor will be allowed to repeat the sequence. This decision cannot be protested. The order of flight will be determined by the Chief Judge. However, the pilot who aborted will fly as soon as possible after the malfunction has been corrected. If the malfunction cannot be corrected by the completion of

the flight program, the Chief Judge may allow the pilot to make up the lost flight by flying twice in the next competition program for that category.

Competitors must refly the sequence from the beginning, but judging and grading will commence with the figure in which the defect occurred. However, any program interruptions which occur in the reflown sequence, whether before or after the first gradable figure, will be penalized in the normal manner.

4.20.3

If the Technical Committee finds no technical problem to justify discontinuing the flight, the competitor will be awarded an interruption penalty and allowed to finish the flight. If the program was interrupted during a figure, then the competitor will receive a zero for that figure.

Competitors must refly the sequence from the beginning, but judging and grading will commence with the first figure following the point where the sequence was aborted. Any program interruptions which occur in the reflown sequence, whether before or after the first gradable figure, will be penalized in the normal manner.

4.21 *METEOROLOGICAL CONDITIONS*

4.21.1

The minimum weather conditions for aerobatic flight are regulated by the special provisions of the airspace waiver.

4.21.2

Weather conditions that allow power competitors to climb to 3,500 feet (4,000 feet in the case of gliders) while maintaining a minimum cloud clearance are the most desirable.

4.21.3

Flight will not be conducted if the wind speed exceeds 20 knots, except at the discretion of the Contest Jury.

4.21.4

Flight will not be conducted in discernible precipitation, except at the discretion of the Contest Jury. The Aerobatic Box must be free of precipitation for glider flights.

4.21.5

If the conditions of 4.21.2 do not exist, the Contest Jury may, after calling for such advice as required, authorize programs to be flown with an optional break (an interruption where no interruption penalty is assessed). Such breaks allow competitors to climb and reposition, thereby enabling the contest to continue.

(a) Competitors may not land between parts of the program during an optional break.

(b) The Contest Jury will decide where the optional break is to occur for the Known and Unknown programs.

(c) Each competitor will indicate on their Free Program Forms B and C, by means of a distinct and noticeable double line, the point at which they will exercise the optional break.

(d) In the event weather conditions improve to meet requirements of 4.21.2, competitors may no longer take the optional break without penalty. Once the optional break is removed by the Contest Jury, a notice to that effect will be given to the remaining competitors a minimum of 10 minutes before flight.

4.21.6

In the case of glider flight programs where the height of the cloud base is less than 4,000 feet AGL and more than 2,500 feet AGL, the Contest Jury may allow competitors to fly shortened compulsory programs. The figures to be graded will be announced at a briefing. A Free Program interrupted by low ceilings will be flown in two parts, with the break occurring at a point clearly indicated by the competitor on their Forms B and C.

4.22 *DETERIORATING WEATHER CONDITIONS*

4.22.1

A competitor may decide not to fly due to deteriorating meteorological conditions. The competitor may refuse at any time, including before takeoff as well as any time in flight.

4.22.2

In such cases, the competitor may hold on the ground, hold in the air or land. In all circumstances, the competitor must immediately establish communications with the Chief Judge. If airborne, the competitor will communicate directly with the Chief Judge. If on the

ground, the competitor will communicate with the Chief Judge via the Starter or other Official designated at the briefing.

4.22.3

The Chief Judge will confer with the Judges who will decide whether to accept the competitor's reason for not flying or not completing the flight.

4.22.4

(a) If the judges accept the competitor's reasons for not flying or discontinuing a sequence in progress, and the competitor is on the ground, the competitor will be allowed to fly or refly the sequence without penalty. The Chief Judge will assign a starting position that allows the competitor to fly again as soon as practicable. The competitor must fly the sequence from the beginning, but grading will commence with the first figure not flown or completed. For example, if the competitor discontinued the sequence during the vertical portion of a hammerhead, the first graded figure in the reflight will be the hammerhead. However, any program interruptions which occur in the reflown sequence, whether before or after the first gradable figure, will be penalized in the normal manner.

(b) If the judges accept the competitor's reasons for discontinuing the sequence and the competitor has elected to hold in the air, the competitor will be allowed to resume the sequence without penalty. In this case, the competitor may resume the sequence with either the first figure not flown or completed or the last figure completed before the interruption. In either case, grading will commence with the first figure not flown or completed (see example in paragraph (a) above).

(c) If the judges do not accept the competitor's reasons for not flying or discontinuing the sequence, the competitor will be awarded an interruption penalty and allowed to complete the flight. This will be done in accordance with the rules of paragraph (a) or (b) above, depending upon whether the competitor is on the ground or in the air at the time of the judges' decision.

4.22.5

If any Judge determines that the pilot can no longer be judged because of clouds (either the airplane being flown into or behind clouds), the Chief Judge will immediately notify the pilot by radio and request that a break occur. The pilot will re-enter the box and resume

the flight as weather conditions permit. The grading of the figures will commence with the figure that could not be graded and the pilot will not be charged with an interruption.

4.23 *PERSONNEL ON THE JUDGING LINE*

4.23.1

The only personnel permitted on the judging line except by specific permission of the Chief Judge are: Contest Director, Chief Judge, Contest Jury, Judges, Assistant Judges, Recorders, Hot Box Panel Operators, Volunteer Coordinator, Starter, and Score Runners.

4.23.2

Any competitors in the category being judged who appear at the judging line, boundary judging positions or deadline judging position without the Chief Judge's permission will be disqualified from the contest.

4.24 *TOW AND RELEASE PROCEDURES*

After clearance from the Starter, the towplane will tow the competitor to the altitude determined for that flight (no more than 4,500 feet AGL or less than 2,500 feet AGL). The towplane will then tow the glider perpendicular to the X axis (base leg) on the side of the box downwind from the official wind direction. If the glider pilot does not release on the first pass, the towplane will initiate a turn away from the box and, staying as close as possible to the box, re-entry on the base leg as before. The glider pilot must release before the end of the second pass when clearance to release had been given, unless given permission by the Chief Judge.

The pilot may reposition the glider after release and prior to beginning the flight program; however, intentional maneuvering to gain altitude through thermals will result in a zero score for that flight.

The towplane and glider pilots must monitor the frequency assigned by the Chief Judge at the daily pilot briefing and follow all directions issued by the Chief Judge during the approach to the box. Glider and towplane pilots shall use the appropriate air-to-air signals in the event of radio failure in either aircraft.

In the event of radio failure of either aircraft or weather conditions that prevent the competitor from entering the box, the glider pilot will disconnect from the towplane and land. The glider pilot must

promptly contact the Chief Judge regarding the reason for discontinuing the flight. The procedures of 4.20 (mechanical abort) or 4.22 (weather abort) will then be followed to determine if a reflight will be allowed.

CHAPTER 5 THE FLIGHT PROGRAMS

5.1 COMPETITION FLIGHT PROGRAMS

A complete contest will consist of the competition flights shown in Table 5.1.1 or Table 5.1.2, as appropriate.

POWER COMPETITION FLIGHT PROGRAMS
Table 5.1.1

CATEGORY	KNOWN	FREE	UNKNOWN
Primary			
Sportsman		(See 5.1.3) 	
Intermediate			
Advanced			
Unlimited			

GLIDER COMPETITION FLIGHT PROGRAMS
Table 5.1.2

CATEGORY	KNOWN I	KNOWN II	FREE	UNKNOWN I	UNKNOWN II
Sportsman					
Intermediate					
Unlimited					

5.1.1

For Unlimited, the 4-Minute Free Program may also be scheduled, but only for powered aircraft. This flight program's results will not be included in the scores that determine final standings. It will be treated as a separate trophy flight.

5.1.2

Category flight programs will be conducted in the following order: Known, Free or Unknown (K,F,U,4 or K,U,F,4), and Unlimited Power 4-Minute Free.

5.1.3

Sportsman competitors have the option to repeat the Known compulsory in lieu of a Free program.

5.1.4

If Contest Directors desire, additional flight programs can be added to those programs listed on Table 5.1.1 and Table 5.1.2.

(a) Additional flight programs contemplated will be included in the proposed supplementary rules submitted to the IAC Sanctions Director.

(b) A second or third Primary flight, or a third Sportsman flight, may be scheduled without request for supplemental rules.

(c) Should a third Sportsman flight be scheduled, the competitors must repeat their second flight program.

5.1.5

The final score will be the sum of all flight programs completed by the competitor, unless a contest is terminated due to weather, time, or any unforeseen reason.

5.1.6

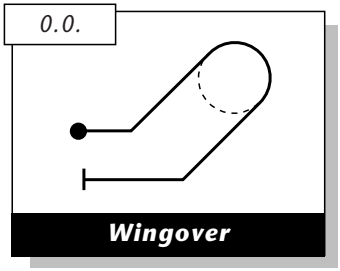
For all categories, in the event of an incomplete contest because of weather or for any other reason, each category will be considered complete based on any flight programs finished in their entirety. All competitors in a category must be given an equal opportunity to fly a particular sequence or that flight program must be canceled and any scoring disregarded.

5.1.8

When there are both powered airplanes and gliders competing in the same contest, the mixing of flight programs shall be done in a manner permitting efficiency of operation without compromising safety. If there is an adequate number of towplanes to permit a continuous flow of gliders into the Aerobatic Box, then the glider flights in a given program should follow one another. If there is not an adequate number of towplanes to permit continuous glider operations, then the Contest Director may schedule the order of flight to interleaf glider and powered aircraft, keeping the same set of Judges. The determination of the order of programs will be done by the Contest Director, giving equal consideration to both power and glider competitors.

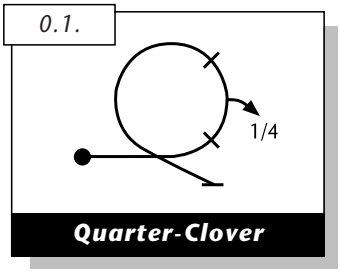
5.1.9

Use of the wingover will be allowed only in the Glider Sportsman and Glider Intermediate categories. It will be assigned a pseudo Catalogue number of 0.0. and a K-Factor of 8. It will be judged according to criteria stated in Chapter 8. The symbol is drawn at right.



5.1.10

Use of the Quarter-Clover will be allowed only in the Glider Sportsman and Glider Intermediate categories. It will be assigned a pseudo-Catalogue number of Family 0.1 (rolling on the ascending half loop) with a K-Factor of 16, or Family 0.2 (rolling on the descending half loop) with a K-Factor of 13. It will be judged according to criteria stated in Chapter 8. The symbol for the Family 0.1 Quarter-Clover is drawn above.



5.2 *QUALIFICATION FLIGHTS*

5.2.1

The first Known compulsory in each category is a qualification flight. If a majority of the Judges in that category votes that a competitor has demonstrated an inability to safely control the aircraft, the competitor will be disqualified from that category.

5.2.2

In addition, competitors who do not complete 75% of the figures (by either not flying the figure or receiving a grade of zero for a figure flown) in their Known compulsory will be disqualified from that category. This does not mean that competitors who receive zeros for figures flown in the wrong direction will be disqualified solely for this error.

5.3 *THE KNOWN COMPULSORY FLIGHT*

Known compulsories for powered aircraft are sequences of figures and figure combinations taken from the *FAI Aerobatic Catalogue.* Glider aerobatic sequences are composed of figures and figure combinations taken from the *FAI Catalogue of Glider Aerobatic Figures* (GAF). It is important to note that the *GAF* often assigns different K-Factors from those in the *FAI Aerobatic Catalogue.* Not all figures in the *FAI Aerobatic Catalogue* are in the *GAF*.

5.3.1 *Direction of Flight*

Known compulsory programs will always begin with the first figure flown in the official direction of flight, as determined by the Chief Judge for the category.

5.3.2 *Primary*

The Primary sequence is depicted in Appendix 1 and does not change year-to-year.

5.3.3 *Sportsman and Intermediate Knowns*

Known compulsories for IAC Sportsman Power and Glider, and Intermediate Power and Glider, are selected from those proposed or from a bank of Known sequences previously used. The IAC Board of Directors approves these Known sequences prior to each contest season.

5.3.4 *Advanced and Unlimited Knowns*

Each year the FAI International Aerobatics Commission (CIVA) selects compulsory sequences for the Advanced and Unlimited Power and the Glider Unlimited categories from proposals made by their

member nations, including the USA. These sequences will normally be adopted for use in IAC sanctioned competitions if they are determined to be suitable by the IAC Board of Directors or its duly elected Executive committee.

5.3.5

Competitors may elect to drop any figure or group of figures from the Known compulsory as long as they fly at least 75% of those programmed. However, sequence and direction must be maintained.

(a) Competitors must indicate figures planned to be omitted on their Form A.
(b) Competitors will be graded zero on these omitted figures.

5.4 THE FREE PROGRAM

The Free program is the personal expression of each competitor. The pilot designs the Free program using figures from the *FAI Aerobatic Catalogue* in accordance with Chapter 6 of this manual.

5.4.1 Direction of Flight

Competitors may design their Free program to start upwind or downwind on the X-axis or on the Y-axis. It is recommended that a downwind X-axis or Y-axis entry be noted on Forms B and C. *(See 6.13.4.)*

5.5 THE UNKNOWN COMPULSORY PROGRAM

5.5.1

IAC Headquarters will provide Unknown compulsory programs for each category scheduled to be flown to each Contest Director.

5.5.2

The figures utilized in the design of the Unknowns will be chosen from Appendix 3 for Power and Appendix 4 for Gliders of this manual. No other figures are allowed. For all Unknowns:

(a) There will not be more than 1 snap roll (Family 9.9/9.10) per figure.

(b) Maximum of 1 figure allowed from Family 7.23-7.30 (horizontal 8's).

(c) Maximum of 1 figure allowed from Family 9.11/9.12 (spins).

5.5.3

The start of an Unknown program can be upwind or downwind on the X-axis or the start can be on the Y-axis. A downwind X-axis or Y-axis entry should be noted on Forms B and C. *(See 6.13.4)*

5.5.4

The Unknown sequences will be made available to the competitors by the Contest Director no later than eighteen (18) hours prior to the time the program is scheduled to be flown. Practice of these sequences is prohibited.

5.5.5 ***Unlimited Unknowns***

Unlimited Power:

The Unlimited Power Unknown must have no less than ten (10) nor more than fourteen (14) figures. The maximum K-factor shall not exceed 400. In the selection of figures for the Unlimited Power Unknown, the following limits apply:

(a) Maximum of 6 snap rolls, only 4 of which may be from the same family (9.9 or 9.10).

(b) A minimum of one snap roll must be a vertical climbing maneuver (9.9.1, 9.9.6, 9.10.1, or 9.10.6).

Unlimited Glider:

The Unlimited Glider Unknown must have no less than seven (7) nor more than ten (10) figures. The maximum K-factor shall not exceed 190. No single figure combination may exceed 35K.

5.5.6 ***Advanced Unknowns***

The Advanced Power Unknown must have no less than ten (10) nor more than fourteen (14) figures. The maximum K-factor shall not exceed 275. In the selection of figures for the Advanced Unknown, a minimum of 2, and a maximum of 4 snap rolls are allowed from Family 9.9.

5.5.7 ***Intermediate Unknowns***

Intermediate Power:

The Intermediate Power Unknown must have no less than six (6) nor more than twelve (12) figures, totaling no more than 150K.

Intermediate Glider:

The Intermediate Glider Unknown must have no less than six (6) nor more than nine (9) figures, totaling no more than 110K.

5.6 *THE UNLIMITED POWER 4-MINUTE FREE PROGRAM TROPHY EVENT*

5.6.1

The contest Director may schedule this special trophy event for Unlimited Power category competitors who have completed the scheduled Unlimited competition flights.

5.6.2

The selection of figures or figure combinations for this program need not be made with reference to the *FAI Aerobatic Catalogue*; there will be no limitation on the number of figures or difficulty coefficients.

5.6.3

There will be no submission of forms containing the sequence of figures to the Contest Director.

5.6.4

Smoke systems and music may be used at the option of each individual pilot.

5.6.5

The start and finish of the Unlimited Power 4-Minute Free Program may be in normal or inverted flight on a horizontal, ascending or descending path, which must not deviate from the horizontal by more than 45 degrees. Competitors may begin or finish their program at any height between 328 and 3,280 feet above ground level.

5.6.6

Boundary infringement penalties will not be applied to this program. Altitude limitations will be enforced. FAA Deadline infringements will be penalized: each excursion across the Deadline will incur a penalty of 300 points.

5.6.7

The total K-Factor for this program will be 400. This program will be graded by each Judge under three performance categories:

(a) Technical Merit	K = 160
(b) Artistic Impression	K = 160
(c) Positioning	K = 80
Total K	***400***

5.6.8

Each objective within a major performance area is assigned a K-Factor as shown below. A mark of 10 to 0 (zero), in increments of 0.5, will be given for each objective according to the following criteria:

Technical Merit (160K):

The Technical Merit of a flight shall be judged according to four objectives:

(1) Complete Use of the Flight Envelope - 40K

The pilot is expected to make full use of the flight envelope of the aircraft. This means flying at the full range of air speeds and accelerations permitted. Program time should be divided between high and low speeds, high and low G maneuvers, and both positively and negatively G loaded flight segments. The flight should include the demonstration of controlled flight beyond the stall boundary by use of autorotation or other high angle of attack maneuvers. The judge will deduct points if any of these areas are noticeably under-utilized.

(2) Exploitation of Aerodynamic and Gyroscopic Forces - 40K

The pilot is expected to show movement of the aircraft about all axes using both conventional aerodynamic controls and propeller-generated gyroscopic forces. Higher marks will be given to pilots able to make use of all these effects through a wide range of aircraft attitudes and flight paths. Repeated use of any such forces in the same or similar attitudes should result in lower scores.

(3) Execution of Individual Maneuver Elements - 40K

It should be clear that the maneuvers flown were, in fact, intended and fully under the pilot's control. Higher marks will be given for this objective when individual maneuver elements are started and finished on obviously precise headings

and in well-defined attitudes. When, for example, gyroscopic maneuvers are allowed to decay into imprecise, poorly defined autorotation, marks should be deducted for poor execution. Marks should also be deducted if it appears that the pilot has relinquished control of the aircraft at any time.

(4) Wide Variety of Figures Flown on Different Axes and Flight Paths - 40K

Many different figures should be completed in the time avail-able. These should include maneuver elements of many different kinds and should use many different flight paths and axes. Lower marks should be given to a pilot who used only one or two principal axes of flight. However, the use of additional axes within the performance zone must be clear and precise, not giving the appearance of being used by chance. Marks should also be deducted if any particular maneuver ele-ment is over-used or continues for an excessive period of time. For example, higher marks would be given in the event of a two-turn flat spin followed by something else, than to a multi-turn spin that simply took up more time.

Artistic Impression (160K):

The Artistic Impression of a flight shall be judged according to four objectives:

(1) The Pleasing and Continuous Flow of Figures - 40K

In a precisely flown sequence, the completion of a figure will be well described when movement about an axis ceases and a particular attitude is briefly held. The start of the next figure or maneuver should then begin without any prolonged period of inactivity caused by the need to reposition the aircraft or reorientate the pilot. Marks will be deducted for any obvious period of level flight, or inactivity, required between figures.

(2) Contrasting Periods of Dynamic and Graceful Maneuvers - 40K

In a musical symphony, the listener's mood may be changed by contrasting fast and slow movements. Similarly, in a 4-Minute Free Program, the judge should be treated to a flight that causes different reactions. While some maneuvers involve very high speeds, sudden attitude changes and rapid rotations, others involve slower speeds or more gentle transitions. Higher marks will be given to a pilot who finds time in his program for showing such differences of mood and pace. Marks should be deducted in this category for a flight that shows no such distinctions.

(3) Presenting Individual Figures in Their Best Orientation - 40K

Figures can give different impressions when seen from different viewpoints. For example, a climbing inverted flat spin looks most impressive when the top surface of the aircraft can be seen. A loop flown in a plane inclined at 45 degrees to the vertical is best appreciated when it is flown on the Y-axis. Marks should therefore be deducted if the judge is not shown a figure in its best orientation.

(4) Placing Individual Figures in Their Optimum Position - 40K

Each figure has an optimum position from which it is best viewed. For example, a loop flown overhead does not give the same pleasing geometry as one flown further distant. Similarly, a figure flown near the upper height limit will cause discomfort when flown at the near edge of the performance zone; a low-level horizontal figure is better seen from close by than far away. Higher marks will therefore be given when individual figures are optimally placed, while judges should deduct marks when it appears that a figure is not well positioned.

Positioning (80K):

Positioning of a flight shall be judged according to two objectives:

(1) Symmetry - 40K

Highest marks will be given when the sequence as a whole is balanced evenly to the left and right of the judges' direct line of vision towards the center of the performance zone. Marks should be deducted if, by design or by the influence of the wind, a pilot's program is noticeably biased to left or right. The greater the degree of asymmetry, the greater should be the deduction.

(2) The Performance Zone - 40K

Even though a flight might be symmetrical, it may also be spread too far to either side, so that some maneuver elements are flown outside the performance zone. Figures may also be flown on the direct line of vision but very distant. Any part of the flight that is flown so far away that it appears to be outside the zone should be penalized at a rate of 0.5 of a mark for each apparent excursion.

5.6.9

For the performance of the program, the time limit will be between 3 minutes 30 seconds and 4 minutes. Any deviation from this limit will incur penalties at the rate of 10 points for each second or fractional part of second over or under the limit.
Examples:
A total time of 3 minutes 29.5 seconds would receive 10 penalty points.
A total time of 4 minutes 1.3 seconds would receive 20 penalty points.

5.6.10

The competitor must signal the start and finish of this program by distinctly dipping a wing more than 45 degrees three (3) times, one after the other. Failure to properly signal the start and/or finish of the program as noted above will result in a penalty of 150 points for each signaling error. These penalties will be in addition to any time penalties incurred. If the competitor fails to signal the finish of the program, the time at which the program is ended will be determined by the Chief Judge, assisted by the Time Keepers.

5.6.11

For timing purposes, the program is deemed to start on the return to wings level after the third wing dip; and is deemed to finish on the return to wings level after the first of the final three (3) wing dips. Timing and the assessment of any penalty points is done at the Chief Judge's station.

5.7 *THE PRIMARY CATEGORY*

5.7.1

The Primary category is designed as both the entry level into aerobatic competition and as a place for pilots with low performance aircraft, or aircraft with certain restrictions, to successfully compete. Primary competitors may fly only the depicted sequence *(See Appendix 1)*, although the sequence may be flown more than once at the discretion of the Contest Director.

5.7.2

There will be no boundary infringement penalties assessed for this category.

5.7.3

The Primary sequence consists of five (5) figures to be flown in the order shown in Appendix 1. Breaks in the sequence will be penalized by five (5) points each unless subject to other rules relating to free breaks for weather or mechanical problems. The flights will be flown in the official direction of flight as set by the Chief Judge.

The figures are: one-turn spin (1.6.3 +9.11.1.4); loop (7.5.1); 180-degree turn (2.2.1); slow roll (1.1.1 + 9.1.3.4); and 90-degree turn (2.2.3). This sequence is depicted symbolically in Appendix 1.

5.7.5

Although no boundary infringements are assessed in the Primary category, for the best presentation grade the competitor should place all figures within the limits of the aerobatic box. *(See 8.6)*

5.8 *PRESENTATION COEFFICIENTS*

Category Presentation coefficients for Power programs are as follows:

Primary	3 K
Sportsman	6 K
Intermediate	8 K
Advanced	12 K
Unlimited	20 K (Known and Unknown)
	26 K (Free)

Category Presentation coefficients for Glider programs are as follows:

Sportsman	15 K
Intermediate	15 K
Unlimited	20 K (Known and Unknown)
	35 K (Free)

CHAPTER 6 — *FREE PROGRAM - DESIGN LIMITS AND DOCUMENTATION*

6.1 *FREE PROGRAMS - GENERAL*

The Free Program affords each competitor the opportunity to express his or her personal skills in the design of a sequence as well as demonstrating piloting ability.

6.2 *FIGURES AND K-FACTOR LIMITS*

Free programs are limited to the maximum number of figures and maximum total Figure K-Factor as shown in Tables 6.2.1 and 6.2.2. The Maximum Figure K is the sum only of figures depicted on the Form B/C and does not include the Presentation K-Factor.

To achieve the maximum allowable K-Factor without compromising a desired Free Program, competitors may, at their option, use a floating point in the construction of their Free Programs. The floating point is equal to 1 K-Factor and is allocated to the highest K-Factor figure in the Free Program by writing the initials "F.P." in the "Catalogue No." column on Form A.

The total K-Factor for that figure will then be reduced by 1. On Form A, the original figure coefficient will be given as well as the reduced value. After exercising the right to use the floating point, competitors cannot delete the floating point without revising and re-certifying their Free Program.

6.2.1

The total K-factor for Glider Intermediate shall not exceed 140. The sum of the normal coefficients may be as large as 143, but will be reduced to 140 by removing one point from the highest coefficient figures, starting with the highest K-value figure and then each figure in decreasing K-value order until the maximum total of 140K is achieved. On Form A, the original figure coefficient will be given as well as the reduced value for each figure affected.

The total K-factor for Glider Unlimited shall not exceed 220. The sum of the normal coefficients may be as large as 223, but will be reduced to 220 by removing one point from the highest coefficient

figures, starting with the highest K-value figure and then each figure in decreasing K-value order until the maximum total of 220K is achieved. On Form A, the original figure coefficient will be given as well as the reduced value for each figure affected.

POWER FIGURE AND K LIMITS
Table 6.2.1

FREE CATEGORY	MAX # OF FIGURES	MAXIMUM FIGURE K	PRESENTATION K-FACTOR	MAXIMUM PROGRAM K
Sportsman	*No Limit*	*Same K as current Known*	*6*	*Same as current Known*
Intermediate	*15*	*190*	*8*	*198*
Advanced	*15*	*300*	*12*	*312*
Unlimited	*15*	*420*	*26*	*446*

GLIDER FIGURE AND K LIMITS
Table 6.2.2

FREE CATEGORY	MAX # OF FIGURES	MAXIMUM FIGURE K	PRESENTATION K-FACTOR	MAXIMUM PROGRAM K
Intermediate	*No Limit*	*140*	*15*	*155*
Unlimited	*13*	*220*	*35*	*255*

6.2.2

For the Unlimited power Free Program only, for each figure less than ten (10) that goes to make up a total sequence, a bonus score will be added to the total score before penalties. Bonus points will be calculated using the percentages in Table 6.2.3 and added to the competitor's final score automatically by the computer scoring system.

UNLIMITED POWER FREE PROGRAM BONUS POINTS
Table 6.2.3

# OF FIGURES	9	8	7	6
BONUS PTS. %	3	6.5	10.5	15

6.2.3

For the Unlimited glider Free Program only, for each figure less than thirteen (13), but not less than ten (10), which goes to make up the total sequence, a bonus score will be added to the total score before penalties. Bonus points will be calculated using the percentages in Table 6.2.4 and added to the competitor's final score automatically by the computer scoring system.

UNLIMITED GLIDER FREE PROGRAM BONUS POINTS
Table 6.2.4

# OF FIGURES	12	11	10
BONUS PTS. %	1.5	3.5	6.5

6.3 *VERSATILITY*

6.3.1 *GLIDER*

The Intermediate Glider Free Program must include a figure from Family 2 (Turns), Family 5 (Hammerheads), Family 7 (Loops), Family 9.1 (Slow Rolls), and Family 9.11 (Upright Spins).

The Glider Unlimited Free Program must include at least one figure from Family 2 and Families 5 through 9 which must include the following sub-families:

a. 2.3 - 2.20, a rolling turn with at least one roll.

b. From Family 9 the following must be included as an independent figure or in combination with a figure of other families:

1. a roll at less than 10 seconds (slow roll, at least ½ roll),
2. a roll at more than 10 seconds (super slow roll, at least ½ roll),
3. hesitation roll (at least 2 points),
4. inside snap roll (at least ½ roll),
5. outside snap roll (at least ½ roll),
6. spin element.

6.3.2 *POWER*

Each Free program will contain at least one (1) figure from these *FAI Aerobatic Catalogue* families and sub-families:

Sportsman	
Loop and Eights	7.1 thru 7.10
Combination of Lines, Angles and Loops	Family 8
Roll (Slow or Hesitation)	9.1 thru 9.8
Spin	9.11.1.X
Intermediate	
Hammerhead	Family 5
Loop and Eights	7.1 thru 7.10
Combination of Lines, Angles and Loops	Family 8
Roll (Slow or Hesitation)	9.1 thru 9.8
Roll (Snap)	9.9 thru 9.10
Spin	9.11 thru 9.12
Advanced	
Rolling Turn	2.3 thru 2.20
Hammerhead	Family 5
Loop and Eights	7.1 thru 7.10

Combination of Lines, Angles and Loops	Family 8
Roll (at least one figure from each)	9.1 thru 9.8
Roll (Snap)	9.9 thru 9.10
Spin (only one figure allowed)	9.11 thru 9.12

Unlimited

Lines and Angles	Family 1
Rolling Turn	2.5 thru 2.15 or 2.17 thru 2.20
Hammerhead (maximum of three)	Family 5
Tailslide	Family 6
Loops and Eights	Family 7
Combination of Lines, Angles and Loops (minimum of one Family 8 and a maximum of four 8.1 thru 8.4 figures)	Family 8
Spin (only one figure allowed)	9.11 thru 9.12

For Unlimited, at least two positive (9.9) and two negative (9.10) snap rolls must be included. At least one figure must contain opposite rolls. There are no other Family 9.1 - 9.8 figures required.

6.4 START AND FINISH ATTITUDES

The start and finish of the Free Program will be carried out in horizontal level flight, either upright or inverted, parallel to the X or Y axis.

In the case of the Glider Intermediate Free Program, the flight must begin and end in level upright flight while the Glider Unlimited Free Program can start in upright or inverted flight but must end in upright flight.

Competitors may design their Free program to start upwind or downwind on the X-axis or on the Y-axis. It is recommended that a downwind X-axis or Y-axis entry be noted on Forms B and C. *(See 6.13.4)*

6.5 ALLOWABLE FIGURES

Any figure identified in the *FAI Aerobatic Catalogue* may be selected to compose the Free Power program. Figures 1.1.1. thru 1.1.4. can only be used with Family 9 rolls added.

Any figure identified in the *FAI Catalogue for Glider Aerobatic Figures* (GAF) may be selected to compose the Free Glider program. In addition, the Wingover *(See 5.1.9)* and Quarter-Clover *(See 5.1.10)* may be used in Intermediate Glider Free Programs only. Figures 1.1.1 thru 1.1.4. can only be used with Family 9 rolls added.

6.6 FIGURE DOCUMENTATION

Each figure selected must be listed on Form A, showing the *FAI Aerobatic Catalogue* number, the correct K-Factor and the correct symbol, whether it is used singly or in combination.

6.7 DEFINITIVE CRITERION

The *FAI Aerobatic Catalogue* number shown on Form A is the definitive criterion in the event any errors are made in drawings of symbols on Forms B or C. The catalogue number will also be used to prescribe proper K-Factors. There are two exceptions to this:

(1) The determination of whether rolls that are not linked are flown in the same direction or opposite direction. For these figures, the appropriate B or C form (based on direction of flight) is used.

(2) When the flight is in progress, the drawing held by the judges for scoring purposes (Form B or C) shall be the definitive criterion for the proper figure and direction to be flown. *(See 7.3.1 (c))*

6.8 REPETITION

Repetition of any *FAI Aerobatic Catalogue* number is not permitted except that Sportsman and Intermediate may use 1.1.1. thru 1.1.4. without limit.

Intermediate Gliders may repeat basic figures if they are used in combination with different rolls. For example, it would be legal to include both an 8.42.1. + 9.1.4.2. and an 8.42.1. + 9.4.4.2. in the same Glider Intermediate Free program.

Repetition in Unlimited Glider Free programs is not permitted except for Families 1.1.x. and 9.1.x.x.

6.9 TOTAL K-FACTOR OF A COMBINATION FIGURE

To calculate the total K-Factor of a combination figure, simply add the K's of its components. For example, to construct a horizontal slow roll from upright to upright:

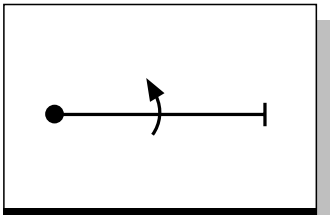


Fig 6.9.1

1.1.1.	K = 2
+ 9.1.3.4.	K = 8
Total K-Factor	***10***

6.10 CORRECT SNAP ROLL ATTITUDE

The correct catalogue number for the snap roll to be added to a figure is determined by the loading (positive or negative) on the aircraft at the point on the figure where the snap roll is initiated. *(Fig 6.10.1)*

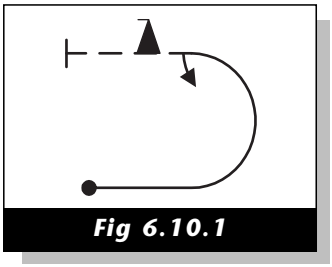


Fig 6.10.1

7.1.1.	K= 6
9.1.3.2.	K= 4
+ 9.10.8.2.*	K= 15
Total K-Factor	***25***

**Not a 9.10.3.2. K = 13*

There is only one exception to this rule: When the angle-of-attack is zero. The angle-of-attack is considered to be zero if any one of four events occur: 1) after a vertical aileron or snap roll; or 2) in the downline after a hammerhead; or 3) after a tailslide; or 4) in the downline after a spin element. In any of these cases the lower of the two possible K-Factors and the associated *FAI Aerobatic Catalogue* number must be used. *(Fig 6.10.2)*

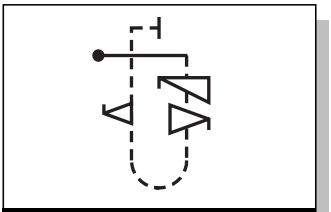


Fig 6.10.2

8.2.3.	K = 17
+ 9.11.1.4.	K = 5
+ 9.9.5.4.	K = 11
+ 9.9.6.2.	K = 17
Total K-Factor	***50***

•Note: Full inside Snap Roll uses lower K-Factor of 9.9.5.4. (K=11) rather than 9.9.10.4 (K=13) because the angle of attack following the spin element is defined as zero.

6.11 CONSTRUCTION OF FIGURES AND K-FACTORS

The method of constructing figures and calculating difficulty coefficients is described in the *FAI Aerobatic Catalogue* as currently amended by the FAI International Aerobatics Commission (CIVA). In addition, "Special Bulletins" issued by IAC to further explain the use of the catalog will be considered regulatory.

6.12 FORM A - THE COMPETITOR'S SCORESHEET

(See Appendix 7 for examples.)

6.12.1

Competitors will present their Free Programs to the Registrar on current forms, as published by IAC, in the quantity required by the Contest Director.

6.12.2

Each component *FAI Aerobatic Catalogue* number, each component K-Factor, and figure symbols must be clearly legible on Form A.

6.12.3

A total, derived by addition of the K-Factors for each figure, must be on Form A.

6.12.4

Presentation K-Factor for the category must be shown on Form A. *(See 5.8)*

6.12.5

It is the competitor's responsibility to have his or her three (3) Free Program Forms checked, signed, and dated by a current Judge prior to a contest. Competitors arriving without Forms A, B, and C being certified in accordance with these rules may be refused entry. Such certification does not relieve the competitor of the final responsibility for the legality and legibility of the forms. A competitor cannot sign off his or her own Free Program.

6.12.6

If the legality of a Free Program is questioned by another competitor in the same category or a Judge, the matter may be put before the Contest Jury by filing a protest.

6.12.7

If a protest is lodged regarding the validity of a Free Program, the Contest Jury shall apply the Judges Checklist for Free Programs *(See 6.14)* to the program in question. If problems are found, penalties shall be assessed as specified in the applicable subpart(s) of 6.14.1.

6.12.8

The symbols drawn on the Form A should be those from the *FAI Aerobatic Catalogue* with only such changes as are necessary to show opposite directions of rolls and direction of turns.

6.12.9

The character and composition of basic figures must not be changed when combining other figures with them. The direction of rotation of rolls and spins is not prescribed. However:

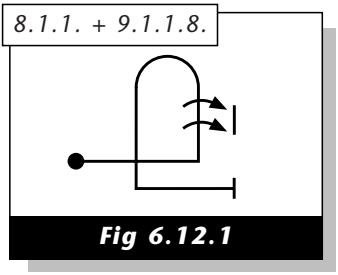


Fig 6.12.1

(a) When rolls are in continuous rotation, the tips of the symbols are to be linked by a small line. (*Fig 6.12.1)*

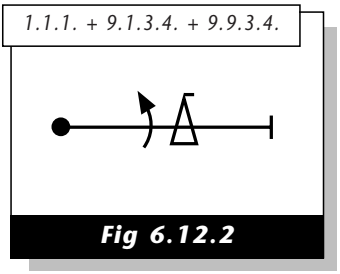


Fig 6.12.2

(b) For unlinked rolls in the same direction, no line links the symbols, but their tips must be drawn on the same side of the line where they are placed. (*Fig 6.12.2)*

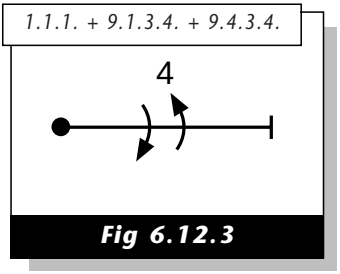


Fig 6.12.3

(c) For opposite rotation rolls, the tips of the symbols must be drawn on the opposite side of the line (*Fig 6.12.3)*

6.12.10

Unlinked rolls in the same direction must be of different types. The two types of rolls are defined as follows:

(a) Aileron rolls (slow rolls and hesitation rolls).

(b) Snap or flick rolls (positive and negative).

6.12.11

When entering a figure on the Y axis which exits along the X axis, the direction of spin, turn, or roll must result in exiting, after the prescribed degrees of rotation, in the proper direction for entry into the subsequent figure. The proper direction is as prescribed on Forms B and C.

6.13 *FORMS B & C (FLIMSIES)*

(*See Appendix 7 for examples.)*

6.13.1

Each figure will be drawn on standard IAC Forms B and C (flimsies) showing the sequence of figures to be flown. These are separate forms and should not be printed back-to-back.

6.13.2

Form B will show the continuous sequence of the program as it is flown with the wind blowing from the Judges' right to left.

6.13.3

Form C will show the continuous sequence of the program as it is flown with the wind blowing from the Judges' left to right.

6.13.4

The only notations allowed on Forms B & C are: "Note Y-axis entry", "Note downwind entry", "90 degree", "180 degree", "270 degree", or "360 degree" inside a turn, and the optional break symbol. No account will be taken of any other notations and none should appear on the forms, except those described in 6.13.7 and 6.13.8.

6.13.5

The symbols drawn on Forms B & C should be identical to those from the *FAI Aerobatic Catalogue.* They may be enlarged and modified as necessary to show left direction as all those in the catalogue are right direction. They may also be modified to show entry from, or exit to, the Y axis. Lines may be extended or shortened to enhance the drawing, however, the burden for easy readability and clarity lies with the competitor.

6.13.6

A number, either directly above the small "dot" or inside an open circle that signifies the beginning of the figure, should be placed on Forms B and C to depict the numerical order of the sequence.

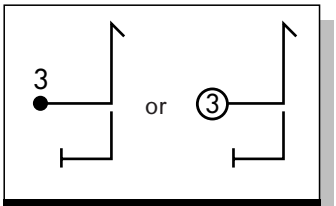


Fig 6.13.1

6.13.7

The competitor should strive to space the drawn symbols on forms B & C so that the sequence is easily followed. If the symbols can not be spaced on the drawing in such a way that following the sequence of figures is unambiguous, a dotted line or series of tiny circles should be used to lead the judge's eye from the end of one figure to the beginning of the following figure.
(See Fig 3 and 4, and Fig 9 and 10 on Form B, Appendix 7)

6.13.8

A distinct and noticeable double line will be drawn on the Forms B and C at the point where the optional break would be taken. *(See 4.21.5 and Appendix 7)*

6.14 *JUDGE'S CHECKLIST FOR FREE PROGRAMS*

6.14.1

The competitor has the sole responsibility for the selection of figures for their Free Program. The Judge checks for legality, readability, and agreement between catalog numbers, K-Factors and drawings. The *FAI Aerobatic Catalogue* number is always definitive.

The following items form a checklist for Free Programs, and describe the penalties for non-compliance *(See 6.12.7)*:

(a) Total number of figures. It must not exceed that authorized for the category. *(Power, Table 6.2.1; Glider, Table 6.2.2)* Any excess figure(s) shall be zeroed, starting from the last and working backwards until the maximum allowable number of figures is reached.

(b) Versatility. The requirements of 6.3.2 must be met for Power and 6.3.1 for Gliders. Should a versatility element be missing, one figure shall be zeroed for each missing versatility element, starting with the highest K figure and working backwards.

(c) Repetition. Check figures on Form A for duplicate *FAI Aerobatic Catalogue* numbers. The repetition of any *FAI Aerobatic Catalogue* number is not permitted except as provided in 6.8. Also scan Forms B and C for repeated figures. The most likely repetitions occur in Family 9 (Rolls), Family 8 (Combinations) and Family 5 (Hammerheads).

Intermediate gliders may repeat basic figures if they are used in combination with different rolls. For example, it would be legal to include both an 8.42.1. + 9.1.4.2 and an 8.42.1. + 9.4.4.2. in the same sequence.

All subsequent figures that contain an illegal repetition shall be zeroed. For example, the first figure containing a 9.1.1.1 roll would be scored, but all subsequent figures containing that element would be zeroed.

(d) Illegal construction. *(See FAI Aerobatic Catalogue, Section I)*. Inspect the added rolls carefully. All illegally constructed figures shall be zeroed.

(1) Where a 1/2 roll symbol appears, only rolls resulting in a 180 degree change in roll attitude can be used, as the character of the basic figure cannot be changed *(See FAI Aerobatic Catalogue, Section I, para. 7.1)*.

(2) Where the 360 degree roll symbol appears, only 360 degree or 720 degree rotations can be used. It is also the competitor's option to use no roll at all.

(3) Rolls of 1/4, 1/2, 3/4, 1, 1 1/4, 1 1/2, 1 3/4 or 2 may appear only on vertical lines where the optional 90 degree roll symbol appears.

(4) Linked rolls must be multiples of the same type of roll.

(5) Unlinked rolls in the same direction of rotation must be of different types.

(6) Opposite rolls - Multiple rolls may be used more than once in a figure but no more than a pair of them may be used on a straight or curved line *(See FAI Aerobatic Catalogue, Section I, para. 17)*.

(7) Where a Family 9.1 - 9.10 roll is combined with a Family 9.11 or 9.12 spin element on the same line, the spin must occur first on the line.

(8) Positive/Negative entry snap rolls - in Families 9.9 and 9.10 (snap rolls), the proper *FAI Aerobatic Catalogue* number for the snap roll is determined by the loading at the point where the snap roll is placed *(See FAI Aerobatic Catalogue, Section I, para. 23-24)*.

(e) On Form A, verify that each *FAI Aerobatic Catalogue* number is entered correctly, the correct K-Factor has been entered for each component, the total K-Factor for the figure is correct, and the symbol is proper for the figure described by the *FAI Aerobatic Catalogue* number. Any figures with an incorrect catalog number or K factor shall be zeroed.

(f) With a calculator, verify the grand total K-Factor for the program is correct and does not exceed the maximum K-Factor allowable for the category. *(See 6.2)* Should the maximum K-Factor be exceeded, figures will be zeroed starting with the last figure and progressing backwards until

the total K-Factor (not including the Presentation K) is within allowable limits.

(g) On Form A, verify the Presentation K-Factor is correct for the category. *(See 5.8)*

(h) Place Forms B & C side by side and follow them as you would while grading at a contest. Are they clearly legible and easy to follow? Do the drawings on both forms agree in every important detail, i.e. dashed lines, roll symbols, figure numbers, roll designations? All illegible figures and/or figures that can't be flown as drawn shall be zeroed. Note: This applies only to the form in use *(See 6.7.2)*.

(i) On Forms B and C, check that the optional break point has been clearly marked with a distinct double line. If the optional break symbol is missing, an interruption penalty shall be assessed.

(j) If all the above items are correct, sign and date each of the three Forms.

(k) Remind the competitor that no changes or alterations can be made to these forms without having them recertified.

CHAPTER 7 GRADING AND SCORING

7.1 GRADING OF FIGURES

The Judges will independently assess the quality of each figure and its components as performed in the sequences, grading with numbers from 10 to 0 in increments of 0.5. The Unlimited Power 4-Minute Free program is graded on a special scale described in 5.6.8.

7.1.1

A grade of ten (10) represents a perfect figure in which the Judge saw no deviations from prescribed criteria. Each figure is assumed to start with a grade of ten (10).

7.1.2

When grading the quality of the performance of individual figures, Judges should consider the following general principles:

(a) The geometry of the figures (including shape, radii, angles, plane of flight, direction of flight, heading and bank angle) must comply with the prescribed criteria.

(b) The precision of the performance compared to the criteria in Chapter 8.

(c) The distinctly recognizable start and finish of each figure with a horizontal line.

(d) The figure must be the one depicted on the flimsy appropriate to the official wind direction (Form B or C) and located at its proper place in the sequence.

(e) The grading criteria of each component will apply in a combination figure so that one overall grade for the figure will result.

(f) The length of the lines and the size of the radii caused by the flying characteristics of an aircraft are not to be taken into account in the grading.

(g) Negative figures are graded by the same criteria as positive figures.

7.1.3

A reduction of grade will be applied for each deviation from the prescribed criteria for the figure. For all deviations from the correct geometry (plane of flight, direction of flight, heading, bank angle),

and for deviations from the proper flight path or the proper attitude, the grade will be reduced by one (1) point per five (5) degrees of deviation. Similarly, a reduction of 0.5 point will be made for each 2.5 degrees of deviation.

Examples:

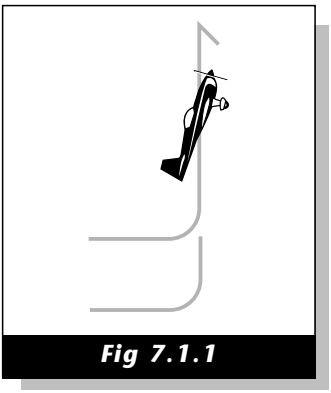


Fig 7.1.1

A hammerhead flown at 75° versus the prescribed 90° cannot receive more than a 7.0.

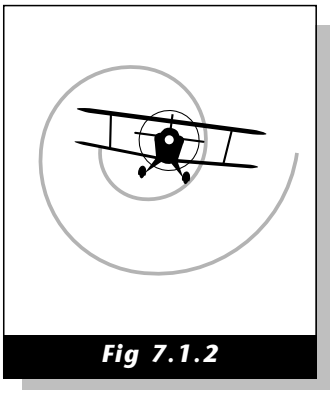


Fig 7.1.2

A snap roll which over-rotates 7.5° cannot receive more than an 8.5.

7.2 BEGINNING AND ENDING OF A FIGURE

7.2.1

The first figure of a sequence begins at the moment the aircraft departs from wings-level, horizontal flight path. A figure is complete at the moment the aircraft returns to a wings-level, horizontal flight path. The only exceptions to this are the exit lines in *FAI Aerobatic Catalogue* Families 7.7 and 7.8 (Square Loops).

If the competitor corrects any errors in exit flight path, bank angle, or heading before initiating the subsequent figure, only the first figure shall be downgraded. Failure to correct such errors shall result in a downgrade to both figures.

7.2.2

The aircraft shall fly in straight, wings-level, horizontal flight (upright or inverted) between figures. Any geometric deviation (pitch, roll, heading) observed in the line between figures shall be deducted from the subsequent figure at the rate of one (1) point per five (5) degrees of deviation. In Glider flights, the lines marking the

entry into and exit from a maneuver can be at any "reasonable" angles and need not be the same. "Reasonable" means an attitude angle that is appropriate for the forthcoming maneuver and does not violate the basic form of the figure. For example, if a glider pilot is about to fly a loop which requires only a moderate velocity - and then a Hammerhead with a quarter-roll on the up line which requires a high velocity - then one can expect to see a much flatter attitude on the line marking the entry than on the line marking the exit to the loop. The usual criterion of constancy still applies.

7.2.3

The absence of a distinct straight, wings-level horizontal flight path between figures will result in the grades being reduced by one (1) point in each case for each figure. *(See Fig 8.4.1)*

7.3 *ZEROS*

7.3.1 *A zero (0) will be given for:*

(a) Omitting a figure in the program.

(b) Adding a figure to a program. In this case a zero will be given to the figure immediately following the added figure. Refer to 4.12.1(c) for interruption. As long as the judge is able to follow the sequence, the competitor is to be given the benefit of doubt.

(c) Flying a figure which deviates from the drawing held by the judges for scoring purposes (Form B or C). Note: When a figure is added to a sequence Rule 7.3.1 (b) applies.

As long as the Judge is able to follow the sequence, the competitor is to be given the benefit of doubt.

(d) Flying a figure in the wrong direction on the X axis. The Y axis is non-directional.

(e) Any cumulative deviation in excess of 45 degrees on the roll, pitch, or yaw axes.

(f) Any figure or figures started and flown completely outside the Aerobatic Box prior to initial entry, as determined by the Boundary Judge. Any such figures will be awarded a zero (0) by the Chief Judge and no additional boundary infringement penalty will be imposed.

(g) Any figure started behind the Judges' line as determined by the Chief Judge.

(h) Any figure that is entirely or partially flown behind the deadline.

(i) Any Super Slow roll flown at a rotation rate less than 10 seconds per 360 degrees. Timing is done at the Chief Judge's station.

(j) Any figure interrupted for a technical fault ruled to be invalid. (See 4.20.3)

(k) Any figure flown as part of a Free Program which is found by the Contest Jury to be illegal. *(See 6.12.7)*

7.3.2

When zeros occur and the Chief Judge determines there has been difficulty in properly assessing zeros on the judging line, the Chief Judge will call a conference of Judges on the line as soon as possible.

7.3.3

A mark of zero will not stand if given by a minority, defined as equal to or less than 50%, of the grading judges. If there is not a majority zero mark, each zero must be corrected upward to at least the mark nearest zero given by any other judge.

Examples:
Five judges score: 8.5, 7.5, 0, 0, 8.0
The zeros do not stand and must be corrected to at least a 7.5. (See also 7.3.7)

Four judges score: 6.5, 0, 4.5, 0
The zeros do not stand and must be corrected to at least a 4.5.

7.3.4

If a majority of Judges give a grade of zero (0) for a figure, Judges in the minority must change their grade for that figure to zero (0).

7.3.5

Grading of a sequence will commence with the first figure. Any figure or figures started and flown completely outside the Aerobatic Box prior to initial entry, as determined by the Boundary Judge, will be awarded a zero (0) by the Chief Judge. *(See 7.3.1(f))*.

Example: A competitor performs the first figure in its entirety outside the Aerobatic Box, flies figure number 2 partially outside and partially inside the Box, flies figure 3 through 9 in the Box, figure number 10 outside and figures 11 and 12 inside the Box. The first figure will be given a zero (0) by the Chief Judge. Boundary infringement penalties will be assessed for figures 2 and 10 by the Chief Judge.

7.3.6

If a Judge misses seeing a figure, or any part of a figure such that a grade cannot be given with full confidence, the Judge will instruct the Recorder to write "A" in the top of the grade block. The average score given by the judges who graded the figure will be computed to the nearest 0.5 by either the Chief Judge or Scoring Director and used in place of the "A" in the final score computation.

7.3.7

When both "A's" and "0's" appear for a figure, the "A's" will be temporarily set aside and the zeros resolved in the standard fashion *(See 7.3.3 and 7.3.4)* as if the "A" scores did not exist. If the zeros hold, the "A's" will also be set equal to zero. If the zeros do not hold, the "A's" will be calculated using the original non-zero scores and the scores to which the minority zeros were raised in accordance with the procedure given in 7.3.3.

Examples:
Scores: 8.0, 7.0, 0, A, 7.5
Step 1 - the 'A' is ignored and the zero (0) does not stand. The judge giving the zero chooses to raise it to a 7.5 (must be at least a 7.0).
Step 2 - the 'A' (average) is calculated as (8+7+7.5+7.5)/4 = 7.5

Scores: 5.5, 0, 0, A, A
Step 1 - both A's are set aside. The zeros are in a majority and stand.
Step 2 - all five scores are set to zero

7.4 *PRESENTATION*

A grade for Presentation will be given by each judge after the flight is complete based on the judge's impression of the overall presentation. *(See 8.6)*

7.5 *SCORE COMPUTING*

7.5.1

The grades for each figure will be multiplied by the K-Factor (coefficient of difficulty) to derive a figure score. The total of figure scores when added to the positioning score will constitute that Judge's total raw score for that flight. This computation is done in the computing room.

7.5.2

Infringements of the Aerobatic Box boundaries, altitude infringements, interruptions, and time penalties in the Unlimited Power 4-Minute Free will be assessed by the Chief Judge or his assistants and recorded on the "Chief Judge's Penalty Worksheet".

7.5.3

The "Chief Judge's Penalty Worksheet" will be attached to the Form A's for the flight and sent to the computing room. Once the forms leave the Chief Judge's station, they come under the jurisdiction of the Contest Jury.

7.5.4

In the computing room, the current IAC contest scoring system, supplied by IAC Headquarters, will be used.

(a) After the total score is computed per this section, the penalty points from the "Chief Judge Penalty Worksheet" will be deducted to arrive at the competitor's final score.

(b) If a Judge is unable to complete his or her duties during a flight program, a substitute Judge can be appointed. However, that Judge shall only take his or her place on the judging line at the start of the subsequent program. The grades of the departed Judge will be deleted for the flight program he or she did not complete.

(c) In the event of a disqualification, the Scoring Director will enter total penalty points equal to 9999 for the disqualified flight(s).

(d) In the event of a withdrawal, the Scoring Director will assign scores of zero to all figures and penalties. Those scores will not be discarded but will remain part of the calculations for the category.

7.5.5

The Contest Director will make Forms A available for the personal inspection of the competitors as soon as possible after the Scoring Director has no further need of the Form A and Penalty Worksheet. However, these scoresheets must remain under the supervision of the Contest Director or his designee until the expiration of the protest period. *(See 3.18.2)*

7.5.6

If a computer analysis of judging (JPF) is produced, it will not be distributed to the Judges until after the contest is completed.

7.5.7

Only IAC supplied computer scoring programs will be permitted. The Scoring Director will ensure the current year's version of the scoring system is being used and is responsible for adhering to the instructions and notices supplied by IAC and contained in the opening pages of the software.

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CHAPTER 8 CRITERIA FOR JUDGING AEROBATIC FIGURES

8.0 PREFACE

The following is an expansion and clarification of the general principles for grading aerobatic figures stated in Chapter 7. The final grade awarded to a figure has many facets, but the first and most important component in any grade is the geometry of the figure as compared to the true horizon and Aerobatic Box axes. Geometry is derived from two distinctly different entities: flight path and attitude.

8.1 FLIGHT PATH AND ATTITUDE

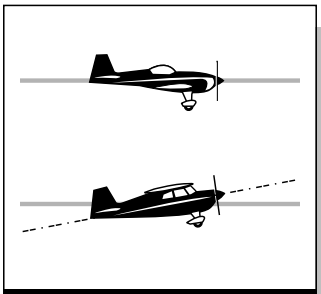

Fig 8.1.1

- *Horizontal flight is based on flight path, NOT aircraft attitude.*

8.1.1 Flight Path

Think of the airplane condensed into a single dot and watch the path this dot takes through the sky. This is the flight path, or track, of the aircraft's center of gravity. Judging the flight path consists of comparing the observed path with fixed references such as the horizon or the X and Y axes of the Aerobatic Box. *(Fig 8.1.1)*

8.1.2 Vertical Attitude

Judging vertical lines is based on the attitude of the aircraft and not its flight path. When an aircraft's flight path, in a zero wind condition, is exactly 90 degrees to the horizon, the wings are being held at the correct angle to produce no lift. The aircraft's attitude while in this condition (zero lift) defines the proper judging criterion for vertical attitude. This is called the zero-lift axis.

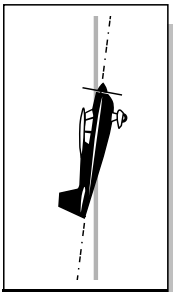

Fig 8.1.2

- *Aircraft may not appear vertical when flying a zero-lift axis.*

(a) When this zero-lift axis is vertical, the longitudinal axis of some aircraft may not appear to be vertical. *(Fig 8.1.2)* The Judge must determine the proper vertical attitude for each aircraft type according to its zero-lift axis. The best opportunity to make this determination is to observe practice flights and note the different aircrafts' vertical attitudes, both up and down.

(b) An aid for judging the perfect vertical (zero-lift) attitude is to observe vertical rolls. During a truly vertical roll, the aircraft's wings will constantly be parallel to the horizon, something which is especially noticeable after 90 degrees of roll.

(c) Be aware that aircraft types whose zero-lift axis does not pass through the tail will make a spiral with the tail during a perfect vertical roll. From the Judge's perspective, this spiral will look as if the tail is shifting off-axis from the zero-lift axis flight path.

(d) When there is a wind of any kind, the observed flight path will be offset from perpendicular to the horizon by some degree. This wind effect must be completely ignored by the Judge, who must only evaluate the accuracy of the vertical attitude. *(Fig 8.1.3)*

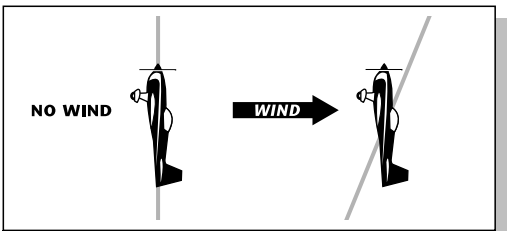

Fig 8.1.3

- *Vertical flight is judged on attitude, NOT flight path. Both aircraft illustrated receive no deduction for vertical flight since they both are flying on their zero-lift axis.*

8.1.3 *The 45° Attitude*

This is the vertical attitude plus or minus 45 degrees. In view of the difficulty in judging 45 degree lines accurately, scoring deductions should be applied with care. When flown into the wind, a perfect 45 degree line will appear to be steep while the opposite is true when flown downwind. *(Fig 8.1.4)* As with the vertical attitude, this wind effect must be completely ignored by the Judge who must only evaluate the accuracy of the 45 degree attitude. The prescribed deduction is one (1) point per five (5) degrees of deviation from the correct geometry (0.5 points per 2.5 degrees).

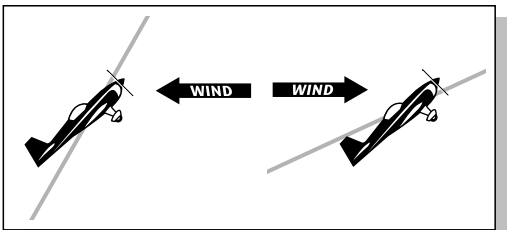

Fig 8.1.4

- *45 degree lines are judged on attitude, NOT flight path. Both aircraft illustrated receive no deduction for 45 degree lines since both are maintaining a 45 degree attitude throughout the length of the lines.*

8.1.4 *Horizontal Flight In Gliders*

In Glider flights, the lines marking the entry into and exit from a maneuver can be at any "reasonable" angle and need not be the same. "Reasonable" means an attitude angle that is appropriate for the forthcoming maneuver and does not violate the basic form of the figure. For example, if a pilot is about to fly a loop which requires only a moderate velocity - and then a Hammerhead with a quarter-roll on the up line which requires a high velocity - then one can expect to see a much flatter attitude on the line marking the entry than on the line marking the exit for the loop. The usual criterion of constancy still applies.

Furthermore, level attitude figures such as horizontal rolls and turns, may be flown at a constant, reasonable angle to the horizon. If the angle changes during the figure, however, a deduction will be applied. For example, if a 360 degree rolling turn is entered and flown with a constant 10 degree descent, no deduction would be made. If the angle changed to 15 degrees during some portion of the turn, however, a one (1) point deduction would be applied.

8.1.5 *Use of 30 Degree Lines*

In the case of Glider Sportsman and Glider Intermediate, all of the lines discussed in this section as 45 degree lines will be flown and judged as lines that are 60 degrees from the vertical attitude (30 degree lines).

8.2 *GRADING*

8.2.1

All transitions from one plane of flight to another should have a reasonable and constant radius. The size of that radius is not a grading criteria and higher grades are not to be given to "square, high-G" corners.

8.2.2

It should be assumed that a competitor is going to fly a perfect figure, so a Judge starts with a grade of 10. As the figure is performed, the Judge then begins to find faults (if any) with what he or she sees, and starts downgrading as the figure progresses. This system of grading is required by the rules as opposed to waiting until the figure is finished and assigning a grade based on overall impression. The latter causes the judging to be erratic and inconsistent.

8.2.3 *Summary*

Remember, it is the Judge's job to find fault: be a nit-picker.

Give a grade of 10 if you see a perfect figure - but if you are really being critical you won't see too many. Don't get in a rut. Guard against confining your grades in too narrow a range. If you watch carefully and grade consistently, you will find yourself giving an occasional 2, 3, or 4 on some sloppy figures that are not quite bad enough for a zero. You will also be giving an occasional 9 or 10 for the superlative figure with which you can find little or no fault. Take care not to grade on an overall impression of a flight. Be ready to award a low grade for a poor figure even if you have been grading other figures flown by that competitor with 8's and 9's.

On the other hand, when you see a competitor barely getting through the figures and you have been giving 4's and 5's, don't be afraid to award a 9 for the almost perfect 90 degree turn that you just saw.

Finally, and most importantly, only grade what you see. If you can't see anything wrong with a figure, don't deduct any points, even if you think there must be something wrong. Always give the competitor the benefit of the doubt.

8.3 *WIND CORRECTION*

There are two kinds of wind correction: correction for figure geometry (shape) and correction for Aerobatic Box positioning.

8.3.1

The competitor is required to make the shape of all loops and part-loops within a figure perfectly round as seen by the judge on the ground. Wind correction is required for loops and part-loops within figures so that the aircraft's flight path describes a constant radius circle or part circle. Remember, the Judge grades for the roundness of the flight path. Any deviation from perfect roundness must result in a reduction of the score for that figure.

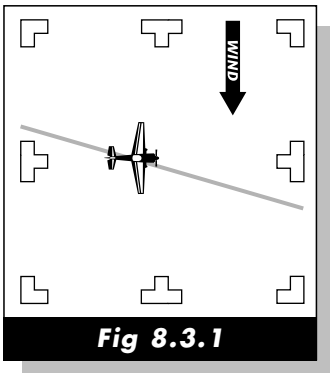

Fig 8.3.1

- *Flight path across Box with no wind correcting applied. As seen from above.*

8.3.2

The competitor is also required to keep the aircraft within the Aerobatic Box. This becomes more of a problem when a wind is blowing at an angle to the X axis. *(Fig 8.3.1)* The primary method of dealing with cross-box

drift is to include a "wind corrector" figure in the sequence. A wind corrector is a figure which places the aircraft onto the Y axis. Because the Y axis is non-directional, the competitor can turn onto the Y axis in the direction which will allow an upwind position change before flying a subsequent figure which returns the aircraft to the X axis.

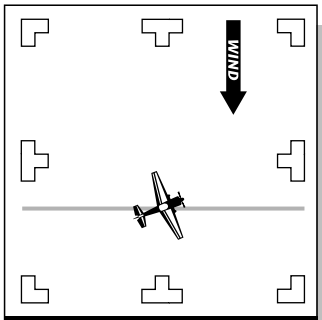

Fig 8.3.2

- *Flight path across Box with wind correction applied (crabbing). If Judge sees correction, a deduction must be given.*

A well designed Free Program will always include at least one, and preferably more, wind corrector figures. Not every Known Compulsory or Unknown Program contains sufficient (or any) wind corrector figures, however. In this case, it is up to the competitor to keep the aircraft within the Aerobatic Box without benefit of a specific Y axis figure to accomplish it.

A common approach is to crab into the wind as done in navigational flight. *(See Fig 8.3.2)* Crabbing means that the aircraft's heading is at an angle to the competition axis (X or Y). If this crab angle can be detected by the judge, however, a deduction of one (1) point per five (5) degrees of heading deviation must be given.

It is possible for the competitor to correct for wind in such a manner that the attitude remains absolutely true to the correct geometry of the figure but the flight path has a sideways component. It goes beyond the scope of this document to provide a tutorial on how this may be accomplished, but if any yaw (heading) deviation or bank angle is visible to the Judge, the score must be reduced at the rate of one (1) point for every five (5) degrees of deviation detected.

Please note: even if it is plainly evident that the aircraft has moved laterally within the Aerobatic Box, if the method of that movement cannot be detected by the Judge, no deduction for such correction must be made.

8.4 *THE TWO BASIC COMPONENTS OF AEROBATIC CONSTRUCTION: LINES AND LOOPS*

8.4.1 *Lines*

All lines are judged in relation to the true horizon and the Aerobatic Box's axes. Horizontal lines are judged on flight path, not attitude. Different aircraft at different airspeeds will employ different attitudes to maintain a horizontal flight path. *(Fig 8.1.1)* While maintaining a horizontal flight path, the aircraft's heading must remain parallel to the X or Y axis. The deduction for deviation in either axis is one (1) point per five (5) degrees from the correct geometry.

(a) All figures begin and end on definite horizontal lines, and both must be present in order to earn a good grade. A competitor who rushes

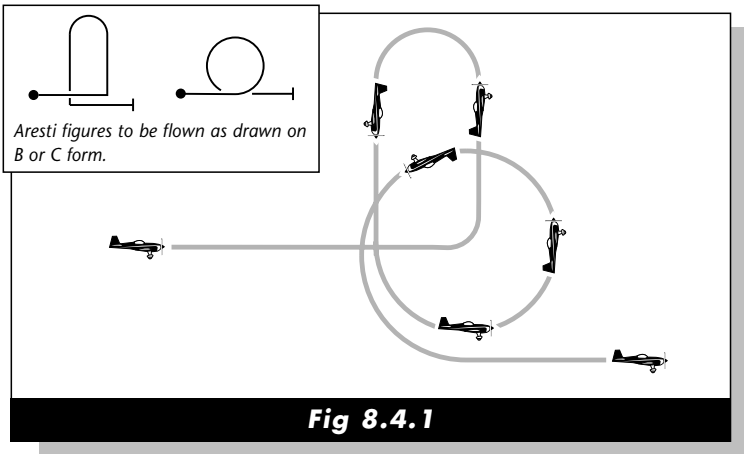

Fig 8.4.1

- *Figures as flown. No line between results in one (1) point deduction given to each figure.*

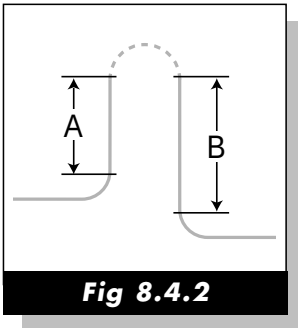

Fig 8.4.2

from one figure to another without showing this horizontal and well-recognizable line will be downgraded by one (1) point for each missing line in each figure affected. Therefore, leaving out the line between two figures will downgrade the preceding figure by one (1) point and the following figure by one (1) point. *(Fig 8.4.1)*

- *Length of lines A & B are defined as starting on and ending with part loops.*

(b) All lines that occur inside a figure have a beginning and an end which define their length. They are preceded and followed by part-loops. *(Fig 8.4.2)*

(c) With the exception of Family 3 figures and some figures in Family 7, the criterion for the length of lines within a figure states that they do not have to be of equal length. Therefore, it is imperative that the judges become familiar with the specific criterion for the length of lines for each figure. For example, the length of the lines in a "Humpty-bump" do not need to be equal, but all four lines in a "Square loop" must be of equal length. *(Fig 8.4.3)*

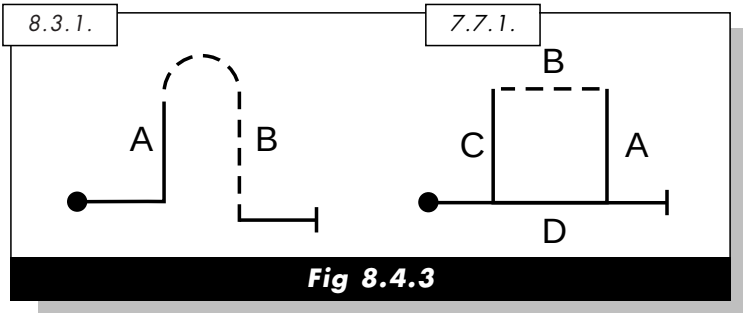

Fig 8.4.3

- *Length A does not need to = B*
- *Length A = B = C = D*

(d) Whenever any kind of roll is placed on an interior line, the lengths of the two parts of the line before and after the roll must be equal. Exceptions are when any type of roll follows a spin element and, for gliders only, snap rolls. Judges should take care to judge the symmetry of the length of lines in a figure using only the length of the lines and not by elapsed time taken to fly each segment. This difference in length versus elapsed time is most noticeable in figures where rolls are placed on up-lines. As the aircraft loses airspeed, the time it takes to fly a line after the roll will be greater than the time required to fly the line of the same length before the roll.

(e) Because of the characteristics of Glider flight, the placement of inside and outside snap rolls need not be at the center of the 45 degree and vertical lines; that is, the line before and after glider snap rolls need not be of the same length.

(f) If within a figure two or more lines must be of the same length, an observed variation is penalized by reducing the grade in the following manner: *(Fig 8.4.4)*

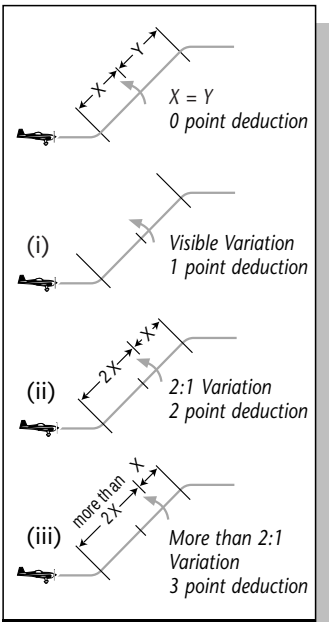

Fig 8.4.4

(i) a visible variation - 1 point deduction;

(ii) if the lengths vary 1:2 - 2 point deduction

(iii) and so forth up to a 3 point deduction.

(iv) No line before *or* after roll, 4 point deduction. *(Fig 8.4.5)*

The basis for judging line length is the first line flown. The absence of one of these lines before OR after a roll has to be penalized by 1 additional point. If there are no lines before AND after the roll, the total penalty is two (2) points only.

Example: The competitor is to fly a 45 degree up-line with a full roll on the line. However, the airplane is returned to level flight immediately after the roll. The deduction is 4 points: 3 points are deducted because the lines are of vastly different length and another 1 point is deducted because of the absence of one of the lines. (Fig 8.4.5)

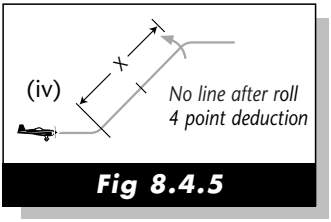

Fig 8.4.5

(g) All 90 degree and 45 degree lines are preceded by the execution of a part-loop. Since we have in this part-loop a significant angle-of-attack, the aircraft's attitude in the part-loop will differ from its flight path. Therefore, when the aircraft's attitude reaches the desired line after transitioning from the part-loop, this difference between attitude and flight path will be carried on and will be the same as the angle-of-attack. For this reason, the only criterion for judging in that moment of reaching the desired line is to be the attitude of the aircraft and not its flight path. It would then be very illogical suddenly to change the criterion of judgment from the visible and straight line of attitude to the unrecognizable and curved line of flight path. Therefore, the judging of 90 degree and 45 degree lines can only be based on attitude, not flight path.

8.4.2 *Loops and Part-Loops*

The loop is a figure from Family 7, but part-loops are integral to every other family so it is necessary to discuss the loop before going on to the other families.

(a) A loop must have, by definition, a constant radius. It starts and ends in a well-defined line which, for a complete loop, will be horizontal. For a part-loop, however, such lines may be in any other plane of flight and will be defined by the aircraft's attitude. As the speed changes during execution of a loop or part-loop, the angular velocity around the aircraft's lateral axis also has to change in order to keep the radius constant. When the speed decreases, for example, to half its initial rate, the angular velocity, to keep the same radius, will be reduced by half – this is a fact of physics. Thus, the angular velocity can be an aid for the Judge to gauge the radius – especially when the angular velocity in the higher part-loop is seen to be faster, as this is a clear indication that the radius is smaller. This aid becomes more important when two part-loops are separated by a line between.

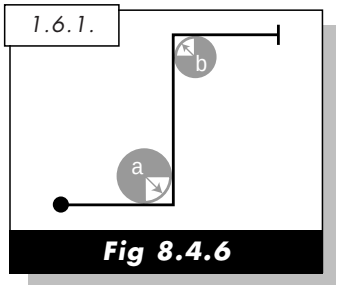

Fig 8.4.6

- *In Family 1 figures, radius a need not match radius b.*

(b) The part-loops of any one figure should all have the same radius, except in Family 1 figures and where indicated in Family 8.1 thru 8.28 and 8.49 thru 8.56. For example, a figure starts on a horizontal line, with a quarter loop next, followed by a vertical line and then another quarter loop. The quarter-loop at the top of the vertical line (Family 1 figure) need not have the same size radius as the quarter-loop at the bottom. *(Fig 8.4.6)* However, the top radius must not be a "corner" or very sharp angle. It must have a smooth, distinct and constant radius. *(Fig 8.4.7)*

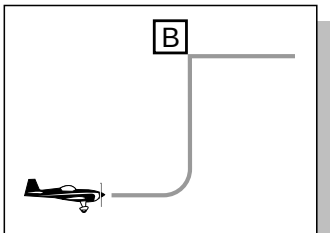

Fig 8.4.7

- *Sharp angles, or "corners" B are NOT allowed.*

(c) When the looping portion of a figure is immediately preceded or followed by one or more rolls (i.e., rolls not centered on a straight line), there must be no visible line between the roll and loop elements. Drawing a line requires a downgrade of at least one (1) point depending on the length of the line drawn. This criterion is not meant to imply that one element (roll or loop) must start before the preceding element is completely finished. A brief hesitation between elements (similar to opposite rolls) must not be downgraded.

8.5 FAI AEROBATIC CATALOGUE FAMILIES

FAMILY 0.0 *Wingover*

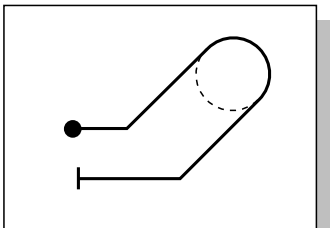

Fig 8.5.1

• *Wingover*

The Wingover will begin with a climbing coordinated turn, with the turn begun immediately after the climb is initiated. Climb and turn will be timed so that at the top of the climb, heading is 90 degrees off the original heading, the wings are perpendicular to the horizon, and the longitudinal axis of the aircraft is horizontal. Deductions for errors in heading and attitude at this point should be made according to the "one point per five degree" rule. The second half of the wingover is a continuation of the turn, now on a descending flight path, returning to horizontal flight on the reciprocal of the entry heading. *(Fig 8.5.1)* The 180-degree change of heading should be flown at a constant rate of turn and the bank angle should be constantly and smoothly changed throughout the turn, stopping only briefing as the roll direction is reversed at the 90-degree point of turn. Each change in the rate of roll or turn is a deduction of no more than one (1) point. Any complete stoppage of the rate of roll or turn is also a deduction of no more than one (1) point.

FAMILY 0.1 - 0.2

Quarter-Clover

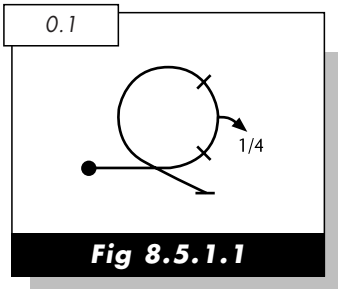

Fig 8.5.1.1

The quarter-clover is a loop with a quarter roll evenly integrated either within the first half loop up (Family 0.1) or within the second half loop down (Family 0.2). In

either case, the exit direction of flight will be 90 degrees to the entry heading. *(Fig. 8.5.1.1 and 8.5.1.2)*

For the Family 0.1 quarter-clover, the roll should begin simultaneously with the pitch up and continue at a constant rate such that the aircraft reaches the top of the loop inverted with the fuselage horizontal and the longitudinal axis 90 degrees from the start direction. The second half loop down is conventional, like the second half of a 7.5.1.

For the Family 0.2 quarter-clover, the first half loop up is conventional, like the first half of a 7.5.1. The aircraft should begin the quarter roll immediately upon reaching the apex of the first half loop and continue at a constant rate such as to reach upright, wings-level horizontal flight at the bottom of the second half loop.

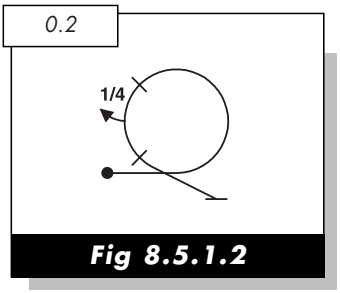

Fig 8.5.1.2

For both figures, start and finish altitudes should be equal and standard criteria for the quality of the looping portion are maintained.

FAMILY 1 *Lines and Angles*

Family 1.1 to 1.11 has been fully covered in the preceding section. Note that the figures in Family 1.12 to 1.43 are NOT performed as drawn in the *FAI Aerobatic Catalogue*. *(Fig 8.5.2)* In each of these figures there are three looping components: a one-eighth loop, a three-eighths loop and a quarter loop. (*Fig 8.5.3)* Rolls may be performed on the 45 degree line and/or the 90 degree line, with the part-lines before and after the roll being of equal length. The initial horizontal line and the line at the end of the figure may be flown at different altitudes.

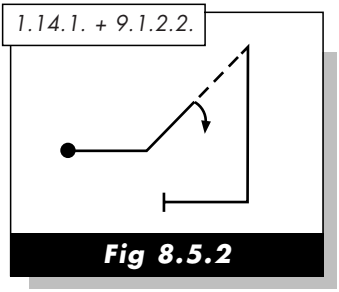

Fig 8.5.2

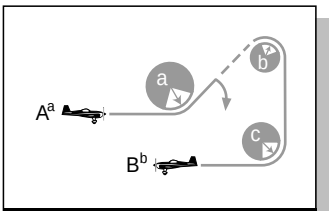

Fig 8.5.3

- *Family 1.12 - 1.19 as flown. Radii a, b and c may all be different and entrance altitude "A^a" can be different from exit altitude "B^b".*

FAMILY 2 *Turns and Rolling Turns*

FAMILY 2.1 - 2.2 *Turns*

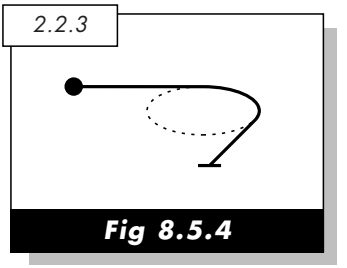

Fig 8.5.4

- *90 degree turn.*

Competition turns are not to be confused with standard coordinated turns. In aerobatic competition, a turn is divided into three parts: 1) establishing the bank using a roll on heading; 2) the turn itself; and 3) a roll back to straight and level flight on heading. Let's look at the turn during each of these three parts.

First, the roll to establish the bank. This must be a roll of between 60 and 90 degrees, it must be performed on the entry heading, and the aircraft must maintain a constant horizontal line.

Once the roll is completed and the angle of bank is established, the competitor immediately performs the turn. The turn must maintain the established angle of bank throughout. The aircraft must also maintain horizontal flight. The rate of turn is constant throughout and is NOT wind corrected. Therefore, in wind, a 360 degree turn will not appear as a perfect circle.

As soon as the aircraft is on the exit heading, the competitor performs another roll at a rate equal to the entry roll. Again the aircraft must maintain a constant horizontal line.

Downgrades:

1. The angle of bank established by the initial rolling maneuver must be at least 60 degrees. Anything less is a one (1) point deduction for every five (5) degrees.
2. The angle of bank, once established, must remain constant. Any deviation is a one (1) point deduction for every five (5) degrees of deviation.
3. The rate of roll must be the same for the entry and exit rolls of this figure. Any deviation is a one (1) point deduction.
4. The aircraft must maintain a constant altitude throughout the figure. Any variation would be either one (1) point for every five (5) degrees of change or 1 point for every 100 feet.

5. The rate of turn must remain constant. Any change would be not more than a one (1) point deduction for each change. Note that the rate of turn may appear to change in a strong wind, when it really isn't changing. The Judge must always keep the wind in mind and give the pilot the benefit of the doubt if there is any question.

6. The aircraft must begin and end on the prescribed heading. Any deviation is a one (1) point deduction for every five (5) degrees of deviation.

FAMILY 2.3 - 2.20 *Rolling Turns*

The rolling turn is a figure that combines a turn of a prescribed amount with a roll or rolls integrated throughout the turn.

These rolls may be in the same direction as the turn and are called "rolls in" or "rolls to the inside". They can be rolls in the opposite direction of the turn and are called "rolls out" or "rolls to the outside". *(Fig 8.5.5)* Or there can be rolls alternating in and out.

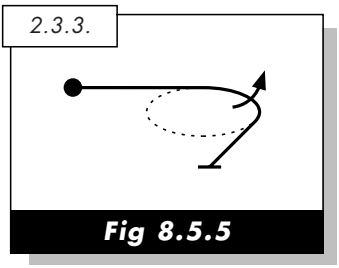

Fig 8.5.5

- *90 degree turn with one roll to the outside.*

When we say that the rolls are integrated, we are saying that in addition to there being constant rate of turn throughout the figure, there is also a constant rate of roll throughout. Naturally, the one exception to this constant roll rate is the pause when reversing roll directions.

To help visualize the execution of this figure and facilitate a way for the Judge to determine a constant roll rate, let's look at an aircraft performing a 360 degree rolling turn with 4 rolls to the inside from upright (Family 2.10.1). First, on the prescribed entry heading, the pilot executes a turn and simultaneously initiates a roll in the same direction as the turn. The judge will expect the aircraft to be inverted at 45, 135, 225, and 315 degrees and to be upright at 90, 180, 270 and 360 degrees. At these interim headings, the Judge will NOT downgrade using the one (1) point for five (5) degrees rule but will judge changes in the rate of roll, changes in rate of turn and changes in altitude *(see downgrades on next page).* At the end of the figure the aircraft must be wings level and on the prescribed heading.

When a rolling turn is performed with rolls in alternating directions, the aircraft must change direction of roll at a wings level attitude. The position of the aircraft in the turn is still only used as an aid to determine if the pilot is varying the rate of roll or turn.

Downgrades:

1. Performing more or fewer rolls than the catalog description calls for results in the figure being zeroed.
2. All rolls in a rolling turn are slow rolls. If a snap roll is performed, the figure is zeroed.
3. Each variation in the rate of roll is no more than a one (1) point deduction.
4. Each complete stoppage of the rate of roll is a deduction of one (1) point.
5. Each variation in the rate of turn is no more than a one (1) point deduction.
6. Variations in altitude are deducted using either one (1) point for every five (5) degrees or 100 feet of altitude.
7. One (1) point for every five (5) degrees that the aircraft is not in level flight when reversing roll direction.
8. One (1) point for every five (5) degrees of roll remaining when the aircraft has reached its exit heading.
9. One (1) point for every five (5) degrees of turn remaining when the aircraft has completed its last roll.

FAMILY 3 *Combinations of Lines*

The transition from level flight to 45 degree lines should be at a constant and reasonable 1/8 looping radius. All lines within the figure should be equal in length. The 45 degree transitions in Family 3.1 should have a constant and reasonable radius and not (as drawn) a sharp corner. *(Fig 8.5.6)*

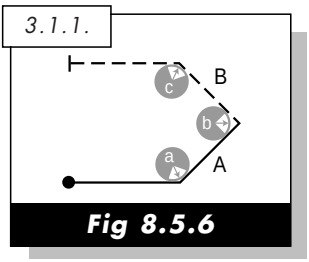

Fig 8.5.6

- *Radii a = b = c.*
- *Length of line A = B.*

FAMILY 4 *Not in use.*

FAMILY 5 *Hammerheads*

Hammerheads, also referred to as stall turns, are some of the most graceful figures in the *FAI Aerobatic Catalog*. In its most basic form *(Fig 8.5.9)*, the figure begins when the aircraft leaves horizontal flight and flies a quarter loop to establish a vertical climb. At the top of the vertical line, the aircraft pivots and establishes a vertical descent, with the figure ending as the aircraft is returned to horizontal flight.

The judging criteria are:

1. The entry and exit quarter loop radii must be equal. *(Fig. 8.5.9)*
2. The vertical lines, both up and down, must be flown on the zero-lift axis. *(see 8.1.2)*

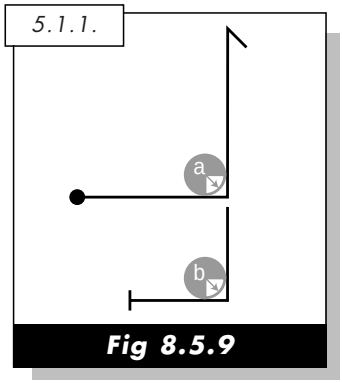

Fig 8.5.9

- *Radius a = b*

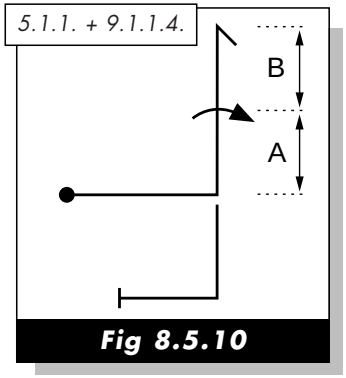

Fig 8.5.10

- *Length of line A = B.*

3. Any deviation from vertical, either up or down, will result in a deduction of one (1) point per five (5) degrees from the zero lift axis.
4. Any added roll(s) must be in the vertical climb or vertical descent and positioned so that the lines before and after the roll are of equal length *(Fig 8.5.10).* For deductions see 8.4.1 (f).
5. The length of the vertical up and down lines need not be equal. As such, the altitude of the horizontal lines at the start and finish of the hammerhead may be different.
6. During the vertical climb or vertical descent, the wings must remain parallel to the horizon. There will be a one (1) point deduction per five (5) degrees of deviation of the vertical (yaw) axis from horizontal. This deviation is often referred to as "dragging a wing".
7. As the aircraft nears the point where it would stop climbing, it must pivot in a plane parallel to vertical. Ideally, the aircraft

would come to a complete stop at the top of the hammerhead and pivot around its center of gravity (CG). This ideal motion around the CG is nearly impossible to achieve aerodynamically and the criteria therefore allows for a small circular area of acceptable error. This "circle of acceptable error" is centered about the ideal pivot point and is one-half wingspan in radius *(Fig 8.5.11(a))*. As long as the airplane's center of gravity remains within this area during the pivot, no deductions will be made *(Fig 8.5.11(b))*. An error greater than 1/2 wingspan is downgraded by one (1) point per half wingspan that the CG's trajectory exceeds the circle of acceptable error. Note that this circle of acceptable error applies only to the yaw axis and any deviation of the pitch or roll axis from the ideal must be downgraded by one (1) point per five (5) degrees of error.

For example, if the pilot initiates the pivot slightly earlier than ideal (referred to as an "early kick" or "fly-over"), the trajectory of the aircraft's CG will continue up and over the point of rotation *(Fig 8.5.11(c))*. As long as the center of gravity does not move more than 1/2 wingspan away from the ideal rotation point, no deduction is made *(Fig 8.5.11(b))*. Judges must be careful to deduct only for true fly-over, and not for any apparent fly-over caused by wind drift during the pivot. Wind drift can be separated from fly-over by watching the center of gravity. If the CG does not continue upward by more than 1/2 wingspan after the pivot is initiated, any lateral motion of the CG beyond a half wing span is the result of wind drift and not fly-over.

Conversely, should the pilot initiate the pivot later than ideal ("late kick"), the aircraft will be seen to have a sideways ("wing slide"), or even a slight backwards component to the turnaround before the pivot is complete. Again, if the amount of error is contained within an area 1/2 wing span in radius about the ideal pivot point, no deductions should be made. If the circle of acceptable error is exceeded in this case, a deduction of at least one (1) point, or more depending on the severity of the error, shall be assessed. *(Fig 8.5.11(d))*

8. The rate at which the aircraft pivots around its vertical axis is not a judging criterion.

9. The wings must remain in the vertical geometric plane throughout the turnaround, and the aircraft's attitude before and after the turnaround must be absolutely vertical, with no extraneous movement. There must be no rotation around the longitudinal or lateral axes. If there is movement around any axis other than the yaw axis,

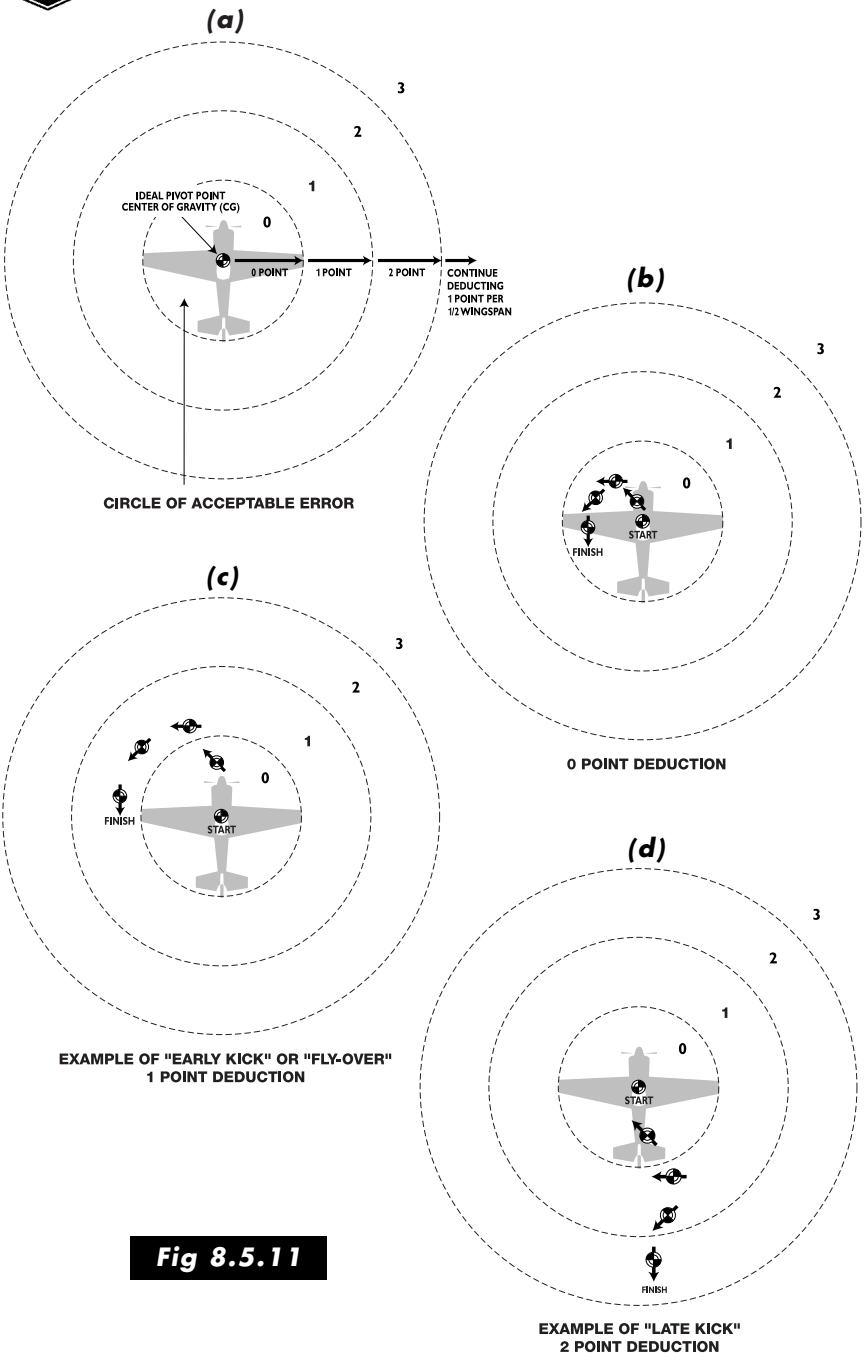
(a)
3
2
1
0
IDEAL PIVOT POINT
CENTER OF GRAVITY (CG)
0 POINT
1 POINT
2 POINT
CONTINUE
DEDUCTING
1 POINT PER
1/2 WINGSPAN
CIRCLE OF ACCEPTABLE ERROR
(b)
START
FINISH
0 POINT DEDUCTION
(c)
FINISH
START
EXAMPLE OF "EARLY KICK" OR "FLY-OVER"
1 POINT DEDUCTION
(d)
START
FINISH
EXAMPLE OF "LATE KICK"
2 POINT DEDUCTION

Fig 8.5.11

often referred to as "torquing" *(Fig. 8.5.12)*, there is a deduction of one (1) point for each five (5) degrees off axis.

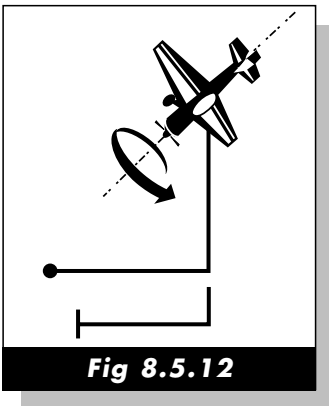

Fig 8.5.12

- *"Torquing" is rotation about the longitudinal axis during a hammerhead pivot.*

FAMILY 6 *Tailslides*

All the criteria of the Hammerhead apply to this figure except, of course, for the maneuver at the top of the vertical climb. At the point when the aircraft stops, it must slide backwards a minimum distance of one-half fuselage length. Because of the unique aerodynamics of gliders, a glider is required to slide only a visible amount. If there is insufficient slide for the aircraft type (glider or power), or the aircraft pivots about the tail rather than sliding backwards, the grade is zero (0). The aircraft must slide in the vertical plane and not with the nose inclined towards the horizon. A slide of this type must be downgraded by the formula of one (1) point for every five (5) degrees of inclination.

Following the slide backwards, the aircraft must then tip over and fall through to a diving position. Often the nose will swing back or "pendulum" past the vertical after falling through. The figure is not to be downgraded for this, nor downgraded if it does not happen. It is a function of the length of the slide and the type of aircraft, and is not to be considered in grading the figure.

6.1.1.

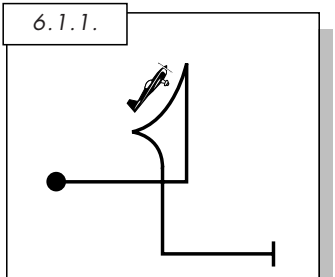

Fig 8.5.13

- *Wheels down tailslide.*

There are two types of tailslides: wheels-down (also called "canopy-up") and wheels up (also called "canopy-down"). The wheels-down tailslide is depicted in the Aresti diagram with a curved solid line at the top of the tailslide symbol. *(Fig 8.5.13)* The wheels-up tailslide is depicted in the Aresti diagram with a curved dashed line at the top of the tailslide symbol. *(Fig 8.5.14)*

This figure must be watched carefully, as the aircraft can fall the wrongway (which is graded a zero) with the correct direction of flight and

6.2.1.

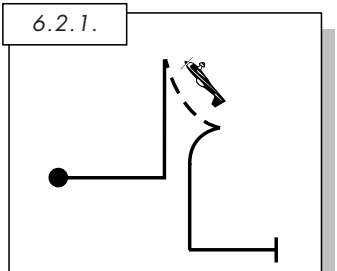

Fig 8.5.14

- *Wheels up tailslide.*

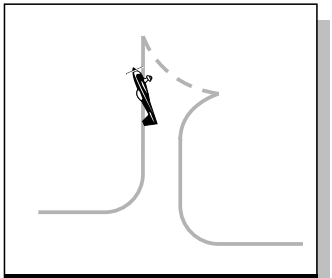

Fig 8.5.15

- *Aircraft "cheating" by changing attitude to favor type of tailslide desired. Aircraft position just before wheels-up tailslide.*

the proper aircraft attitude still maintained. Wings should stay level with the horizon throughout and not drop during the slide or the fall through. Watch for the aircraft torquing off the correct plane of flight, which must be downgraded. Also watch for "cheating" on the vertical line up in the direction of the slide just prior to sliding. *(Fig 8.5.15)* The standard deduction of one (1) point per five (5) degrees of deviation apply. Any "cheating" on the up-line will most likely carry over into the backwards slide as well. Because the slide backwards must also be perfectly vertical, a second deduction would be taken if this deviation from vertical is visible. The entry quarter loop and the exit quarter loop must both have the same radii. The altitude of the entry and exit horizontal lines need not be the same and the figure must not be downgraded if they are different.

When rolls are combined with Family 6 figures, there must be an equal length of line before and after the roll(s). In the vertical downline, the aircraft must attain a vertical attitude and establish a downline before starting the roll(s).

In summary, the aircraft should make a smooth and steady transition up to vertical flight, the wings should stay level in relation to the horizon, and the aircraft should come to a complete stop in this attitude. After sliding backwards the required amount, it should fall through in the appropriate direction without dropping a wing or the nose moving off axis, and recover on the same plane as that of entry. After completion of this, it should again project the 90 degree down line before transitioning into horizontal flight with a quarter loop of radius equal to the entry quarter loop.

FAMILY 7 *Loops, Vertical S's, and Figure 8's*

The size of a loop is not a grading criteria. It will vary according to the flight characteristics of the aircraft. A large loop is not graded any

higher or lower than a small loop. But any variation to the radius will downgrade these figures.

FAMILY 7.1 - 7.4 *Half-Loops With Rolls*

The half-loops in this sub-family must be of a constant radius and wind-corrected to appear as a perfect half circle (see full loops discussion below).

When a half-loop is preceded by a roll or rolls, the half-loop follows immediately after the rolls without any visible line. Should the half-loop begin before the roll is completed, the judge must downgrade the figure one (1) point for every five (5) degrees of half-loop flown on which the roll was performed.

The half-loop followed by a roll is also flown with no line between the half-loop and roll. Drawing a line requires a downgrade in accordance with *8.4.2(c)*. Should the roll begin before the half-loop is completed, the judge must downgrade the figure one (1) point for every five (5) degrees of half-loop on which the roll was performed. *(Fig 8.5.16)*

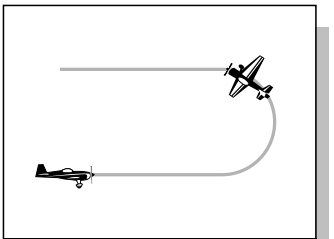

Fig 8.5.16

- *Aircraft rolls five degrees early before reaching horizontal flight. Deduction of one point is given.*

FAMILY 7.5 - 7.6 *Full Loops*

All full loops must appear perfectly round to the Judge. This means that they must be wind corrected to have a constant radius. This wind correction is only with regards to the roundness of the loop and not for the effect of any crosswind on the figure. Therefore, no deduction is given if the finish point is displaced relative to the start point in a direction perpendicular to the plane of the loop. Full loops must also begin and end at the same altitude or they will be downgraded. *(Fig 8.5.17)*

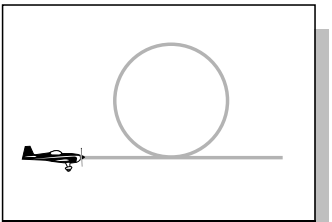

Fig 8.5.17

- *Round loop*

Loops must be flown with no visible crabbing and wings must be level at all times. The one (1) point for every five (5) degrees rule holds for both these cases.

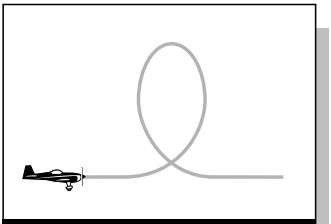

Fig 8.5.18

- *"L shaped" loop*

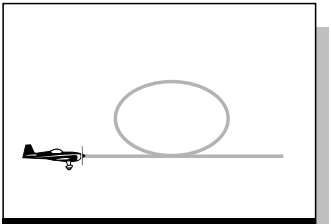

Fig 8.5.19

- *"Egg shaped" loop*

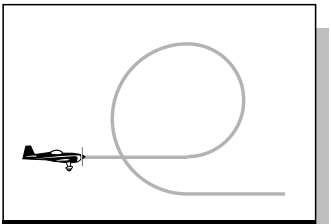

Fig 8.5.20

- *"e shaped" loop*

If there is a roll or rolls at the apex of the loop, it must be centered in the loop and flown on the arc of the loop itself. Flying the roll on a line at the apex of the loop is at least a two (2) point downgrade. If the roll is not centered, it must be downgraded one (1) point for every five (5) degrees of the arc that it is off center.

To better quantify deductions for irregularity of the radius of looping figures, the Judge divides the loop into quadrants. Any variation in the radius from one quadrant to the next can be downgraded a fixed number of points depending on the magnitude of the variation. The goal of each Judge is to develop a reproducible method to judge all loops with the same criteria.

In judging loops, a common error is for the vertical diameter of the loop to be larger than the horizontal diameter. This is often called an "L" shaped loop. *(Fig 8.5.18)* Less common are loops with a horizontal diameter greater than the vertical. This is called an egg-shaped or pumpkin-shaped loop. *(Fig 8.5.19)* Another common error is in varying the radius of the final quadrant performing an "e" shaped loop. *(Fig 8.5.20)* Whatever method is used, standard downgrades should be applied for each of these errors. Additional downgrades should be applied based on the magnitude of variation.

FAMILY 7.7 - 7.10 *Square, Diamond and Octagon Loops*

Square and Octagon loops are flown as hesitation loops with lines of equal length and partial loops with equal radii. All horizontal lines are judged on flight path and vertical and diagonal lines are judged based on aircraft attitude. As such, except in a windless condition, the judge should never expect to see these figures closed. They will always be driven by the wind. Square and Octagon loops are not considered complete until the last horizontal line is drawn equal to the length of the first line of the figure. *(Fig 8.5.21)* In the case of a short final horizontal line, a deduction for the unequal line length must be given according to the schedule in 8.4.1(f). Should the final line of the square or octagonal loop be completely missing, a four (4) point deduction would apply to the loop with a further downgrade of one (1) point on the subsequent figure for a missing horizontal entry line.

Where rolls are flown on the Square or Diamond loops, they must be centered on the line.

7.7.1.

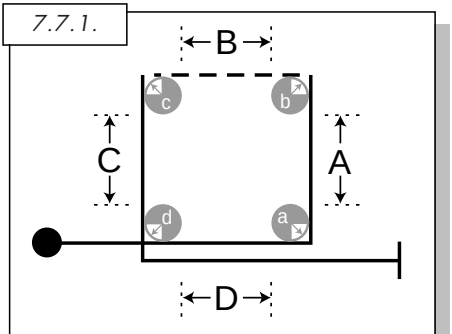

Fig 8.5.21

- *Line Length A = B = C = D (length of line C is extended for illustration purposes)*
- *Figure is not complete until D = A*

Aids for judging all hesitation loops are that a good performance will contain changes of angular velocity in all the partial loops, and variations of time taken to draw the length of each interior line, which also varies according to the aircraft's speed. The rhythm of all these partial loops is a help for judging. A frequently seen error in hesitation loops is for the aircraft to overshoot the partial loop and then have to bring the nose back to correct the attitude. This must be downgraded by one (1) point for every five (5) degrees.

FAMILY 7.11 - 7.12 *Vertical S's*

These figures are accomplished with two joined half-loops flown in opposite directions. *(Fig 8.5.22)* Look for both half-loops to be the same size and perfectly round. The half-loops should be a continuous looping figure when there is no roll between the half-loops.

When a roll is performed between the half-loops, there is no line before or after the roll. However, the roll is flown on a horizontal line which begins as soon as the first half-loop is finished. As soon as the roll is finished, the next half-loop must begin immediately. Adding a line at either of these points is at least a two (2) point deduction depending on the length of the line.

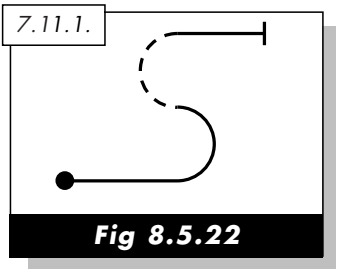

Fig 8.5.22

- *Vertical S*

FAMILY 7.13 - 7.18 *Vertical 8's*

These figures are performed by flying two loops, one above the other. Sub-family 7.13-7.16 is composed of two loops, both above or both below the entry altitude. Sub-family 7.17 - 7.18 is composed of one loop above and one loop below the entry altitude. In either case the entry and exit altitudes must be the same.

These figures may be combined with various types of half rolls. When a roll is performed between the loops, there is no line before or after the roll. However the roll is flown on a horizontal line which begins as soon as the first loop is finished. As soon as the roll is finished, the next loop must begin immediately. These figures are to be graded using the same criteria as full loops. Additionally, both loops must be of the same size. Unless there is a roll between the loops, the two loops must be directly above one another. *(Fig 8.5.23)*

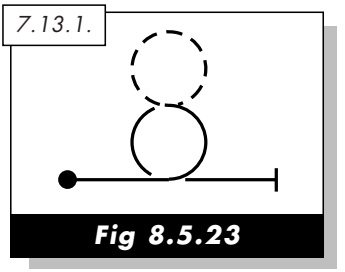

Fig 8.5.23

- *Vertical 8*

FAMILY 7.19 - 7.22 *Partial 8's*

Sometimes referred to as "Goldfish", the entry, 3/4 loop, and exit radii in these figures must all be identical. The entry and exit lines are judged with reference to the 45 degree attitude, not flight path.

Any rolls on the 45 degree lines must be centered on that line. It is not required that the lengths of the 45 degree lines bear any strict relation to the diameter of the three quarter loop. That is, the entry and exit altitudes need not correspond to the altitude limits of the loop. *(Fig 8.5.24)*

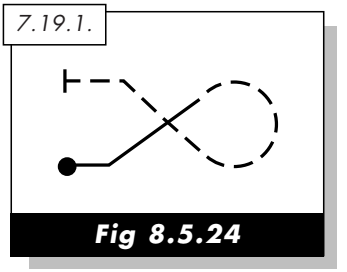

Fig 8.5.24

- *Partial 8 or Goldfish*

FAMILY 7.23 - 7.30 *Horizontal 8's*

Both loops must be the same size and the lines between the loops flown at exactly 45 degrees attitude. This means that only if there is no wind will they intersect at the exact midpoint of the 8. If there are rolls of any variety, they will only occur on the 45 degree lines and be positioned so that the lines before and after the roll are of equal length. For deductions see 8.4.1(f).

The start and finish of the figure and the bottoms (or tops if the figure is reversed) of the two loops must be at the same altitude. However, if there are multiple rolls flown on the last 45 degree line, that line may project above or below the looping portions and exit at a different altitude than the entry altitude of the figure.

All part-loops between 45 degree and horizontal lines should have the same radii as the loops of the Horizontal 8 itself. A common fault is to fly these part-loops as drawn in the catalogue symbol, which means with a corner. This must be downgraded. *(Fig 8.5.25)*

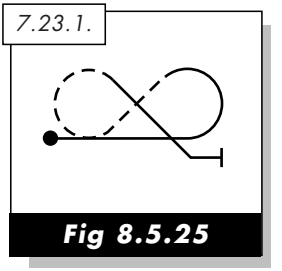

Fig 8.5.25

- *Horizontal 8*

FAMILY 7.31 - 7.38 *Combination 8's*

Besides possessing the unique characteristic of containing three 45 degree lines on which rolls may potentially be placed, this family can be thought of as two linked Partial 8's (sub-families 7.19-7.22).

Radii of the entry/exit 1/8 loops and the two 3/4 loops must all be equal. Each of the 45 degree lines may be of different lengths, but any rolls

placed on them must be centered. The two 3/4 loops need not occur at the same altitude, nor is there any strict relationship between the horizontal entry/exit altitudes and the altitude limits of the two 3/4 loops. *(Fig 8.5.26)*

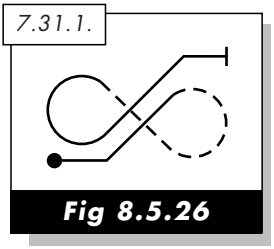

Fig 8.5.26

- *Combination 8*

FAMILY 8 *Combinations of Lines, Loops and Rolls*

Although some of the figures in this Family appear to be exotic, there are no new judging criteria for these figures. These figures are combinations of horizontal, vertical and 45 degree lines as well as partial loops of varying degrees. The judging criteria for these lines and loops are unchanged. What is left to discuss are the judging criteria for the combinations of these lines and loops.

FAMILY 8.1 - 8.28 *Humpty Bumps*

These figures, whether vertical or performed with 45 degree lines, are judged as a combination of lines and loops. For all these figures, the radii of the first and last partial loop must be equal. However, the half loop in the middle of the figure can be of a different radius. *(Fig 8.5.27 & 8.5.28)* These half-loops must still have a constant radius from the time they depart the vertical or 45 degree line. This requires a change in angular velocity during the half-loop.

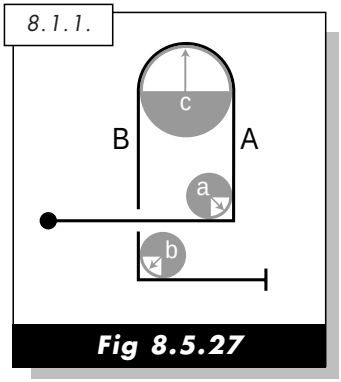

Fig 8.5.27

- *Radius a = b but c does not have to equal a or b.*

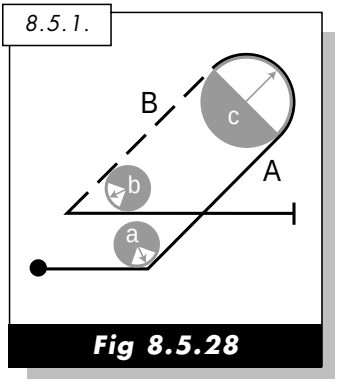

Fig 8.5.28

- *Length of line A does not need to equal B.*

FAMILY 8.29 - 8.48 *7/8 Loops, Reverse Half Cubans,*
FAMILY 8.51 - 8.54 *3/4 Loops, Half Cubans*

In these figures, all partial loops must have the same radii. When the looping portion of the figure is immediately preceded or followed by a roll or rolls, there must be no visible line between the roll and loop elements. The rolls on vertical and 45 degree lines must be centered. If there is a roll or rolls at the apex of the loop (Families 8.29-8.30, 8.33-8.36, 8.39-8.40, and 8.43-8.46), the roll must be centered in the loop and flown on the arc of the loop itself. Flying the roll on a line at the apex of the loop is at least a two (2) point downgrade. If the roll is not centered, it must be downgraded one (1) point for every five (5) degrees of the arc that it is off center.

FAMILY 8.49 - 8.50 *Multiple Looping Combinations*
FAMILY 8.55 - 8.56

When 1/4, 1/2 and 3/4 loops join each other in these sub-families, their radii must be equal and there is no line between the loops. Any rolls on the vertical line must be centered. In these figures all partial loops must have the same radii with the exception that the final 1/4 loop that returns the aircraft to horizontal flight must have a reasonable radius, but need not match the other looping radii.

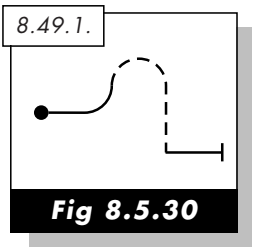

Fig 8.5.30

FAMILY 8.57 - 8.72 *Teardrops*

In these figures, all partial loops must have the same radii. The rolls on vertical and 45 degree lines must be centered. Angles drawn in the *FAI Aerobatic Catalogue*, such as in figure 8.58.2., are to be flown as partial loops. In the case of the figure shown in the illustration to the left *(Fig 8.5.31)* a 3/8 loop is flown followed by an inverted 45 degree line up with a 360 degree roll. Then an outside 5/8 loop is flown and a vertical line down on which there is another 360 degree roll. Finally a quarter loop is flown bringing the aircraft back to upright horizontal flight.

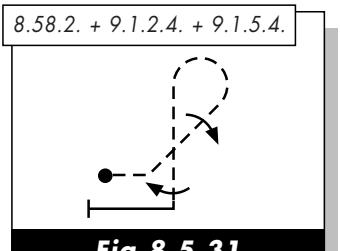

Fig 8.5.31

FAMILY 9 *Rotational Elements*

Rolls (9.1-9.10) may be performed on horizontal, 45 degree or 90 degree lines; on complete loops, between part-loops; between part-loops and lines; and following spin elements.

They may be 1/4, 1/2, 3/4 or a full 360 degrees in their rotation, up to two consecutive full rolls. In all cases, the same criteria apply: the rate of roll must be constant throughout the roll(s). The aircraft should continue to project, during the rolling portion, the prescribed plane and direction of flight.

Multiple rolls may be linked, un-linked, or opposite.

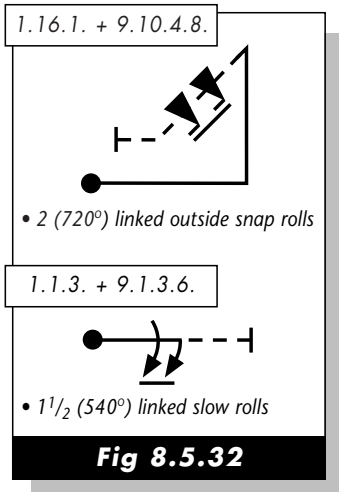

Fig 8.5.32

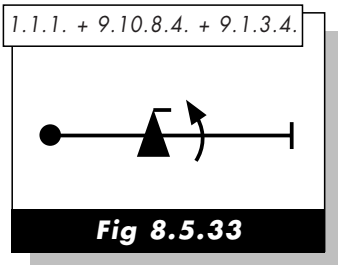

Fig 8.5.33

- *Unlinked snap and slow roll, same direction.*

(1) When rolls are in continuous rotation, the tips of the symbols are linked by a small line. When flying linked rolls there is no pause between them. *(Fig 8.5.32)*

(2) Unlinked rolls must be of different types, the two types being defined as follows:

(i) Aileron rolls (slow rolls and hesitation rolls)

(ii) Snap rolls (positive and negative)

No line links the symbols, though their tips are drawn pointing in the same direction (i.e., on the same side of the line). They must have a brief but perceptible pause between them and they are to be flown in the same direction of rotation. *(Fig 8.5.33)*

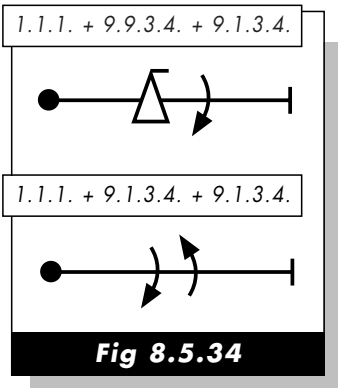

Fig 8.5.34

- *Two examples of legal opposite rolls.*

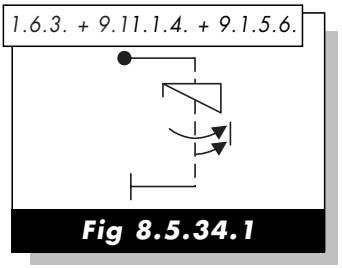

Fig 8.5.34.1

- *Legal - As drawn, spin and roll elements must be flown in opposite direction.*

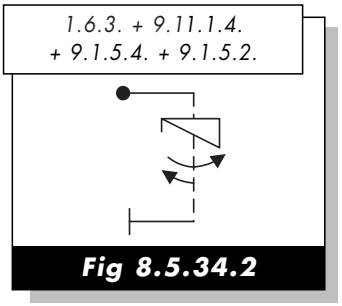

Fig 8.5.34.2

- *Illegal - more than two rotational elements*

(3) Opposite rolls may be either of the same or different type. In opposite rolls, the tips of the symbols are drawn on opposite sides of the line, indicating they are to be flown in opposite directions of rotation. The pilot may elect to fly the first roll in either direction, but the second roll must be opposite direction to the first. Opposite rolls, including those in rolling turns, should be flown as one continuous maneuver - the brief pause between opposite rotations should be minimal. *(Fig 8.5.34)* If the two rolls are of the same type, they must be flown in opposite directions if they are not linked.

(4) Either aileron or snap rolls may follow spin elements (Family 9.11 or 9.12). When a spin and a roll are combined on the same vertical downline they will always be unlinked; may be flown either in the same or opposite direction, as shown by the position of the tips of the symbols on the flimsy; and the combination may not exceed two rotational elements. (For example, it would be illegal to combine two opposite direction aileron rolls with a spin element.) *(Figs 8.5.34.1 and 8.5.34.2)*

FAMILY 9.1 *Slow Rolls*

The penalty for varying the rate of roll is one (1) point per variation. Any stoppage in the slow roll that could result in its being considered a hesitation roll, would zero (0) the figure.

The finish of the roll must be as crisp and precise as possible. Coming to a slow finish in fact represents a change in the rate of roll and should be penalized accordingly.

The wings must stop precisely after the desired degree of rotation and not go past the stop point and then return. This is referred to as "bumping the point". A deduction of 0.5 point to one (1) point is given depending on the severity of the "bump".

FAMILY 9.2 - 9.8 *Hesitation Rolls*

These rolls are judged on the same criteria as the slow roll, only the aircraft stops rotation during the roll for a prestated number of times, i.e., 2, [3 (Glider only)], 4 or 8. The rate of the roll and the rhythm of the hesitations must be constant throughout with the aircraft projecting the prestated plane and direction of flight.

The pauses will be of identical duration and the degree of rotation correct between each pause: 180 degrees, [120 degrees (Gliders)], 90 degrees or 45 degrees. Each pause of a hesitation roll must be clearly recognizable in every case, but it is especially important that in poor visibility or at high altitude, the competitor pauses long enough to make them recognizable to the Judges. If a pause is not recognizable, the figure is graded a zero (0).

For hesitation rolls, the second digit in the catalogue number indicates the number of points: Family 9.2 is 2-point rolls; Family 9.4 is 4-point rolls; and Family 9.8 is 8-point rolls.

FAMILY 9.9 *Positive Snap Rolls*

Snap rolls represent one of the greatest challenges to judges. This is primarily due to two factors: (1) the "snapping" characteristics of different types of aircraft are unique; and (2) snap rolls are a high energy maneuver that occur very quickly.

The judge must see two things to determine that a snap roll has occurred. The nose must depart the flight path in the correct direction and autorotation must be initiated. If the judge does not observe both events, the figure must be given a zero (0).

1.1.1. + 9.9.3.4.

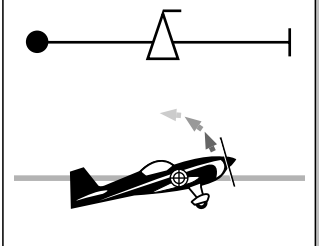

Fig 8.5.35

- *Aircraft's nose must break towards top of aircraft in positive snap.*

For a positive snap roll, the nose must move away from the wheels. (Fig 8.5.35) This puts the aircraft's wings near the critical angle-of-attack. Either shortly after the nose moves, or simultaneously with the nose movement, the aircraft must be seen to yaw around its vertical axis, thus initiating a stall of one wing and subsequent autorotation. If any movement about the longitudinal (roll) axis is observed before the nose departs the line of flight, the figure is downgraded one (1) point per five (5) degrees.

Throughout the snap roll, the main axis of the snap roll's rotation must be in the correct plane and direction of flight. However, the type of motion (angle-of-attack and angular velocity) displayed around the main axis of autorotation differs between aircraft types (much as each type of aircraft has different spin characteristics). If the character of the snap roll changes during the figure, the figure is downgraded. *(See Family 9.1)* A changing rate of rotation or the nose moving more onto the flight path (like a slow roll) is the most often observed change in character. But for all aircraft types, the criteria for stopping the snap roll is the same: the attitude before starting the snap roll and in the instant of stopping it must be identical and must correspond to the geometry of the basic figure on which the snap roll is performed.

Snap rolls must be observed very carefully to ensure that the competitor is not "aileroning" the aircraft around its longitudinal axis. Aerobatic aircraft with very high rates of roll can occasionally fool a judge in the execution of snap rolls. The movement of the aircraft's nose departing the flight path prior to autorotation is a good clue to the proper execution of a snap roll. As always, the competitor is given the benefit of the doubt, but if a judge is certain that a proper snap roll has not been executed, a zero (0) is given. Another common error is for the aircraft to autorotate, but to not stay in autorotation until the end of the figure. In this case, a deduction of one (1) point for each five (5) degrees of rotation remaining when the autorotation stops must be made. If autorotation ends with more than 45 degrees of rotation remaining, even if the roll is completed with aileron, the snap roll is zeroed.

FAMILY 9.10 *Negative Snap Rolls*

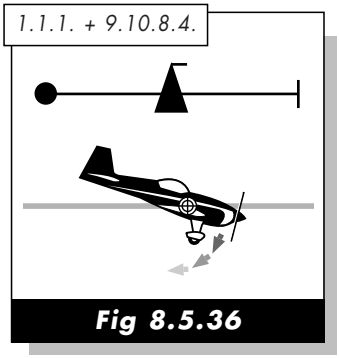

Fig 8.5.36

- *Aircraft's nose must break flight path away from top of aircraft in negative snap.*

For negative snap rolls, all criteria stated for positive snap rolls apply except, of course, that the aircraft is in a negative rather than positive angle-of-attack during autorotation. Therefore, in a negative snap roll the nose of the aircraft will move toward the wheels as it departs the line of the aircraft's flight path. (Fig 8.5.36) This direction of motion must be observed very carefully, since it is the defining characteristic that differentiates a negative snap roll from a positive snap roll. As with positive snap rolls, if the nose does not move in the correct direction, it is not a negative snap roll and the figure must be given a zero (0).

FAMILY 9.11 - 9.12 *Spins*

Spin elements may be placed on a number of Family 1 and Family 8 figures (where so indicated by the optional spin symbol); however, all spins begin from horizontal flight. When the aircraft stalls, the center of gravity will drop from wings-level horizontal flight. It should be noted that an aircraft has forward inertia as the aircraft decelerates through stall speed.

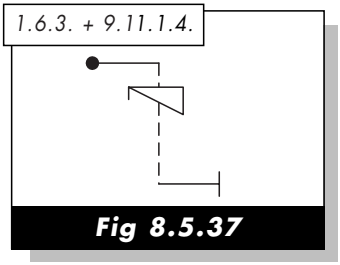

Fig 8.5.37

- *One turn spin figure as drawn.*

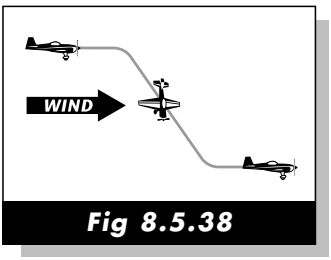

Fig 8.5.38

- *Effect of wind and forward inertia on flight-path during one turn spin (effect exaggerated)*

This appearance is more pronounced when the figure is performed downwind, and is enhanced when performed into the wind. This change in appearance is not a grading criteria. (*Fig 8.5.38)*

When the aircraft stalls, the aircraft should simultaneously move around all three flight axes: (1) the nose will pitch toward the ground; (2) the nose will yaw in the direction of spin; and (3), the wing tip will drop in the direction of the spin. Failure to achieve simultaneous motion about all three axes will be downgraded one (1) point per five (5) degrees of deviation on each axis. For example, if 10 degrees of pitch and 10 degrees of roll are observed before any motion about the yaw axis is seen, a four (4) point deduction would be made.

If the aircraft never stalls, it is apparent that it cannot spin, and a zero (0) must be given. “Simulated” spins where snap rolls or other techniques are offered as spin entries will also be seen. Regardless of the entry technique, if the judge believes the aircraft did not stall prior to spin autorotation, the figure must be zeroed.

After completion of the prescribed number of turns, the aircraft must stop rotating precisely on the pre-stated heading, then a 90 degree down, wings-level attitude must be seen. It is acceptable for the pilot to achieve the wings-level, vertical down line in either of two ways: Immediately after rotation stops, the nose is pitched to the vertical down line and the wings are brought to the level attitude; or, the vertical down line and wings-level attitude are achieved as the pilot halts the rotation, such that the prescribed number of turns, vertical down line, and wings-level attitude are all achieved simultaneously. Judges must be careful not to confuse this “blended” recovery with aileroning the final portion of the spin rotation. Grading criteria for the basic figure being flown then resumes.

If a roll follows a spin, there should be a brief, but perceptible pause (similar to unlinked rolls) between the spin and the roll. Because there is no vertical line before the spin, there is no criteria to center either a spin element alone or a spin-roll combination on the vertical down-line. Be alert for early stopping of the stalled autorotation followed by “aileroning” to the pre-stated heading. In this case, a deduction of one (1) point for every five (5) degrees of "aileroning" must be applied. For example, in a one-turn spin the autorotation is observed to stop after 345 degrees of rotation and the ailerons are used to complete the rotation. The highest score this spin could receive is a 7.0.

No account is to be taken of the pitch attitude of the aircraft during autorotation, as some aircraft spin in a nearly vertical pitch attitude while others spin quite flat in conventional spins. Speed of rotation is also not a judging criterion.

In all spins the grading criteria are:

1. A clean breaking stall in horizontal flight.
2. Fully-stalled autorotation.
3. Stopping on pre-stated heading.
4. 90 degrees down, wings-level attitude after stopping on heading.

FAMILY 9.13 *Super Slow Rolls*

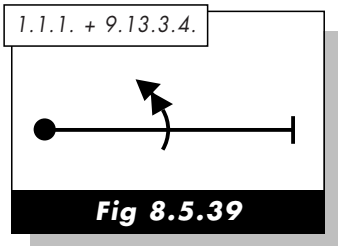

Fig 8.5.39

These figures occur only in Glider flights and are judged by the same criteria as Family 9.1 (Slow Rolls). The rate of rotation must be at least 10 seconds per 360 degrees of rotation. *(Fig 8.5.39)* Timing will be done at the Chief Judge's station.

8.6 *PRESENTATION*

Just as a musical symphony is more than a simple collection of perfectly played notes, an aerobatic sequence should be more than merely flying a set of geometrically precise figures. The very best flights will also exhibit attributes such as the placement of figures for optimum judging, balance within the performance zone, and harmony. In short, presentation.

The Presentation mark is based on the judge's overall impression of the sequence and has a range of possible scores from 10 to 0 in 0.5 increments. The exact method used to determine the Presentation mark is left to the individual judge using the guidance provided in the paragraphs below. More important than the particular methodology chosen is the consistent application of that methodology to every pilot flying the program.

To determine the Presentation mark, the judge must remain alert to elements within the sequence beyond the technical execution of each figure. The most basic of these elements is the placement of individual figures and the sequence as a whole in relation to the boundaries of the aerobatic box.

The sequence should be presented in such a manner that it achieves a sense of balance to the right and left of the Y axis. While

a Known or Unknown program may limit the pilots' choices, the best presentation is the one which accomplishes the best balance given the sequence being flown. A judge should not make allowances for difficult sequences or wind, but merely judge the final result as presented by each pilot. For example, downgrades should be given to the pilot who misjudges the headwind and flies the majority of the sequence in the downwind side of the box.

Some maneuvers can be adequately seen and appreciated by the judges no matter at what distance they are flown from the judging line. Others are best viewed at a greater distance and still others may be more accurately judged up close. The best pilot is the one who plans and flies each sequence in such a manner that every figure is presented at its optimum viewing distance.

Placing a figure for optimum judging not only concerns distance, but also altitude. Compromises in safety can never be tolerated, but within the limits for each category, the best pilot will select combinations of altitudes and distance to present each figure at the best viewing angle for the judges. An example of poor placement which should be downgraded is the pilot who misestimates the crosswind component and flies a significant portion of the sequence either near the front or back edge of the box.

Beyond placement and balance, the best sequences will be harmonious. A flight is harmonious when the individual figures are clearly separated and follow one another at similar intervals in time. While some figures consume more time than others, a superior pilot will choose intervals between figures, and for the internal components of figures, that create a sense of rhythm and conscious pacing. This is a better presentation than one in which the timing between figures is haphazardly flown. A harmonious sequence will flow at a natural pace without very long or very short lines in between figures resulting from poor box management.

It has been noted that the Presentation mark is "subjective." That is true and it is by design. Many aspects of an aerobatic performance cannot be defined objectively and it is correct to award pilots who present a superior overall sequence and to downgrade those pilots who merely fly precise maneuvers without regard for placement, balance, harmony, and the other subjective attributes that combine to make a visually pleasing performance. The Presentation mark is simply one more tool which the judge can use to separate the top pilot from the second best and on down the rank order.

The judge's decision on a mark for Presentation is not a simple one. The score must take into account the placement of individual figures, the balance of the sequence taken as a whole, and the harmony of execution. As much thought must be put into assigning a Presentation mark as with any figure mark if the differences between the best and worst flights are to be fairly assessed.

A FINAL WORD

In conclusion, remember that you, as a Judge, are expected to grade only against one standard, and that is perfection. The performance of the aircraft or the difficulty in performing a figure (on the basis of your personal perceptions or experience) in any given type of aircraft is not to be considered in formulating your grade.

Do not be afraid to find fault with a competitor's flying, regardless of name or reputation. As a Judge, this is your job.

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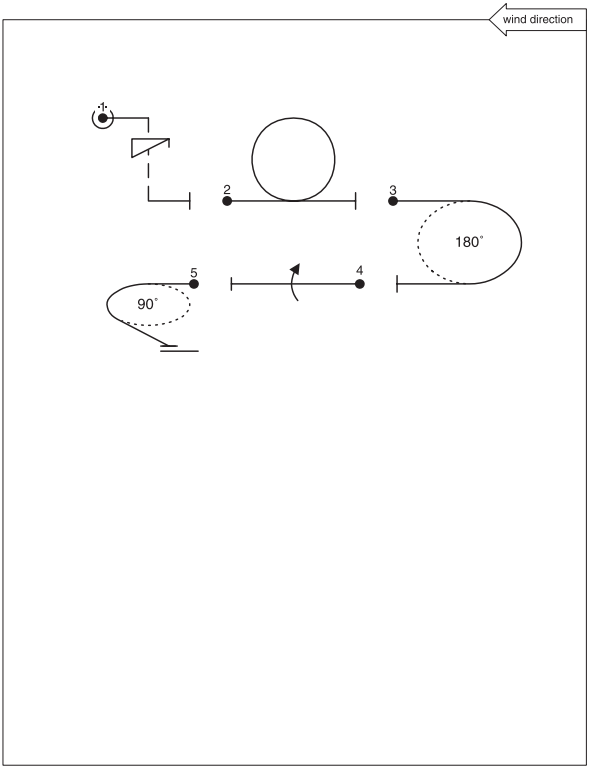
APPENDIX I *2004 KNOWN COMPULSORY PROGRAMS*

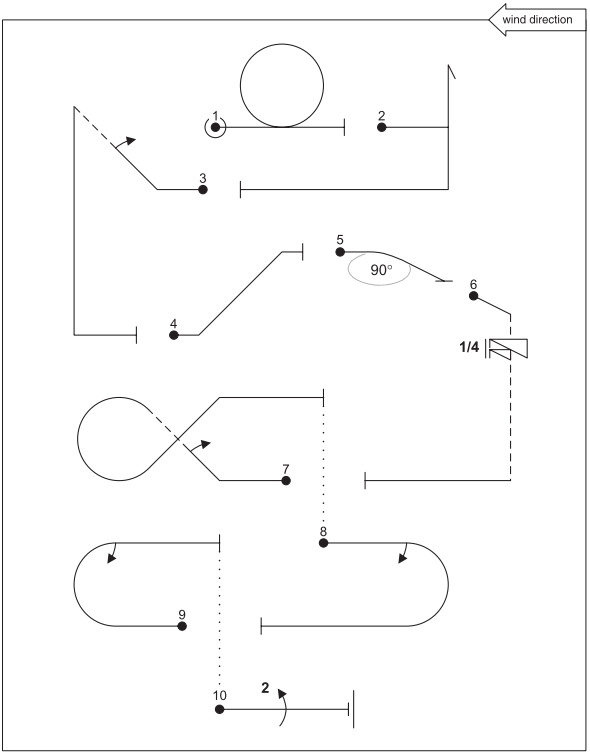
PRIMARY *POWER*

Fig 1	1.6.3 9.11.1.4	10 5	15
Fig 2	7.5.1	10	10
Fig 3	2.2.1	4	4
Fig 4	1.1.1 9.1.3.4	2 8	10
Fig 5	2.2.3	3	3
Total K = 42			



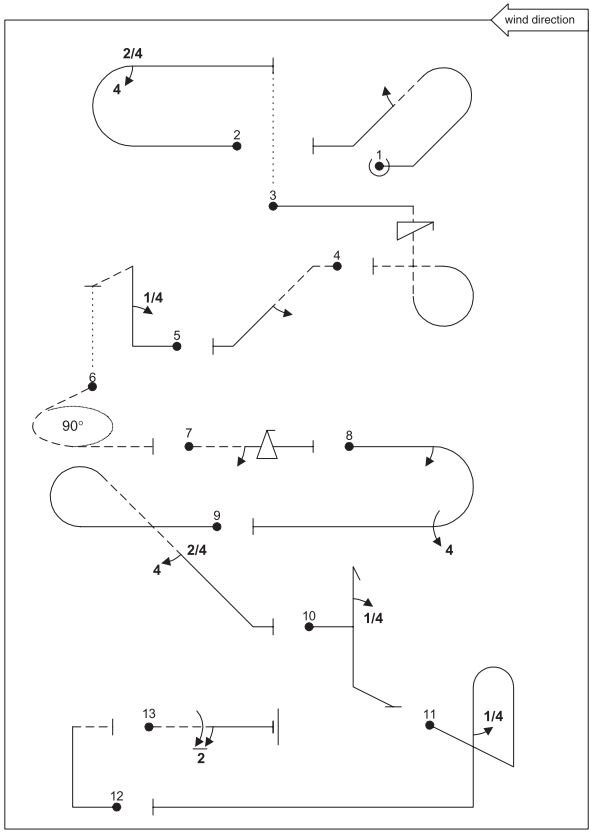
SPORTSMAN *POWER*

Fig 1	7.5.1	10	10
Fig 2	5.1.1	17	17
Fig 3	1.14.1 9.1.2.2	12 6	18
Fig 4	1.2.1	7	7
Fig 5	2.2.3	3	3
Fig 6	1.6.3 9.11.1.5	10 4	14
Fig 7	7.20.1 9.1.2.2	14 6	20
Fig 8	7.3.3 9.1.3.2	6 4	10
Fig 9	7.2.1 9.1.3.2	6 4	10
Fig 10	1.1.1 9.2.3.4	2 9	11
Total K = 120			



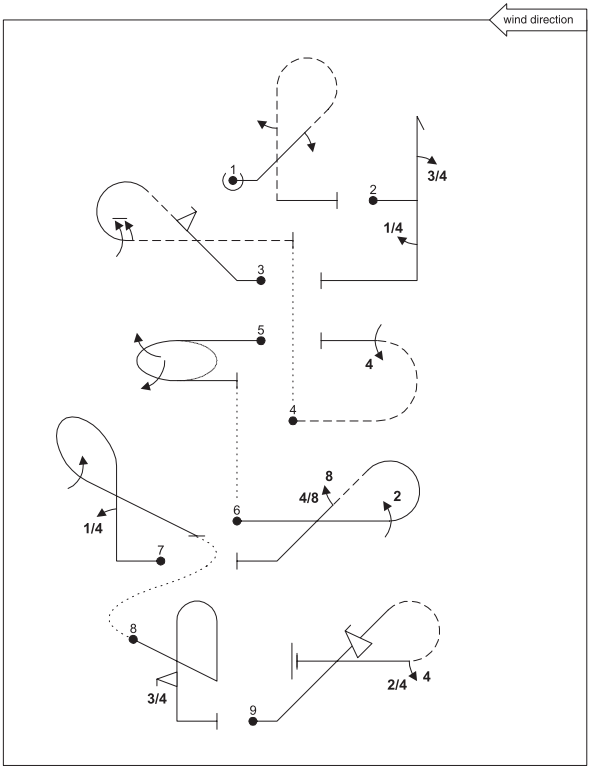
INTERMEDIATE *POWER*

Fig 1	8.14.1 9.1.4.2	12 4	16
Fig 2	7.2.1 9.4.3.2	6 5	11
Fig 3	8.34.3 9.11.1.4	13 5	18
Fig 4	1.3.4 9.1.4.2	7 4	11
Fig 5	1.7.1 9.1.1.1	9 6	15
Fig 6	2.2.4	4	4
Fig 7	1.1.4 9.1.3.2 9.9.3.4	2 4 11	17
Fig 8	7.3.3 9.1.3.2 9.4.3.4	6 4 11	21
Fig 9	8.42.1 9.4.4.2	10 5	15
Fig 10	5.1.1 9.1.1.1	17 6	23
Fig 11	8.1.1 9.1.5.1	13 2	15
Fig 12	1.7.1	9	9
Fig 13	1.1.4 9.2.3.6	2 12	14
Total K = 189			



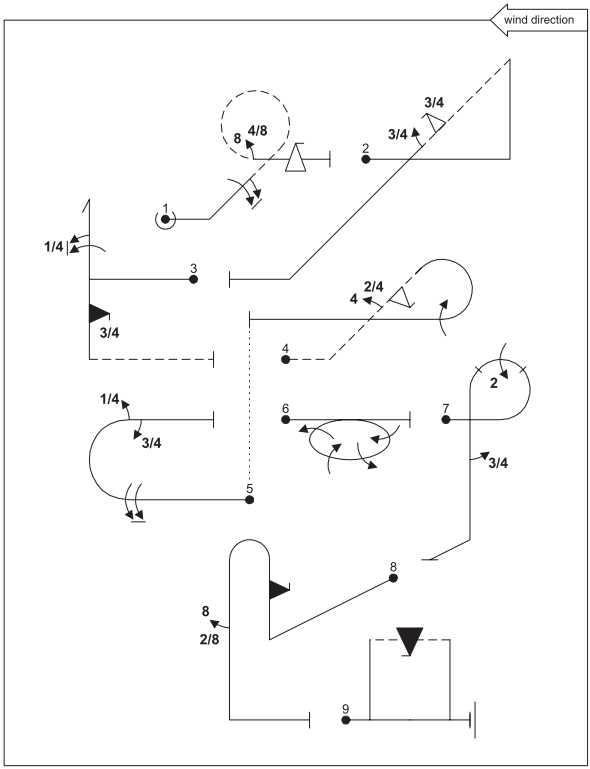
ADVANCED *POWER*

Fig 1	8.59.1 9.1.2.2 9.1.5.2	17 6 4	27
Fig 2	5.1.1 9.1.1.3 9.1.5.1	17 10 2	29
Fig 3	8.38.1 9.9.2.2 9.1.3.6	10 13 10	33
Fig 4	7.1.2 9.4.3.4	8 11	19
Fig 5	2.6.3	15	15
Fig 6	8.42.1 9.2.3.4 9.8.4.2	10 9 7	26
Fig 7	8.33.1 9.1.1.1 9.1.3.4	11 6 8	25
Fig 8	8.1.1 9.9.5.3	13 11	24
Fig 9	8.37.1 9.9.2.4 9.4.3.2	12 13 5	30
Total K = 228			



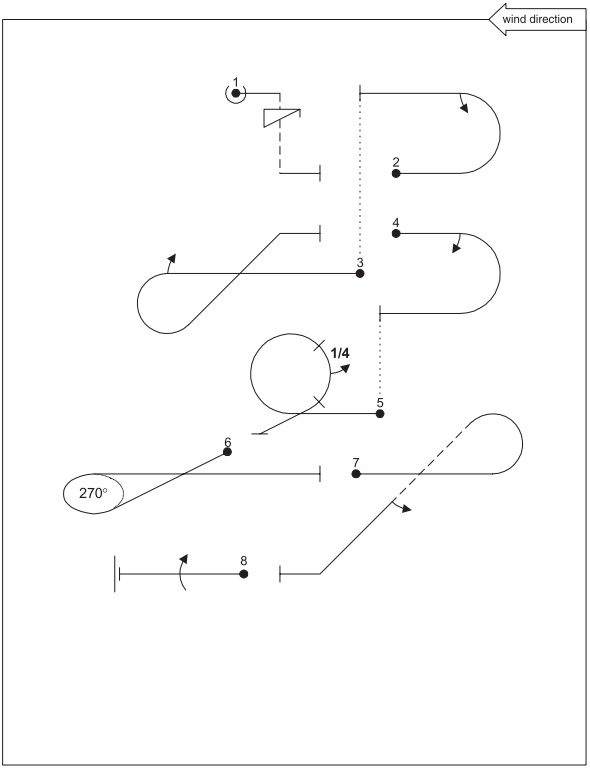
UNLIMITED *POWER*

Fig 1	8.36.1 9.1.2.6 9.8.3.2 9.9.3.4	17 12 7 11	47
Fig 2	1.18.1 9.9.9.3 9.1.4.3	13 13 6	32
Fig 3	5.1.3 9.1.1.5 9.10.5.3	18 14 13	45
Fig 4	8.31.2 9.4.2.2 9.9.2.2 9.1.3.4	10 7 13 8	38
Fig 5	7.2.1 9.1.3.8 9.1.3.1 9.1.3.3	6 12 2 6	26
Fig 6	2.15.1	24	24
Fig 7	8.43.1 9.2.3.4 9.1.5.3	11 9 6	26
Fig 8	8.1.1 9.10.6.2 9.8.5.1	13 19 3	35
Fig 9	7.7.1 9.10.3.4	14 13	27
Total K = 300			



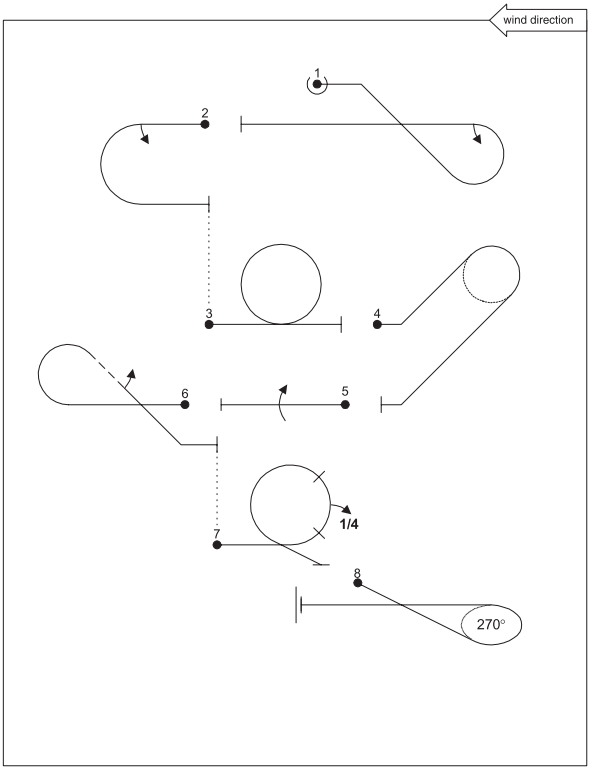
SPORTSMAN I *GLIDER*

Fig 1	1.6.3 9.11.1.4	10 5	15
Fig 2	7.2.1 9.1.3.2	6 6	12
Fig 3	8.47.3 9.1.3.2	10 6	16
Fig 4	7.3.3 9.1.3.2	6 6	12
Fig 5	0.2	13	13
Fig 6	2.1.3	5	5
Fig 7	8.42.1 9.1.4.2	10 6	16
Fig 8	1.1.1 9.1.3.4	2 12	14
Total K = 103			



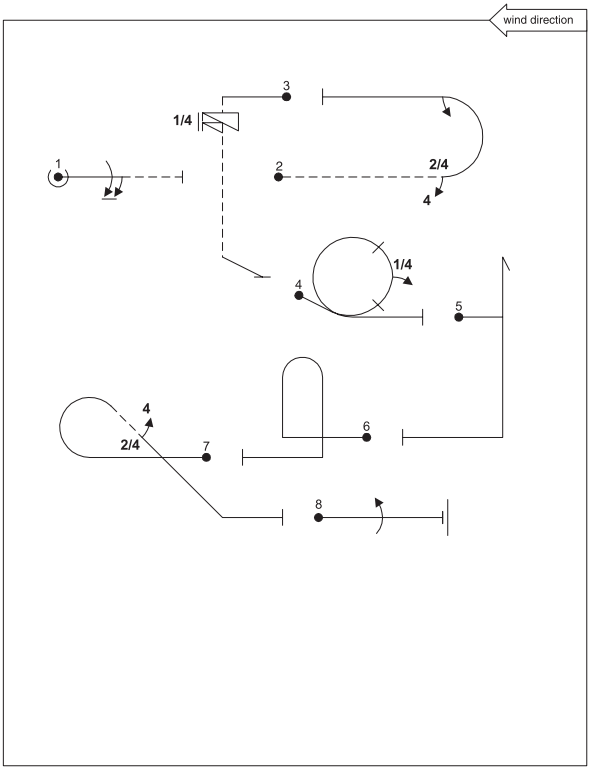
SPORTSMAN II *GLIDER*

Fig 1	8.37.3 9.1.3.2	10 6	16
Fig 2	7.3.3 9.1.3.2	6 6	12
Fig 3	7.5.1	10	10
Fig 4	0.0	8	8
Fig 5	1.1.1 9.1.3.4	2 12	14
Fig 6	8.42.1 9.1.4.2	10 6	16
Fig 7	0.1	16	16
Fig 8	2.1.3	5	5
Total K = 97			



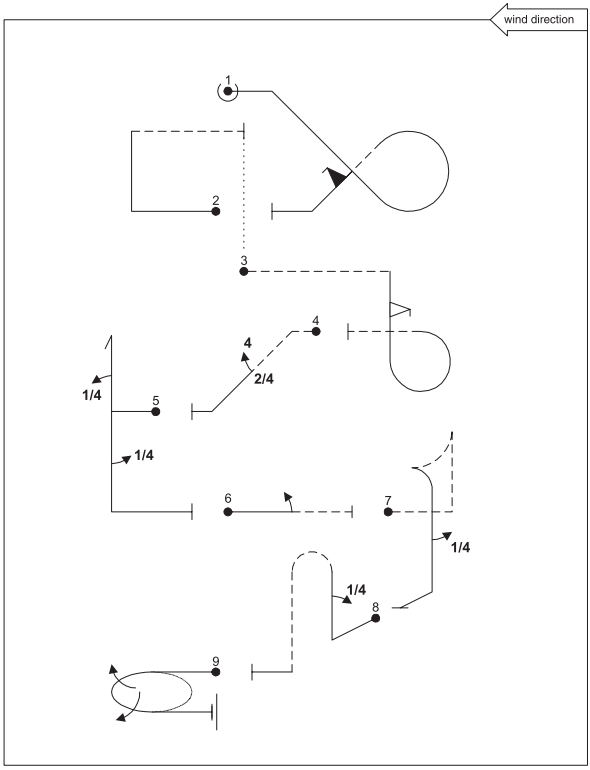
INTERMEDIATE *GLIDER*

Fig 1	1.1.3 9.1.3.6	2 15	17
Fig 2	7.4.2 9.4.3.2 9.1.3.2	6 8 6	20
Fig 3	1.6.3 9.11.1.5	10 6	16
Fig 4	0.1	16	16
Fig 5	5.1.1	17	17
Fig 6	8.1.1	13	13
Fig 7	8.42.1 9.4.4.2	10 8	18
Fig 8	1.1.1 9.1.3.4	2 12	14
Total K = 131			



UNLIMITED *GLIDER*

Fig 1	7.21.3 9.10.4.2	14 15	29
Fig 2	1.7.1	9	9
Fig 3	8.33.4 9.9.5.2	12 12	24
Fig 4	1.3.4 9.4.4.2	7 8	15
Fig 5	5.1.1 9.1.1.1 9.1.5.1	17 9 3	29
Fig 6	1.1.3 9.1.3.2	2 6	8
Fig 7	6.2.4 9.1.5.1	17 3	20
Fig 8	8.3.1 9.1.1.1	15 9	24
Fig 9	2.6.3	30	30
Total K = 188			



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APPENDIX 2 *CALCULATION OF SCORES USING TBLP METHOD*

INTRODUCTION TO TBLP

Competition aerobatics is scored by a panel of judges who grade each flight on the basis of their perception of how well the competitor flies against the criterion of perfection. Judges, like the pilots they grade, are not infallible. Whether caused by bias, inconsistency, experience level, fatigue, or other factors, there will always be some variation in the scores. Different judges also have different "styles": Some score generously, others stingily; certain judges use the full range of marks while the scores of others are clustered around a single value (e.g., 8.5). It is because of these very human traits that a panel of judges is employed rather than a single judge. The TBLP (Tarasov-Bauer-Long-Penteado) system bases its foundations on the premise that by combining the scores from several judges in a clever statistical way, we can eliminate many of those undesirable effects.

In 1999, a new version of the TBLP scoring system was put into place, TBLP per figure. Instead of operating on the total raw score only, this latest version includes individual figure marks in its calculations as well. Although the previous TBLP system was excellent in dealing with large scale inconsistencies and bias, it was not able to address perturbations caused by individual figure scores; for example, a judge who scores some figures too high and others too low, but who still has a reasonable total raw score. In operation, TBLP per figure acts on the individual figure scores first and then on the total raw scores, making possible a very reliable representation of each competitor's performance.

Even if a single judge viewed an identical flight a number of times, slightly different scores would be recorded for each flight. There is simply an element of randomness in the scoring process, no matter how competent or unbiased the judge. There is, however, a low probability the randomness will be identical across the entire panel of judges. This is why statistical methods yield a more reliable result than simple averaging. The use of straight averages for scoring would result in the judges who use a wide range of scores having far more influence on the final standings than the judges who confine their scores to a narrow range. Excluding the highest and lowest judges from the average does not remove the second or third out-of-range or biased judges and often does remove judges who are rigorous with their scores. The statistical method of TBLP normalizes the scores, giving each judge

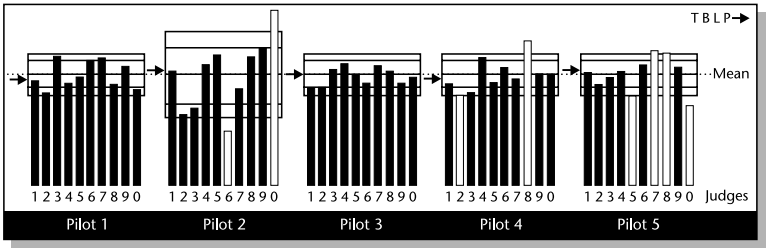
equal ability to influence the final standing and removes the biased or out-of-range judges from the final result, even if there were more than one on a panel. For instance, in world championships where ten judges are used, it is not uncommon to see three or even four judges deleted from a pilot's flight scores.

In operation, TBLP first normalizes the individual judge's scores to remove the distortion caused by different judging styles. This is done by raising the scores of the low scoring judges, lowering the scores of the high scoring judges, compressing the scores of the wide-range scoring judges, and expanding the scores of the narrow-range scoring judges. This normalization process results in equal means and scatters for each judge. When the scores are normalized in this manner to remove stylistic differences between judges, the relative standing of each pilot is not affected. An individual pilot's scores may be bumped up or down, but the relative finish order, as seen by each judge, does not change.

If each judge's score is compared to the mean of all judges, it will be seen that some scores are greater than the mean and some lesser. That is, the scores fall not in a straight line, but within a window, with the mean as its center line. But how wide should we allow the window to be? That depends on how confident we want to be that a given score is valid. Based on many trials and analysis of contest data from the last 20 years, it was decided that one 'standard deviation' (little less than 70% of the scores population) was good enough. To increase the population would increase the risk of passing biased or incompetent scores. To lower the population would discard too many valid scores.

With the width of the window set, TBLP removes any scores that are outside the window and averages the remaining scores to produce the final score for the pilot. The removal of those outlying scores is not done on a black or white basis, however. The window in TBLP has 'fuzzy' edges. Instead of a score being simply in or out of the window, the score is examined to determine how far outside the window it is. If it is only 'slightly out', the score is still used, but is given less weight (importance) when the final average is calculated. That is, TBLP progressively removes scores near the edge of the acceptance window from the final results, rather than using an all-or-nothing approach. When a judge's score does fall completely outside the 'fuzzy' edge of the window, the score is totally discarded. It is as if that judge was not even on the panel for that pilot. This progressive deletion eliminates a past characteristic of TBLP where major reordering of the final standings could result when a single score was changed after a protest or entry error correction.

To graphically depict what was just described, the following figure is an actual TBLP output for five pilots each of whom was scored by the same panel of ten judges. The rectangular box at the top of each bar graph is the TBLP 'window' and the center line of the window is the mean. The two horizontal lines above and below the mean line define the 'fuzzy' zone. Note that some judges are totally inside the windows, some are in the 'fuzzy' border, and others are totally out because they scored excessively low or high (see the white bars). The little arrow on the left represents the final TBLP value.



CALCULATION OF SCORES

Scores Calculation System for an aerobatic program using the TBLP (Tarasov, Bauer, Long, Penteado) per figure method.

The rating of a pilot's performance for a given flight is the number of points combined from three separate sources:

A) Quality evaluation of flown figures or flight positioning or presentation with a score given by judges observing the flight, on a scale ranging from 0 to 10.

B) Bonus points, if applicable, applied on a percent basis over the flight results according to the number of figures flown and depending on the type of program.

C) Penalties arising from height or time infringements and/or interruptions of the program sequence and other disciplinary actions.

The scores from (A) are subject to random and systematic errors due to the inevitable lack of exactness of judging, and the purpose of the TBLP system is to reduce the effect of those errors.

The bonus points from (B), applied in a percentage basis, are simply added (if applicable) to the scores results (A) after they have been calculated as described below.

The penalties from (C), not subject to the same errors, are then subtracted from the results (A+B) to form the final score.

The calculation of Judges Scores (A) is performed in two separate phases:

PHASE 1

Scores assigned to individual figures on each flight are statistically treated to remove coarse deviations from a calculated expectation range. This range is centered at 1.4 times the individual pilot-figure Standard Deviation and the removal is performed in a continuous weighted fashion from 1.2 SD (no removal) to 1.6 SD (full removal). The score is either taken with its original value or slowly changed to a value that represents the average of the scores of the other judges. Pilots or Judges with all scores equal zero will be considered as non-existent for calculation purposes.

Let:

G(p,j,f) = Figure Grade given to the p-th pilot, f-th figure by the j-th judge.

np = Total number of pilots in the flight with at least one figure score bigger than zero.

nj = Total number of judges on the panel with at least one figure score bigger than zero.

nf(p) = Total number of figures for the p-th pilot.

Rg(p,j) = Raw grade for the p-th pilot, j-th judge.

Ga(p,j) = Grade average for the p-th pilot, j-th judge.

Ja(j) = Average of Raw grades given by the j-th judge.

Js(j) = The mean-square difference between Raw grades given by the j-th judge and his average Ja(j).

A = The average of all Raw grades given by all judges.

S = The mean square difference between all Raw grades and the average A.

Acf(j) = Average correction factor for the j-th judge.

Scf(j) = Scatter correction factor for the j-th judge.

Ng(p,j,f) = Rescaled grade corrected to each p-th pilot, j-th judge and f-th figure.

Fa(p,f) = Pilot averages on each figure (for all judges).

Fs(p,f) = Pilot scatters on each figure

Fssd(p,f) = Pilot Std.Deviation on each figure (Sqrt Fs(p,f)).

Fd(p,f) = Figure displacement in Sd.Dv. units.

Fk(p,j,f) = Figure progressive deletion limit in standard deviation units. This is the external size of the acceptance window for grade displacements.

Fwm(p,j,f) = Figure weighted average multiplier (0 to 1).

Ft(p,f) = Corrected figure grade.

R(p,j) = Corrected raw score. Sum of corrected figure grades multiplied by respective K factors.

Re-scale the original figure grades for minimizing errors arising from differences in judging style.

Compute the Raw grade for the p-th pilot and j-th judge,

$$Rg(p,j) = \sum_{f=1}^{nf} G(p,j,f)$$

Compute the Grade average for that p-th pilot and j-th judge.

$$Ga(p,j) = \frac{1}{nf(p)} Rg(p,j)$$

Compute the j-th judge average,

$$Ja(j) = \frac{1}{np} \sum_{p=1}^{np} Rg(p,j)$$

Compute the j-th judge mean-square scatter,

$$Js(j) = \frac{1}{(np-1)} \left[\sum_{p=1}^{np} Rg(p,j)^2 - np\ Ja(j)^2\right]$$

Compute the flight average,

$$A = \frac{1}{nj} \sum_{j=1}^{nj} Ja(j)$$

Compute the flight mean-square scatter,

$$S = \frac{1}{np\ nj-1} \left[\sum_{j=1}^{nj} \left(\sum_{p=1}^{np} Rg(p,j)^2\right) - np\ nj\ A^2\right]$$

Compute the average correction factor,

$$Acf(j) = \frac{1}{Ja(j)} A$$

Compute the Scatter correction factor,

$$Scf(j) = \frac{1}{\text{Sqrt } Js(j)} \text{Sqrt } S$$

Compute the re-scaled figures grades,

$$Ng(p,j,f) = [G(p,j,f) - Ga(p,j)]\ Scf(j) + Ga(p,j)\ Acf(j)$$

Re-scaled grades for all figures in all judges now have similar averages and scatters (A and S). The rescaled figure grades are then weighted and progressively adjusted before being transformed into a raw score for that p-th pilot and j-th judge. This procedure will remove individual figure grades that are presumed to be unrepresentative of the pilot's performance.

Compute the p-th pilot, f-th figure rescaled grades average of all judges,

$$Fa(p,f) = \frac{1}{nj} \sum_{j=1}^{nj} Ng(p,j,f)$$

Fa(p) is the estimated mean value of the hypothetical Gaussian population from which the Grades were drawn.

Compute the p-th pilot, f-th figure mean square scatter,

$$Fs(p,f) = \frac{1}{nj-1} \left[\sum_{j=1}^{nj} Ng(p,j,f)^2 - nj\ Fa(p,f)^2 \right]$$

Compute the p-th pilot, f-th figure Standard Deviation,

$$Fssd(p,f) = Sqrt\ Fs(p,f)$$

If $Fssd(p,f) > 0.03\ Fa(p,f)$ then, $Fssd(p,f) = 0.03\ Fa(p,f)$

Compute the p-th pilot, j-th judge, f-th figure, displacement in units of Fssd(p,f),

$$Fd(p,f) = \frac{Abs[Ng(p,j,f) - Fa(p,f)}{Fssd(p,f)}$$

Compute the maximum window acceptance values expressed in units of Fssd(p,f),

$$Fk(p,j,f) = 1.6 - Fd(p,j,f)$$

If $Fk(p,j,f) < 0$ then, $Fk(p,j,f) = 0$

Compute the Weighted average multiplier in values expressed in units of Fssd(p,f)

$$Fwm(p,j,f) = \frac{1}{0.4} Fk(p,j,f)$$

If $Fwm(p,j,f) > 1$ then, $Fwm(p,j,f) = 1$

Compute the corrected final figure value.

$$Ft(p,j,f) = [G(p,j,f) - Fa(p,f)]\ Fwm(p,f)] + Fa(p,j,f)$$

Compute the corrected raw score for the p-th pilot, and j-th judge, to be used in the next phase,

$$R(p,j) = \sum_{f=1}^{nf(p)} [Ft(p,j,f)\ Kf(p,f)]$$

PHASE 2

The calculated corrected raw scores are now used in a second computation. The term raw score now refers to the corrected raw scores R(p,j) obtained with the previous calculations. Again, pilots or judges with all raw scores equal zero will be considered as non-existent for calculation purposes.

Let:

R(p,j) = Raw score calculated for the p-th pilot and the j-th judge.

np = Total number of pilots flying the program with at least one raw score bigger than zero.

nj = Total number of judges on the panel with at least one raw score bigger than zero.

Ja(j) = Judge average: the average raw score given by the j-th judge.

Js(j) = Judge scatter: the mean-square difference between raw scores given by the j-th judge and his average score Ja(j).

A = Overall average: the average of all raw scores given by the panel of judges in that flight.

S = Overall scatter: the mean square difference between all raw scores and the average A.

N(p,j) = Rescaled score corrected to each p-th pilot and j-th judge.

Pa(p) = Pilot average: the p-th pilot average rescaled score.

Ps(p) = Pilot scatter: the mean-square difference between the p-th pilot rescaled scores N(p,j) and their averages Pa(p).

Psd(p) = Pilot Standard Deviation Sqrt Ps(p).

D(p,j) = Displacement of the j-th judge rescaled score from Pa(p) in units of Standard Deviation Sqrt Ps(p).

K(p,j) = Progressive deletion limit in standard deviation units. This is the external size of the acceptance window for score displacements.

Wm(p,j) = Weight average multiplier factor for each judge in a pilot (varies from 0 to 1).

Wd(p) = Total weight average sum for all judges scores on the p-th pilot.

T(p) = Final TBLP average score for the p-th pilot.

The first step in the procedure is to rescale the raw scores in order to minimize errors arising from differences in judging style.

Compute the j-th judge average raw score,

$$Ja(j) = \frac{1}{np} \sum_{p=1}^{np} R(p,j)$$

Compute the j-th judge mean-square raw score scatter,

$$Js(j) = \frac{1}{(np-1)} \left[\sum_{p=1}^{np} R(p,j)^2 - np\ Ja(j)^2 \right]$$

Compute the overall event average,

$$A = \frac{1}{nj} \sum_{j=1}^{nj} Ja(j)$$

Compute the overall event scatter,

$$S = \frac{1}{(np\ nj\ -1)} \left[\sum_{j=1}^{nj} \left(\sum_{p=1}^{np} R(p,j)^2 \right) - np\ nj\ A^2 \right]$$

Compute the rescaled scores,

$$N(p,j) = \left[\frac{R(p,j)-Ja(j)}{\text{sqrt } Js(j)} \text{ Sqrt } S \right] + A$$

Rescaled scores for all judges now have the same average and scatter (A and S). The rescaled scores are now progressively weighted before averaging to remove outliers that are presumed to be unrepresentative of the pilot performance.

Compute the pilot average rescaled score,

$$Pa(p) = \frac{1}{nj} \sum_{j} N(p,j)$$

Pa(p) is the estimated mean value of the hypothetical Gaussian population from which the scores were drawn.

Compute the pilot mean-square scatter,

$$Ps(p) = \frac{1}{(nj-1)} \left[\sum_{j} N(p,j)^2 - nj\ Pa(p)^2 \right]$$

Compute the pilot Standard Deviation,

$$Psd(p) = Sqrt\ Ps(p)$$

If $Psd(p)<0.03Pa(p)$ then, $Psd(p)=0.03Pa(p)$

Compute the judges scores displacements in units of pilot standard deviation,

$$D(p,j) = \frac{Abs[N(p,j)-Pa(p)]}{Psd(p)}$$

Compute the maximum window acceptance values in units of pilot standard deviation,

$$K(p,j) = 1.2-D(p,j)$$

if $K(p,j)<0$ then, $K(p,j)=0$

Compute the average weight multiplier for the judges,

$$Wm(p,j) = \frac{1}{0.4} K(p,j)$$

if $Wm(p,j)>1$ then, $Wm(p,j)=1$

Compute the total average weight for all judges on each pilot,

$$Wd(p) = \sum_{j} Wm(p,j)$$

Compute the final TBLP scores,

$$T(p) = \frac{1}{Wd(p)} \sum_{j} [N(p,j)\ Wm(p,j)]$$

Bonus points are added to the resulting score, if applicable, depending on the number of figures on the program.

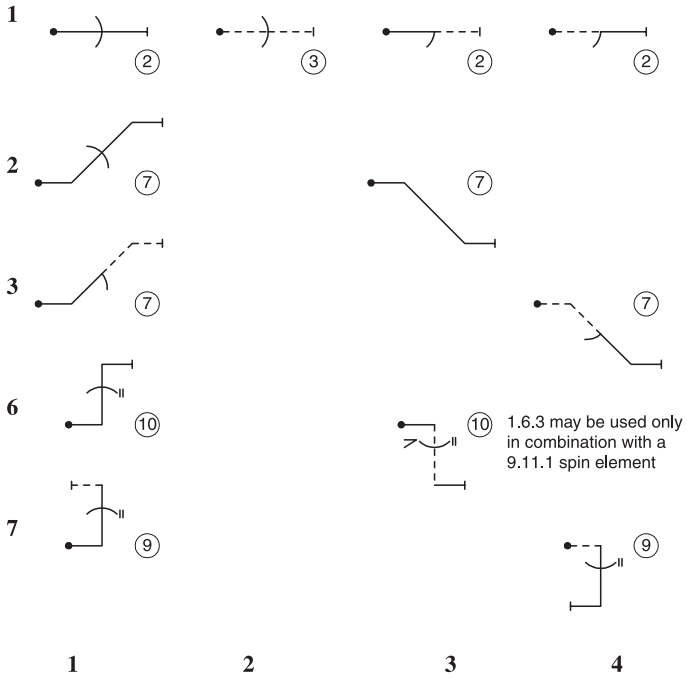
Penalty Points arising from category (C) are then subtracted from the results calculated above. The result is the pilot final score for the flight. If the final score is negative, a zero will be used for that pilot on that flight.

APPENDIX 3 *ALLOWABLE FIGURES FOR POWER UNKNOWNS*

INTERMEDIATE

NOTE FOR ALL FAMILIES: Rolling elements may only be added where indicated. Unlinked and opposite rolls, including rolls following a spin element, are not permitted.

1.



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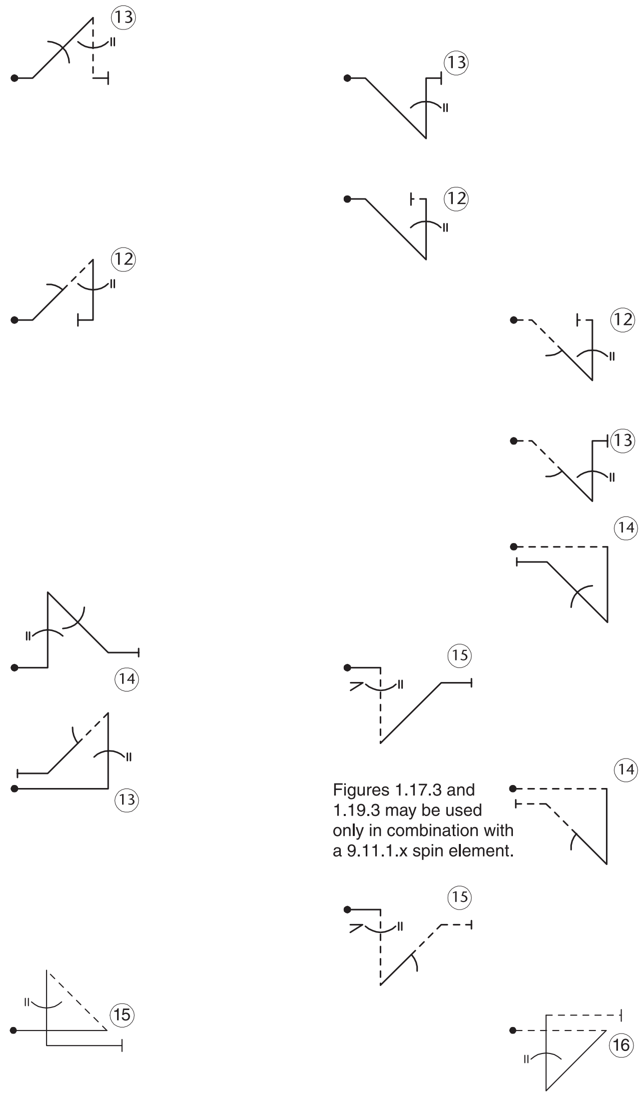
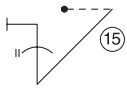


Figures 1.17.3 and 1.19.3 may be used only in combination with a 9.11.1.x spin element.

1 2 3 4

1.

21



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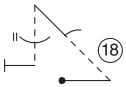

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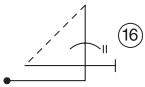

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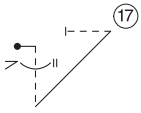

Figure 1.25.3 may be used only in combination with a 9.11.1.x spin element.

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1 **2** **3** **4**

1.

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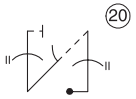

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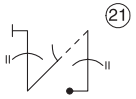

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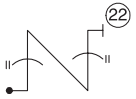

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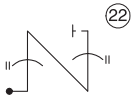
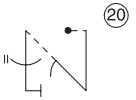
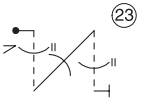
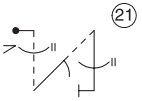


43



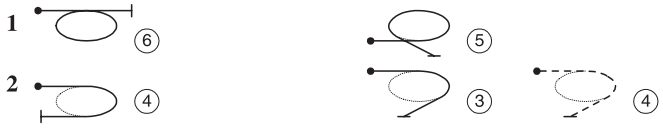


Figures in column 3 may be used
only in combination with a 9.11.1.x spin element.



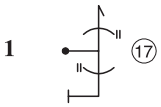
1 **2** **3** **4**

2.



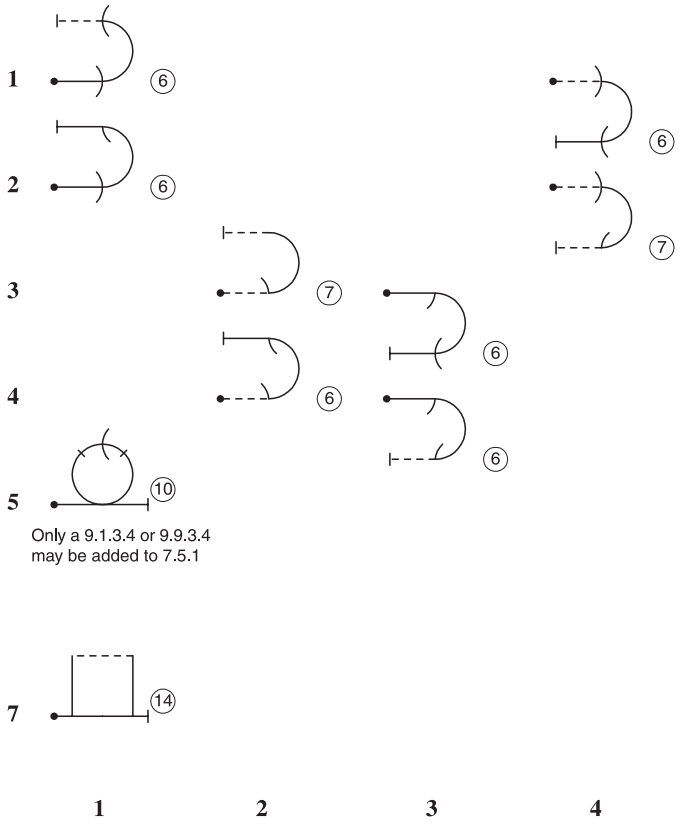
1 **2** **3** **4**

5.



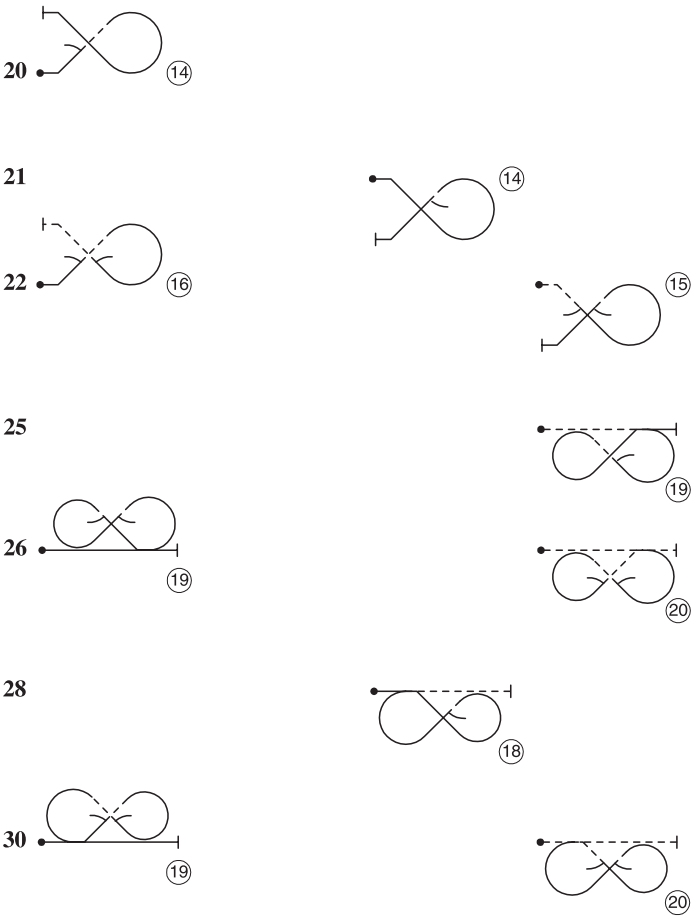
1

7.

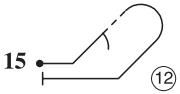


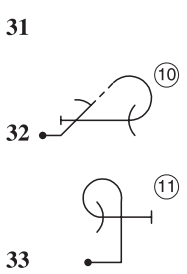
For Family 7.1 – 7.4, snap rolls are not permitted on the horizontal entry lines of figures in columns 1 and 2, nor on the horizontal exit lines of figures in columns 3 and 4.

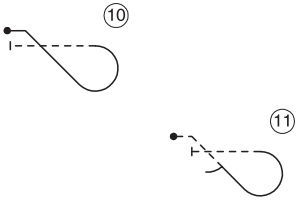
7.



8.





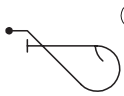


Snap rolls are not permitted on the horizontal exit line of figures 8.32.1 and 8.33.1.

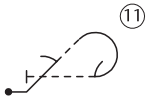
1 **2** **3** **4**

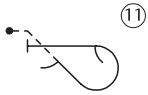
8.

37

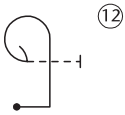


38

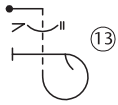




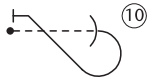
39



40



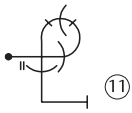
41



42

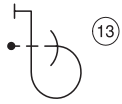
Snap rolls are not permitted on the horizontal entry lines of figures 8.42.1 and 8.43.1

43



A maximum of one optional rolling element may be added to 8.43.1. If used, the roll at the top of the loop must be either a 9.1.3.4 or 9.9.3.4.

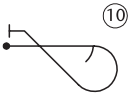
44



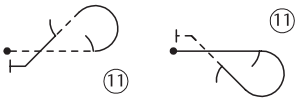
1 **2** **3** **4**

8.

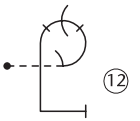
47



48



51

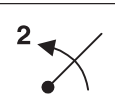
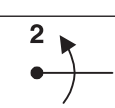
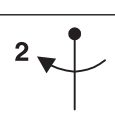


If used, the roll at the top of the loop must be either a 9.1.3.4 or 9.9.3.4.

1 **2** **3** **4**

9.1

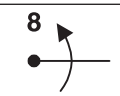
		1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2
1		6							
2			6		10				
3			4		8		10		
4			4						
5		2							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

9.2					**1**		**1 1/2**		**2**
1									
2									
3					9				
4									
5									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

9.4

			1/2	3/4	1	1 1/4	1 1/2	1 3/4	2
1									
2			7						
3			5		11				
4			5						
5									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

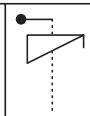
9.8

		1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2
1									
2									
3			7						
4									
5									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

9.9

			1/2	3/4	1	1 1/4	1 1/2	1 3/4	2
1									
2									
3					11				
4					11				
5									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

FAMILY 9.11 (POSITIVE SPINS)

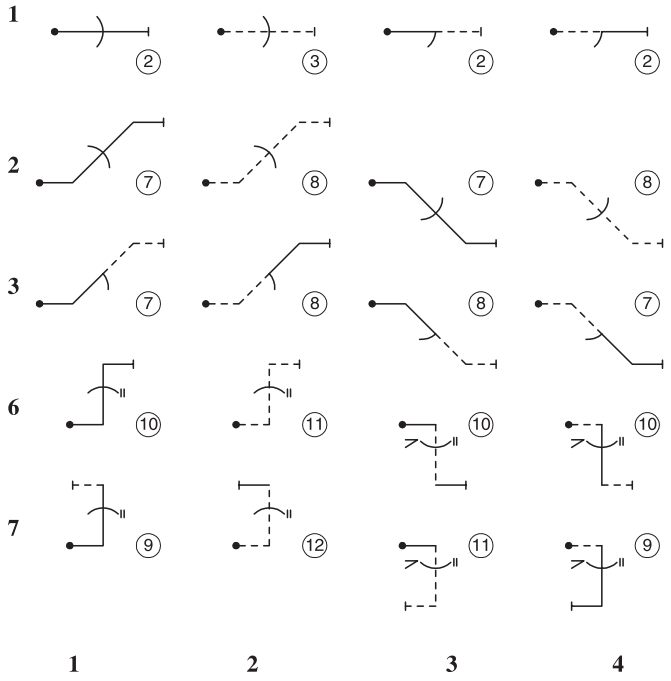
					1	1 1/4	1 1/2	1 3/4	2
1		**Upright Entry Line**			**5**	**4**	**3**		
					4	**5**	**6**	**7**	**8**

APPENDIX 3 *ALLOWABLE FIGURES FOR POWER UNKNOWNS*

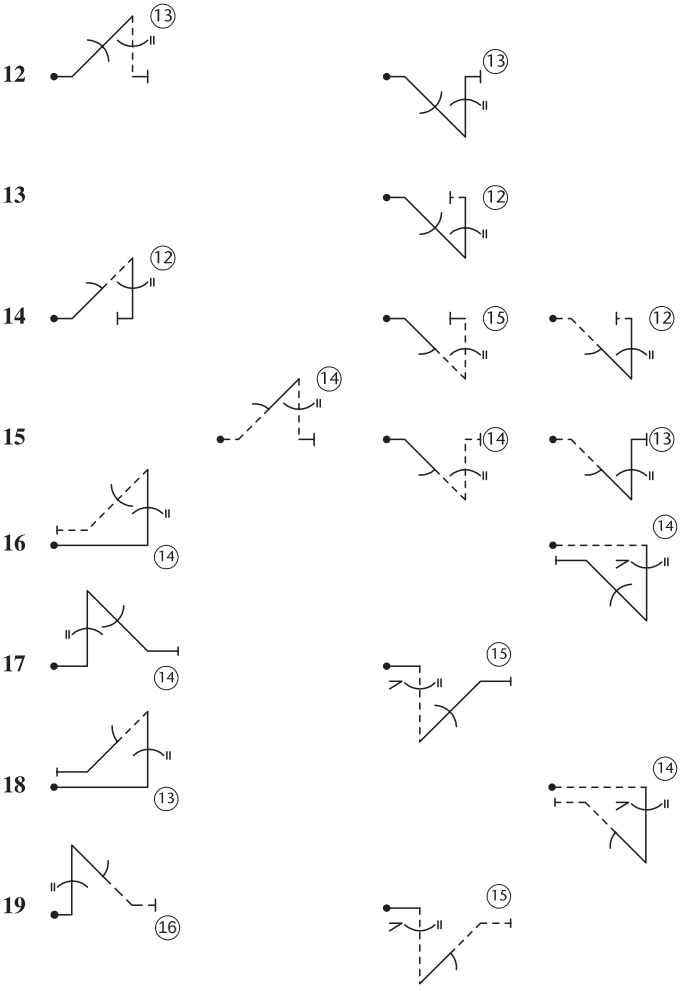
ADVANCED

NOTE FOR ALL FAMILIES: Unlinked and opposite rolls permitted only on straight, horizonal lines. Rolling elements may be added only where indicated, but are never permitted following a spin element.

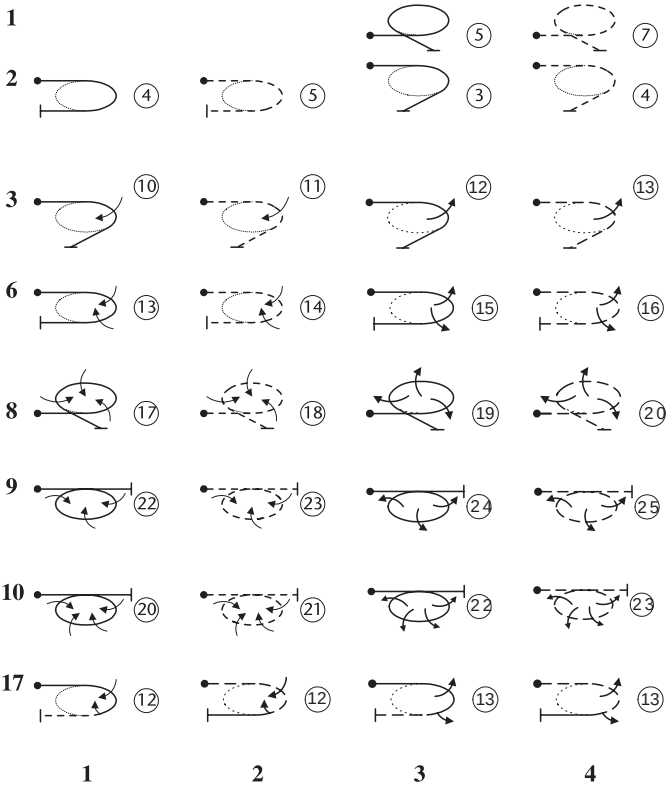
1.



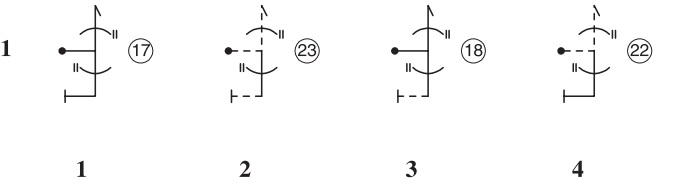
1.



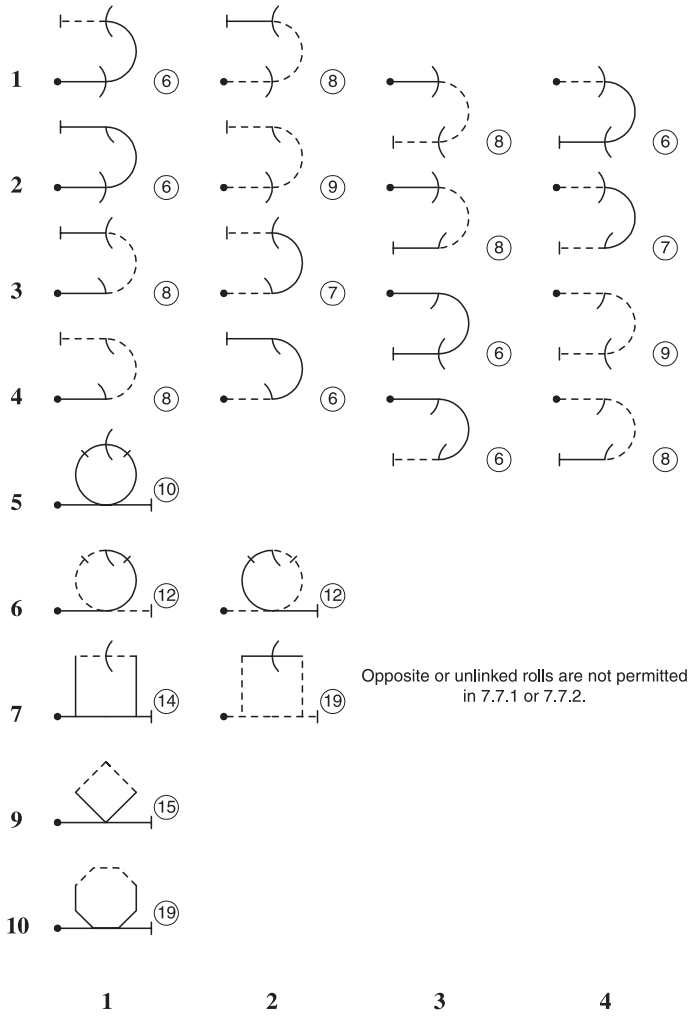
2.


1
2
3
6
8
9
10
17
4
5
3
7
4
10
11
12
13
13
14
15
16
17
18
19
20
22
23
24
25
20
21
22
23
12
12
13
13
1
2
3
4

5.

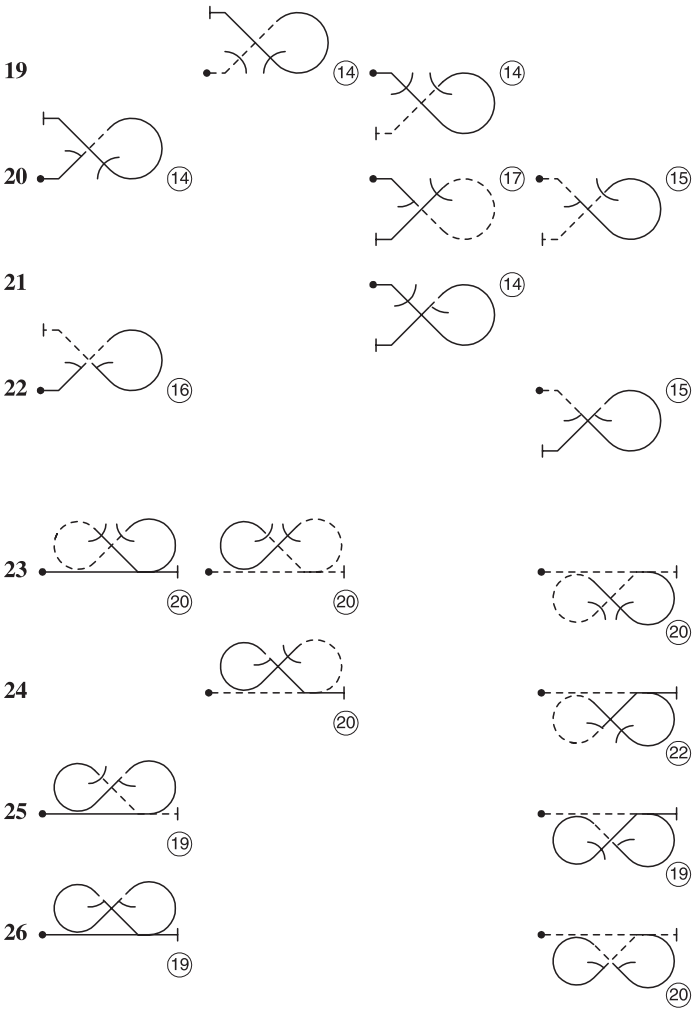

1
17
23
18
22
1
2
3
4

7.



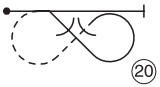
For Family 7.1 – 7.4, snap rolls are not permitted on the horizontal entry lines of figures in columns 1 and 2, nor on the horizontal exit lines of figures in columns 3 and 4.

7.

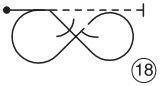

19
20
21
22
23
24
25
26
14
14
14
14
17
15
16
15
20
20
20
20
22
19
19
20
1
2
3
4

7.

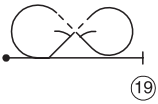
27



28



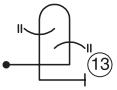
30

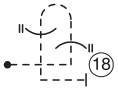


1 **2** **3** **4**

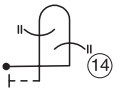
8.

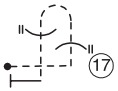
1



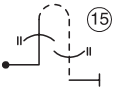


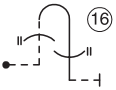
2



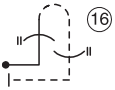


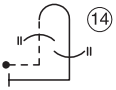
3





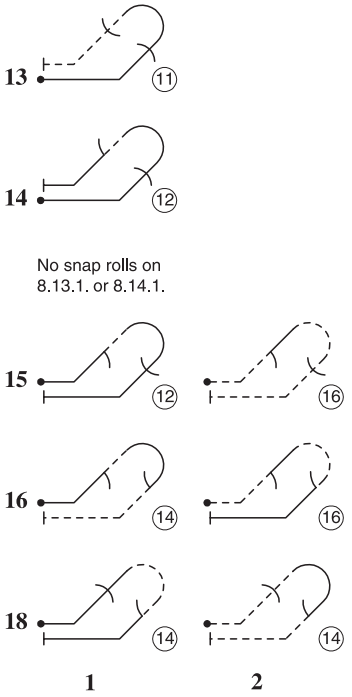
4



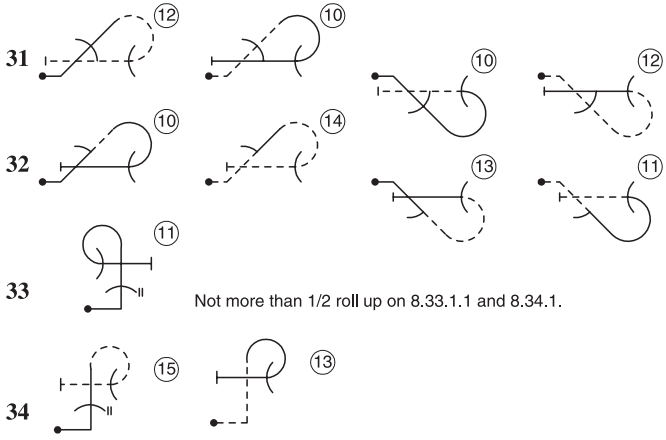


1 **2**

8.

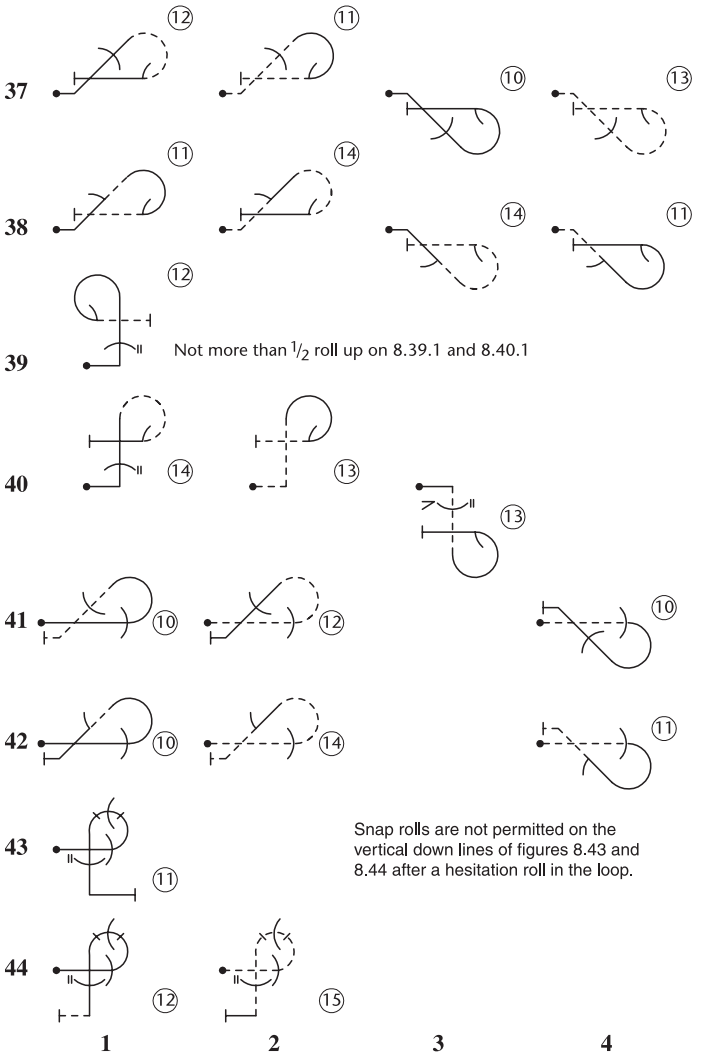

13
11
14
12
No snap rolls on
8.13.1. or 8.14.1.
15
12
16
16
14
16
18
14
14
1
2

8.



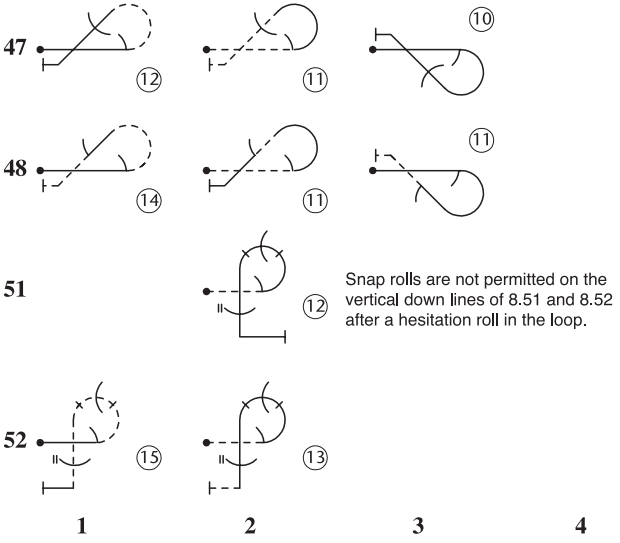
For Family 8.31 – 8.34, snap rolls are not permitted on the horizontal exit lines of figures in columns 1 and 2.

8.



Snap rolls are not permitted on the horizontal exit lines of figures 8.37 to 8.40, nor on the horizontal entry lines on figures 8.41 to 8.44, columns 1 and 2.

8.



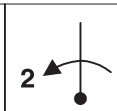
Snap rolls are not permitted on the horizontal entry lines on figures 8.47 to 8.52 columns 1 and 2.

9.1

		1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2
1		6	8	10*					
2			6		10				
3			4		8		10		12
4			4		8				
5		2	4	6**					
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

* 3/4 roll up may not be followed by level fly-off
** 3/4 roll down may not be followed by negative recovery

9.2

					1		**1 1/2**		**2**
1									
2					11				
3					9		12		15
4					9				
5									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

9.4

			1/2	3/4	1	1 1/4	1 1/2	1 3/4	2
1			9*						
2			7		13				
3			5		11				
4			5						
5			5**						
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

* 2/4 roll up may not be followed by level fly-off
** 2/4 roll down may not be followed by negative recovery

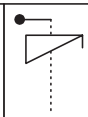
9.8

		1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2
1		7							
2			9						
3			7		15				
4									
5		3							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

9.9

		1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2
1									
2			13		13				
3			11		11		14		
4			11		11				
5			11	11					
10			13						
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

FAMILY 9.11 (POSITIVE SPINS)

					1	1 1/4	1 1/2	1 3/4	2
1		Upright Entry Line			5	4	3		
					4	5	6	7	8

FAMILY 9.12 (NEGATIVE SPINS)

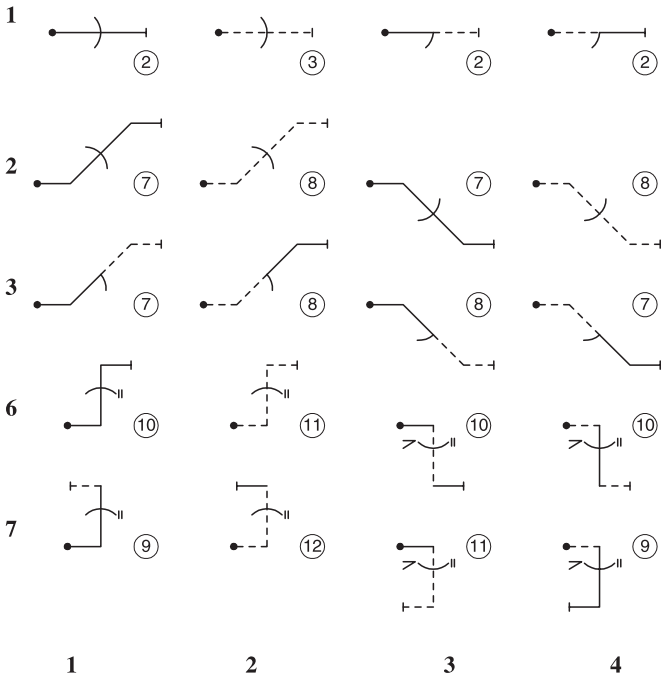
					1	1 1/4	1 1/2	1 3/4	2
1		Inverted Entry Line			7	6	5		
					4	5	6	7	8

APPENDIX 3 *ALLOWABLE FIGURES FOR POWER UNKNOWNS*

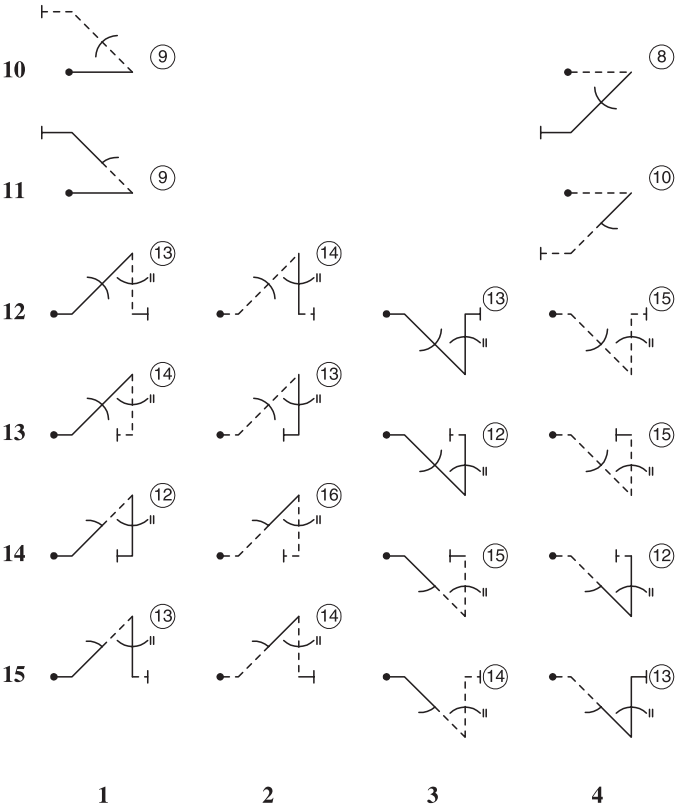
UNLIMITED

NOTE FOR ALL FAMILIES: Unlinked and opposite rolls permitted only on straight, horizontal lines. However, an aileron or snap roll element may be added after a spin. On vertical up lines, opposite aileron rolls may be added as long as the total extent of rotation does not exceed 540 degrees nor the number of stops exceeds 5. On vertical down lines, opposite aileron rolls may be added as long as the total extent of rotation does not exceed 450 degrees nor the number of stops exceeds 4.

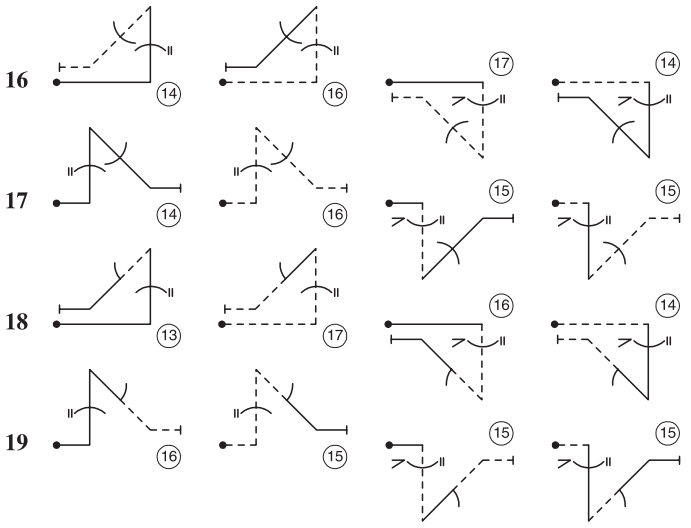
1.



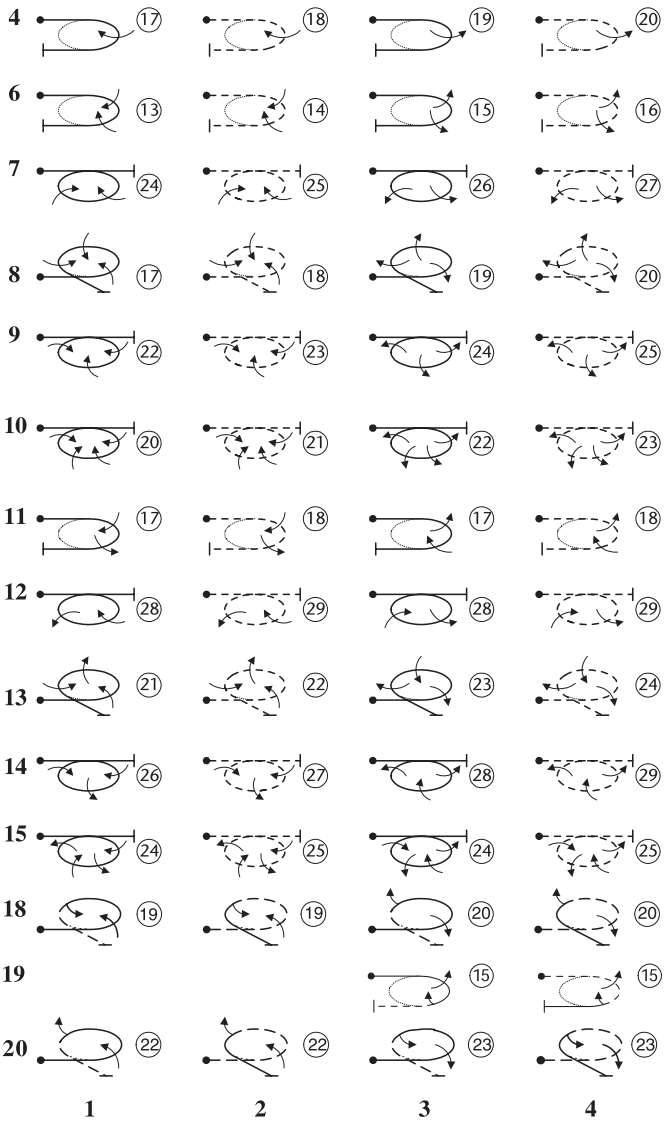
1.



1.



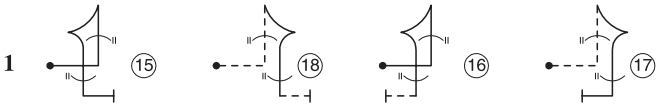
2.


4 17 18 19 20
6 13 14 15 16
7 24 25 26 27
8 17 18 19 20
9 22 23 24 25
10 20 21 22 23
11 17 18 17 18
12 28 29 28 29
13 21 22 23 24
14 26 27 28 29
15 24 25 24 25
18 19 19 20 20
19 15 15
20 22 22 23 23
1 2 3 4

5.

1 **2** **3** **4**

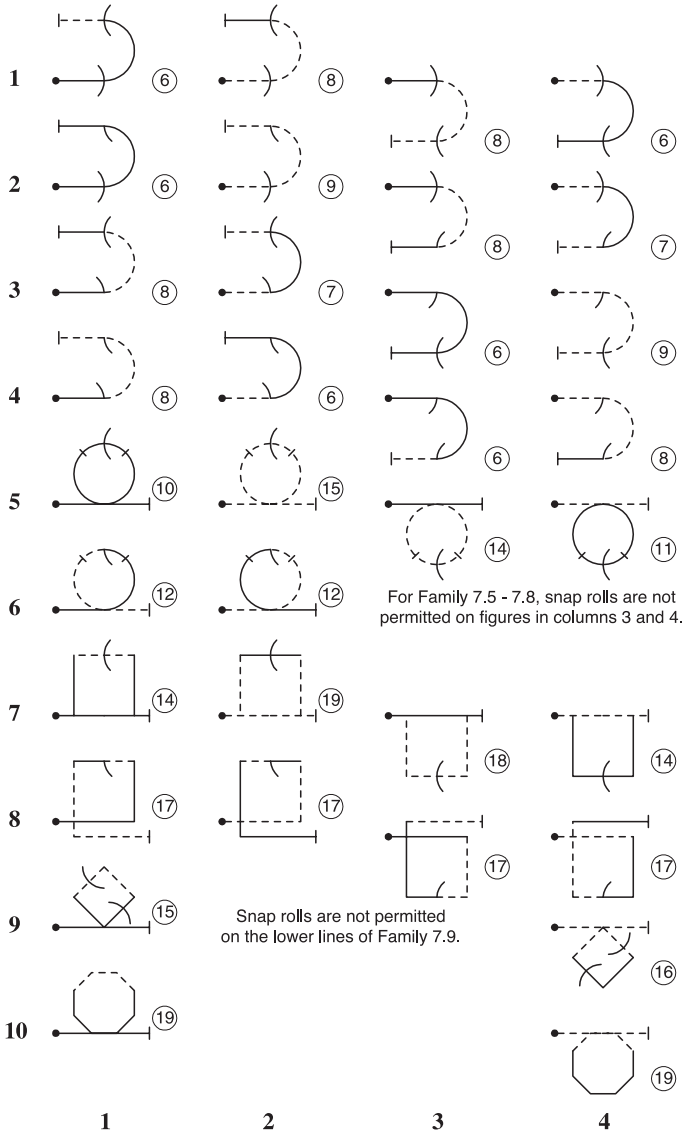
6.



1 **2** **3** **4**

Family 6: No snap rolls allowed on upward vertical lines.

7.

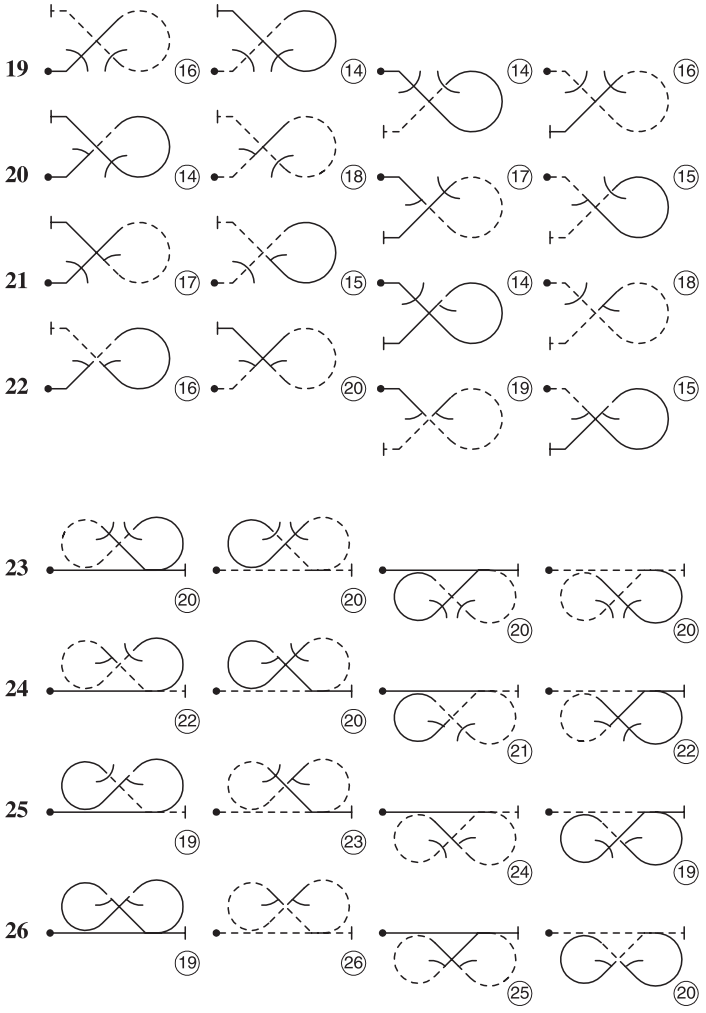


For Family 7.5 - 7.8, snap rolls are not permitted on figures in columns 3 and 4.

Snap rolls are not permitted on the lower lines of Family 7.9.

For Family 7.1 – 7.4, snap rolls are not permitted on the horizonal entry line of figures in column 1 and 2, nor on the horizonal exit lines of figures in columns 3 and 4.

7.


19
16
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24
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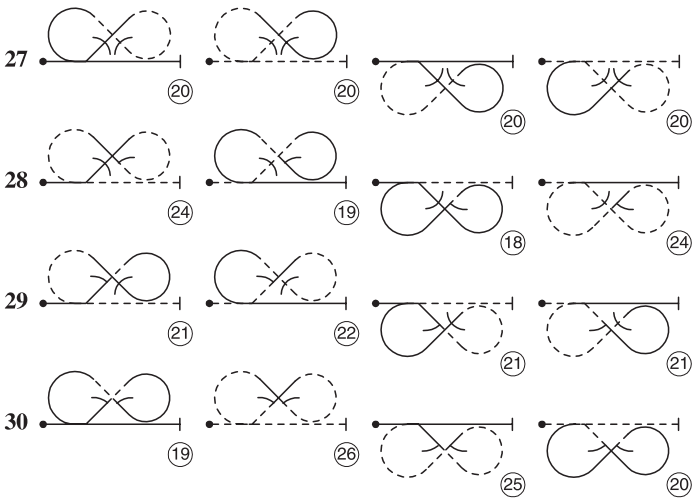
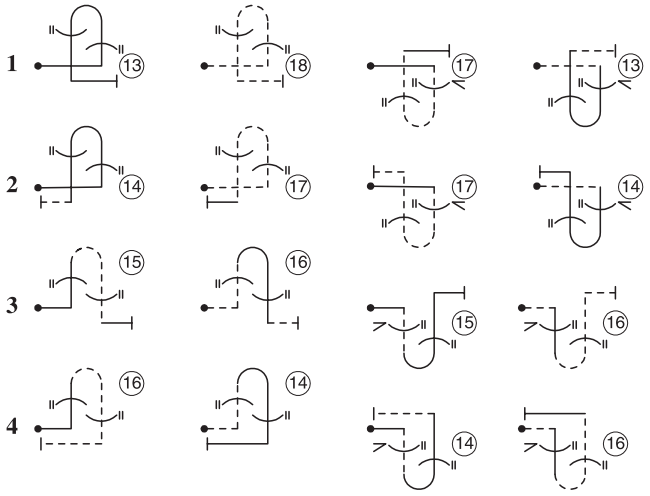
26
19
26
25
20
1
2
3
4

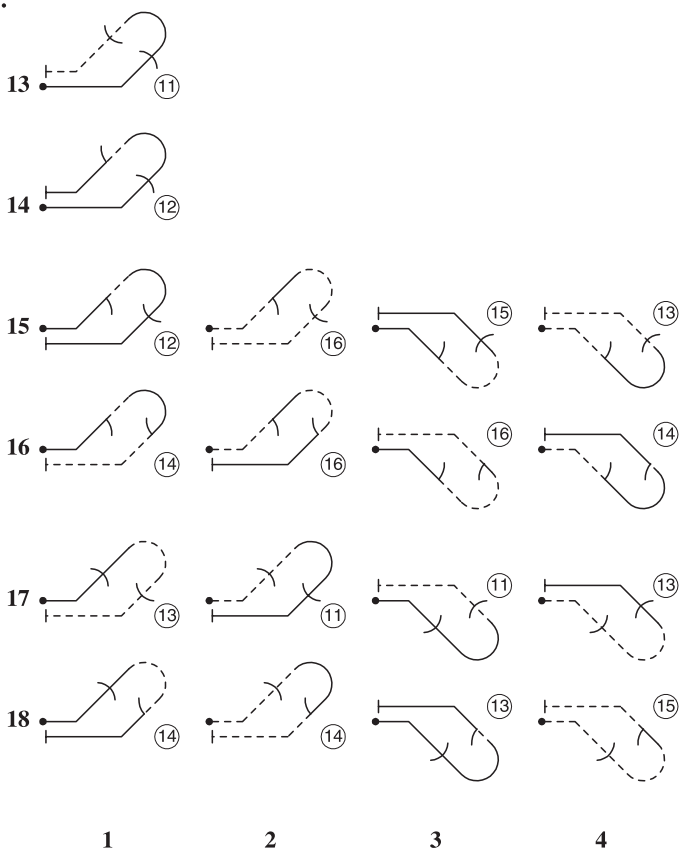
7.


27
20
20
20
20
28
24
19
18
24
29
21
22
21
21
30
19
26
25
20
1
2
3
4

8.


1
13
18
17
13
2
14
17
17
14
3
15
16
15
16
4
16
14
14
16
1
2
3
4

8.


13
11
14
12
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12
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15
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16
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16
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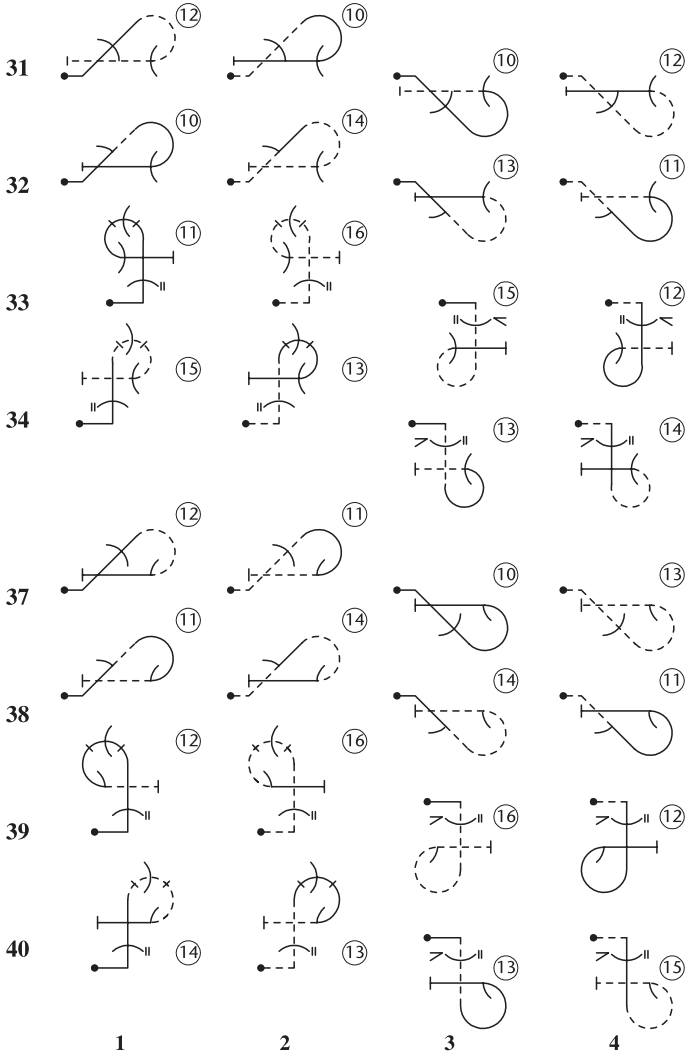
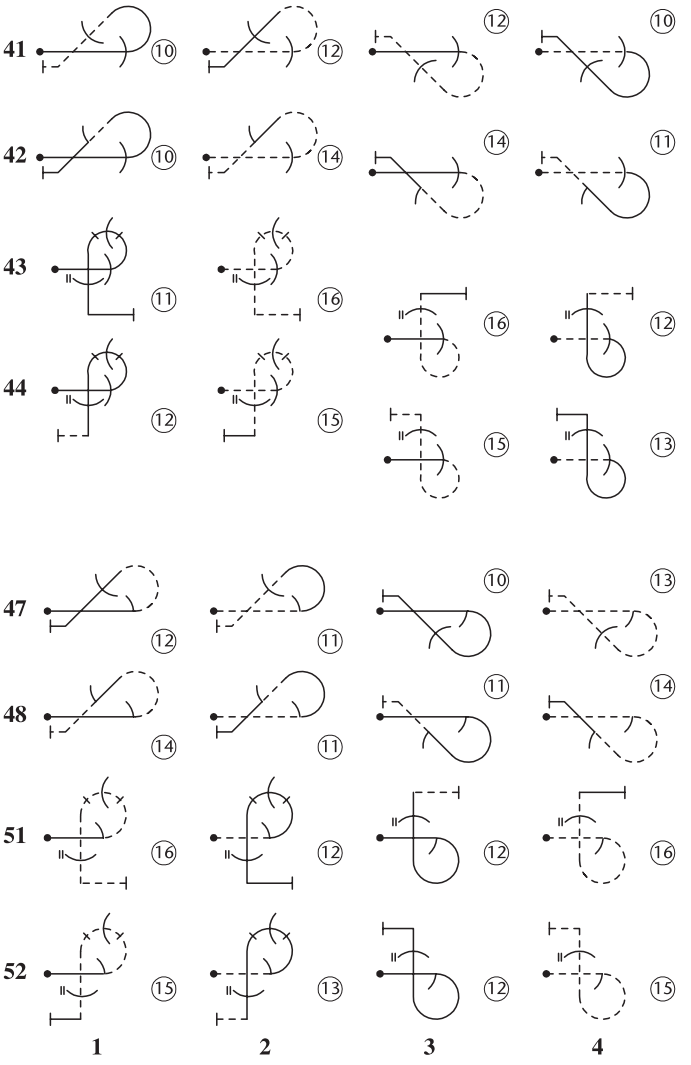
14
17
13
11
11
13
18
14
14
13
15
1
2
3
4

8.



Snap rolls are not permitted on the horizonal exit lines of figures in columns 1 and 2 on this page.

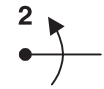
8.



Snap rolls are not permitted on the horizonal entry lines of figures in columns 1 and 2 on this page, nor on vertical down lines of 8.43, 8.44, 8.51, and 8.52 after a hesitation roll in the loop.

9.1

		1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2
1		6	8	10	12	14			
2			6		10		12		
3			4		8		10		
4			4		8		10		
5		2	4	6	8				
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

9.2					**1**		**1 1/2**		**2**
1					13				
2					11				
3					9		12		
4					9				
5					9				
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

9.4

			1/2	3/4	**1**	1 1/4	1 1/2	1 3/4	**2**
1			9	12	15				
2			7		13				
3			5		11				
4			5		11				
5			5	8					
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

9.8

		1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2
1		7	11						
2			9						
3			7		15				
4			7						
5		3	7						
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

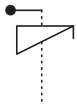
9.9

			1/2	3/4	1	1 1/4	1 1/2	1 3/4	2
1			15	15	15				
2			13		13				
3			11		11		14		
4			11		11		14		
5			11	11	11				
6			17	17	17				
7			15		15				
8			13		13				
9			13		13				
10			13	13	13				
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

9.10

			1/2	3/4	1	1 1/4	1 1/2	1 3/4	2
1			17	17	17				
2			15		15				
3			13		13		16		
4			13		13				
5			13	13	13				
6			19	19	19				
7			17		17				
8			15		15				
9			15		15				
10			15	15	15				
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

FAMILY 9.11 (POSITIVE SPINS)

					1	1 1/4	1 1/2	1 3/4	2
1		Upright Entry Line			5	4	3		
					4	5	6	7	8

FAMILY 9.12 (NEGATIVE SPINS)

					1	1 1/4	1 1/2	1 3/4	2
1		Inverted Entry Line			7	6	5		
					4	5	6	7	8

INTENTIONALLY LEFT BLANK

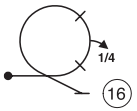
APPENDIX 4 *ALLOWABLE FIGURES FOR GLIDER UNKNOWNS*

INTERMEDIATE

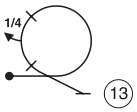
NOTE FOR ALL FAMILIES: Rolling elements may only be added where indicated. Unlinked and opposite rolls, including rolls following a spin element, are not permitted.

0.

1



2



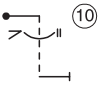
1.

1

2

3

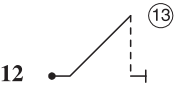
6



1.6.3 may be used only in combination with a 9.11.1.x spin element

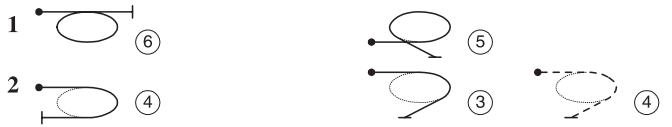
1 **2** **3** **4**

1.



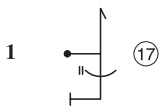
1 **2** **3** **4**

2.



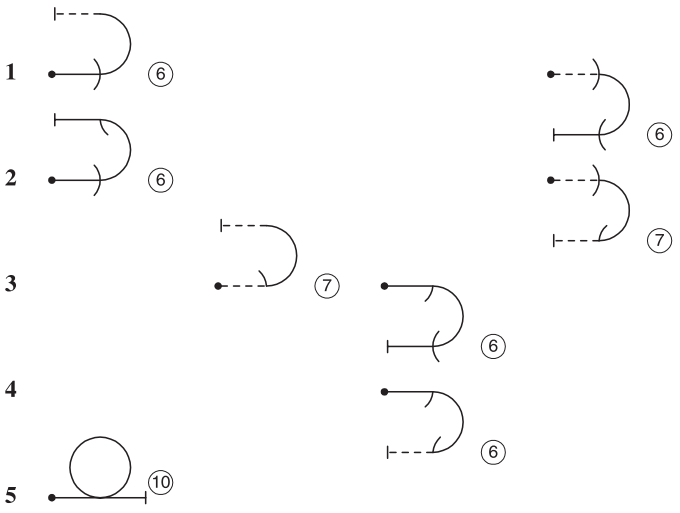
1 **2** **3** **4**

5.



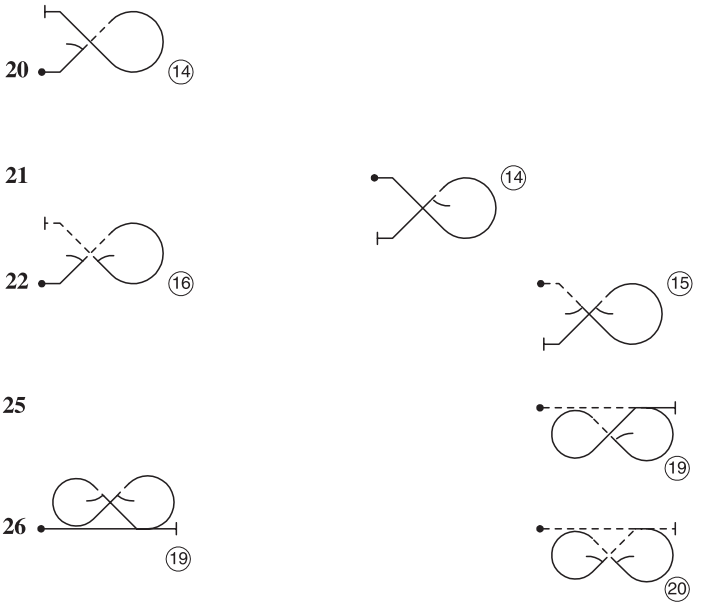
1

7.

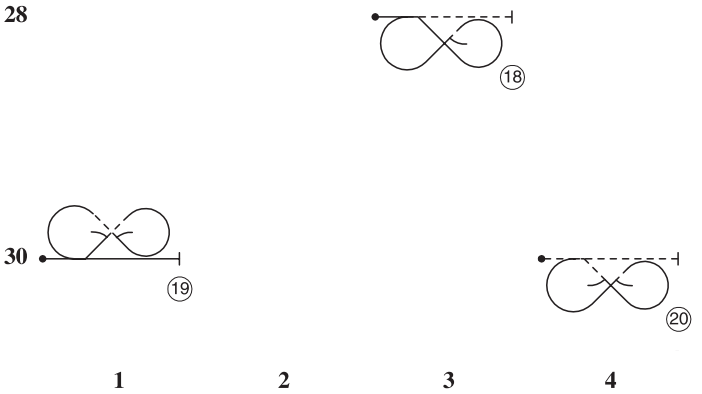


1 **2** **3** **4**

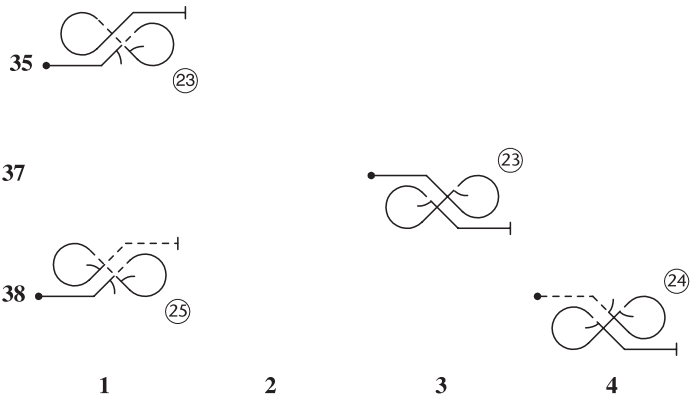
7.



Note: At the sign ⌒, only half-rolls permitted.

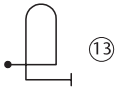


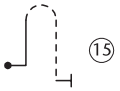
7.



Note: At the sign ⌒, only half-rolls permitted.

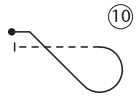
8.

1 

3 

15 

17 

31 

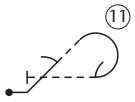
32 

1 **2** **3** **4**

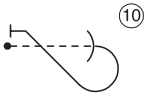
8.

37

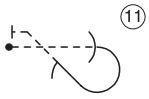
38



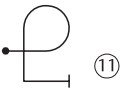
41



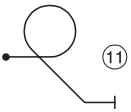
42



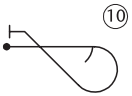
43



45



47



1 **2** **3** **4**

9.1

		1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2
1									
2			9						
3			6		12				
4			6						
5		3							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

9.2

					1		1 1/2		2
3	**2** 				14				
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

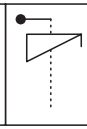
9.4

			1/2	3/4	1	1 1/4	1 1/2	1 3/4	2
3			8						
4			8						
		1	2	3	4	5	6	7	8

9.13

			1/2		1		1 1/2		2
3			8		16				
		1	2	3	4	5	6	7	8

FAMILY 9.11 (POSITIVE SPINS)

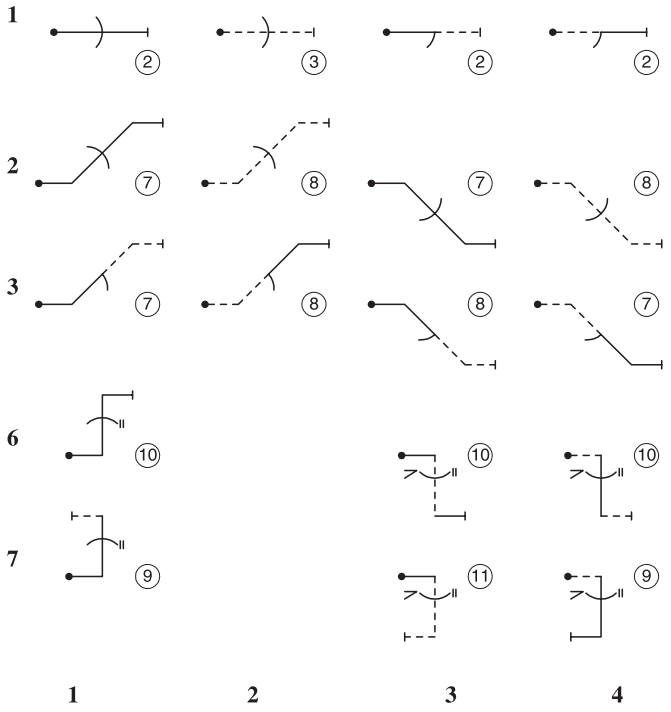
					 1	 1 1/4	 1 1/2	 1 3/4	 2
1		Upright Entry Line			5	6	7		
					4	5	6	7	8

APPENDIX 4 *ALLOWABLE FIGURES FOR GLIDER UNKNOWNS*

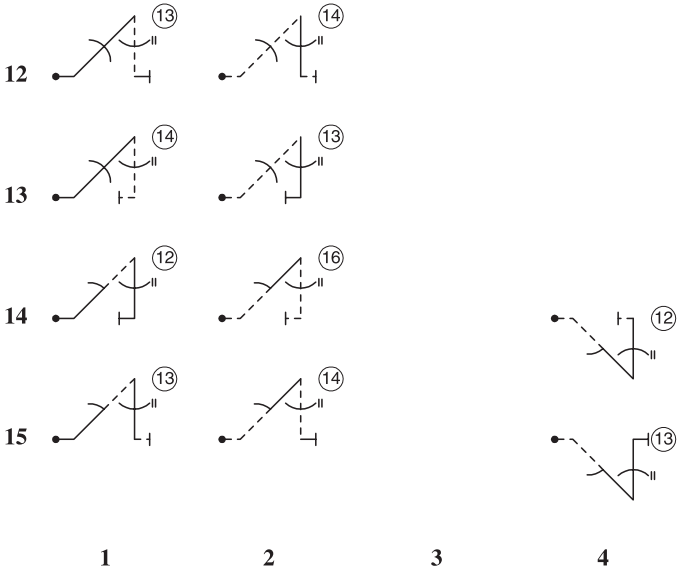
UNLIMITED

NOTE FOR ALL FAMILIES: Unlinked and opposite rolls are not permitted.

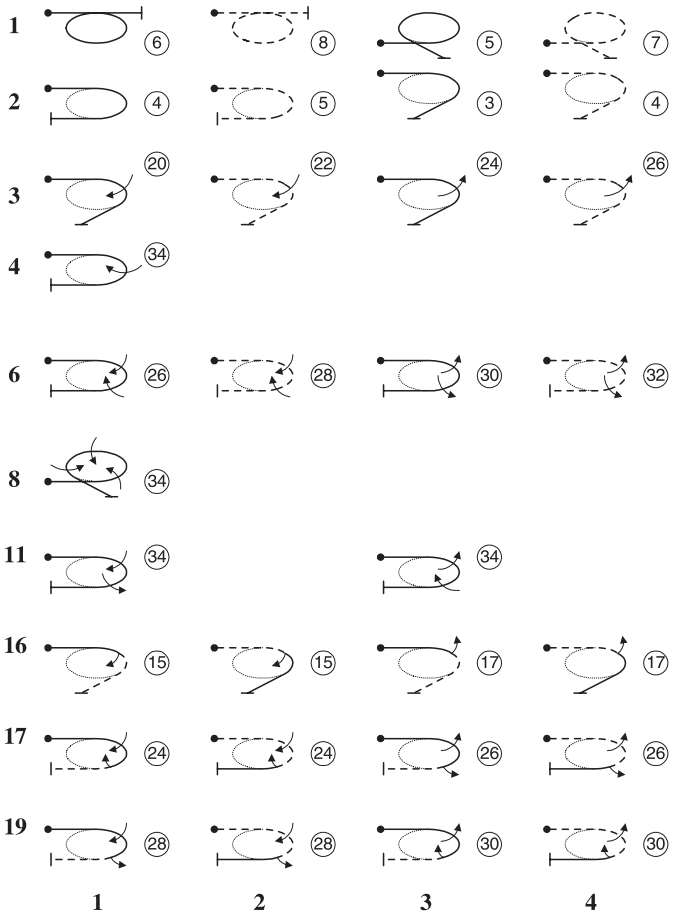
1.



1.



2.


1
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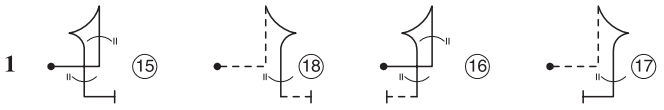
8
5
7
2
4
5
3
4
3
20
22
24
26
4
34
6
26
28
30
32
8
34
11
34
34
16
15
15
17
17
17
24
24
26
26
19
28
28
30
30
1
2
3
4

5.

1 **2** **3** **4**

Note: Rolling elements may be added only where indicated.

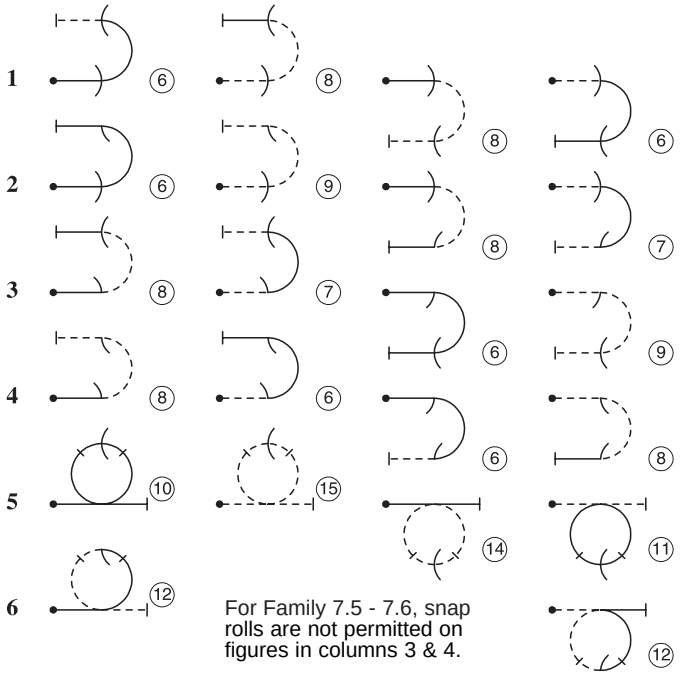
6.



1 **2** **3** **4**

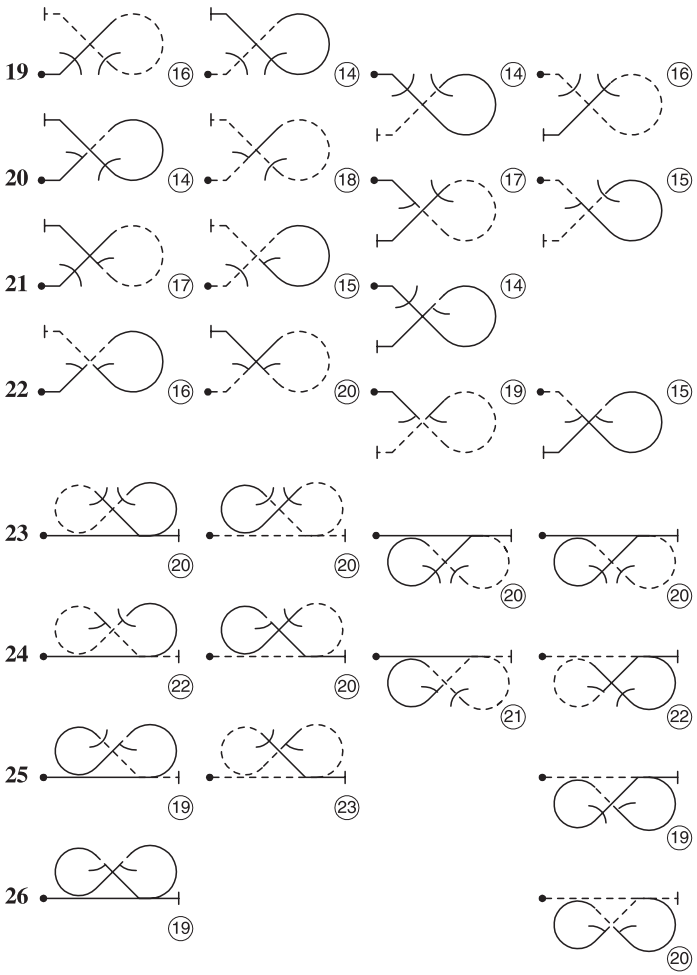
Note: Rolling elements may be added only where indicated.

7.



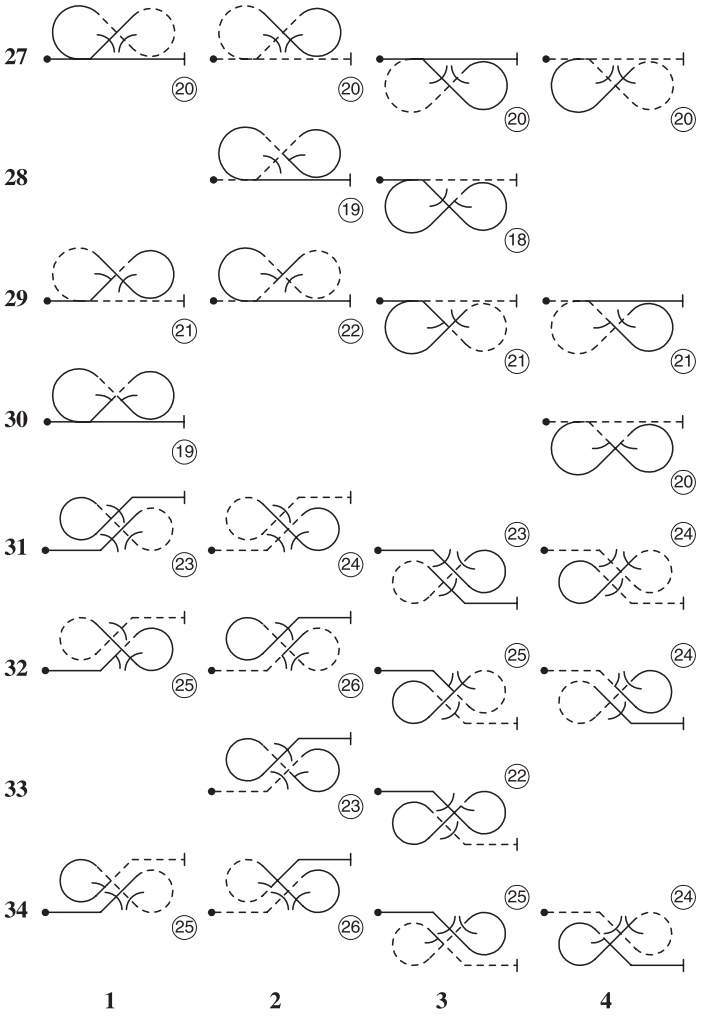
For Family 7.1 – 7.4, snap rolls are not permitted on the horizontal entry lines of figures in columns 1 and 2, nor on the horizontal exit lines of figures in columns 3 and 4.

7.



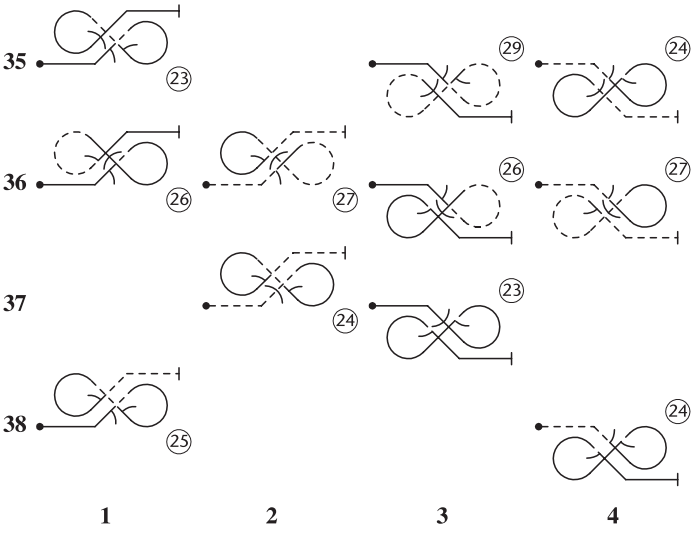
Note: At the sign ⌵, only half-rolls permitted.

7.



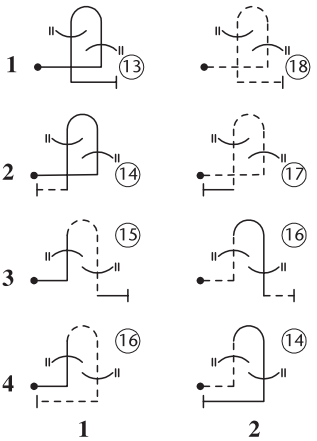
Note: At the sign ⌒, only half-rolls permitted.

7.



Note: At the sign ⌒, only half-rolls permitted.

8.



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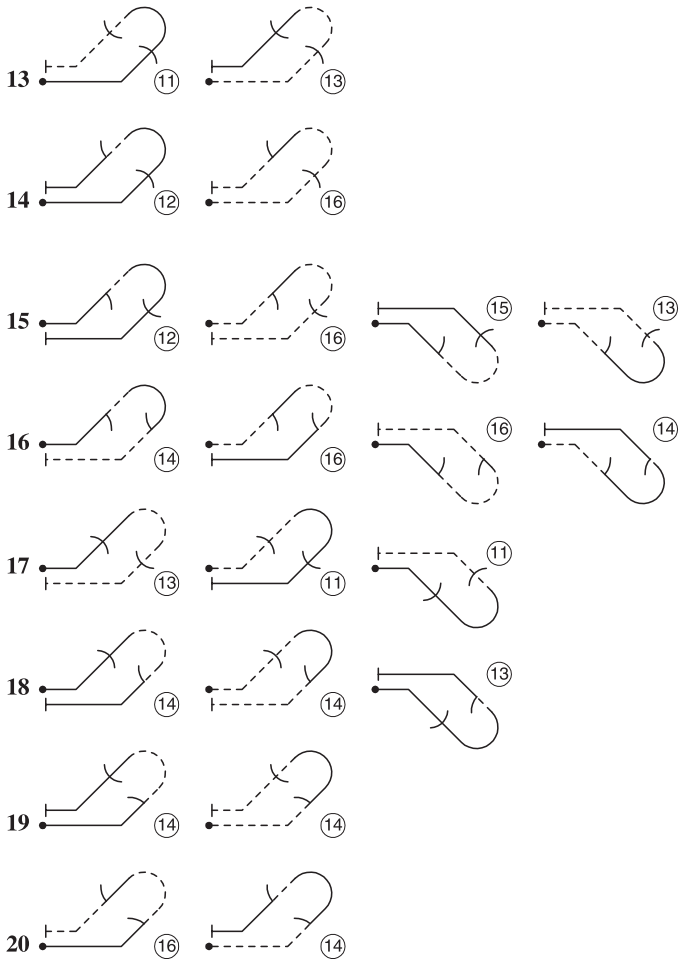
13
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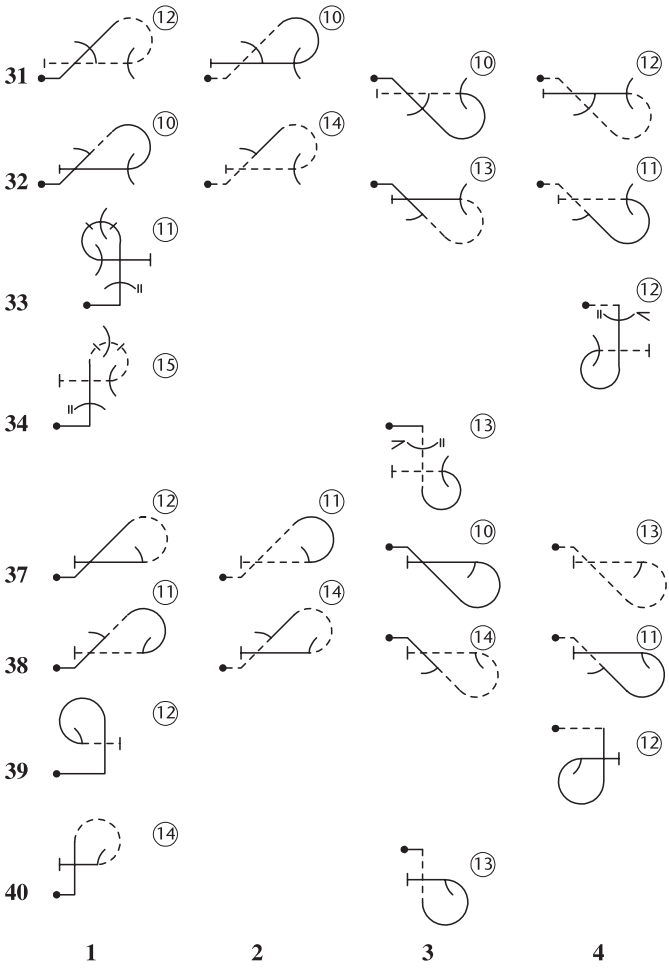
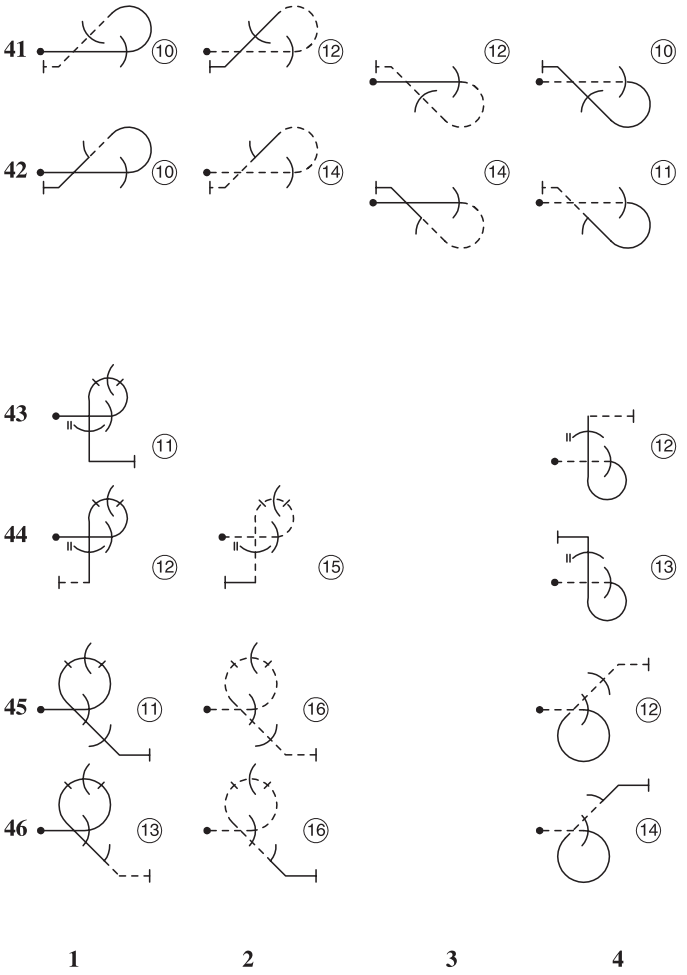
1 **2** **3** **4**

8.



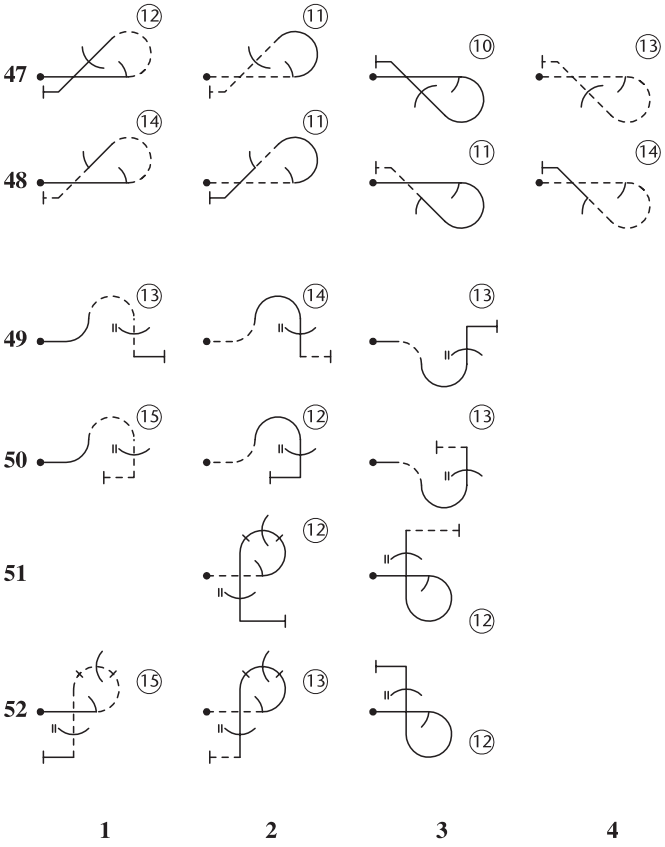
For Family 8.31 - 8.40, snap rolls are not permitted on the horizontal exit lines of figures in columns 1 and 2.

8.



Snap rolls are not permitted on the horizontal entry lines of figures in columns 1 and 2 on this page, nor on the vertical down lines of 8.43 or 8.44 after a hesitation roll in the loop.

8.



Snap rolls are not permitted on the horizontal entry lines of figures in columns 1 and 2 on this page, nor on the vertical down lines of 8.51 or 8.52 after a hesitation roll in the loop.

9.1

		1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2
1		9							
2			9						
3			6		12		15		18
4			6		12				
5		3	6						
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

9.2

					1		**1 1/2**		**2**
3					14				
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

9.4			1/2	3/4	**1**	1 1/4	1 1/2	1 3/4	**2**
2			11						
3			8		17				
4			8						
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

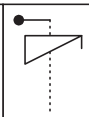
9.8			1/2	3/4	**1**	1 1/4	1 1/2	1 3/4	**2**
3			11						
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

9.13			1/2		**1**		1 1/2		**2**
3			8		16				
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

9.9			**1/2**	**3/4**	**1**	**1 1/4**	**1 1/2**	**1 3/4**	**2**
2			15						
3			12						
4			12		16				
5			12	14	16				
10			12	14	16				
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

9.10			1/2	3/4	**1**	1 1/4	1 1/2	1 3/4	**2**
2			18						
3			15						
4			15		19				
5			15	17	19				
10			15	17	19				
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

FAMILY 9.11 (POSITIVE SPINS)

					1	1 1/4	1 1/2	1 3/4	2
1		Upright Entry Line			5	6	7		
					4	5	6	7	8

FAMILY 9.12 (NEGATIVE SPINS)

					1	1 1/4	1 1/2	1 3/4	2
1		Inverted Entry Line			7	8	9		
					4	5	6	7	8

APPENDIX 5 *ACHIEVEMENT AWARDS PROGRAM*

1. *PURPOSE*

The IAC Aerobatic Achievement Awards program was formulated to promote and advance sport aerobatics. The IAC sanctions many regional aerobatic contests every year, but at the same time realizes that all pilots who fly aerobatics may or may not wish to enter competition but yet deserve recognition of their own abilities. Therefore, the IAC Aerobatic Achievement Awards program furnishes the mechanism in which competition and non-competition pilots can work in reaching various levels of proficiency. Aerobatic competitions benefit as more people will be encouraged to enter; aerobatic education will be more widely disseminated; and, finally, aerobatics as a sport will grow as more people learn of the enjoyment, fun and comradeship that is known in aerobatic circles.

The IAC Aerobatic Achievement Awards program supplies a definite goal which a pilot can work toward while increasing proficiency in aerobatics. These awards are not easy to achieve and a high level of skill is required. They are, however, within the reach of every pilot. When the award is given it is something of which to be proud.

Many more people will be introduced to aerobatics under this program with its incentive to achieve a high degree of skill, under strictly controlled conditions, tightly monitored and with an eye always on safety.

2. *GENERAL RULES*

A. The flight or flights made to obtain this award shall satisfy the definitions of the following rules.

B. The awards are international in scope, as is the IAC. All pilots from all countries may achieve the awards as long as they meet the qualifications and requirements of this program.

C. An applicant for an IAC Aerobatic Achievement Award must be a member in good standing of the International Aerobatic Club, Inc.

D. All *"IAC Official Contest Rules"* will prevail with the following exceptions:

(1) There will be no maximum altitude except that the figures must be easily seen from the ground with the naked eye.

(2) Technical inspections will not be required.

3. *CATEGORY CLASSIFICATIONS*

A. ***Power*** - There are five (5) categories of achievement awards that can be earned in SMOOTH (Non-Contest Environment) and an additional five (5) in STARS (Contest Environment). Gradual step up of proficiency and skill is required to successfully complete the figures in progressive categories. The categories are: Primary, Sportsman, Intermediate, Advanced and Unlimited.

B. ***Glider*** - There are four (4) categories of achievement awards that can be earned in SMOOTH (Non-Contest Environment) and an additional three (3) in STARS (Contest Environment). A gradual step up in proficiency and skill is required to successfully complete the figures in progressive categories. The SMOOTH categories for glider are: Basic, Sportsman, Intermediate, and Unlimited. The STARS categories for glider are: Sportsman, Intermediate, and Unlimited.

4. *SMOOTH AWARDS*

Awards given in a non-contest environment are referred to as "SMOOTH" awards. Each category (power and glider) has a designated set of figures which must be completed for a SMOOTH award.

(1) Each figure in the Category Figure Lists, Section 7 (Power) or Section 8 (Glider), must be entered on a single application form clearly marked for that category and award.

(2) These figures can be completed in either one flight or on multiple flights on different days, in different aircraft.

(3) One Judge or Chief Judge from the current IAC Approved Judges List must observe from the ground and grade EACH figure with date performed, legible signature and Judge's IAC number.

(4) Each figure must earn a grade of five (5.0) or higher using Chapter 8 criteria.

(5) There is no overall score nor presentation grade as this is not a sequence nor is a marked zone required; however, contest practice days are appropriate occasions to earn SMOOTH Awards.

(6) Breaking minimum altitude limits for any part of a figure will result in a zero (0) grade for that figure. The minimum limits for power are: Primary and Sportsman = 1500' AGL; Intermediate = 1200' AGL; Advanced = 800' AGL; and Unlimited = 328' AGL. The minimum altitude limits for glider are: Basic and Sportsman = 1500' AGL; Intermediate = 1200' AGL and Unlimited = 600' AGL.

(7) In case the applicant is flying for awards in more than one category, each duplicate figure must be reflown and graded for each separate application.

(8) Aerobatic maneuvers may only be performed in compliance with FAA regulations. Waivered airspace may be required.

(9) Applicant must be the sole occupant of the aircraft during SMOOTH Award flights except that a "safety pilot" for insurance purposes may be carried during Primary and Sportsman flights. The applicant must be sole operator of the controls during aerobatic figures.

5. *STARS AWARDS*

Awards given in a contest environment are referred to as "STARS" awards. STARS awards must be earned in competition at an IAC sanctioned contest.

(1) A minimum raw grade of five (5.0) or higher must be awarded on each figure and on presentation of all flights completed in a contest with four or more Judges, except ONE grade on EACH figure and on presentation may be less than 5.0. In a three judge contest, ALL grades must be 5.0 or higher. The Unlimited Power 4-Minute is not to be included as a flight.

(2) Each applicant desiring a STARS Award will complete an application and submit it along with an official copy of all raw grades for all contest flights to the Chief Judge of the category for validation and signature. Forward approved application to the Achievement Awards Chairperson noted on the application.

(3) Contest flights may not be used to qualify for the SMOOTH Award.

(4) Intermediate, Advanced (Power only) and Unlimited must fly at least two flights to qualify for a STARS Award. A contest that is able to fly only one flight for these categories cannot qualify a competitor for a STARS Award. All applicants must fly and qualify in all flights available at a contest in their category.

6. CERTIFICATES AND PATCHES

A. A certificate suitable for framing will be issued for each award certified by the Achievement Awards Chairperson.

B. Distinctive patches will be available for purchase by applicant.

C. ***Power*** - A unique ALL-FIVE patch will be awarded free upon earning all five SMOOTH awards, and a unique ALL-TEN patch will be awarded free to applicants earning all five SMOOTH and all five STARS awards.The names of the ALL-TEN recipients for the previous 12 months will be announced each year at the U.S. National Aerobatic Championships by the President of IAC.

Glider - A unique ALL-SEVEN patch will be awarded free to applicants upon earning all four SMOOTH awards and all three STARS awards. The names of the ALL-SEVEN recipients for the previous 12 months will be announced each year at the U.S. National Glider Championships by the President of IAC.

D. A permanent list of all applicants and recipients of both SMOOTH and STARS awards will be maintained by the Achievement Awards Chairperson.

E. Applications for Achievement Awards can be obtained from the Achievement Awards Chairperson, from the Registrar at a sanctioned contest, or downloaded from the IAC website. *www.iac.org*

7. CATEGORY FIGURE LISTS - POWER

Primary	FAI Catalogue #
(1) Spin(one turn)	1.6.3. + 9.11.1.4.
(2) Loop	7.5.1.
(3) Slow Roll	1.1.1. + 9.1.3.4.
(4) 270-deg. Turn	2.1.3.

Sportsman

(1) Spin (one turn)	1.6.3. + 9.11.1.4.
(2) Loop	7.5.1.
(3) Hammerhead	5.1.1.
(4) 1/2 loop up + 1/2 roll (Immelmann)	7.2.1. + 9.1.3.2.
(5) Humpty Bump	8.1.1.
(6) Reverse Half Cuban 8	8.32.1. + 9.1.2.2.
(7) One-half Cuban 8	8.42.1. + 9.1.4.2.
(8) Slow Roll	1.1.1. + 9.1.3.4.

Intermediate

(1) Spin (1 1/4 turn)	1.6.3. + 9.11.1.5.
(2) Hammerhead with 1/4 rolls up and down	5.1.1. + 9.1.1.1. + 9.1.5.1 .
(3) Half Cuban 8	8.42.1. + 9.1.4.2.
(4) Slow Roll on 45° up line	1.2.1. + 9.1.2.4.
(5) Snap Roll on 45° down line	1.2.3. + 9.9.4.4.
(6) 1/2 loop up + 1/2 roll (Immelmann)	7.2.1. + 9.1.3.2.
(7) 4 Point Hesitation Roll	1.1.1. + 9.4.3.4.
(8) Reverse Shark's Tooth	1.14.1. + 9.1.2.2.
(9) Square Loop	7.7.1.

Advanced

(1) Inverted spin (one turn)	1.7.4. + 9.12.1.4.
(2) Loop with Snap Roll	7.5.1. + 9.9.3.4.
(3) Half Cuban 8, 2 of 4 down	8.42.1. + 9.4.4.2.
(4) 3/4 Snap Roll on vertical line down	1.7.4. + 9.9.5.3.
(5) Outside Loop	7.5.3.
(6) Snap Roll on 45° up line	1.2.1. + 9.9.2.4.
(7) 90-deg. rolling circle, 1 to outside	2.3.3.
(8) Opposite Half-Rolls	1.1.1. + 9.1.3.2. + 9.1.3.2.
(9) Cuban 8 (inside-outside)	7.23.1.
(10) 360° rolling circle, 4 to inside	2.10.1.
(11) Humpty-Bump, 1/2 roll up	8.3.1. + 9.1.1.2.
(12) 8-point Roll	1.1.1. + 9.8.3.4.

Unlimited

(1) Inverted spin, inverted exit	1.6.4. + 9.12.1.4.
(2) 4 of 8 point roll from inverted	1.1.4. + 9.8.3.2.
(3) 3/4 Roll on vertical up line	1.6.1. + 9.1.1.3.

(4) 8-sided Loop	7.10.4.
(5) Outside Loop	7.5.2.
(6) Snap Roll on vertical up line	1.6.1. + 9.9.1.4.
(7) Outside Snap Roll on 45° up line	1.2.1. + 9.10.7.4.
(8) Hammerhead with inverted entry, 1/2 Roll up	5.1.4. + 9.1.1.2.
(9) Tailslide, wheels down	6.1.1.
(10) Cuban 8, double outside	7.25.2. + 9.1.4.2.
(11) 360° rolling circle, 4 Rolls, inside/outside	2.15.1.
(12) Full Roll, 1/2 Loop, 3 of 2-point Roll	9.1.3.4. + 7.2.1.+ 9.2.3.6

8. *CATEGORY FIGURE LISTS - GLIDER*

Primary	FAI Catalogue #
(1) Spin (one turn)	1.6.3. + 9.11.1.4.
(2) Loop	7.5.1.
(3) Wingover	0.0.
Sportsman	
(1) Spin (one turn)	1.6.3. + 9.11.1.4.
(2) Loop	7.5.1.
(3) Slow Roll	1.1.1. + 9.1.3.4.
(4) Half Cuban-8	8.42.1. + 9.1.4.2.
(5) Split-S	7.3.3. + 9.1.3.2.
Intermediate	
(1) Spin (1 1/4 turn)	1.6.3. + 9.11.1.5.
(2) Quarter-Clover	0.1.
(3) 2 Point Hesitation Roll	1.1.1. + 9.2.3.4.
(4) Hammerhead	5.1.1.
(5) Immelmann	7.2.1. + 9.1.3.4.
Unlimited	
(1) Inverted spin, inverted exit	1.6.4. + 9.12.1.4.
(2) Reverse Half Cuban	8.32.1. + 9.1.2.2.
(3) Hammerhead, 1/4 roll up, push out	5.1.3. + 9.1.1.1.
(4) Inside Snap Roll on 45-down line	1.2.3. + 9.9.4.4.
(5) 90-degree turn, one roll to outside	2.3.3.
(6) Tailslide, Canopy Up	6.1.1.
(7) Outside Loop, Down	7.5.3.
(8) Half-Cuban, outside 1/2 snap roll	8.42.1. +9.10.4.2.

APPENDIX 6 *CHAMPIONSHIP EVENTS*

IAC Championship Events and Team Selection policies are established by the IAC Board of Directors. These policies are stated in the *IAC Policy and Procedures Manual,* Section 500. The policies establish supplemental rules and regulations for: IAC Regional Championships (Section 502); U.S. National Aerobatic Championships (Section 503); Selection of the U.S. Aerobatic Teams (Section 504); and Contest Juries (Section 505). To read the complete text of these policies and procedures, you may contact IAC Headquarters at 920-426-6881 to request a copy of the *IAC Policy and Procedure Manual* or view it on the IAC website at:

http://members.iac.org/leadership/manual.html

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APPENDIX 7 *EXAMPLE FORMS*

FORM A

A — INTERNATIONAL AEROBATIC CLUB SCORESHEET

Contest: **Hawaiian Tropics Invitational** | Date: **1 June 2003** | Category: **ADVANCED** | Programme: **FREE** | pilot's number

No	Symbol	Catalogue No.	K	Total K	Score	Remarks
1		8.1.1 9.2.1.4 9.1.5.4	13 13 8	**34**		
2		5.1.1 9.1.1.3 9.9.5.3	17 10 11	**38**		
3		1.6.1 9.1.1.2	10 8	**18**		
4		8.34.3 9.11.1.4 9.9.5.2 9.1.3.4	13 5 11 8	**37**		
5		5.1.4 9.4.5.2	22 5	**27**		
6		1.17.1 9.4.1.2 9.1.4.4	14 9 8	**31**		
7		8.3.1 9.8.1.1 9.1.5.2	15 7 4	**26**		
8		1.18.1 9.1.1.1 9.1.4.2	13 6 4	**23**		
9		7.2.1 9.4.3.4 9.9.3.6	6 11 14	**31**		
10		7.3.3 9.1.3.6 9.2.3.4	6 10 9	**25**		
11		2.3.1	10	**10**		
12						

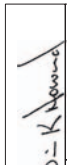
Item	K	Score
Presentation	**12**	

FIGURE TOTAL K = 300

INCLUDING PRESENTATION = 312

Aircraft Type: **Pitts S-1S**

FREE PROGRAM CHECKED BY:

Signature: 

Date: 1 January 2003

IAC No. 499999

Judge

Name

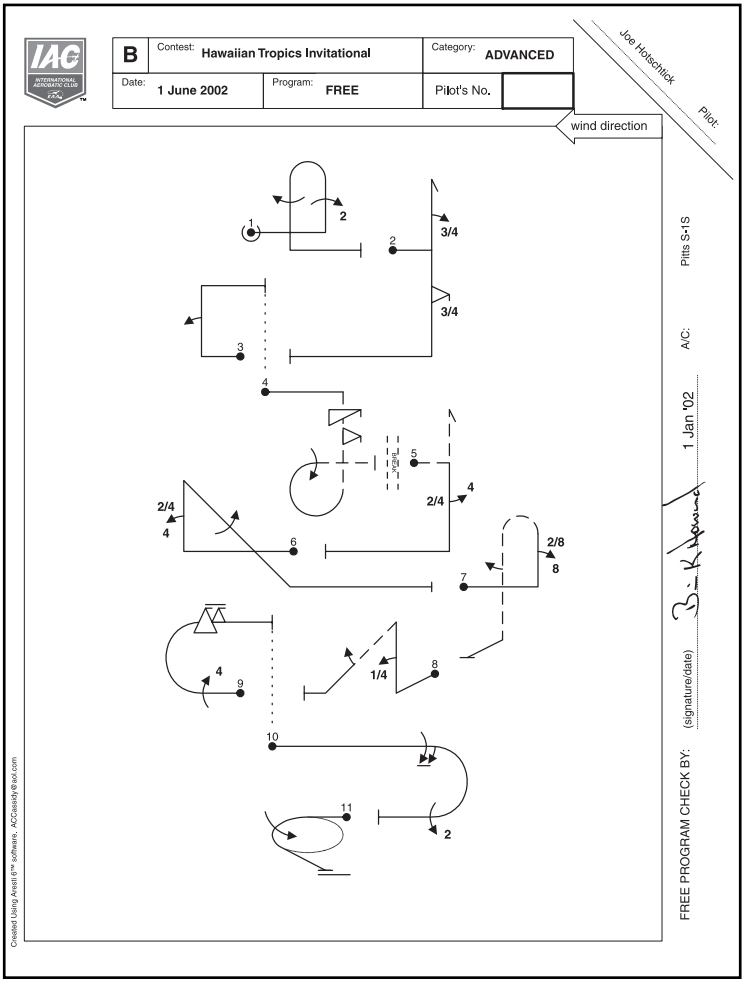
Number

Joe Holschlick pilot

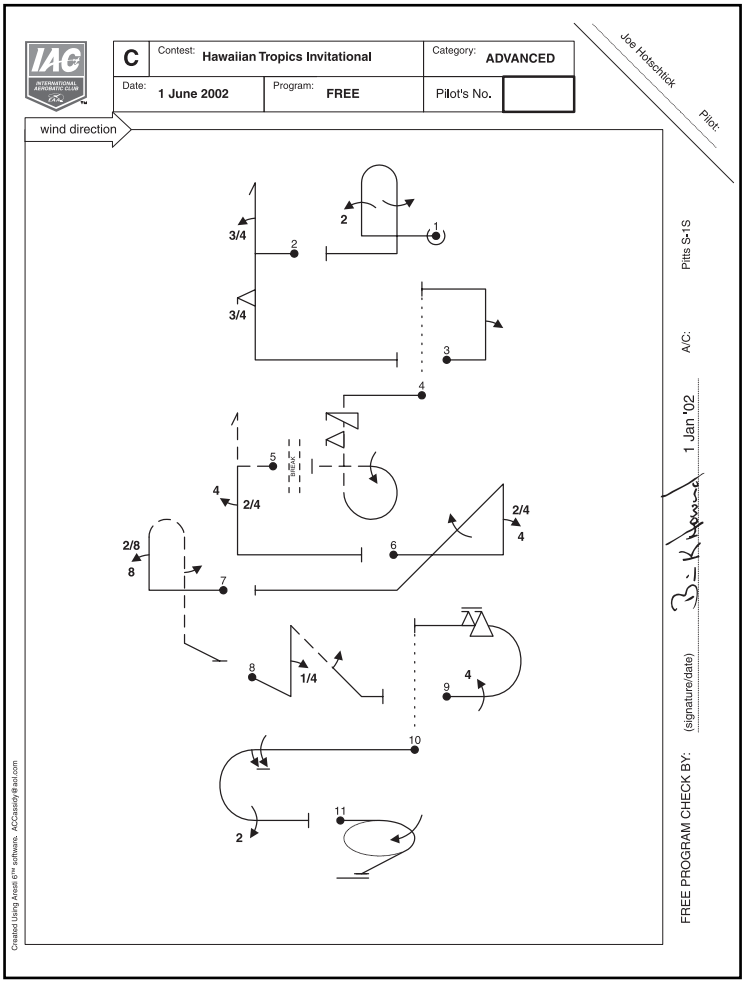
Created Using Aresti 6™ software. ACCassidy@aol.com

Note: Form A's are also available in 8, 16 and 18-figure versions.

FORM B


B
Contest: Hawaiian Tropics Invitational
Category: ADVANCED
Date: 1 June 2002
Program: FREE
Pilot's No.
Joe Hotschtick
Pilot:
wind direction
3/4
3/4
2/4
4
2/4
4
2/8
8
1/4
2
Pitts S-1S
A/C:
1 Jan '02
(signature/date)
FREE PROGRAM CHECK BY:
Created Using Aresti 5™ software, ACCassidy@aol.com

FORM C


C
Contest: Hawaiian Tropics Invitational
Category: ADVANCED
Date: 1 June 2002
Program: FREE
Pilot's No.
Joe Holschlick
Pilot:
wind direction
3/4
2
1
3/4
3
4
5
4
2/4
2/4
4
2/8
8
6
7
8
1/4
4
9
10
2
11
A/C: Pitts S-1S
1 Jan '02
FREE PROGRAM CHECK BY:
(signature/date)
Created Using Aresti 6™ software. ACClassify@aol.com

CHIEF JUDGE'S PENALTY FORM & FINAL COMPUTATION WORKSHEET — POWER

PILOT NAME/NUMBER

CATEGORY: ☐ P ☐ S ☐ I ☐ A ☐ U

FLIGHT: ☐ K ☐ F ☐ U

BOUNDARY INFRINGEMENTS

FIGURE NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
NORTH																		
EAST																		
SOUTH																		
WEST																		

PENALTIES

CATEGORY	Missing Roll Call/ ($50 not paid) Starting Penalty	Low Altitude Infringements (ea. fig): 1-200' Low (Primary-Advanced) 1-164' Low (Unlimited)	Low Altitude Infringements (any fig): More than 200' Low (Primary-Advanced) More than 164' Low (Unlimited)	High Altitude Infringements	Boundary Infringements (ea. fig.)	Program Interruption
Primary	10	"0" Entire Program	"0" Entire Program	5	None	5
Sportsman	25	"0" Entire Program	"0" Entire Program	5	5	5
Intermediate	50	60	"0" Entire Program	10	10	15
Advanced	75	100	"0" Entire Program	20	20	50
Unlimited	100	150	"0" Entire Program	30	30	90

ALTITUDE LIMITS

CATEGORY	Upper Limits	Lower Limits
Primary/Sportsman	3,500 AGL	1,500 AGL
Intermediate	3,500 AGL	1,200 AGL
Advanced	3,500 AGL	800 AGL
Unlimited	3,280 AGL	328 AGL

PENALTY POINTS SUMMARY

Points Each	Error	Number of Times	Total Penalty Points
	Boundary Infringement		
	Interruptions		
	Altitude Infringement		
	Missing Roll Call/Starting Penalty		

CHIEF JUDGE	

TOTAL PENALTY POINTS FOR THE FLIGHT	

4-MINUTE FORM A

4-MINUTE FREE PROGRAM

Flight No. _____

Form A

Judge's Name _____ Judge's Number _____

TECHNICAL MERIT		K	Grade
1	Complete Use of the Flight Envelope	40	
2	Exploitation of Aerodynamic and Gyroscopic Forces	40	
3	Execution of Individual Maneuver Elements	40	
4	Wide Variety of Figures Flown on Different Axes and Flightpaths	40	

ARTISTIC IMPRESSION		K	Grade
5	The Pleasing and Continuous Flow of Figures	40	
6	Contrasting Periods of Dynamic and Graceful Maneuvers	40	
7	Presenting Individual Figures in Their Best Orientation	40	
8	Placing Individual Figures in Their Optimum Position	40	

POSITIONING		K	Grade
9	Symmetry	40	
10	The Performance Zone	40	

CHIEF JUDGE PENALTY WORKSHEET

TIMING	Minimum Time = 3:30 Maximum Time = 4:00	
Start Time		
End Time		
Duration		Min:Sec

Pilot / A/C

Chief Judge's Name _____

Chief Judge's Number _____

PENALTIES			Penalty Points
Seconds Error		x 10 =	
Too High		x 50 =	
Too Low		x 250 =	
Improper Wing Dips		x 150 =	
Deadline Violation		x 300 =	
TOTAL PENALTY POINTS			
Disqualified (Low/Dangerous)			

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INDEX

A

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