IAC Contest Rules 2020

Member Comment Edition

International Aerobatic Club, Inc.
A Division of the
Experimental Aircraft Association and
National Aeronautic Association

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In Appreciation

The following volunteers worked very hard throughout 2019 to bring you this document.

The IAC Rules Task Force

Tasked with improving the rule book maintenance processes.

Jim Bourke (Chair), DJ Molny, Tom Myers, Peggy Riedinger, Dave Watson

The IAC Rule Book Refactoring Working Group

Tasked with rewording the rule book to increase clarity and reduce size.

Jim Bourke (Chair), DJ Molny

The IAC Rules Committee

Tasked with soliciting rule change proposals from members, submitting those for public comment, and providing recommendations to the IAC board.

Doug Sowder (Chair), Robert Armstrong, Jim Bourke, Mike Gallaway, Weston Liu, DJ Molny, Jason Stephens

WANT THESE RULES TO CHANGE?

Rules proposals for the following contest year are due July 1.

Email them to the IAC Rules Committee.

ruleschair@iac.org

Judge's Quick Reference

General Reminders

Guiding Principles:

Start each figure with a score of 10.0.
Deduct for every error you see, no matter how small. The standard is perfection.
Deduct for errors but not for corrections.
Stay objective.

For any individual error in angle:

Less than 90 degrees	Deduct one (1) point for every five (5) degrees of error (0.5 points for 2.5 degrees)
90 degrees or over	HZ the figure

HZs are also given for:

Wrong figure, added figure, omitted figure
Wrong direction on X Axis
Wrong exit direction on the Y Axis (only when the figure entry direction is also on the Y Axis)
Family-Specific Criteria

Line References

Line	Aircraft Reference	World Reference
Horizontal	Flight Path	True Horizon
Vertical	Zero-lift axis	90 Degrees from Horizontal
45 Degrees	Zero-lift axis	+/- 45 Degrees from Vertical

Rolls

Varying the rate of roll	1 point per variation

Variations in Line Length

Any visible variation	1 point
Ratio is 2:1	2 points
Ratio is more than 2:1	3 points
No line before OR no line after	4 points
No line before AND no line after	2 points

Looping Lines

Deduct at least 0.5 points for each change in radius

Looping Lines with Connected Rolls

Deduct at least 1 point for more than a momentary hesitation between the Looping Line and the roll

Looping Lines with Integrated Rolls

Flying the roll on a straight line	At least 2 points
Roll not centered	1 point for every 5 degrees

Figures with Matching Radii Requirements:

Combination of Lines (3), Segmented Loops (7.4.3 to 7.4.6), Reversing Whole Loops (7.4.7 to 7.4.14), Horizontal Ss (7.5), Vertical Ss (7.6), Figures 8s (7.8), Reversing P Loops (8.6.9 to 8.6.16), Reversing 1 ¼ Loops (8.10).

There is no standardized downgrade for mismatched radii, but the minimum deduction is 0.5 points.

Gliders

Figure Entry/Exit Lines, Turns, Rolling Turns, and Single Horizontal Lines	May be any reasonable angle: level, ascending or descending
45 Degree Lines	Only Advanced and Unlimited gliders fly actual 45 degree lines Other glider competitors must fly 30 degree lines in place of 45 degrees
Snap Rolls	Need not be centered on their lines
Tailslide	Slide must only be visible

Judge's Quick Reference

Family-Specific Criteria

Family 2 – Turns	
Bank angle less than 60 degrees	1 point for every 5 degrees
Bank angle change	1 point for every 5 degrees
Rate of turn change	1 point per change
Altitude change	1 point for every 5 degrees of angle or 100 feet
Path of turn not a constant radius	No deduction, wind correction is not a criterion
Roll and heading change blended	1 point for every 5 degrees
Family 3 - Rolling Turns	
Too few or too many rolls	HZ
Snap roll during figure	HZ
Roll in wrong direction	HZ
Variation in rate of roll	no more than 1 point
Stoppage of roll	1 point
Variation in rate of turn	no more than 1 point
Altitude change	1 point for every 5 degrees or 100 feet
Family 3 – Combinations of Lines	
Lines not equal in length	1 to 3 points, see Variations in Line Length
Radii not equal	at least 0.5 points
Family 5 – Hammerheads	
Pivot more than ½ wingspan	1 point for each half wingspan
Pivot rate change	no deduction
Family 6 – Tailslides	
Slide in wrong direction	HZ
Slide less than one-half fuselage length	HZ
7.4.3 to 7.4.6 – Square, Diamond, and Octagon Loops	
Lines not equal	1 to 3 points, see Variations in Line Length
Radii not equal	at least 0.5 points
Square and Octagon Loops Only:	
• Final line is short	at least 1 point
• Final line is missing	4 point deduction to the loop, 1 point on the subsequent figure.
Family 7.8.1 to 7.8.16 – Horizontal 8s and Horizontal Super 8s – Power Only	
Loops not equal in radius	at least 0.5 points
Start and Finish not at correct altitude	Up to 2 points Entry and exit lines may be extended when they have any single roll greater than 360 degrees, or two unlinked rolls.
Family 7.4.7 to 7.4.14, 8.6.9 to 8.6.16, and 8.10 – Reversing Loops and Reversing Whole Loops	
Looping Segments not equal in radius	at least 0.5 points
Drawing a line between Looping Segments	at least 2 points

1 About this Edition

1.1 How it Came About

1.1.1 The IAC board created the Rule Book Task Force in early 2019, assigning it to improve the rule book maintenance process.

1.1.2 In the Spring of 2019, the board approved the task force's recommendation to create a "refactoring" team. The word "refactoring" is taken from software design and means that a careful effort would be taken to restructure the rule book without changing its intent.

1.2 Principles

1.2.1 Every effort has been taken to reduce complexity, redundancy, and verbosity while preserving the original intent of the rules.

1.2.2 The guiding principles chosen by the refactoring team were to:

a) Remove duplication. Repeated statements are sources of ambiguity and error.
b) Reduce wordiness. Verbosity obscures the plain meaning of the text.
c) Remove background information. Do not teach about aerobatics. Strive to leave only *rules*, and only IAC *contest* rules at that.
d) Use care when ordering and grouping information.

1.3 Results

1.3.1 The document's page count has been reduced from 269 pages to under 100 pages.

1.3.2 The rule book is now entirely numbered and organized in an outline format. Each rule is written with as much brevity as possible and stands by itself with no explanatory text or background information. If needed, clarifications and examples follow rules to ease interpretation. When a rule has important exceptions it is first written without consideration for the exception, then the exception is introduced below.

1.3.3 Glider rules were moved to a separate chapter in this edition. This reduces the number of conditional statements which were previously littered throughout the text.

1.3.4 The Appendix on Allowable Unknown Figures has been dramatically reduced in size by combining all categories. A glider icon has been added to the glider section to make it easier to see which part of the tables the reader is viewing.

1.3.5 Some sections of the rule book were removed to reduce the document's size and scope:

a) Some rules specific to the *IAC National Aerobatic Championships* were duplicated from the IAC Policy and Procedures documents. This gave a partial story of how to run the Nationals and cluttered the text for regional contests. Therefore, these rules are not included in this edition.
b) The section on Judge Certification has been removed. It is enough for the rule book to note that judges must be approved by the IAC. These rules were highly coupled to the rules on the IAC National Aerobatic Championships. Moving this section out of the rule book and into the relevant IAC Policy and Procedures document allows the IAC Judge Chair more flexibility in presenting policy changes to the board.
c) The section on Achievement Awards is also removed. Again, moving this information out of the rule book and into an IAC Policy and Procedures document allows the Achievement Awards Chair to more easily adapt this program.
d) Sample Forms and Known Sequences are no longer duplicated within the rule book. These are available separately from the IAC web site.

1.4 Looking Forward

1.4.1 Unfortunately, a byproduct of renumbering the rules is every external reference to the rule book in all IAC publications must be revisited. This will not happen overnight.

1.4.2 The text has been reviewed numerous times to assure that all the concepts from 2019 were retained. Still, with such a large project it's likely the proofreading team missed something. Excepting those specific rule changes accepted by the IAC Board of Directors for introduction in 2020, any change of intent is entirely accidental and can be resolved by contest officials using the 2019 rule book. Please report any omissions or errors to the IAC Rules Committee.

1.4.3 We can maintain a concise rule book if we ask future rule change proponents:

a) Did you test the idea? Rules Deviations allow contest directors to test out new ideas. If an untested idea is added to the rule book it is likely to be removed or changed again later.

b) Did you write the rule as succinctly as possible? Avoid flowery phrases. Keep each rule to one or two sentences. Eliminate redundancies. Readers are smart. They understand context.

c) Do you use the terms correctly? Terms should be defined and used consistently. There is no reason to define a term that has an obvious English meaning or will come up after a quick search engine query. Define terms if they are unique to the rule book.

d) Is this a rule or is it guidance? Guidance can go elsewhere. If there are no repercussions for ignoring the rule it is probably guidance.

e) Does this rule interconnect with many others? The glider rules and the rules for the four minute freestyle are your templates. These rules exist in isolation. The rest of the rule book is largely written as if these rules do not exist. This is easier to follow than many examples of "unless" or "except if" that would otherwise be sprinkled throughout the rule text.

f) Have you rewritten the rule several times to find the best wording? A rule can improve a lot after several drafts even when the meaning stays the same.

g) Are any clarifications, exceptions, or examples necessary and called out in the proper format? Do not include these unless they are needed. Diagrams are necessary when it is not possible for text to get the point across, but do not use them when the text is clear. Diagrams take up space, are hard to format, and are hard to update.

h) Is the rule in the proper place? If there are several possible places to put the rule test them all out. Find the spot that minimizes redundancy and best considers how readers search for information.

i) Is the idea workable given typical contest resources? It's very easy to come up with clever ideas but keep in mind that this competition aerobatics is mostly a weekend activity.

j) Does this rule reference other rules? It's probably better to reference a term or the title of a rule than to reference the rule number, in case a future edit changes the numbering.

1.4.4 The refactoring team dedicates this rule book to the many IAC pilots, enthusiasts, and volunteers who will use it for decades to come.

2 Contest Staff

2.1 Contest Director

2.1.1 The Contest Director is the general manager of the event, responsible for all contest planning, delegation, appointments, finances, and operations.

2.1.2 The Contest Director will be assisted by staff in the following positions:

a) **Registrar:** collects registration documents, accepts payments, distributes paperwork.
b) **Volunteer Coordinator**: recruits and marshals volunteers.
c) **Technical Committee:** inspects aircraft, lends technical expertise.
d) **Chief Technical Monitor:** leads the Technical Committee.
e) **Safety Director:** ensures the contest is run safely.
f) **Medical Director:** evaluates condition of competitors, coordinates medical services.
g) **Chief Judge:** manages the judge panel, directs competitors during contest flights.
h) **Grading Judge:** grades performances.
i) **Judge Assistant:** helps Judges spot downgrades and penalties.
j) **Recorder:** writes down Judge grades and remarks.
k) **Boundary and Deadline Judge:** records infringements of the aerobatic boundaries.
l) **Contest Jury:** ensures the contest runs according to the rules, makes weather decisions.
m) **Scoring Director:** accepts scoresheets, operates scoring software, posts results.

2.2 Volunteer Coordinator

2.2.1 A Volunteer Coordinator may be appointed at the discretion of the Contest Director to obtain and coordinate volunteers. The Volunteer Coordinator will:

a) Obtain commitments from volunteers to serve in all positions under the guidance of the Contest Director.
b) Maintain a list of all volunteers for the Contest Director, Chief Judge(s), and other officials as necessary.
c) Coordinate with judges, assistants, and other volunteers in preparation for each category change to minimize time loss during changes from one category to the next.

2.3 Medical Director

2.3.1 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.

3 Sanctioning and Insurance

3.1 Obtaining Sanction

3.1.1 The Contest Director shall apply for sanction on official forms provided by IAC Headquarters at least thirty (30) days in advance of the contest.

3.1.2 The IAC, EAA, NAA, and FAI logos may not be used, either directly or indirectly, without sanctioning.

3.2 Sanction Revocation

3.2.1 Any violation of the contest rules by contest officials will result in an immediate and automatic termination of the sanction.

3.3 Rules Deviations

3.3.1 The Contest Director may request rules deviations from the IAC Contest Sanctioning Committee.

3.3.2 Proposed rules deviations must be attached to the application for sanction.

3.3.3 Rules deviations will be published and made available to competitors.

3.4 Contest Insurance

3.4.1 An aerobatic contest must be covered by a liability policy that includes the International Aerobatic Club, the Experimental Aircraft Association, and the National Aeronautic Association as named insureds.

3.4.2 Written verification of coverage must arrive at IAC Headquarters at least seven (7) days prior to the event.

4 Registration

4.1 The Registrar

4.1.1 The Registrar presides over contest registration, accepts payments, and prepares paperwork as needed by other contest officials.

4.2 Entry Forms

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

a) Official Contest Entry Form.

b) As many certified, legible copies of IAC Free Program Forms A, B and C as are needed. Forms B and C are separate forms and should not be printed back-to-back.

c) The IAC Technical Inspection Form filled out by a member of the Technical Committee.

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

4.3 Competitor Qualifications

4.3.1 Competitors must be:

a) current members of the IAC; or
b) holders of a valid FAI Sporting License issued outside the USA; or
c) current members of an aerobatic organization that has been delegated aerobatic sporting powers by their country's National Airsports Control. Two examples of qualifying organizations are Aerobatics Canada and the BAeA.

4.3.2 Competitors must meet legal pilot certification requirements appropriate for their aircraft.

Exception: A pilot with a Sport Pilot certificate may fly a non-Light Sport Aircraft in the Primary or Sportsman Category, if accompanied by a qualified Safety Pilot.

4.3.3 Competitors must meet legal medical requirements appropriate for their aircraft.

Exception: This requirement is waived if the competitor flies with a qualified Safety Pilot.

4.4 Categories

4.4.1 Aerobatic competition is divided into five categories, listed here in increasing order of difficulty:

a) Primary
b) Sportsman
c) Intermediate
d) Advanced

e) Unlimited

4.4.2 Competitors may only register in a single category.

Exception: A competitor may also register in a lower category for the purpose of obtaining an IAC Achievement Award.

4.5 Safety Pilots

4.5.1 The competitor will be the sole occupant of the aircraft during Advanced and Unlimited competition flights. In all other categories, Safety Pilots are authorized.

4.5.2 Safety Pilots must have aerobatic competition experience.

4.5.3 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.

4.6 Late Arrivals

4.6.1 A competitor is declared late when it is no longer possible to complete registration, receive the required briefings, and be ready to fly prior to normal completion of their Known Program.

4.6.2 A competitor who arrives late to the contest will have zeros entered for any completed Programs unless the jury determines that the tardiness was outside of the competitor's control.

4.6.3 The jury may require the tardy competitor to fly the Known Sequence during a qualifying flight even if scores cannot be earned.

4.7 Withdrawal of Entry

4.7.1 A competitor may withdraw from a contest at any time.

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

5 Technical Matters

5.1 Technical Committee

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

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

5.1.3 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.

5.1.4 The Technical Committee will be responsible for inspecting competitor aircraft and verifying that the competitor possesses required certificates and aircraft documents.

5.2 Sterile Area

5.2.1 The Technical Committee will designate a Sterile Area where declared Mechanical Defects can be evaluated.

5.2.2 An aircraft in the Sterile Area may be approached only by the Starter, a member of the Technical Committee, or another authorized contest official.

5.3 Aircraft and Equipment Inspection

5.3.1 Compliance with aircraft and equipment standards is required for Registration and recorded on the IAC Technical Inspection Form by a member of the Technical Committee.

5.3.2 Required Documentation:

a) Airworthiness Certificate.
b) Aircraft Registration Certificate or military serial number designation.
c) Aircraft operating limitations.
d) Current aircraft weight and balance.
e) Entries from the Aircraft and Engine log books, recording annual inspection.
f) Certificate of Insurance verifying coverage of $1,000,000 property damage and $100,000 single limit bodily injury minimum.

5.3.3 Copies of required documents are allowed for the purposes of registration.

5.3.4 Airworthiness and Equipment:

a) Airframe:
No obvious physical damage or potential structural problems indicated by wrinkles in metal or fabric coverings or loose structural members.
b) Controls:
Complete freedom of movement.
c) Interior:
Free of foreign and loose objects.
d) Canopy, or door for cabin-type aircraft:
If hinged on the forward (leading) edge, it must incorporate a quick-release mechanism to facilitate emergency egress.
e) Seat belts:
Dual seat belts with separate attach points and a shoulder harness are mandatory for Advanced and Unlimited categories
f) Engine Compartment, by inspection through cowl openings and service doors only:
No hazardous conditions in the engine compartment such as cracked exhaust, fuel leaks, or excessive oil leaks.
g) Propeller:
No apparent physical damage.
h) Personal parachute or the aircraft's ballistic recovery system, if so equipped:
i. In good general condition
ii. Current in accordance with FAA regulations.
i) Radio:
Capable of transmitting and receiving common VHF frequencies.

6 Safety

6.1 Responsibility

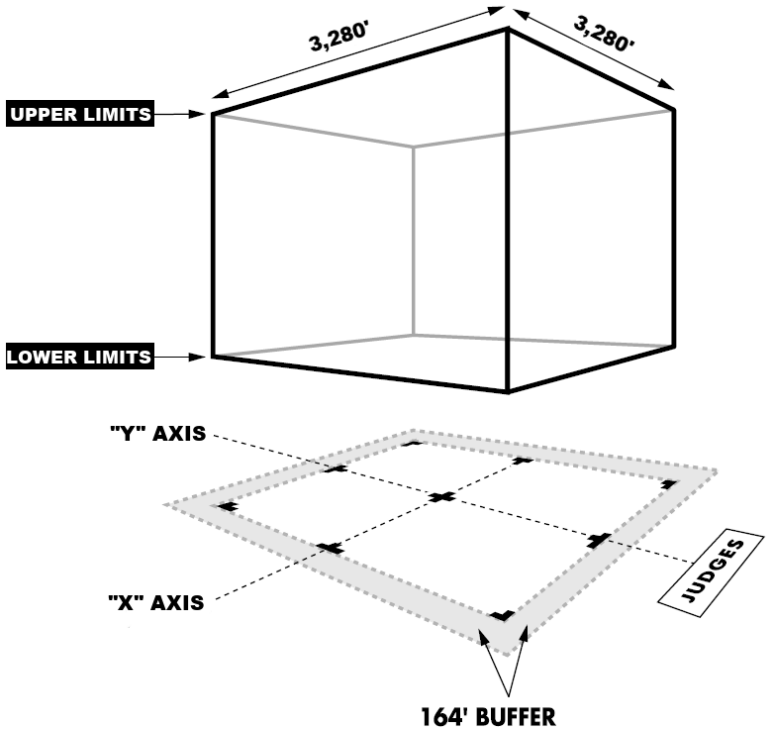
6.1.1 The responsibility for safe operation of the contest falls equally on all contest officials, volunteers, and competitors.

6.2 Safety Director

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

a) Flight safety - assisted by the Chief Judge(s) and Technical Committee.
b) Preparation and dissemination of the contest Incident Response Plan to all responsible parties.
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 Program Briefings.
e) Recommending to the Contest Jury that a competitor be disqualified for violating or refusing to follow established contest safety procedures.

7 The Aerobatic Box



7.1 Description

7.1.1 Performances occur above a clearly marked area of 1,000 meters (approximately 3,280 feet) square whose central point will be the intersection of the X and Y axes.

7.1.2 The Judging Line 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.

7.2 Location

7.2.1 The Aerobatic Box in all sanctioned contests will be over or adjacent to a suitable landing area.

7.3 Box Axes

7.3.1 The X axis is parallel to the official wind. Most figures are flown on the X axis in either an upwind or downwind direction.

7.3.2 The Y axis is perpendicular to the X axis.

7.4 Deadline

7.4.1 If a Deadline exists, it will normally be a minimum of 500 feet from the boundary of the box, but the exact location will be specified by either the special provisions of the FAA waiver, or the Contest Director.

7.5 Buffer

7.5.1 Boundary Judges are stationed such that there is a 50-meter (164 feet) buffer zone before boundary infringement penalties are noted.

8 Boundary Judges

8.1 Qualifications

8.1.1 Boundary Judges must understand Aresti notation well enough to correctly determine which figure is being flown by a competitor.

8.2 Equipment

8.2.1 A visual sighting device will be used to determine each infringement.

8.2.2 A boundary infringement is considered to have occurred if the entire aircraft is seen outside of the sighting device.

8.3 Real-time Infringement Reporting

8.3.1 Boundary Judges will report in real time by radio:

a) When the aircraft enters the Aerobatic Box buffer zone for the first time with intent to start the Performance.
b) Each occurrence of a boundary crossing including which boundary was crossed and whether crossing out of the Box or crossing back in.

8.4 Infringement Records

8.4.1 Boundary Judges shall maintain written record of all infringements for each figure. Records will be provided to the Chief Judge when the Program is complete.

8.5 Traffic Alerts

8.5.1 Boundary Judges shall notify the Chief Judge immediately if a non-contest aircraft is seen entering, or is on a course to enter, the aerobatic box.

9 The Starting Line

9.1 Starter

9.1.1 The Starter is responsible for coordinating the timely departure of competitor aircraft according to the Order of Flight and the direction of the Chief Judge.

9.2 Equipment

9.2.1 The Starter will be provided with a fire extinguisher.

9.3 Starting Line Procedures

9.3.1 A competitor must be at their aircraft in sufficient time prior to their scheduled flight.

9.3.2 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.

9.3.3 The Starter will brief the competitor as to the official wind direction.

9.3.4 Competitors must receive permission from the Starter before departing for the aerobatic box.

9.4 Failure of a Competitor to Comply

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

9.4.2 If a competitor misses their starting position, that competitor will be assessed a Failure to Prepare Penalty, and will be assigned a new starting position by the Chief Judge.

9.4.3 The Contest Jury has the right to remove penalty points if missing the Order of Flight was due to conditions outside the competitor's control.

10 Public Address System

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

a) It must not be audible from the judging line. This does not preclude audible music on the judging line during the Four Minute Freestyle.
b) No comment shall be made on the quality of performances.
c) No derogatory remarks about competitors or officials will be allowed.

11 The Judging Line

11.1 Phones and Other Devices

11.1.1 All portable communication devices (cell phones, tablets, two-way radios, etc.), other than those in use for official contest purposes, will be turned off or set to silent-ring when on the judging line.

11.1.2 No calls, texting, or e-mails shall be initiated or viewed unless on official break, or otherwise authorized by the Chief Judge.

11.2 Non-Essential Personnel on the Judging Line

11.2.1 The only personnel permitted on the judging line except by specific permission of the Chief Judge are: Contest Director, Chief Judge, Contest Jury, Grading Judges, Judge Assistants, Recorders, Volunteer Coordinator, Starter, and Runners.

11.2.2 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.

11.3 Judge Selection

11.3.1 The Contest Director shall appoint judges who appear on the IAC Current Judges List.

11.3.2 Relatives *(*any person connected to a competitor by family, marriage, or domestic partnership*)* of competitors may not act as Grading Judges in categories wherein their relatives are competing.

11.3.3 A competitor may serve as a judge only if the competitor can attend every Judge Briefing and debriefing for the Program(s) they wish to judge.

11.4 Number of Judges

11.4.1 A minimum of three (3) and a maximum of ten (10) Grading Judges must be used for each category.

11.4.2 Effort should be made to use at least five (5) Grading Judges for each category.

11.5 Chief Judge

11.5.1 Chief Judges are responsible for managing the Grading Judges and competition flights.

11.5.2 There will be a Chief Judge for each category. A Chief Judge may serve in that capacity in more than one category.

11.6 Chief Judge Assistants

11.6.1 One or more Chief Judges Assistants may be appointed for the purpose of assuring the correct Chief Judge Penalty Form and appropriate Forms A, B and C are ready and in proper order.

11.6.2 Chief Judge Assistants shall handle paperwork, time Four Minute Freestyle Performances, monitor traffic, communicate with Boundary Judges and competitors by radio, and perform other duties as delegated by the Chief Judge.

11.7 Grading Judges

11.7.1 Grading Judges grade figures and the Presentation of aerobatic sequences.

11.7.2 Grading Judges are responsible for the performance of their Judge Assistant and Recorder.

11.8 Judge Assistants

11.8.1 The Judge Assistant is primarily responsible for dividing their attention between the sequence drawing and the competitor's aircraft, verbally announcing Figures so the Grading Judge's attention can remain fixed on the Performance. They also perform other duties deemed necessary by their judge.

11.8.2 One assistant shall be assigned to each Grading Judge.

11.8.3 Assistants must have the ability to fluently read Aresti drawings, look up Aresti Aerobatic Catalogue numbers, and follow their judge's instructions.

11.8.4 Assistants will be preferred who have:

a) Attended an approved IAC Judges School; or
b) Completed the IAC Regional Judge Exam; or
c) Flown as an aerobatic competitor.

11.9 Recorders

11.9.1 One Recorder is assigned to each Grading Judge to record all grades and such comments as time permits on the competitor's Form A (scoresheet).

11.9.2 Recorders must have the ability to listen for their judge's grades and comments and enter them rapidly and clearly on the competitor's scoresheet as instructed by the judge.

11.9.3 The Recorder maintains possession of the clipboard with Forms A, B and C in the proper Order of Flight.

11.9.4 The Recorder passes Form A to their judge for a review of the comments and grades before it is released to the runner.

12 Weather

12.1 Official Wind Direction

12.1.1 The Official Wind Direction, in relation to the Judging Line (i.e., right to left or left to right), will be determined by the Chief Judge. The Official Wind Direction dictates whether Form B (wind from the right) or C (wind from the left) will be used for judging the Performance.

12.1.2 If the Official Wind Direction must be changed during the Program, then a fifteen (15) minute notice must be given to all remaining competitors.

12.2 Airspace Waiver

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

12.3 Ceiling

12.3.1 Weather conditions that allow competitors to climb to the upper altitude limit for their category while maintaining a minimum cloud clearance are the most desirable.

12.4 Wind Limits

12.4.1 Flight will not be conducted if the crosswind component for the active runway exceeds 20 knots or the steady wind velocity at the surface exceeds 25 knots from any direction. The Jury shall use the best data available to determine if flights can be safely conducted or not.

12.5 Precipitation

12.5.1 Flight will not be conducted in discernible precipitation.

Exception: The Contest Jury may overrule this restriction.

12.6 Optional Break

12.6.1 If the ceiling requirements are not met, or if the airport field elevation is charted at or above 3,500 feet MSL, the Contest Jury may authorize Programs to be flown with an optional break.

12.6.2 When the optional break is authorized by the Contest Jury:

a) Pilots will be given a minimum of 10 minutes notice before flight that the optional break may be used.
b) Each pilot may take one Interruption within their Performance without penalty.
c) The Chief Judge will record all Interruptions normally on the *Chief Judge's Penalty Form*, but the first Interruption observed will be considered the Optional Break and not penalized. Any additional interruptions will be penalized in the usual manner.
d) Competitors may not land during an optional break.

12.6.3 In the event weather conditions improve, the Contest Jury may rescind the optional break giving at least 10 minutes notice to the competitors.

12.7 Deteriorating Weather Conditions

12.7.1 A competitor may decide not to fly, or to abort, due to deteriorating meteorological conditions.

12.7.2 The competitor will immediately notify the Chief Judge of their refusal.

12.7.3 The Chief Judge, by a simple majority vote of the Grading Judges, will determine whether the competitor has a valid meteorological reason for refusing.

12.7.4 If the delay is found to be invalid the competitor will be treated as if they had taken an Explicit Interruption. The Chief Judge shall zero any partially completed figure.

12.7.5 Competitors who have aborted and returned to the airfield will refly according to Reflight After an Abort.

12.8 Obscuration of Aircraft Due to Meterological Conditions

12.8.1 If the Chief Judge determines that none of the Grading Judges are able to see the competitor's aircraft, they will immediately notify the pilot by radio and instruct the pilot to break off the flight.

12.8.2 The pilot will re-enter the box, as conditions permit, and resume the flight, beginning the Performance with the figure specified by the Chief Judge.

12.8.3 Grading shall commence with the figure that could not be graded.

12.8.4 The pilot will not be charged with an Interruption Penalty.

13 Penalties

13.1 Failure to Prepare

13.1.1 This rulebook will occasionally prescribe penalties for situations where a competitor is not ready or otherwise fails to prepare themselves as demanded by the contest schedule. This penalty depends on category as follows:

	Category	Penalty
a)	Primary	10 points
b)	Sportsman	25 points
c)	Intermediate	50 points
d)	Advanced	75 points
e)	Unlimited	100 points

13.2 Boundary Infringement Penalties

13.2.1 The penalties for flying any part of a figure outside the lateral boundaries of the Aerobatic Box are:

	Category	Penalty
a)	Primary	Not Applicable
b)	Sportsman	5 points
c)	Intermediate	10 points
d)	Advanced	20 points
e)	Unlimited	30 points

13.2.2 Only one Boundary Infringement Penalty may be assessed per figure.

13.3 Interruption, Signaling and Other Box Procedure Penalties

13.3.1 The penalties for an Interruption, Improper Program Start, Improper Restart, and Illegal Safety Check are:

	Category	Penalty
a)	Primary	5 points
b)	Sportsman	5 points
c)	Intermediate	15 points
d)	Advanced	50 points
e)	Unlimited	90 points

13.4 Altitude Limits

13.4.1 Competitors must obey the following altitude limits.

	Category	Lower Limit	Upper Limit
a)	Primary	1,500 feet	3,500 feet
b)	Sportsman	1,500 feet	3,500 feet
c)	Intermediate	1,200 feet	3,500 feet
d)	Advanced	656 feet (200m)	3,609 feet (1100m)
e)	Unlimited	328 feet (100m)	3,280 feet (1000m)

13.5 Altitude Limit Infringement Penalties

13.5.1 There are three types of Altitude Limit Infringement Penalties:

a) **LOW:** Assessed if any portion of the figure is below the floor of the aerobatic box.
b) **LOW-LOW:** Assessed if any portion of the figure is at an unsafe altitude far below the floor of the aerobatic box.
c) **HIGH:** Assessed if any portion of the figure is above the ceiling of the aerobatic box.

13.5.2 Primary and Sportsman

	Infringement	Tolerance	Altitude	Penalty
a)	HIGH	None	Above 3,500 feet	5 points each figure
b)	LOW	None	Below 1,500 feet	Zero Entire Performance

13.5.3 Intermediate

	Infringement	Tolerance	Altitude	Penalty
a)	HIGH	None	Above 3,500 feet	10 points each figure
b)	LOW	1 to 200 feet	1,000 to 1,199 feet	60 points each figure
c)	LOW-LOW	> 200 feet	Below 1,000 feet	Zero Entire Performance

13.5.4 Advanced

	Infringement	Tolerance	Altitude	Penalty
a)	HIGH	None	Above 3,609 feet	25 points each figure
b)	LOW	1 to 328 feet	328 to 656 feet	120 points each figure
c)	LOW-LOW	> 328 feet	Below 328 feet	Zero Entire Performance

13.5.5 Unlimited

	Infringement	Tolerance	Altitude	Penalty
a)	HIGH	None	Above 3,280 feet	30 points each figure
b)	LOW	1 to 164 feet	164 to 328 feet	150 points each figure
c)	LOW-LOW	> 164 feet	Below 164 feet	Zero Entire Performance

Note: 164 feet = 50 meters, 328 feet = 100 meters, 3,609 feet = 1100 meters, 3,280 feet = 1000 meters

13.6 Noting Altitude Infringements

13.6.1 If, in the Grading Judge's opinion, a competitor has exceeded their altitude limits, the judge or their recorder shall comment in the "Remarks" section on Form A indicating "LOW", "LOW-LOW", or "HIGH" as applicable.

14 Box Procedures

14.1 Radio Procedures

14.1.1 Radio shall be the sole means of controlling the Aerobatic Box.

14.1.2 All competitors must be able to receive and transmit VHF radio messages.

14.2 Competitor Recall

14.2.1 A recalled competitor must immediately break off their flight and safely return to the airport and land.

14.3 Safety Checks

14.3.1 Competitors have the option of performing two half rolls from upright with a reasonable hesitation at inverted to check safety belts and inverted fuel and oil systems.

14.3.2 Safety Checks may be performed only in the area designated during the Program Briefing and only after the competitor has been cleared to approach the Aerobatic Box.

14.3.3 If the Safety Check does not conform to these rules, the competitor shall receive an Interruption Penalty.

14.4 Signaling

14.4.1 The standardized signal is a visible and distinct dipping of the wings.

14.4.2 The ideal signal consists of three (3) wing dips, each with a 45 degree or greater bank angle. However, no penalty shall be given for deviating from the ideal if the intent is clear to the Chief Judge.

14.4.3 Signaling may be performed on a horizontal, climbing, or descending flight path, either inside or outside the aerobatic box.

14.4.4 If the first figure following Signaling begins in inverted flight, Signaling must be performed in inverted flight and the competitor must change the flight attitude from upright to inverted only by a half roll prior to the first wing dip.

14.4.5 A competitor may make, without penalty, lateral and vertical adjustments to their position prior to beginning their Performance.

14.4.6 A competitor may decide not to begin performing after Signaling. Provided the competitor flies through the Aerobatic Box without initiating an aerobatic figure there will be no penalty for restarting.

14.5 Start and End of a Performance

14.5.1 If a competitor fails to Signal their intent to begin performing, the Chief Judge shall assess an Improper Program Start Penalty.

14.5.2 The competitor is expected to signal to indicate the end of the Performance. No penalty shall be incurred if this signal is omitted.

14.5.3 If the Flight ends in an inverted orientation, the competitor may execute a half roll to upright prior to signaling.

14.6 Low Lines

14.6.1 The Chief Judge may schedule a pilot to fly Low Lines at the start of a Program to calibrate the Grading Judges' perception of that category's aerobatic box floor.

14.6.2 The pilot shall fly their aircraft at their category's appropriate altitude, parallel to a box axis over the requested box markers, dipping a wing each time they pass over a marker.

15 Interruptions

15.1 Explicit Interruptions

15.1.1 An Explicit Interruption is a break in the Performance following Signaling by the pilot.

15.1.2 The Chief Judge shall assign the competitor with an Interruption Penalty for each Explicit Interruption.

15.1.3 If the Performance is interrupted in inverted orientation, the competitor may execute a half roll to upright prior to signaling without penalty.

15.1.4 The intent to resume the Performance after an Explicit Interruption must be signaled. If the competitor fails to Signal, they shall be assessed an Improper Restart Penalty.

15.1.5 The Performance may be resumed with

a) the figure immediately preceding the point of interruption, or
b) the figure in progress at the time of interruption, or
c) the figure immediately following the point of interruption.

If the Performance is resumed at any other point, an Improper Restart Penalty shall be assessed.

15.1.6 If the Performance is interrupted on the Y axis, it may be resumed in either direction on the Y axis.

15.1.7 Judges will resume grading with the first full figure following the original point of interruption.

15.1.8 A competitor may earn a maximum of two penalties per Explicit Interruption event: one Interruption Penalty and not more than Improper Restart Penalty).

15.2 Implicit Interruptions

15.2.1 An Implicit Interruption is any of:

a) Using a turn of 90 degrees or more to correct a heading deviation between figures.
b) Using a one-half roll to correct an improper attitude (upright to inverted or vice versa) between figures.
c) Deliberately climbing or diving between figures or flying any figure in a way such that the obvious intent is to gain or lose altitude or energy. The competitor shall be given the benefit of the doubt when applying this penalty.

15.2.2 Implicit Interruptions are penalized as if they were Explicit Interruptions. They are *not* treated as added figures.

15.2.3 Signaling to resume the Performance following an implicit interruption is not mandatory.

16 Temporary Competitor Incapacitation

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

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

16.1.3 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.

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

17 Mechanical Defects

17.1 Defects Found Prior to Flight

17.1.1 In the event of mechanical difficulties before being released to the Aerobatic Box, the competitor will notify the Starter and remain with the aircraft until an inspection by the Technical Committee is made.

17.2 Aborted Flights

17.2.1 In the event a competitor aborts a flight due to a Mechanical Defect, they shall land and taxi to the designated Sterile Area (if able), and wait with their aircraft until the Starter or Technical Committee arrives.

17.2.2 The Technical Committee determines whether the Mechanical Defect was valid. A Mechanical Defect is valid if it legitimately compromised flight safety and was not under the reasonable control of the competitor.

17.2.3 If the Mechanical Defect is invalid the competitor will be assessed an Interruption Penalty and will receive a zero for any figure in process at the time of the Interruption.

17.2.4 The decision of the Technical Committee is final and may not be protested.

17.3 Replacement Aircraft

17.3.1 The competitor may change aircraft if a defect cannot be corrected and a replacement is available.

18 Reflight After an Abort

18.1.1 In any case where a competitor has departed, aborted, and returned to the airfield for landing, the Chief Judge will schedule a Reflight as soon as possible.

18.1.2 The pilot must re-fly their Performance from the beginning.

18.1.3 Judging and grading will commence following the last graded figure.

18.1.4 Any Interruptions which occur in the re-flown Performance, whether before or after the first gradable figure, will be penalized in the normal manner.

19 Non-Competition Flying

19.1.1 All flying not directly related to the contest is prohibited after a time designated by the Contest Director. If not otherwise designated, the prohibition begins immediately following the first Program Briefing.

19.1.2 The Jury may waive this prohibition in the following circumstances:

a) Flights needed to ascertain the weather conditions.
b) Test flights following repairs made during the contest.
    1) Up to three aerobatic figures may be approved by the Jury;
    2) A member of the Jury will observe the test flight from the ground to ensure compliance.

c) To allow a competitor transportation into and out of the contest environment in a nonaerobatic aircraft. It is the competitor's responsibility to ensure weather conditions will allow return to the contest site in time for their next Program Briefing.

20 Scheduling

20.1 Schedule of Programs

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

20.1.2 Contest Directors typically schedule three Programs for each category, generally in this order:

a) **Known**: competitors fly a Known Sequence designed by the IAC. These are typically changed each year.
b) **Free**: competitors fly a Free Sequence they may design themselves.
c) **Unknown**: competitors fly an Unknown Sequence they have not seen or practiced before.

20.1.3 Changes to the Schedule of Programs must be approved by the Contest Jury and posted in sufficient time to notify all personnel affected by the change.

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

20.2 Order of Flight

20.2.1 Within each Program competitors fly their aircraft according to the Order of Flight.

20.2.2 The Order of Flight will be chosen by lot by the Registrar, or determined by the IAC-approved scoring software.

20.2.3 The order 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 their flight that day of the contest.

20.2.4 The Order of Flight may be altered after the Program begins by the Starter or Chief Judge if required by special circumstances.

20.2.5 If for any reason a competitor must fly twice in the same Program, they should be scheduled with sufficient time between both flights to prepare.

20.2.6 Competitors who are also acting as a Safety Pilot in the same category must fly their Unknown Program before flying as a Safety Pilot for another competitor in the Unknown Program.

21 Program Forms

21.1 Aresti Figure Construction

21.1.1 All figures drawn on Program Forms shall conform to the instructions found in Chapter 1 of the Aresti Aerobatic Catalogue.

21.2 Form A – The Scoresheet

21.2.1 Each figure must be listed and legible on Form A showing the Aresti Aerobatic Catalogue number, the correct K-Factor and the correct symbol(s).

21.2.2 The Total Figure K-Factor must be on Form A.

21.2.3 The Presentation K-Factor for the category must be shown on Form A.

21.3 Forms B & C – Aresti Drawings

21.3.1 IAC Forms B and C shall contain Aresti sequence drawings:

a) Form B will be drawn with the wind blowing from the Judging Line's right to left.
b) Form C will be drawn with the wind blowing from the Judging Line's left to right.

21.3.2 Symbols on Forms B/C shall be spaced so the sequence is easily followed. If needed, a dotted line or series of tiny circles will be used to lead the eye from the end of one figure to the beginning of the following figure.

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

21.3.4 The notation, "Note Y Axis Entry", or "Note Downwind Entry" shall appear on Forms B and C if the sequence does not begin upwind.

21.4 Resolving Conflicts on Program Forms

21.4.1 Conflicts internal to Form A shall be resolved using the Aresti Aerobatic Catalogue number.

21.4.2 Conflicts between Forms B/C shall be resolved using the Form appropriate to the direction of flight.

21.4.3 Conflicts between Forms A and B/C shall be resolved as follows:

a) Conflicts regarding roll direction (same or opposite) shall be resolved using the drawing on Forms B/C.

b) Conflicts regarding anything else will be resolved using the information on Form A until the first competitor in the Program has been released to the Aerobatic Box. In that case, use Form B/C.

22 The Known Program

22.1 Publication

22.1.1 Known Sequences for each category are published annually by the IAC.

22.2 Composition

22.2.1 Known Sequences are unrestricted in K value and figure selection but will be created to match the aircraft capability and experience expectations of their associated categories.

22.3 Order Within the Schedule of Programs

22.3.1 Known Programs will be flown prior to any other Programs.

23 The Free Program

The Free Program allows competitors to fly a sequence tailored to their skills and aircraft capabilities.

23.1 Sequences to be Flown During this Program

a) Primary competitors must fly the Primary Known Sequence.
b) Sportsman competitors may fly either the Sportsman Known Sequence or a Free Sequence.
c) Intermediate, Advanced, and Unlimited competitors must fly Free Sequences designed according to the rules in this chapter.

23.2 Free Sequence Figure and K-Factor Limits

23.2.1 Free Sequences are limited to the maximum number of figures and Maximum Total Figure K-Factor as shown below.

	Category	Maximum # of Figures	Maximum Total Figure K-Factor
a)	Sportsman	12	Must not exceed current Known Sequence
b)	Intermediate	15	190
c)	Advanced	12	300
d)	Unlimited	9	420

23.3 Floating Points

23.3.1 Competitors may reduce the Total Figure K-Factor by removing one point (the "Floating Point") from the highest coefficient figure.

Clarification: It can be difficult to make a sequence exactly match the Maximum Total Figure K-Factor. This rule allows a bit of flexibility, permitting competitors to exceed the Maximum Total Figure K-Factor by one point.

23.3.2 Both the original figure coefficient and the reduced value must be shown on the Form A and the initials "F.P." written in the "Catalogue No." column on Form A.

23.4 Versatility

23.4.1 Free Sequences must include, at minimum, the following entries from the Aresti Catalogue:

23.4.1.1 Sportsman

a)	**Family 7**	At least one from Half-Loop or Full Loop (7.2.1 thru 7.2.4, 7.4.1 thru 7.4.6).
b)	**Family 8**	At least one.
c)	**Family 9**	At least one Aileron Roll (9.1 thru 9.8).
d)		At least one Spin (9.11 thru 9.12).

23.4.1.2 Intermediate

a)	**Family 5**	At least one.
b)	**Family 7**	At least one Half-Loop or Full Loop (7.2.1 thru 7.2.4, 7.4.1 thru 7.4.6).
c)	**Family 8**	At least one.
d)	**Family 9**	At least one Aileron Roll (9.1 thru 9.8).
e)		At least one Snap Roll (9.9 thru 9.10) or *alternatively*, at least one 4 point roll on a horizontal line (9.4.3.4).
f)		At least one Spin (9.11 thru 9.12).

23.4.1.3 Advanced

a)	**Family 1**	At least one.
b)	**Family 2**	At least one Rolling Turn (2.1.2 thru 2.1.3, or 2.2.2 thru 2.2.7, or 2.3.2 thru 2.3.6, or 2.4.2 thru 2.4.8).
c)	**Family 5**	At least one.
d)	**Family 7**	At least one.
e)	**Family 8**	At least one.
f)	**Family 9**	At least one Aileron Roll from *each* sub-Family (9.1, 9.2, 9.4, and 9.8).
g)		At least two Snap Rolls (9.9 thru 9.10).
h)		At least one Spin (9.11 thru 9.12).
i)	**Other**	At least one Interior Line must contain opposite Aileron or Snap Rolls (9.1 thru 9.10) not in combination with a Spin.

23.4.1.4 Unlimited

a)	**Family 1**	At least one.
b)	**Family 2**	At least one Rolling Turn (2.2.3 thru 2.2.7, or 2.3.2 thru 2.3.6, or 2.4.2 thru 2.4.8)
c)	**Family 5**	At least one.
d)	**Family 6**	At least one.
e)	**Family 7**	At least one.
f)	**Family 8**	At least one.
g)	**Family 9**	At least two Positive Snap Rolls (9.9).
h)		At least two Negative Snap Rolls (9.10).
i)		At least one Spin (9.11 thru 9.12).
j)	**Other**	At least one Interior Line must contain opposite Aileron or Snap Rolls (9.1 thru 9.10) not in combination with a Spin.

23.5 Allowable Figures

23.5.1 Any figure identified in the Aresti System Catalogue may be used.

23.5.2 In addition, the Quarter-Clover, while normally a glider figure, may be used in Sportsman Free Sequences.

23.5.3 Figures 1.1.1.1 and 1.1.1.2 may be used only in conjunction with Family 9 rolls.

23.6 Repetition

23.6.1 Sportsman and Intermediate categories may repeat 1.1.1.x figures without limit.

23.6.2 No other repetition of Aresti Aerobatic Catalogue numbers is allowed.

23.7 Free Program Form Certification

23.7.1 It is the competitor's responsibility to have their Free Program Forms checked for compliance with these rules signed, and dated by a current judge who must provide their IAC member number on the Form A.

23.7.2 The judge's signature does not have to have been in the current contest year, if there were no rule changes which affected a previously certified Free Sequence legality.

23.7.3 Such certification does not relieve the competitor of the final responsibility for the legality and legibility of the forms.

23.7.4 A competitor who is also a judge may not sign off their own Free Program Forms.

23.7.5 Any changes or alterations void the signatures and render the forms noncompliant.

23.8 Checklist for Free Program Forms

23.8.1 The following items comprise a checklist for judges to use for certifying Free Program Forms.

a) Forms:
Current IAC forms must be used.

b) Form A:
i. Each Aresti Aerobatic Catalogue number must be entered correctly.
ii. The correct K-Factors must be recorded.
iii. The total K-Factor for each figure (including any Floating Point) must be correct.
iv. Each figure drawing must match the Aresti Aerobatic Catalogue number(s).

c) Form B & C:
i. The figures must be legal drawings according to the Aresti Aerobatic Catalogue
ii. All drawings on the forms must be legible.
iii. The forms must agree with each other.
iv. The forms must agree with Form A.

d) Free Sequence Figure and K-Factor Limits [23.2]:
i. The total number of figures must not exceed the limit.
ii. The Total Figure K-Factor must not exceed the limit.

e) Versatility [23.4]:
The sequence must include all specified items.

f) Allowable Figures [23.5]:
The sequence must include only allowed figures.

g) Repetition [23.6]:
The sequence must not repeat any catalog numbers except as allowed.

h) Presentation Coefficient [29.2]:
The Presentation K-Factor on Form A must be correct.

i) Execution:
If all the above items are correct, sign and date each of the three Forms A, B, and C.

24 The Unknown Program

24.1 Applicability

24.1.1 The Unknown Program is reserved for competitors in the following categories

a) Intermediate
b) Advanced
c) Unlimited

24.1.2 At the discretion of the Contest Director, flights may be scheduled during this Program for the Primary and Sportsman categories, in which case these pilots will repeat the sequences they flew during the Free Program.

24.2 Receipt of Sequences

24.2.1 IAC Headquarters will provide the Contest Director, or a designated representative, with Unknown Program Forms.

24.2.2 They shall check these forms for legality prior to the start of the contest and notify the IAC of any issues found.

24.3 Distribution

24.3.1 The Unknown Sequence Forms will be made available to the competitors by the Contest Director no less than twelve (12) hours prior to the flight.

24.3.2 The minimum time may be waived if there is unanimous agreement among all pilots in the affected category.

24.4 Practice

24.4.1 Practice of Unknown Sequences is prohibited.

24.5 Restrictions

24.5.1 The figures utilized in the design of the Unknown Sequences must be taken only from Allowable Figures for Unknown Sequences.

24.5.2 For all Categories:

a) There will not be more than one (1) snap roll (Family 9.9/9.10) per figure.
b) Maximum of one (1) Horizontal 8 from Family 7.8.1 to 7.8.8.
c) Maximum of one (1) spin from Family 9.11/9.12.

24.6 Additional Restrictions by Category

24.6.1 Number of Figures and Total Figure K-Factor are restricted as follows:

		Number of Figures		
	Category	Minimum	Maximum	Maximum Total Figure K-Factor
a)	Intermediate	6	12	175
b)	Advanced	10	14	275
c)	Unlimited	10	14	400

24.6.2 Rolls are restricted as follows:

a) Intermediate
   i. No unlinked rolls.

b) Advanced

   i. A minimum of 2 and a maximum of 4 snap rolls.
   ii. Rolls are not permitted following spins.
   iii. Unlinked rolls are permitted, but only on *straight* horizontal lines with a maximum of 10 stops per line.

c) Unlimited

   i. Maximum of 6 snap rolls, only 4 of which may be from the same sub-Family (9.9, 9.10).
   ii. A minimum of one snap roll must be a vertical climbing maneuver (9.9.1, 9.9.6, 9.10.1, 9.10.6).
   iii. Unlinked rolls are permitted, but only according to the following table:

Line Direction	Total Rotation	Max Stops	Type
Horizontal	720°	10	Any
Vertical up	450°	4	Aileron Only
Vertical Down	360°	3	Aileron Only
45° Up (see exception below)	540°	4	Aileron Only

Exception: On a 45° up line, an aileron roll may be followed by a snap roll given the following constraints:

a) Families 1, 7, and 8 only.
b) The line is set initially with a positive attitude from a positive Looping Line.
c) The total rotation limit remains 540°.
d) The maximum number of stops is reduced to 3.

Clarification: This exception implies:

a) The line will be solid, not dashed.
b) Only certain half and full aileron rolls are allowed (9.1.2.2, 9.1.2.4, 9.2.2.4, 9.4.2.2).
c) Only certain half and full snap rolls are allowed
d) (9.9.2.2, 9.9.2.4, 9.10.2.2, 9.10.2.4

25 Program Briefing

25.1.1 Program Briefings are mandatory for all contest officials and competitors.

25.1.2 Notification of time and place will be given in advance.

25.1.3 The briefing will be officiated by the Chief Judge(s) or their representative.

25.1.4 Program Briefings may be given for each Program individually or combined into a daily briefing.

25.1.5 The briefing will include, in the following order:

a) Roll call and Order of Flight.

1) Pilots must answer roll call in person. Competitors who miss roll call shall be charged $50 to receive a special individual briefing.

2) If the special briefing fee has not been paid by the time the competitor flies, the Chief Judge will assess a Failure to Prepare Penalty.

3) The Contest Jury has the right to waive penalties if missing roll call was due to circumstances beyond the competitor's control.

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

c) Introduction of FAA officials.

d) Weather forecast and winds aloft.

e) Official wind direction for the flight(s) immediately following the briefing.

f) Position of the Aerobatic Box, Judging Line, and Deadline if applicable.

g) Starting procedures.

1) Location of dead prop area(s), if any.
2) Taxi, take-off, and holding procedures.
3) Noise abatement procedures and location of any noise sensitive areas.
4) Traffic pattern.
5) Aborts by competitors on the ground and in the air.
6) Location of Sterile Area.

h) Radio procedures and frequencies.

i) Recall signals. Briefing of the recall signal shall include the phrasing to be used in the event of a recall, and the types of instructions that will be given in the event of a traffic conflict.

j) Optional Safety Check maneuver.

k) Official contest working hours.

l) Low Lines.

m) Personnel permitted on the judging line.

n) Review of the Incident Response Plan.

o) Review of grading criteria for figures and Presentation, as required.

26 Grading Judge Concepts

26.1 Grading of Figures

26.1.1 Grading Judges must independently and dispassionately assess the quality of every figure, against the standard of perfection, during each Performance.

Clarification: To judge dispassionately means to disregard the subjective "wow" factors of the flight (e.g., aircraft noise, speed, and acceleration; the difficulty of the sequence; etc.).

26.1.2 Each numbered figure receives one overall grade, regardless of its complexity.

26.1.3 A grade of ten (10.0) represents a perfect figure in which the judge saw no deviations from the prescribed criteria.

26.1.4 Judges shall deduct points in multiples of 0.5 as defects are observed.

26.1.5 A grade of zero (0.0) is the lowest possible grade for a figure.

26.1.6 In certain cases, judges cannot award a numeric grade and an "HZ" (Hard Zero) or "A" (Average) will be entered instead.

26.1.7 Figures begin and end in wings-level, horizontal flight, aligned with a box axis.

26.1.8 The grading of each figure begins upon departure from horizontal flight and ends upon resumption of horizontal flight.

Exception: Square and Octagon Loops (Aresti Aerobatic Catalogue numbers 7.4.3 thru 7.4.6) are not complete until their final horizontal line is drawn.

26.2 Zeros

26.2.1 There are two types of zeros. The correct one to mark on the score sheet depends on the judge's reason for giving the zero:

a) Numeric Zeros. The figure is basically correct but contains one or more errors that cause the grade to fall to zero by accumulation of downgrades. Judges shall record a numeric zero on Form A with the mark "0.0".

b) Hard Zero. The figure is so incorrect, according to the rules below, it cannot be subject to grading at all. Judges shall record a Hard Zero on Form A with the mark "HZ".

26.2.2 The judge must state the reason for the zero, regardless of type, in the Remarks column.

26.2.3 If a figure could be given either zero, Hard Zero (HZ) takes precedence over numeric zero (0.0).

26.3 Hard Zeros

26.3.1 Hard Zeros must be given for:

a) Omitting a figure. An HZ will be awarded to the missing figure and scoring will resume with the next figure.

b) Adding a figure. In this case, an HZ will be given to the figure that was supposed to be flown. If the competitor flies that figure as well scoring for that figure is ignored, but scoring will resume normally following that figure.

c) Any single deviation in geometry, flight path, entry or exit direction, attitude, or rotation of 90 degrees or more. In this case the figure is given an HZ and scoring continues with the next figure.

Example 1: Flying a figure, or part of a figure, in the wrong direction on the X Axis.

Example 2: Over-rotation of a snap roll by 90 degrees or more.

d) Failure to meet certain Family-Specific Grading Criteria for a figure.

26.4 Averages

26.4.1 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 may not grade the figure. Instead, judges shall record a letter "A" in the grade block.

26.5 Benefit of the Doubt

26.5.1 When there is any question about exactly what was observed, the benefit of the doubt shall always be given in the competitor's favor.

26.5.2 If a competitor's actions can be understood in more than one way (e.g. an Implicit Interruption vs. an added figure), the most favorable interpretation will be chosen.

26.6 Errors are Downgraded, Corrections Aren't

26.6.1 Downgrades are always made for the original error but not for any corrections which immediately follow.

Example: Over-rotating a roll and rolling the wings back again must be penalized for the over-rotation, but not penalized a second time for resuming the correct geometry afterwards.

26.6.2 When a downgrade in geometry (pitch, roll, yaw) is observed for one maneuver within a figure, any immediately following maneuver within the same figure is not downgraded a second time for any misaligned entry geometry.

Example: The first point of a 4-point roll stops at 100° of rotation. The second point stops exactly at 180° of rotation. There is no downgrade for point number two.

26.6.3 If any errors observed immediately following the final maneuver of the preceding figure are corrected before beginning the subsequent figure, only the preceding figure shall receive the deduction.

26.6.4 Failure to correct such errors shall result in a downgrade to both figures.

26.7 No Line Between Figures

26.7.1 If there is no discernible horizontal line between figures deduct one (1) point for each figure.

26.8 Directionality

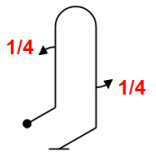
26.8.1 Any figure entry or exit lines drawn aligned on the X axis must be flown in the direction as depicted, either into or away from the official wind.

26.8.2 Any Interior Lines drawn on the X axis, whether straight or looping, must be flown in the direction depicted.

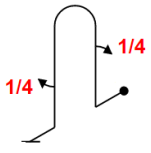
Exception: Turns, and the pivots of Hammerheads and Tailslides are not directional, even though they are drawn on the X Axis.

26.8.3 The Y axis is generally non-directional. However, for any figure with both entry and exit lines on the Y axis, the exit must be flown in the same or opposite direction relative to the entry as depicted.

Example: These figures have both entry and exit lines on the Y Axis. The exit line for the figure on the left must be flown in the *opposite* direction of the entry line. The exit line for the figure on the right must be flown in the *same* direction as the entry line.



Opposite direction



Same direction

26.9 Autorotation

26.9.1 At certain angles of attack, rudder input causes an aircraft to rotate about both the yaw and roll axes. The rotation continues if the rudder is continuously applied and the angle of attack is maintained, even if the ailerons are centered. This regime is called “autorotation”.

Clarification: If the yaw component of rotation ceases, Autorotation has ended.

27 Basic Criteria for Judging Aerobatic Figures

27.1 Flight Path

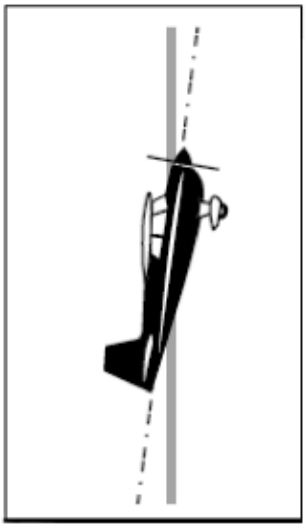
27.1.1 The Flight Path is the movement of the aircraft’s center of gravity through the sky. Judging the flight path consists of comparing the observed path with fixed references such as the horizon or the X and Y axes of the Aerobatic Box.

27.2 The Zero-lift Axis

27.2.1 The aircraft's zero-lift axis is the attitude at which the wing produces no lift. It is a function of the wing's Angle of Incidence relative to the fuselage.

27.2.2 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.

Clarification: The longitudinal axis of some aircraft does not match the zero-lift axis. Aircraft types whose zero-lift axis does not pass through the tail will make a spiral with the tail during a perfect vertical roll. During a true vertical roll, in all aircraft, the aircraft’s wings will constantly be parallel to the horizon.



Vertical lines are judged according to the aircraft’s Zero-Lift Axis, not its longitudinal axis.

27.3 Vertical Lines

27.3.1 Vertical lines are judged on the attitude of the aircraft, according to its zero-lift axis, and not the flight path.

Clarification: When there is wind of any kind, the observed flight path will be offset from true vertical by some degree. This wind effect must be completely ignored by the judge.

27.3.2 The wings must be aligned with a box axis and the horizon.

27.4 45 Degree Lines

27.4.1 45 Degree lines are judged according to the perfect vertical attitude plus or minus 45 degrees.

Clarification: When flown into the wind, an aircraft with a correct 45 degree attitude may have a flight path that is steeper than 45 degrees while the opposite is true when flown downwind.

27.5 Horizontal Lines

27.5.1 Horizontal lines are judged on flight path, not attitude.

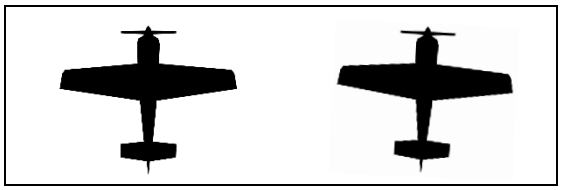
Clarification: The attitude required to maintain level flight varies with aircraft type and airspeed.

27.5.2 The aircraft’s heading must remain parallel to the X or Y axis.

27.6 Deducting for Errors in Angle: The One Point for Every 5 Degrees Rule

27.6.1 For all errors in angle the judge shall deduct 0.5 points for every 2.5 degrees of rotation. For ease of memorization, this is restated as: **One point for every 5 degrees.**

Example: An example of a 0.5 point deduction on a vertical line due to 2.5 degrees of yaw error.



Clarification: This rule and the Hard Zero rule interact in the following ways:

Individual Error	Grade
< 50°	Deduct 1.0 point for every 5 degrees. Continue grading.
50° to 90°	The maximum deduction of 10.0 point is reached. The Grade is 0.0.
≥ 90°	The figure receives a Hard Zero.

27.7 Deductions

27.7.1 For most criteria the amount of deduction is specified. In the case where a deduction is not specified, the judge shall apply a deduction proportional to the error, but not less than 0.5 points.

27.7.2 Common deductions are marked with icons in the margin for easy identification.

HZ Hard Zero criteria.

MR Matching Radii criteria.

1 A specific point deduction is mentioned.

5° The One Point for Every 5 Degree rule is repeated for clarity.

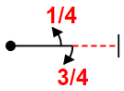
27.8 Unlinked Rolls

27.8.1 The rotation rates of the rolls do not have to match each other.

27.8.2 The rolls must have a brief pause between them.

27.8.3 The pilot may elect to fly the first roll in either direction, but the second roll must be in the correct direction relative to the first.

Example:

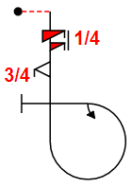


If the ¼ roll in this figure is flown to the left, the ¾ roll must be flown to the right.

27.8.4 The direction of a snap roll or spin is determined by the rotation on the roll axis.

Clarification: Negative spins and snaps have a roll axis rotation in the opposite direction of the yaw axis rotation.

Example:



This P Loop begins with a negative spin followed by a ¾ positive snap in the opposite direction. If the aircraft is flying from left to right inverted and performs the negative spin with right rudder, the aircraft will yaw right and roll **left**. At the conclusion of the spin the top of the airplane will face the judges. The positive snap must be in the opposite direction, performed with right rudder, to cause the aircraft to yaw right and roll **right**. After the snap the right side of the aircraft will face the judges. The pilot can now perform the ¾ loop and end in inverted flight headed to the judge's left.

27.9 Variations in Line Length

27.9.1 All lines within a figure (Interior Lines) are preceded and followed by Looping Lines which define their length.

27.9.2 Interior Lines do not have to be of equal length.

Exception: Some figures in Family 3 and 7 do have this requirement.

27.9.3 If any kind of roll is placed on an Interior Line, the lengths of the two parts of the line (Line Segments) before and after the roll must be equal.

Exception: Rolls following spins do not have to be centered.

123 27.9.4 If within a figure, two or more Interior Lines, or Line Segments, must be of the same length, an observed variation is penalized by reducing the grade in the following manner:

a) a visible variation - 1 point deduction;

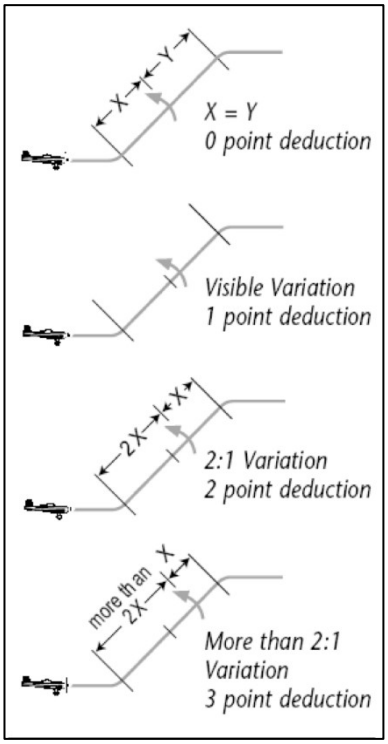
b) if the lengths vary by 2:1 - 2 point deduction;

c) greater than a 2:1 variation - 3 point deduction;

d) no line before OR no line after - 4 point deduction;

e) no line before AND no line after – 2 point deduction.

27.9.5 The basis for judging line length is the first Interior Line or Line Segment flown.



Penalties for uneven roll spacing.

27.10 Looping Lines

27.10.1 Looping Lines are vertically curving flight paths that connect to straight lines (horizontal, vertical, or 45 degree) or other Looping Lines (as in the case of Reversing Loops). They are either positively loaded (aka “pulls”) or negatively loaded (aka “pushes”).

Clarification: Small radius Looping Lines are drawn as sharp angles instead of curves. These are called “corners” in this rule book but are flown like any other Looping Line.

27.10.2 Looping Lines must have a constant radius.

27.10.3 Looping Lines must be wind corrected as indicated by the flight path of the aircraft.

Clarification: The wind correction requirement is only regarding the roundness of the Looping Line and not for the effect of crosswind. 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.

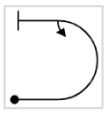
27.10.4 There are no standardized deductions for observed changes in the radius of Looping Lines. A judge must, therefore, develop a consistent and objective method for grading them.

Example 1: deduct 1 point for each just-visible variation in the radius and 2 points for each major deviation from a constant radius.

Example 2: For Looping Lines of 180° or greater, use the first quarter of the loop as the basis for evaluating the remainder of the loop. For each remaining quarter: a visible variation from the first quarter results in a 1-point deduction; a 1:2 variation results in a 2-point deduction; and more than a 1:2 variation results in a 3-point deduction.

These are just two examples. Other methods are equally acceptable, as long as those methods meet the standards of objectivity and consistency of results.

27.11 Looping Lines with Connected Rolls



27.11.1 When a Looping Line is immediately preceded or followed by one or more rolls (i.e., rolls not centered on a straight line), there may be only a brief hesitation between the roll and Looping Line.

≥1 27.11.2 If there is a line between the roll and Looping Line, deduct at least one (1) point.

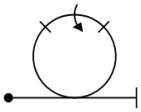
27.12 Looping Lines with Integrated Rolls

27.12.1 Rolls may appear on Looping Lines. The rolls must be centered symmetrically about the apex or nadir and be integrated into the radius.

≥2 27.12.2 If any part of the roll or roll combination is flown on a straight line, deduct at least two (2) points.

5° 27.12.3 If the roll or roll combination is not centered about the apex/nadir point, deduct one (1) point for every five (5) degrees of arc that the roll or roll combination is off center.

Examples:



In this loop the roll must be centered at the top of the loop. If the middle point of the roll is 10 degrees away from the apex of the loop, the deduction is 2.0 points.

Clarification: Note that the pause between rolls in a roll combination may not occur at the apex/nadir.

MR 27.13 Families with Matching Radii Requirements

27.13.1 For figures containing more than one Looping Line, there may be an additional requirement for two or more of them to have matching radii.

27.13.2 Cases where radii must match are called out in Family-Specific Grading Criteria. For easy reference the affected families are:

	Family	Figures	Name
a)	Family 3	ALL	Combination of Lines
b)	Family 7	7.4.3 to 7.4.6	Segmented loops
		7.4.7 to 7.4.14	Reversing Whole Loops
		7.5	Horizontal Ss
		7.6	Vertical Ss
		7.8	Figure 8s
c)	Family 8	8.6.9 to 8.6.16	Reversing P Loops
		8.10	Reversing 1 ¼ Loops

27.13.3 Except for these cases there is no requirement for radii to match within a figure.

27.13.4 There is no standardized downgrade for mismatched radii. For any mismatch deduct at least 0.5 points.

27.14 Families with Special Hard Zero Criteria

HZ 27.14.1 A small number of families have special mandatory requirements that, if not met, result in an HZ for the figure. They are:

	Family		Failure Criteria
a)	Family 2	Rolling Turns	Snap during rolling turn
b)	Family 6	Tailslides	Did not slide
c)	Family 9	Snap Rolls	Did not snap
d)	Family 9	Spins	Did not spin

27.15 Wind Correction

5° 27.15.1 Competitors may attempt to correct for wind drift but if these corrections are visible to the judge the standard deduction of one (1) point per five (5) degrees of heading deviation must be given.

27.15.2 Even if it is clearly 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 should be made.

28 Family-Specific Grading Criteria

28.1 About this Section

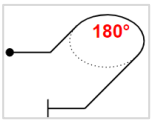
28.1.1 In addition to universal rules about lines, radii, and rolls, there are exceptions and rules unique to certain Family-Specific Grading Criteria.

28.1.2 In the absence of specific instructions, figures are graded according to the Basic Criteria for Aerobatic Figures.

28.1.3 All rotations described in this section are aircraft-relative.

28.2 Family 0.0 - Wingover

28.2.1 The Wingover begins with a climbing coordinated turn, with the turn begun immediately after the climb is initiated.



5° 28.2.2 Climb and turn will be timed so that at the top of the climb, the aircraft's heading is 90 degrees off the original heading, the wings are perpendicular to the horizon, and the longitudinal axis of the aircraft is horizontal. If there are any errors in heading or angle at this point in the figure, deduct one (1) point for every five (5) degrees.

28.2.3 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.

28.2.4 The 180 degree change of heading must be flown at a constant rate of turn.

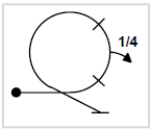
28.2.5 The bank angle must be constantly and smoothly changed throughout the turn, stopping only briefly as the roll direction is reversed at the 90 degree point of turn.

≤1 28.2.6 For each change in the rate of roll or turn, deduct no more than one (1) point.

≤1 28.2.7 For each complete stoppage of the rate of roll or turn, deduct no more than one (1) point.

28.3 Family 0.1-0.2 Quarter-Clover

28.3.1 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).



28.3.2 In either case, the exit direction of flight will be 90 degrees to the entry heading.

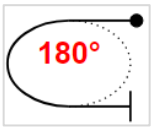
28.3.3 For the Family 0.1 quarter-clover, the roll must begin simultaneously with the pitch up and continue at a constant rate such that the aircraft reaches the top of the loop inverted with the fuselage horizontal and the longitudinal axis 90 degrees from the start direction. The second half loop down is conventional, like the second half of a 7.4.1.1.

28.3.4 For the Family 0.2 quarter-clover, the first half loop up is like the first half of a 7.4.1.1. Immediately upon completing the first half loop, the aircraft must begin a constant rate quarter roll such as to reach upright, wings-level horizontal flight at the bottom of the second half loop.

28.3.5 The figure must be wind corrected to maintain a constant radius.

1 28.3.6 If the roll rate changes, deduct one (1) point for each change.

28.4 Family 2 - Competition Turns



28.4.1 Competition turns should not be confused with standard coordinated turns. In aerobatic competition, a turn is divided into three distinct phases:

1) establishing a bank of at least 60° while maintaining the initial heading;
2) a heading change of 90°, 180°, 270°, or 360°; and
3) a roll back to straight and level flight while maintaining the final heading.

5° 28.4.2 Immediately after the roll to a bank angle of at least 60° is complete, the heading change must begin. If the heading changes before the bank angle is established, deduct one (1) point for every five (5) degrees for any bank angle less than 60°.

5° 28.4.3 If there is any change to the established angle of bank, deduct one (1) point for every five (5) degrees.

28.4.4 Competition turns are not wind corrected.

1 28.4.5 The rate of turn must be constant. If there is a change to the rate of turn, deduct one (1) point for each change.

5° 28.4.6 The altitude must be maintained throughout the turn. If the altitude changes, deduct one (1) point for every five (5) degrees or 100 feet.

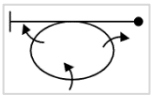
1 28.4.7 As soon as the aircraft is on the exit heading, the heading change must stop on the correct box axis while maintaining the chosen bank angle, followed immediately by a roll back to wings level using a rate of roll equal to the entry roll. If the roll rates do not match, deduct one (1) point.

Clarification: The direction of the turn is up to the competitor, provided the entry and exit headings are aligned with the correct axes.

5° 28.4.8 If the exit heading is not parallel to the proper axis, deduct one (1) point for every five (5) degrees.

5° 28.4.9 If the roll to wings level begins prior to stopping the turn, deduct one (1) point for every five (5) degrees of roll/turn integration.

28.5 Family 2 - Rolling Turns



28.5.1 Rolling turns combine a turn of a prescribed amount with rolls integrated throughout the turn. Rolls may be in the same direction as the turn ("to the inside") or opposite the turn ("to the outside"). Rolls may alternate in direction.

HZ 28.5.2 If the rolls are not flown in the correct direction and quantity, mark the figure HZ.

Clarification: If an improper direction of roll is initiated but reversed to the correct direction before ninety (90) degrees of roll is exceeded, a deduction of one (1) point for every five (5) degrees of the improper roll shall be made.

HZ 28.5.3 If any of the rolls exhibit Snap Roll Autorotation, mark the figure HZ.

28.5.4 While the judge may expect the aircraft to be upright or inverted at certain points in the turn, the downgrades for these figures are based only on changes to rate of roll, rate of turn, and altitude.

≤1 28.5.5 There must be a constant rate of turn. If the rate of turn changes, deduct no more than one (1) point per variation.

≤1 28.5.6 There must be a constant rate of roll. If the rate of roll changes, deduct no more than one (1) point per variation.

1 28.5.7 If the rate of roll stops (aside from any brief pause when changing roll directions), deduct one (1) point.

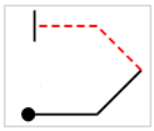
5° 28.5.8 The altitude must be constant. If the altitude changes, deduct one (1) point for every five (5) degrees or 100 feet.

5° 28.5.9 For a rolling turn with rolls in alternating directions, the aircraft must change direction of roll at a wings-level attitude. If the roll direction reverses before or after the wings-level attitude, deduct one (1) point for every five (5) degrees of bank angle error at direction reversal.

5° 28.5.10 The turn and the rolls must finish at the exact same time with the aircraft aligned on the correct box axis. If the turn and rolls do not finish at the same time, deduct one (1) point for every 5 degrees of roll remaining at the completion of the turn, or turn remaining at the completion of the roll.

Clarification: The direction of the turn is up to the competitor, provided the entry and exit headings are aligned with the correct axes.

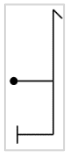
28.6 Family 3 – Combinations of Lines



123 28.6.1 All Interior Lines must be equal in length.

MR 28.6.2 All corners must have matching radii.

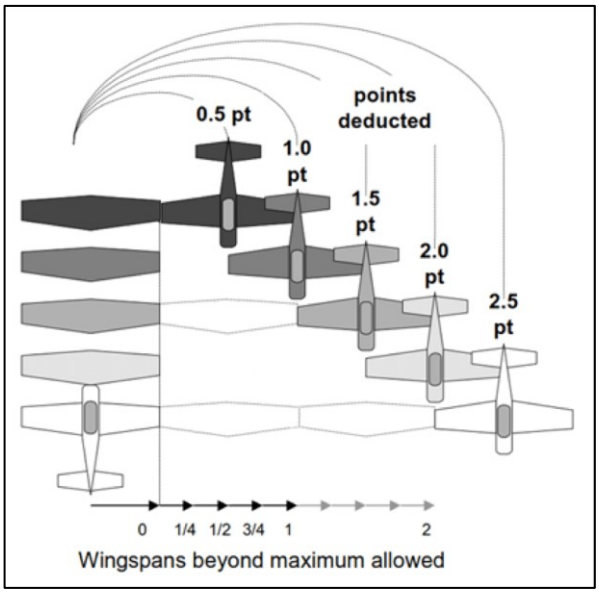
28.7 Family 5 – Stall Turns (aka "Hammerheads")



28.7.1 In its most basic form, a hammerhead begins with a quarter loop to establish a vertical climb. At the top of the vertical line, the aircraft pivots 180 degrees around the yaw axis in either direction to establish a vertical descent. The figure ends when the aircraft completes a quarter loop back to horizontal flight.

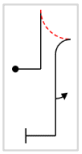
28.7.2 The vertical up line, vertical down line, and 45 degree entry/exit lines (if present) may all be of different length. Therefore, the altitude of the horizontal lines at the start and finish of the figure may be different.

28.7.3 During the pivot, the aircraft's CG may displace by up to one-half wingspan without penalty. The penalty for any additional displacement, either laterally or vertically, is one point per half wingspan.



5° 28.7.4 If there is any rolling or pitching motion during the pivot, deduct one (1) point for every five (5) degrees.

28.8 Family 6 – Tailslides



5° 28.8.1 In a tailslide, the aircraft climbs vertically, stops, and slides backwards vertically before pivoting on the pitch axis to recover in a vertical down line.

Clarification: Leaning into the slide to better control the slide direction is common practice. Regardless, the standard deduction of one (1) point for every five (5) degrees of deviation applies.

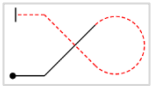
HZ 28.8.2 There are two types of tailslides: wheels-down (also called "canopy-up") and wheels up (also called "canopy-down"). If the aircraft falls the wrong way, mark the figure HZ.

Clarification: The wheels-down tailslide is depicted in the Aresti diagram with a curved solid line at the top of the tailslide symbol. The wheels-up tailslide is depicted with a curved dashed line. These curved lines are always drawn, for convenience only, on the X axis.

HZ 28.8.3 The aircraft must slide backwards at least one-half of the fuselage length. If it fails to do so, mark the figure HZ.

28.8.4 Following the slide backwards, the aircraft must then tip over and fall through to a vertical down position. Often the nose will swing back or "pendulum" once past the vertical after falling through. The figure is not to be downgraded for this, nor downgraded if it does not happen. The slide portion of the figure ends when the vertical downline is established.

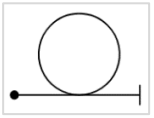
28.9 Family 7.3 – Three-Quarter Loops (aka "Goldfish")



28.9.1 These figures are simply ¾ loops with 45 degree entry and exit lines.

28.9.2 The 45 degree lines may be of any length.

28.10 Family 7.4.1-7.4.2 – Full Loops

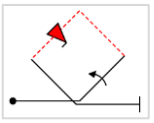


28.10.1 Loops are judged in accordance with the rules on Looping Lines. There are no special rules for Full Loops.

Clarification: A simple full loop, perfectly flown, is exactly circular on the axis of flight, beginning and ending at the same altitude.

28.11 Family 7.4.3 – 7.4.6 – Square, Diamond, and Octagon Loops

28.11.1 The normal criteria for horizontal lines, vertical lines, 45 degree lines, and radii apply.



123 28.11.2 All lines (Interior and any final line) must be of equal length. If they are not of equal length, deduct according to Variations in Line Length.

Clarification: The final line of a Square or Octagon Loop must be drawn to the correct length on the level horizontal line at the end of the figure. This final line begins at the end of the first radius and ends when the aircraft departs straight and level flight. If any final line is seen, regardless of length, the No Line Between Figures downgrade does not apply.

Example: If no final line is seen, a four (4) point deduction applies to the loop according to Variations in Line Length with a further downgrade of one (1) point on the subsequent figure for No Line Between Figures.

MR 28.11.3 All corners must have matching radii.

28.12 Family 7.4.7-7.4.14 – Reversing Whole Loops

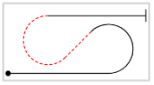
28.12.1 Reversing Whole Loops are loops in which a reversal in direction is made after completing either the first or third quarter.

≥2 28.12.2 The change in loading (positive/negative) must be abrupt. If a line is added between the two Looping Segments, deduct at least two (2) points.

MR 28.12.3 The Looping Lines must have matching radii.

Clarification: If the radii match, the figure will begin and end at the same altitude.

28.13 Family 7.5.1-7.5.8 Horizontal S's

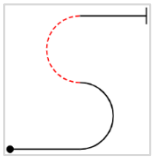


MR 28.13.1 The Looping Lines must have matching radii.

28.13.2 The entry/exit lines must be at the same height as the apex/nadir of the Looping Lines.

28.14 Family 7.5.9-7.5.10 – Vertical S's

28.14.1 These figures are accomplished with two joined half-loops flown in opposite directions.



28.14.2 The two half-loops must be flown as a continuous Looping Line when there is no roll between the half-loops.

≥1 28.14.3 If a roll is performed between the half-loops, it must be performed on a horizontal line. There may only be a brief pause before and after the roll. If a line is added at either of these points, deduct at least one (1) point.

MR 28.14.4 The half-loops must have matching radii.

28.15 Family 7.8.1-7.8.16 – Horizontal 8's and Horizontal Super 8's

28.15.1 These figures are combinations of lines, 3/4 loops, and 5/8th loops, with special criteria.

MR 28.15.2 The Looping Lines must have matching radii.

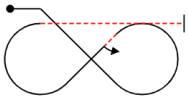
28.15.3 The 45 degree line that connects the loops must be sized so the apex and nadir of both loops match.

≤2 28.15.4 Horizontal entry and exit lines must be at the height of the apex or nadir of the loops, as appropriate. If an entry or exit 45 degree line is short, deduct up to 2 points.

Exception: The initial or final 45 degree lines may be extended if they contain:

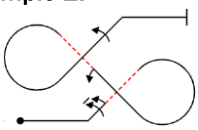
a) Any single linked roll of more than 360 degrees, or
b) Two unlinked rolls.

Example 1:



This Horizontal 8 has two 45 degree lines. If this figure is flown correctly the starting and ending altitudes must be the same, despite the drawing which shows the entry line extended. The drawings of 8s often do not match the mandated shape.

Example 2:

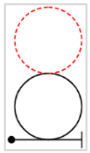


This Horizontal Super 8's three 45 degree lines are each handled differently:

1) The initial 45 degree line has a 1 ½ roll on it. This line may be extended to any length. If this line is too short, the deduction will be no more than 2 points.
2) The second 45 degree line must always be sized so the loop height extents exactly match. There is no standardized deduction specified if this is not the case.
3) The third 45 degree line has a single roll on it. This line must be sized so the horizontal exit line is at the same altitude as the apexes of the loops. If this line is too long there is no standardized downgrade, but if the line is too short the maximum deduction is 2 points.

28.16 Family 7.8.17-7.8.22 – Vertical 8's

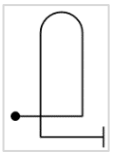
≥1 28.16.1 When a roll is performed between the loops, there must be no line before or after the roll. If a line is added before or after the roll, deduct at least one (1) point.



MR 28.16.2 The loops must have matching radii.

Clarification: Unless there is a roll between the loops, proper wind-correction will result in the two loops being directly above one another.

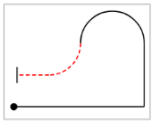
28.17 Family 8.4 and 8.8 – Humpty Bumps and Double Humpty Bumps



28.17.1 There is no requirement for any of the radii to be equal.

28.17.2 There is no requirement for any of the line lengths to be equal.

28.18 Family 8.6.9 to 8.6.16 and 8.10 Reversing P Loops and Reversing 1 ¼ Loops



≥2 28.18.1 The change in loading (positive/negative) must be abrupt. If a line is added between the two Looping Lines, deduct at least two (2) points.

MR 28.18.2 The Looping Lines must have matching radii.

28.19 Family 9.1 – Slow Rolls

28.19.1 Slow Rolls must be flown without pause at a constant roll rate. If there is any variance in the roll rate, deduct one (1) point per variation.

Example: A 180 degree roll is expected. The airplane rolls quickly to 135 degrees, the rotation slows dramatically for the last 45 degrees, but the roll finishes at the correct angle. This is a one (1) point penalty.

5° 28.19.2 The rotation must end with a precise stop with the wings at the desired degree of rotation. If there is any over or under rotation, deduct one (1) point for every five (5) degrees.

Example 1: A 360 degree roll is expected. The airplane rotates 365 degrees then corrects. A one (1) point downgrade applies to the 5 degrees of rotation error.

Example 2: A 180 degree roll is expected. The airplane rotates 130 degrees and stops, then corrects to 165 degrees. The downgrade is 10.0 points. If the rotation had slowed instead of stopped the downgrade would be 4.0 points, 1.0 point for the slow down and 3.0 points for the final angle error.

Example 3: A 360 degree roll is required, but the aircraft rotates 270 degrees, briefly stops, and then finishes the full roll. This is a 90 degree error resulting in an HZ for the figure.

28.19.3 When executing any aileron roll, either the aircraft's CG trajectory (horizontal and Looping Lines) or attitude of the zero-lift axis (45 and vertical lines), must continue, during the rolling portion of the figure, to appear exactly the same as if there had there been no roll.

28.20 Family 9.2-9.8 – Hesitation Rolls

28.20.1 These rolls are judged on the same criteria as Slow Rolls, except the aircraft stops rotation during the roll a pre-stated number of times, e.g., 2, 4 or 8.

5° 28.20.2 For any error stopping the roll at the appropriate portion (e.g., 180°, 90°, 45°, or 22.5°) of a full roll, deduct one (1) point for every five (5) degrees of error.

1 28.20.3 The rates of roll between each point must match. For each roll rate observed to be different from the first, deduct one (1) point.

1 28.20.4 The duration of the hesitations at each point must match. For each pause duration observed to be different from the first, deduct one (1) point.

HZ 28.20.5 Each pause, or point, of a hesitation roll must be clearly recognizable to the judge. If a pause is not recognizable, mark the figure HZ.

28.21 Family 9.9 – Positive Flick Rolls (aka "Positive Snap Rolls")

28.21.1 A snap roll is an Autorotation at a high angle of attack.

HZ 28.21.2 The judge must see two things to determine that a positive snap roll has been correctly initiated:

1) a rapid and clearly visible pitch rotation in the nose up / tail down sense.
2) visible yaw rotation followed by Autorotation.

28.21.3 The yaw rotation may not occur before the pitch rotation, but they may occur simultaneously. If the yaw rotation occurs before the pitch rotation, deduct one (1) point for every five (5) degrees.

28.21.4 If both the required pitch change and Autorotation are not clearly seen, mark the figure HZ.

Clarification: When a snap roll is initiated, the angle of attack may be at or close to zero (e.g., in vertical and 45 degree lines) or significantly positive or negative (e.g., if a looping figure is being flown). The pitch change required to reach the critical angle will, as a result, vary depending on the figure being flown.

HZ 28.21.5 If the aircraft pitches in the wrong direction, mark the figure HZ.

5° 28.21.6 If there is roll motion observed before the Autorotation starts, deduct one (1) point for every five (5) degrees.

5° 28.21.7 Throughout the snap, the Autorotation must continue. If the Autorotation ceases before the end of the roll, deduct one (1) point for every five (5) degrees of rotation remaining.

5° 28.21.8 At the conclusion of the snap the aircraft must immediately adopt the attitude or flight path that conforms to the requirements of the underlying figure. If the original attitude or flight path angle is not reestablished, deduct one (1) point for every five (5) degrees.

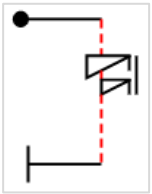
Clarification: A snap roll may cause a lateral or vertical displacement of the aircraft relative to its original flight path. Such displacements will not be downgraded as long as the displaced flight path remains parallel to the original flight path.

28.22 Family 9.10 – Negative Flick Rolls (aka "Negative Snap Rolls")

28.22.1 For negative snap rolls, all criteria stated for positive snap rolls apply except in a negative snap roll the nose and tail of the aircraft must initially move in the nose down / tail up sense.

Clarification: The negative snap roll characteristics of an aircraft may be quite different from positive snaps. As always, the competitor will be given the benefit of the doubt.

28.23 Family 9.11-9.12 – Spins



28.23.1 A spin is an Autorotation performed on a steeply descending flight path following an aerodynamic stall. Spins only appear on vertical downlines.

5° 28.23.2 When the aircraft stalls, the aircraft must simultaneously move around all three flight axes:

1) the nose will pitch toward the ground;
2) the aircraft will yaw; and
3) the aircraft will roll.

For failure to achieve simultaneous motion about all three axes, deduct one (1) point for every five (5) degrees of deviation.

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.

28.23.3 During the spin entry and in the spin, the flight path is affected by wind. When the spin is entered downwind, the flight path may suggest that the spin entry was "forced." The change of appearance due to wind direction is not a grading criterion.

Clarification: An aircraft has forward inertia as it decelerates through stall speed. This issue is more visible when the figure is performed downwind and is less visible when performed into the wind.

HZ 28.23.4 If the aircraft does not stall or establish Autorotation mark the figure HZ.

Clarification: Competitors may use snap rolls or other techniques to simulate a proper spin entry. Regardless of the entry technique, if the judge believes the aircraft did not stall prior to spin autorotation, the figure must be given a hard zero (HZ).

28.23.5 During Autorotation, pitch angle and rotation rate may vary without penalty.

5° 28.23.6 After completion of the prescribed number of turns, the aircraft must stop rotating precisely on either the X or Y axis and in the direction of flight appropriate to the sequence being flown. If the aircraft does not end up with the correct alignment, deduct one (1) point for every five (5) degrees of error.

5° 28.23.7 Autorotation must continue throughout the spin. If the Autorotation ceases before the end of the spin, deduct one (1) point for every five (5) degrees of rotation remaining.

Clarification: Judges must not confuse this with a "blended" recovery, see below.

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 remaining 15 degrees of rotation. The downgrade is three (3) points.

28.23.8 After Autorotation stops, the aircraft must establish a vertical down line with the wings parallel to the horizon. The pilot may achieve this by:

1) Immediately after rotation stops, pitching to the vertical down line and simultaneously bringing the wings parallel to the horizon, or
2) A "blended" recovery in which Autorotation stops, the aircraft pitches to the vertical down line, and the wings become parallel to the horizon simultaneously.

28.23.9 Because there is no vertical line before the spin there is no requirement to center spins on their lines.

28.23.10 If a roll follows a spin, there must only be a perceptible pause between the spin and the roll. There is no requirement for the roll to be centered on the vertical down line.

29 Presentation

29.1.1 The Presentation grade is based on the Grading Judge's overall impression of the Performance and has a possible range from 10.0 to 0.0 in 0.5 increments.

29.2 Presentation Coefficient

29.2.1 The Presentation "K" Factor increases with the difficulty of the category:

	Category	Presentation K
a)	Primary	5 K
b)	Sportsman	10 K
c)	Intermediate	15 K
d)	Advanced	25 K
e)	Unlimited	40 K

29.3 Grading Presentation

29.3.1 The exact method used to determine the Presentation grade is left to the individual judge but shall include the following criteria:

a) Balance on the X axis.
b) Management of wind conditions.
c) Control of distance and altitude for best viewing angle.
d) Consistent pacing.

29.3.2 While Presentation is intentionally subjective, judges must apply their methodology consistently to every pilot.

30 Chief Judge Responsibilities

30.1 Flight Coordination

30.1.1 The Chief Judge will coordinate with the Starter to launch aircraft according to the Order of Flight.

30.1.2 The Chief Judge will communicate by radio with pilots, granting them permission to enter the Aerobatic Box.

30.2 Recording Penalties

30.2.1 Penalties will be assessed by the Chief Judge and recorded on the Chief Judge Penalty Form.

30.2.2 The penalties for Altitude Infringement are only applied if observed by a majority of Grading Judges. The Chief Judge must review all score sheets for a competitor to determine if there is a majority.

30.3 Judge Removal

30.3.1 The Chief Judge will be responsible for removing any Grading Judge for reasons of incompetency.

30.4 Acting as Grading Judge

30.4.1 If necessary, the Chief Judge may also serve as a Grading Judge.

30.5 Emergency Competitor Disqualification

30.5.1 The Chief Judge may call an end to a flight for any competitor at any time for unsafe flying.

30.5.2 The Chief Judge may disqualify a competitor for unsafe flying if a majority of the Grading Judges agree.

30.6 Deadline and Judging Line Violations

30.6.1 The Chief Judge shall zero:

a) Any figure started behind the Judging Line as determined by the Chief Judge.
b) Any figure that is entirely or partially flown behind the deadline as determined by the Deadline Judge.

30.7 Judge Briefing

30.7.1 This briefing is mandatory for all personnel assigned to the Program.

30.7.2 The Chief Judge shall conduct the briefing at contest headquarters or at the Judging Line.

30.7.3 The briefing shall include:

a) Assistant duties.
b) Recorder duties.
c) Grading Judge's signals when problems exist.
d) Duty to clearly and immediately notify the Chief Judge concerning any situation which could compromise safety.
e) Range of grades.
f) Criteria for grading individual figures.
g) Criteria for grading Presentation.
h) Low and high-altitude limits and appropriate Form A comments.
i) Marking Hard and Numeric Zeros.
j) Conferences.
k) Average grade for unseen figures.
l) Debriefing time and place.

30.8 Post Program Duties of the Chief Judge

30.8.1 Before sending Program Forms to the Scoring Director, Chief Judges shall verify that all paperwork is correct:

a) Review the Chief Judge Penalty Forms for accuracy and provide specific reasons for any Zeroed Flight Program, Disqualification, or Illegal Free penalties.

b) Ensure that each competitor's Free Program Forms are signed and dated. In the case of unsigned forms, or any other irregularity noted in a Free Program Form, check the "Illegal Free Program" box on the Chief Judge Penalty Form.

30.8.2 The Chief Judge shall direct the Runner, or other responsible party, to deliver directly to the Contest Jury any competitor's forms which have the "Illegal Free Program" box checked on the Chief Judge Penalty Form.

30.8.3 The Chief Judge will debrief the Grading Judges and review any issues.

30.9 Judge Conferences

30.9.1 The Chief Judge may call a conference of judges, or a judge may request a conference, whenever there is doubt concerning a matter of fact, as indicated by a mix of numeric grades and HZ marks.

30.9.2 Conferences may not be called when the opinion of the Grading Judges is unanimous, when only matters of perception are involved, or there is a mix of zeros and Averages only.

30.9.3 If possible, the Chief Judge shall hold conferences at the next break in activity such that the issue may be discussed without any pilot holding in the air or with the engine running on the ground.

30.9.4 The conduct of Judge Conferences will be as follows:

a) The Chief Judge shall begin the conference by assembling the Grading Judges.

b) Assistants and Recorders shall not attend the conference.

c) The Chief Judge shall inform the judges of the matter of fact(s) to be discussed. Under no circumstances will there be any discussion of matters of perception. The four possible matters of perception are:

1) Whether or not a snap roll autorotated
2) Whether or not a spin autorotated
3) Whether a tailslide slid the required distance
4) Whether or not a rolling turn contained a snap roll

d) The Chief Judge shall return the scoresheets (Form A) to their respective judge.

e) The Chief Judge may assist the judges with ascertaining the facts but shall remain a neutral arbiter. They will not indicate an opinion regarding the proper grade or any other aspect of a competitor's Performance. They will in no way attempt to influence the judges.

f) Following discussion, each Grading Judge shall take one of the following actions:

1) The scoresheet may be left as originally marked.

2) The original mark may be changed to an HZ. For this option, the judge must cross out the original mark, leaving it legible, and write "HZ" with their initials next to the new mark.

3) An HZ mark may be changed to a "C" (Conference Average), to signify the grade resulted from a conference discussion of the facts. For this option, the judge must cross out the HZ, leaving it legible, and write "C" with their initials next to the new mark.

g) The Chief Judge shall not allow any other type of change.

h) After any changes are complete, the Chief Judge will collect and review each scoresheet for compliance with the above stated rules prior to releasing the forms to the Scoring Director.

31 Contest Jury

31.1 Duties

31.1.1 The Contest Jury is the arbitration body of aerobatic events and is primarily responsible for enforcing operation of the contest consistent with the intent of the rules.

31.2 Composition

31.2.1 The Contest Jury will consist of a chairman and at least four (4) additional members.

31.2.2 The Jury Chairman should not hold additional duties as either the Contest Director or Chief Judge.

31.2.3 Alternates may be appointed to replace a jury member, including the Chairman, if a juror is unable to serve.

31.3 Contest Suspension

31.3.1 The jury has the authority to suspend any contest due to a deviation from the rules.

31.4 Invalid Sequences

31.4.1 If the Contest Jury finds an Unknown Sequence to be illegally constructed or dangerous, they shall make the minimum changes required to correct it.

31.4.2 Competitors' Free Program Forms become final when the Program Briefing begins. Free Program Forms may not be altered by the competitor after they become final.

Should Free Program Forms be protested or identified as noncompliant any time after they become final, they are subject to penalty:

a) Forms:
If current IAC Forms were not used, apply a Failure to Prepare Penalty.

b) Form A:
If a figure has an incorrect Aresti Aerobatic Catalogue number, K-Factor, or drawing, it shall be zeroed.

c) Form B & C:
All illegible figures, figures flown which do not agree with Form A, or figures that cannot be flown as drawn, shall be zeroed.

d) Free Sequence Figure and K-Factor Limits [23.2]:
i. If the total number of figures exceeds the limit, any excess figure(s) shall be zeroed, starting from the last and working backwards until the maximum allowable number of figures is reached.
ii. If the Maximum Total Figure K-Factor exceeds the limit, figures will be zeroed starting with the last figure and progressing backwards until the Total Figure K-Factor is within allowable limits. If the Total K-Factor is absent or otherwise incorrect, the K-Factor shall be corrected on Form A and a Failure to Prepare Penalty shall be applied.

e) Versatility [23.4]:
If a versatility requirement is missing, one figure shall be zeroed for each missing versatility requirement, starting with the highest K figure and working backwards.

f) Allowable Figures [23.5]:
If a figure is used which is not allowed, it shall be zeroed.

g) Repetition [23.6]:
If there is an illegal repetition, all subsequent figures that contain an illegal repetition shall be zeroed.

h) Presentation Coefficient [29.2]:

If the Presentation K-Factor is absent or incorrect, the Presentation grade shall be zeroed.

i) Execution:
If the Forms are not signed and dated, the competitor will be assessed a Failure to Prepare Penalty.

31.5 Protests

31.5.1 Competitors and judges are eligible to submit a protest to the Contest Jury for consideration and possible action.

31.5.2 Protests will be submitted by the Grievant(s) in writing on the IAC Official Protest Form to the Contest Jury Chairman, either directly or through any member of the Jury.

31.5.3 Every protest must refer to the rule(s), policy, or other official document to which it relates.

31.5.4 The protest must be accompanied by a fee of $50.00, which will be returned if the protest is upheld.

31.5.5 The protest fee shall be waived for judges submitting a protest for a category they judged.

31.5.6 Protests must be submitted not later than two (2) working hours after the occurrence, decision, or publication of results which causes the protest to be made.

31.5.7 The Jury can accept a protest after the protest period expires if the Grievant was a volunteer whose commitments prevented submitting the protest within the defined period.

31.5.8 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 is entitled to be present at the hearing and to call witnesses and present evidence.

c) Persons not directly involved with the protest will be excluded from the hearing.

d) The Jury Chairman will preside over the hearing.

e) The Chairman will question each juror about their impartiality prior to the hearing and will replace any juror who has a conflict of interest.

f) At least three (3) members of the Jury must be present at the hearing.

g) Should the protest involve one or more grade(s) on the Form A Scoresheet and the protest is upheld, the Jury may take one of three actions:

1) A numeric grade (0.0 to 10.0) may be changed to an HZ.

2) An HZ may be changed to a “C” (Conference Average).

3) A confirmed but unresolvable clerical error (e.g., an unreadable mark) may be changed to a “C” (Conference Average).

h) A numeric grade (0.0 to 10.0) may never be changed to a different numeric grade, nor may an HZ be changed to a numeric grade.

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

31.5.10 The Grievant shall be notified in writing of the Contest Jury’s decision as soon as possible.

31.5.11 The discussion and votes of the Contest Jury are to be kept strictly confidential.

31.5.12 All protests and Contest Jury decisions will be submitted to the Contest Director.

31.6 Disqualification of Competitors

31.6.1 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, Grading Judges, Safety Officer and Technical Committee in these matters.

a) Unsportsmanlike conduct.

b) Missed Briefing - no competitor may fly without a complete Program Briefing.

c) Any flight not otherwise approved by the Contest Jury after the initial Program 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 Four Minute Freestyle.

f) Parachutes during contest flights - all solo competitors must either wear a parachute or fly an aircraft equipped with a ballistic recovery system (BRS). If competing with a Safety Pilot, both individuals are required to wear a personal parachute regardless of whether the aircraft is BRS-equipped.

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.

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.

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 Sequence 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 the aerobatic box without clearance is mandatory disqualification for that Program.

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.

32 Scoring

32.1 Scoring Director

32.1.1 The Scoring Director shall be responsible to the Chief Judge(s) and the Contest Director for operating the scoring software.

32.2 Delivery of Scores

32.2.1 Once the forms leave the Chief Judge's station, they may not be changed except under the direction of the Contest Jury.

32.2.2 The Chief Judge Penalty Form will be attached to the Form A's for the Program and delivered to the Scoring Director.

32.3 Software

32.3.1 Only IAC-supplied computer scoring software will be permitted. The Scoring Director will ensure the current version of the scoring system is being used and is responsible for adhering to the instructions and notices supplied by IAC.

32.4 Judging Line Integrity

32.4.1 The grades of any Grading Judge who was unable to complete grading an entire Program will be deleted from that Program.

32.5 Calculating the Final Grade for a Figure

32.5.1 The Final Grade for a figure will be the average of all scores for that figure with special treatment for:

a) Conference Averages ("C")
b) Hard Zeroes ("HZ")
c) Averages ("A")

32.5.2 Hard Zeroes override the other grades when they are in the majority. If more than 50% of the judges graded the figure a Hard Zero, the Final Grade for the figure is 0.0. Conference Averages are considered grades for the majority calculation, but regular Averages are not.

Example:

Grades: 0.0, HZ, HZ, HZ, A, 10.0
Note: The HZs are in the majority (3 HZ vs 2 other grades).
Result: The Final Grade is 0.0.

32.5.3 If the Hard Zeroes are in the minority, the Final Grade is the average of all the numeric grades. Averages ("A"), Conference Averages ("C"), and minority Hard Zeroes ("HZ") are disregarded.

Example 1:

Grades: 7.0, C, 8.0, A, and 7.5
Note: The "A" and "C" are disregarded.
Result: The Final Grade is (7.0+8.0+7.5)/3 = 7.5.

Example 2:

Grades: 0.0, HZ, HZ, HZ, C, and 10.0
Note: The HZs are in the minority (3 HZs vs 3 other grades). The HZs and C are disregarded.
Result: The Final Grade is (0.0+10.0)/2 = 5.0.

32.6 Final Program Score Computation

32.6.1 The Figure Score for each figure is the figure's Final Grade multiplied by the figure's K-Factor. Similarly, the Presentation Score is the Presentation Grade multiplied by the Presentation K-Factor.

32.6.2 The Raw Program Score is the total of all Figure Scores added to the Presentation Score.

32.6.3 The Final Program Score is the Raw Program Score minus any Penalties.

32.7 Disqualification, Withdrawal, and Incomplete Programs

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

32.7.2 In the event of a withdrawal, the Scoring Director will assign a grade of zero to all figures and penalties. These grades will not be discarded but will remain part of the calculations for the category.

32.7.3 In the event that any Program is not completed (e.g., not all competitors could fly because of weather), the Scoring Director will enter total penalty points equal to 9999 for the competitors that have flown the Program.

32.8 Contest Scores

32.8.1 The Contest Score will be the sum of all Final Program Scores, with the exception of the Four Minute Freestyle, unless a contest is terminated due to weather, time, or any unforeseen reason.

32.9 Official Scores

32.9.1 The Contest Director will make Forms A available for the personal inspection of the competitors as soon as possible. These scoresheets must remain under the supervision of the Contest Director or their designee until the expiration of the protest period.

32.9.2 Scores and standings become final when their protest period has expired.

32.9.3 If the contest must be stopped early only Programs where all competitors flew or were given an equal opportunity to fly will count for scoring.

32.9.4 The Contest Director and Chief Judge(s) will review the computation of all scores as soon as practicable and certify the scores as Official Scores by signing and dating them.

32.9.5 Once a pilot has received grades for any Performance, those grades 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.

32.10 Contest Records

32.10.1 The Contest Director will submit to the IAC:

a) Official Contest Results, including all files from the IAC scoring software.
b) A copy of all protests and Contest Jury decisions.

32.10.2 The Contest Director will retain all contest paperwork until Official Results and Final Standings are posted and the protest period has expired.

32.10.3 The Contest Director will retain the applications for entry into the contest for a period of one year.

33 Trophies and Recognition

33.1 Hors Concours Entrants

33.1.1 A competitor may compete without the intent of earning flight medals or trophies. This is called an "Hors Concours" entry.

33.1.2 A competitor competing in more than one category may only compete for medals and trophies in the highest category entered.

33.2 Minimum Competitors in a Category

33.2.1 The minimum number of competitors to comprise a category for official ranking and trophies is two.

33.2.2 A competitor flying alone in a category competes Hors Concours but may still earn special awards (e.g. Grassroots), IAC Achievement Awards, and point totals for regional, collegiate, or national awards.

33.3 Overall Trophies

33.3.1 Individual 1st, 2nd and, if three or more competitors flew, 3rd place trophies will be awarded to category winners at all sanctioned contests.

33.4 Flight Medals (aka "Clinkies")

33.4.1 Individual 1st, 2nd and 3rd place medals for each Program (Known, Free, and Unknown) may be awarded at the option of the Contest organizers.

33.5 Prize Money

33.5.1 Prize money may be awarded at the discretion of Contest organizers.

33.6 Best First Time Sportsman Award

33.6.1 The highest-ranking first-time Sportsman competitor will be recognized with a separate award.

33.7 Other Awards

33.7.1 Awards for other special categories, as currently defined and recognized by the IAC, will be presented, as appropriate.

33.8 Chapter Team Trophy

33.8.1 Chapter Team Trophies may optionally be awarded at all IAC sanctioned contests.

33.8.2 The Chapter Team Trophy will be presented to the IAC Chapter whose top three members, regardless of category, achieve the highest average percentage score.

33.8.3 All Programs flown at the completion of the contest will be counted, with the exception of the Four Minute Freestyle.

33.8.4 In the event of a tie, those Chapters' next highest placing competitor's scores will be used.

33.8.5 Any perpetual trophy will be retained by the winning chapter for one year.

34 Gliders

34.1.1 Gliders are generally flown in separate Glider Categories with special exceptions to the rules, as defined in this section.

34.2 Glider Categories

34.2.1 Glider Categories are Sportsman, Intermediate, Advanced, and Unlimited.

34.2.2 There is no "Primary" Glider Category.

34.3 Competing in both Power and Glider Categories

34.3.1 Competitors may compete in both a power and a glider category at the same contest.

34.4 Gliders Flying in Power Categories

34.4.1 If glider categories are not flown at a contest, gliders will be permitted to enter the power categories.

34.4.2 A glider may always enter the power Primary category, even if glider categories are flown.

34.4.3 Glider competitors flying in power categories will be treated as if they were flying powered aircraft.

a) All Power Programs (Known, Free, and Unknown, as applicable) will be flown.

b) Power Aresti figure K, power category free construction rules, and power category Known and Unknown Sequences shall apply.

c) Gliders entered into power categories will be judged using the same criteria as power aircraft except that glider rules regarding level lines and snap roll placement will apply for all categories. The flying and judging of 30 degree lines will apply for the Primary, Sportsman, and Intermediate glider categories.

d) Scores will be compiled and listed in order with the Power competitors.

34.5 Motorgliders

34.5.1 Motorgliders, despite their engine, may compete as glider aircraft.

Clarification: This means that motorgliders may be registered as:

a) glider aircraft in a power category
b) glider aircraft in a glider category
c) power aircraft in a power category

34.5.2 If competing as glider aircraft, motorglider pilots must shut down the engine when they are cleared into the box and may not restart it until they depart the box to land.

34.5.3 If competing as powered aircraft, the aircraft will be treated entirely as a powered airplane.

34.6 Glider Pilot Qualifications

34.6.1 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.

34.7 Glider Safety Pilots

34.7.1 Safety Pilots are allowed in all categories of Glider competition.

34.8 Glider Backup Seat Belt Attach Points

34.8.1 The required backup seat belt for the Advanced category may share an attach point with the primary seat belt.

34.9 Boundary Infringement Penalties

34.9.1 The Penalties for flying beyond the boundaries of the Aerobatic Box in a glider are:

	Category	Penalty
a)	Sportsman	5 points
b)	Intermediate	10 points
c)	Advanced	15 points
d)	Unlimited	20 points

34.10 Interruption Penalties

34.10.1 The Penalties for an Interruption in a glider are:

	Category	Penalty
a)	Sportsman	5 points
b)	Intermediate	15 points
c)	Advanced	30 points
d)	Unlimited	70 points

34.11 Altitude Limits

34.11.1 The Glider Altitude Limits are:

	Category	Lower Limit	Upper Limit
a)	Sportsman	1,500 feet	4,000 feet
b)	Intermediate	1,200 feet	4,000 feet
c)	Advanced	656 feet (200m)	3,937 feet (1200m)
d)	Unlimited	656 feet (200m)	3,937 feet (1200m)

34.12 Altitude Limit Penalties

34.12.1 Sportsman

	Infringement	Tolerance	Altitude	Penalty
a)	HIGH	None	Above 4,000 feet	5 points each figure
b)	LOW	None	Below 1,500 feet	Zero Entire Performance

34.12.2 Intermediate

	Infringement	Tolerance	Altitude	Penalty
a)	HIGH	None	Above 4,000 feet	10 points each figure
b)	LOW	1 to 200 feet	1,000 to 1,199 feet	60 points each figure
c)	LOW-LOW	> 200 feet	Below 1,000 feet	Zero Entire Performance

34.12.3 Advanced

	Infringement	Tolerance	Altitude	Penalty
a)	HIGH	None	Above 3,937 feet	15 points each figure
b)	LOW	1 to 328 feet	328 to 656 feet	70 points each figure
c)	LOW-LOW	> 328 feet	Below 328 feet	Zero Entire Performance

34.12.4 Unlimited

	Infringement	Tolerance	Altitude	Penalty
a)	HIGH	None	Above 3,937 feet	20 points each figure
b)	LOW	1 to 328 feet	328 to 656 feet	100 points each figure
c)	LOW-LOW	> 328 feet	Below 328 feet	Zero Entire Performance

Note: 328 feet = 100 meters, 656 feet = 200 meters, 3,937 feet = 1200 meters

34.13 Weather

34.13.1 The Aerobatic Box must be free of precipitation for Glider flights.

34.13.2 If the height of the cloud base is less than 4,000 feet and more than 2,500 feet, the Contest Jury may allow competitors to fly shortened Known and Unknown Sequences. The figures to be graded will be announced at the Program Briefing. A Free Program will be flown in two parts, with a break occurring at a point chosen by the competitor.

34.14 Towplanes

34.14.1 The tow pilots are responsible for the safe tow of competition gliders to altitude and, when cleared by the Chief Judge, onto a base leg where the glider will release and enter the Aerobatic Box. These pilots will also make reports of turbulence, precipitation, visibility, and ceilings, as requested by the Chief Judge.

34.14.2 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.

34.14.3 Tow and release procedures from towplanes will be briefed to all glider competitors.

34.15 Tow and Release Procedures

34.15.1 The towplane will tow the competitor to the altitude appropriate for that flight (no more than 5,000 feet or less than 2,500 feet). The towplane will then position 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 to remain on tow.

34.15.2 The pilot may reposition the glider after release and prior to signaling. If conditions warrant, the glider may release tow prior to being cleared into the aerobatic box by the Chief Judge. In that case, the glider pilot shall advise the Chief Judge of their intention to release early and may use thermals to maintain altitude prior to being cleared into the box. If sufficient altitude cannot be maintained prior to being cleared into the box, the glider will return to the airport and land. In that case, a reflight will be granted without penalty.

34.15.3 The towplane and glider pilots must monitor the frequency assigned by the Chief Judge at the Program 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.

34.16 Mixing Gliders with Powered aircraft

34.16.1 If there are an adequate number of towplanes to permit a continuous flow of gliders into the Aerobatic Box, then Glider flights in each Program will follow one another.

34.16.2 Any mixing of Powered and Glider aircraft shall be done in a manner permitting efficiency of operation without compromising safety.

34.17 Presentation

34.17.1 Category Presentation coefficients for Glider Programs are as follows:

	Category	Presentation K	
a)	Sportsman	15 K	
b)	Intermediate	15 K	
c)	Advanced	25 K	(Known and Unknown)
		35 K	(Free)
d)	Unlimited	25 K	(Known and Unknown)
		35 K	(Free)

34.18 Free Sequences

34.18.1 Figure and K Limits

	Category	Maximum # of Figures	Maximum Total Figure K-Factor
a)	Sportsman	No Limit	Must match current Known Program
b)	Intermediate	No Limit	140
c)	Advanced	10	175
d)	Unlimited	10	230

34.18.2 Floating Points

34.18.2.1 Glider competitors may make use of up to 3 Floating Points in their Free Sequences. Figure K values will be reduced by removing one point from the highest coefficient figures and then each figure in decreasing K-value order until the maximum total is achieved. On Form A, the original figure coefficient will be given as well as the reduced value for each figure affected.

34.18.3 Versatility

34.18.3.1 Sportsman

a)	**Family 2**	At least one.
b)	**Family 7**	At least one.
c)	**Family 9**	At least one Slow Roll (9.1).

34.18.3.2 Intermediate

a)	**Family 2**	At least one.
b)	**Family 5**	At least one.
c)	**Family 7**	At least one.
d)	**Family 9**	At least one Slow Roll (9.1).
e)		At least one Positive Spin (9.11).

34.18.3.3 Advanced

a)	**Family 2**	At least one.
b)	**Family 5**	At least one.
c)	**Family 6**	At least one.
d)	**Family 7**	At least one.
e)	**Family 8**	At least one.
f)	**Family 9**	At least one Slow Roll, ½ or greater (9.1.1.2 thru 9.1.1.8, 9.1.2.2 thru 9.1.2.8, 9.1.3.2 thru 9.1.3.8, 9.1.4.2 thru 9.1.4.8, 9.1.5.2 thru 9.1.5.8).
g)		At least one Hesitation Roll (9.2 thru 9.8) of any extent.

34.18.3.4 Unlimited

a)	**Family 2**	At least one Rolling Turn with at least a full Roll (2.1.3, 2.2.2 thru 2.2.7, 2.3.2 thru 2.3.6, 2.4.2 thru 2.4.8)
b)	**Family 5**	At least one.
c)	**Family 6**	At least one.
d)	**Family 7**	At least one.
e)	**Family 8**	At least one.

f) **Family 9** — At least one Slow Roll, ½ or greater (9.1.1.2 thru 9.1.1.8, 9.1.2.2 thru 9.1.2.8, 9.1.3.2 thru 9.1.3.8, 9.1.4.2 thru 9.1.4.8, 9.1.5.2 thru 9.1.5.8).

g) At least one Hesitation Roll (9.2 thru 9.8).

h) At least one Snap Roll (9.9 thru 9.10).

34.18.4 **Start and Finish Attitudes**

34.18.4.1 Glider Sportsman and Intermediate Free Sequences must begin and end in level upright orientation.

34.18.4.2 Glider Advanced and Unlimited Free Sequences may start in upright or inverted orientation but must end in upright orientation.

34.18.5 **Allowable Figures**

34.18.5.1 Any figure identified in the Aresti System Catalogue for Glider Aerobatic Figures may be used.

34.18.5.2 In addition, Sportsman and Intermediate Free Sequences may also use:

a) The Wingover. It is assigned a pseudo Catalogue number of 0.0. and a K-Factor of 8.

b) The Quarter-Clover. It is 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.

34.18.5.3 Figures 1.1.1.1 and 1.1.1.2 may be used only in conjunction with Family 9 rolls.

34.18.6 **Repetition**

34.18.6.1 Sportsman and Intermediate Sequences may repeat figures if they are used in combination with different Family 9 rolls.

Example: It would be legal to include an 8.5.6.1 + 9.1.4.2 and another 8.5.6.1 + 9.4.4.2 in the same Glider Intermediate Free sequence.

34.18.6.2 Advanced and Unlimited Free Sequences may repeat Families 1.1.1.x. and 9.1.x.x without limit.

34.19 Unknown Sequence Restrictions

34.19.1 The Number of Figures, Individual Figure K-Factor, and Total Figure K-Factor are restricted as follows:

		Number of Figures		Maximum Individual	Maximum Total
	Category	Minimum	Maximum	Figure K-Factor	Figure K-Factor
a)	Intermediate	6	9	N/A	130
b)	Advanced	7	9	35	145
c)	Unlimited	7	9	40	190

34.19.2 Unlinked Rolls are restricted as follows:

	Category	Restriction
a)	Intermediate	Unlinked Rolls are not permitted.
b)	Advanced	Opposite Aileron Rolls are permitted, but only on *straight* horizontal lines.
c)	Unlimited	Opposite Aileron Rolls are permitted, but only on *straight* horizontal lines.

34.20 Grading Glider Performances

34.20.1 **45 degree Lines**

34.20.1.1 In the case of Glider Sportsman and Glider Intermediate, as well as for gliders competing in the power Primary category, 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).

34.20.2 **Figure Entry and Exit**

34.20.2.1 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, provided the angles do not violate the basic form of the figure.

Example: If a pilot is about to fly a loop, which requires only a moderate velocity, followed by a hammerhead with a quarter-roll on the up line, which requires a high velocity, a judge can expect a much steeper attitude on the line marking the loop's exit than on the line marking the entry to the loop.

34.20.3 **Constant Altitude Figures**

34.20.3.1 Figures which must be flown at a constant altitude in power aerobatics, which includes Horizontal Single Lines (1.1.1.1 to 1.1.1.4) and all of Family 2 Turns and Rolling Turns, may be flown by the gliders at a constant, reasonable angle to the horizon. If the angle changes during the figure, however, a deduction will be applied.

Example: If a 360 degree rolling turn is entered and flown with a constant 10 degree descent, no deduction would be made.

34.20.4 **Snap Rolls**

34.20.4.1 Glider snap rolls do not have to be centered on their Interior Lines. Gliders are only required to show a visible line before and after the snap roll.

34.20.5 **Tailslides**

34.20.5.1 A glider is required to slide only a visible amount.

34.20.6 **Horizontal 8's**

34.20.6.1 The ⅝ and ¾ loops, as well as the start and finish of the figure, are never required to be at the same altitude.

Clarification: This family can be thought of as two linked three-quarter loops (sub-Families 7.3.1 -- 7.3.4). Each of the 45 degree lines may be of different lengths. Due to glider flight mechanics, the two ¾ loops cannot occur at the same height, nor is there any strict relationship between the horizontal entry/exit altitudes and the altitude limits of the two ¾ loops.

35 The Four Minute Freestyle

35.1 Description

35.1.1 The Four Minute Freestyle is an optional timed artistic Program held at the discretion of the Contest Director.

35.2 Scoring

35.2.1 This Program's results will not be included in the scores that determine final standings. It will be treated as a separate trophy flight.

35.3 Scheduling

35.3.1 The Four Minute Freestyle is to be the final Program of the contest.

35.4 Eligibility

35.4.1 All Unlimited competitors and any Advanced category competitors who hold at least a current ICAS 250-foot Statement of Aerobatic Competency may compete in the Four Minute Freestyle.

35.4.2 All Four Minute Freestyle competitors must have completed their category's Programs.

35.5 Composition

35.5.1 The selection of figures need not be made with reference to the Aresti Aerobatic Catalogue. There will be no limitation on the number of figures.

35.6 Use of Forms

35.6.1 There will be no submission of forms or sequences to the Contest Director.

35.7 Smoke and Music

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

35.8 Performance Zone

35.8.1 The Performance Zone for the Four Minute Freestyle may coincide with the Aresti competition aerobatic box or be in a different location. There will be no lateral boundaries, nor will Boundary Judges be used. However, the floor and ceiling will be as mandated for the Unlimited category.

35.9 Signaling Start and Finish

35.9.1 The competitor must signal the start and finish of this Performance by distinctly dipping a wing more than 45 degrees three (3) times in succession.

35.9.2 The timer must be started on the return to wings level after the third wing dip; and must be stopped on the return to wings level after the third of the final three (3) wing dips.

35.9.3 The start and finish of the Four Minute Freestyle may be in normal or inverted orientation on a horizontal, ascending or descending path, which must not deviate from the horizontal by more than 45 degrees.

35.10 Penalties

35.10.1 Penalties applicable to the Four-Minute Freestyle are:

a) **Time Limits**

The time limit will be between 3 minutes 30 seconds and 4 minutes. Deduct 10 points for each second or fractional part of a second over or under the limit.

Example 1: A total time of 3 minutes 29.5 seconds would receive 10 penalty points.

Example 2: A total time of 4 minutes 1.3 seconds would receive 20 penalty points.

b) **Deadline Violation**

Each excursion across any Deadline will be penalized by 300 points.

c) **Altitude Infringements**

The Upper and Lower altitude limits for the Unlimited category will be enforced. LOW limit penalties will be 250 points. HIGH penalties will be 50 points. The Chief Judge will instruct any pilot who flies below the LOW-LOW altitude to break and land immediately.

d) **Improper Wing Dip**

If the competitor fails to meet the criteria specified in Signaling Start and Finish, apply an Improper Wing Dip Penalty of 150 points for each violation.

35.10.2 The Chief Judge shall record penalties on the Four Minute Freestyle Program Form A.

35.11 Judging Criteria

Each of the 10 Freestyle objectives has a K value of 40 for a total Program K of 400. A grade of 10.0 to 0.0, in increments of 0.5, will be given for each objective according to their conformance with the following criteria:

35.11.1 Complete Use of the Flight Envelope

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. Flight time will be divided between high and low speeds, high and low G maneuvers, and both positively and negatively G loaded flight segments. The flight will 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.

35.11.2 Exploitation of Aerodynamic and Gyroscopic Forces

The pilot is expected to show movement of the aircraft about all axes using both conventional aerodynamic controls and propeller-generated gyroscopic forces. Higher grades 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 will result in lower grades.

35.11.3 Execution of Individual Maneuver Elements

It must be clear that the maneuvers flown were, in fact, intended and fully under the pilot's control. Higher grades 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, grades will be deducted for poor execution. Grades will also be deducted if it appears that the pilot has relinquished control of the aircraft at any time.

35.11.4 Wide Variety of Figures Flown on Different Axes and Flight Paths

Many different figures must be completed in the time available. These should include maneuver elements of many different kinds with many different flight paths and axes. Lower grades will 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.

Grades will also be reduced if any maneuver element is over-used or continues for an excessive period. For example, higher grades shall 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.

35.11.5 The Pleasing and Continuous Flow of Figures

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 will then begin without any prolonged period of inactivity caused by the need to reposition the aircraft or reorient the pilot. Grades will be reduced for any obvious period of level flight, or inactivity, required between figures.

35.11.6 Contrasting Periods of Dynamic and Graceful Maneuvers

In a musical symphony, the listener's mood may be changed by contrasting fast and slow movements. Similarly, in a Four Minute Freestyle, the judge is to 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 grades will be given to a pilot who finds time in their flight for showing such differences of mood and pace. Grades will be reduced in this category for a flight that shows no such distinctions.

35.11.7 Presenting Individual Figures in Their Best Orientation

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. Grades will therefore be reduced if the judge is not shown a figure in its best orientation.

35.11.8 Placing Individual Figures in Their Optimum Position

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 grades will therefore be given when individual figures are optimally placed, while judges will reduce grades when it appears that a figure is not well positioned.

35.11.9 Symmetry

Highest grades will be given when the Flight is balanced evenly to the left and right of the Performance Zone. Grades will be reduced if, by design or by the influence of the wind, a pilot's flight is noticeably biased to left or right. The greater the degree of asymmetry, the greater the deduction.

35.11.10 The Performance Zone

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 too distant. Any part of the flight that is flown so far away that it appears to be outside the zone will be penalized at a rate of 0.5 for each apparent excursion.

36 Understanding Aresti Notation

36.1.1 This section does not contain IAC rules. It is merely a summary of the information found in Chapter 1 of the Aresti Aerobatic Catalogue.

36.2 Basic Figure Concepts

36.2.1 Figures begin with a dot or small circle and end with a short cross line.

36.2.2 Figures always begin and end in level flight, upright or inverted.

36.2.3 Most figures are merely combinations of lines and radii, but figures can also include turns (Family 2) or special rotations (Families 5 and 6).

36.3 Lines

36.3.1 Within a figure all lines are horizontal, vertical, or 45 degrees.

36.3.2 All lines on the X Axis are drawn according to expectations, but horizontal Flight on the Y Axis is drawn at 30 degrees to distinguish it from a 45 degree line.

36.3.3 Solid lines are used when the aircraft is positively loaded (but not necessarily upright). Dashed red lines are used when the aircraft is negatively loaded (but not necessarily inverted).

36.3.4 When a figure begins and ends on the Y axis, the entry and exit lines must be drawn parallel to each other to indicate whether the figure is to exit in the same or opposite direction of the entry.

36.4 Radii

36.4.1 In the Aresti Aerobatic Catalogue any radii less than 180° is depicted as a hard corner but will still be flown as a smooth radius.

36.5 Rolls

36.5.1 Figures have symbols showing where rolls can be placed. These symbols are:

Compulsory Half-Roll: The aircraft must roll such that it changes upright/inverted orientation.

Optional Roll: If rolls are placed here, they must be a multiple of 360 degrees.

Optional Vertical Roll: If rolls are placed here, they must be a multiple of 90 degrees.

Optional Spin and/or Vertical Rolls: Spins are allowed on this line.

36.5.2 There are three types of rolls: aileron rolls (slow and hesitation), snap rolls (called “flick” rolls in the Aresti system), and spins.

a) Slow rolls are drawn as curved lines with arrow heads. The name “slow” is antiquated and does not define the rate at which the roll should occur.

b) Hesitation rolls are drawn as slow rolls with hesitations listed as AxB, where A is the number of points to be flown and B is the number of points that would occur in 360 degrees of roll, except that when the points of a hesitation roll add up to 360 degrees only the “B” value is printed.

Example: A “3 of 2” roll would be annotated as “3x2” but a “4 point” roll would be annotated only as “4”.

c) Snap rolls are drawn as isosceles triangles with a line emanating from the tip in the direction of flight.

d) Spins are drawn as right triangles with a line emanating from the tip in the direction of flight.

36.5.3 Negative spins and snaps have the triangle filled in and are drawn in red.

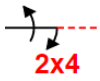
36.6 Linked and Unlinked Rolls

36.6.1 Multiple continuous rotations are called linked rolls. They are drawn as two roll symbols with their tips linked by a small line. These are flown without pause. No linked roll may exceed 720 degrees.

36.6.2 When there are two rolls on a line, they are called unlinked rolls. When unlinked rolls of the *same type* are added to a line, they must be in opposite directions.

36.7 Roll direction

36.7.1 There is no left/right directionality implied, but the pointy part of a roll symbol does indicate opposite vs same direction in the case of unlinked rolls, or inside vs outside in the case of rolling turns.



A "slow" aileron roll followed by a 2 of 4 in the opposite direction. The curve of the line indicates the path of flight is from left to right.

A positive snap roll. The tip is pointing to the right, indicating that the path of flight is from left to right.

A 1 ½ rotation positive spin. Spins, naturally, can only be flown on vertical down lines. This is also an example of a linked roll showing more than 360 degrees of full rotation using two separate spin symbols linked together by a line.

36.8 Figure Numbers

36.8.1 Figures are addressed with four numbers. The first number indicates the Family, the second number is the sub-Family, the third is the row, and the fourth is the column.

36.8.2 Generally, figures in column 1 ascend from upright flight, figures in column 2 ascend from inverted flight, figures in column 3 descend from upright flight, and figures in column 4 descend from inverted flight.

36.9 K Factors

36.9.1 Each figure has a K Factor which is a measure of its difficulty.

36.9.2 The total K Factor for a figure is the K factor of the base figure plus the K Factors of any rolls applied to it.

Example: A P loop with 1 ½ turn spin and a 2 of 2 followed by a 2 of 4 opposite.

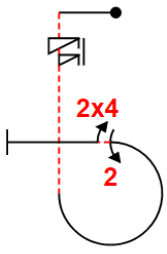


Figure	Aresti Catalog Number	K Factor
P Loop	8.6.4.3	13
1 ½ Turn Positive Spin	9.11.1.6	3
2 point roll	9.2.3.4	9
2 of 4 roll	9.4.3.2	5
Total		**30**

36.10 Snap Roll K Factor

36.10.1 Because the difficulty of a snap roll depends on the aircraft's loading during the snap, the Aresti system provides for different K values for snaps on positively loaded lines vs negatively loaded lines. This is normally easy to understand because the tables show the nature of the lines as solid or dashed lines.

However, there are three special scenarios the Aresti system considers:

1) When snaps are placed on horizontal lines at the end of a Looping Line, the loading of the Looping Line is used.

Example: The snap roll on the left comes after a positively loaded Looping Line. The correct catalog number is 9.9.3.4 which is 11 K. The snap roll on the right, while the same maneuver, comes after a negatively loaded Looping Line. The correct catalog number is 9.9.8.4 which is 13 K.

2) With vertical lines, after a roll (of any type), hammerhead, or tailslide, the loading of the line is considered to be zero and the lower of the two possible K factors is used.

3) Snap rolls initiated from knife edge position are specially handled: the correct K value is the lower value when the snap roll uses "top" rudder, and the higher value when the snap uses "bottom" rudder.

Example: Both ¾ negative snap rolls are from the knife edge position, but the one on the left uses top rudder and therefore is catalog number 9.10.4.3 (13K) while the one on the right uses bottom rudder and is catalog number 9.10.9.3 (15K).

Clarification: This is the most complicated subject in the entire rule book and there is no way to make it easy. Software, such as that found at openaero.net, automates the calculation of K values. For those who want to do it manually, this table makes the process a bit easier. Given the aircraft's starting attitude (upright or inverted) and the roll preceding the snap (which is necessary for knife edge flight to occur), and given the type and direction of the snap (positive/negative, same/opposite), the table shows whether the "higher" or "lower" K snap roll catalog number should be chosen.

Knife Edge Snap Roll K

Starting Attitude	Preceding Roll	Positive Snap Direction		Negative Snap Direction	
		Same	Opposite	Same	Opposite
Upright	¼ or 1 ¼	Higher	Lower	Lower	Higher
	¾ or 1 ¾	Lower	Higher	Higher	Lower
Inverted	¼ or 1 ¼	Lower	Higher	Higher	Lower
	¾ or 1 ¾	Higher	Lower	Lower	Higher

37 Allowable Figures for Unknown Sequences

37.1 About this Chapter

37.1.1 The tables that follow are a subset of the Aresti catalogue showing allowable figures for Power and Glider Unknown sequences.

37.1.2 Each cell in the tables below shows the K-factor and category (or categories) in which the figure can be used.

37.1.3 The categories are abbreviated as

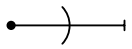
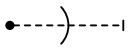
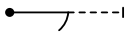
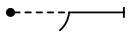
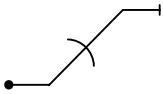
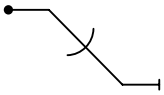
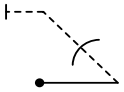
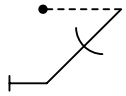
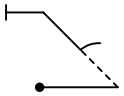
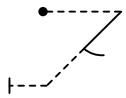
a) **I** (Intermediate)
b) **A** (Advanced)
c) **U** (Unlimited)

Clarification: Contrary to expectations, there are cases where figures that are allowed in a lower category are disallowed in an upper category.

37.1.4 Footnotes describe restrictions on specific figures.

37.2 Allowable Figures for Power

37.2.1 Sub-Family 1.1 – Single Lines

	1	2	3	4
1.1.1	 2K IAU	 3K IAU	 2K IAU	 2K IAU
1.1.2	 7K IAU	 8K AU	 7K IAU	 8K AU
1.1.3	 7K IAU	 8K AU	 8K AU	 7K IAU
1.1.6	 10K IAU	 11K AU	 10K I[1]AU	 10K AU
1.1.7	 9K IAU	 12K AU	 11K AU	 9K IAU
1.1.10	 9K U			 8K U
1.1.11	 9K U			 10K U

1) Must incorporate a 9.11.1 spin.

37.2.2 Sub-Family 1.2 – Two Lines

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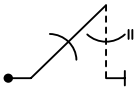
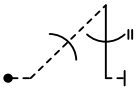
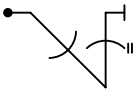
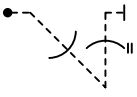
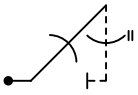
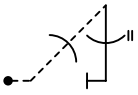
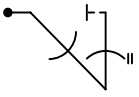
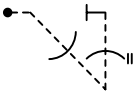
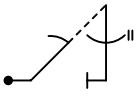
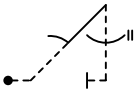
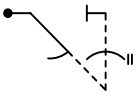
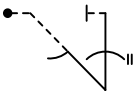
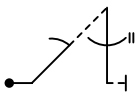
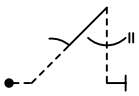
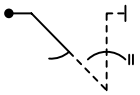
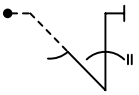
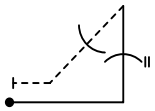
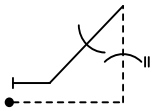
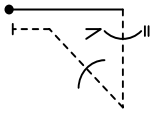
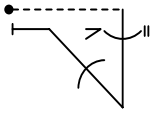
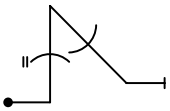
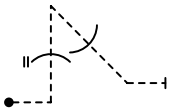
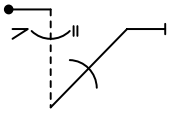
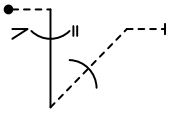
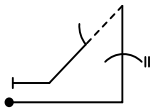
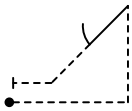
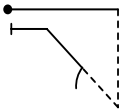
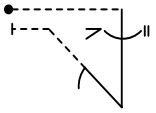
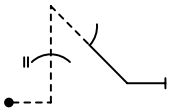
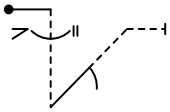
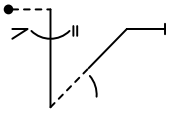
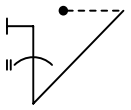
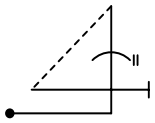
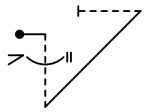
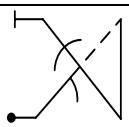
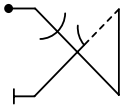
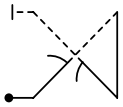
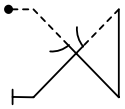
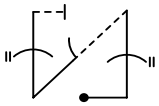
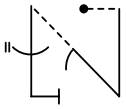
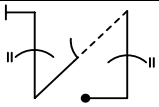
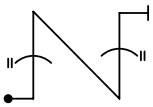
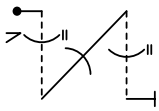
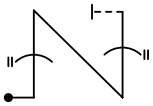
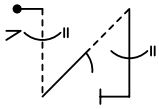
1.2.1	 13K IAU	 14K U	 13K I[1]AU	 15K U
1.2.2	 14K U	 13K U	 12K I[1]AU	 15K U
1.2.3	 12K IAU	 16K U	 15K AU	 12K IAU

1.2.4	 13K U	 14K AU	 14K AU	 13K IAU
1.2.5	 14K AU	 16K U	 17K U	 14K I^2AU
1.2.6	 14K IAU	 16K U	 15K $I^{1+3}AU$	 15K U
1.2.7	 13K IAU	 17K U	 16K 1U	 14K I^2AU
1.2.8	 16K AU	 15K U	 15K I^3AU	 15K U
1.2.10				 15K I^1
1.2.13	 16K I			
1.2.14			 17K I^3	

1) Roll are not permitted on the 45 degree line.
2) Rolls are not permitted on the vertical down line.
3) Must incorporate a 9.11.1 spin.

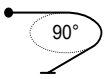
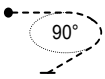
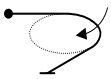
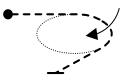
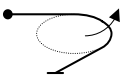
37.2.3 Sub-Family 1.3 – Three Lines

	1	**2**	**3**	**4**
1.3.2	 18K I			

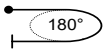
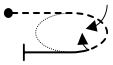
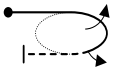
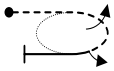
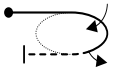
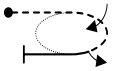
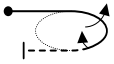
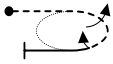
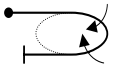
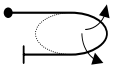
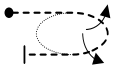
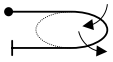
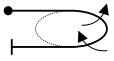
1.3.3			 18K I	
1.3.4	 18K I			 18K I
1.3.11	 20K I			 20K I
1.3.12	 21K I			
1.3.13	 22K I		 23K I[1]	
1.3.14	 22K I			
1.3.16			 22K I[1]	

1) Must incorporate a 9.11.1 spin.

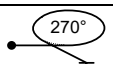
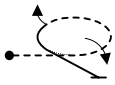
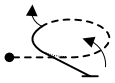
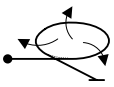
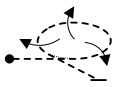
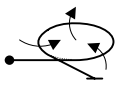
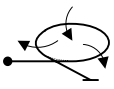
37.2.4 Sub-Family 2.1 – 90 Degree Turns and Rolling Turns

	1	**2**	**3**	**4**
2.1.1	 3K I	 4K I		
2.1.3	 14K IA	 15K A	 15K A	 16K A

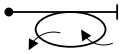
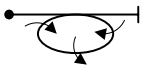
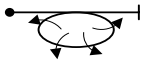
37.2.5 Sub-Family 2.2 – 180 Degree Turns and Rolling Turns

	1	2	3	4
2.2.1	 4K I			
2.2.2	 26K U	 27K U	 28K U	 29K U
2.2.3	 24K AU	 24K AU	 26K AU	 26K AU
2.2.4	 26K U	 26K U	 27K U	 27K U
2.2.5	 22K AU	 23K AU	 24K AU	 25K AU
2.2.6	 25K U	 26K U	 25K U	 26K U

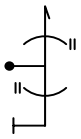
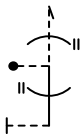
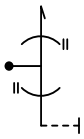
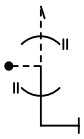
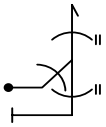
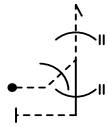
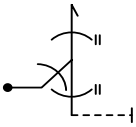
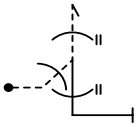
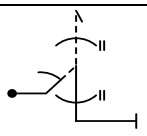
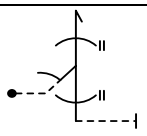
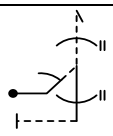
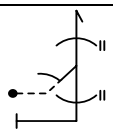
37.2.6 Sub-Family 2.3 – 270 Degree Turns and Rolling Turns

	1	2	3	4
2.3.1	 5K I			
2.3.2	 34K U	 34K U	 37K U	 37K U
2.3.3	 37K U	 37K U	 38K U	 38K U
2.3.4	 30K AU	 31K AU	 33K AU	 34K AU
2.3.5	 35K U	 36K U	 36K U	 37K U

37.2.7 Sub-Family 2.4 – 360 Degree Turns and Rolling Turns

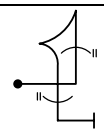
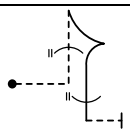
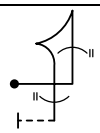
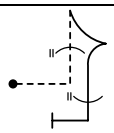
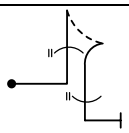
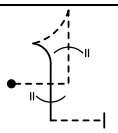
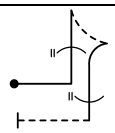
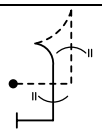
	1	2	3	4
2.4.1	 6K I			
2.4.3	 42K U	 43K U	 46K U	 47K U
2.4.4	 46K U	 47K U	 46K U	 47K U
2.4.5	 39K AU	 40K AU	 43K U	 44K U
2.4.6	 45K U	 45K U	 46K U	 47K U
2.4.7	 38K AU	 39K AU	 42K U	 43K U
2.4.8	 46K U	 47K U	 46K U	 47K U

37.2.8 Family 5 – Stall Turns (Hammerheads)

	1	2	3	4
5.2.1	 17K IAU	 23K AU	 18K AU	 22K AU
5.3.1	 18K A^1U^2	 25K A^1U^2	 20K A^1U^2	 20K A^1U^2
5.3.2	 24K A^1U^2	 22K A^1U^2	 25K A^1U^2	 21K A^1U^2

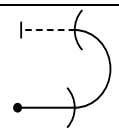
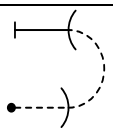
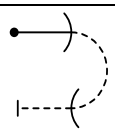
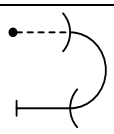
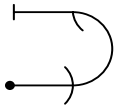
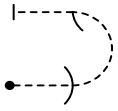
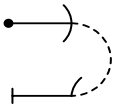
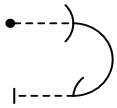
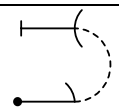
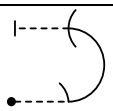
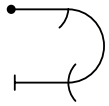
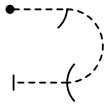
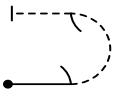
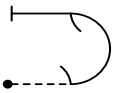
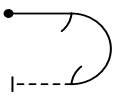
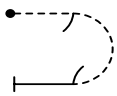
1) Only 9.1.2.2 and 9.4.2.2 are permitted on 45 degree lines. Only 9.1.1.1 is permitted on vertical up lines.
2) Snap rolls are not permitted on vertical up lines or 45 degree lines. The combined total for all rolls on the 45 degree and vertical up lines must not exceed 450 degrees of rotation and 4 stops.

37.2.9 Family 6 - Tailslides

	1	2	3	4
6.2.1	 15K U[1]	 18K U[1]	 16K U[1]	 17K U[1]
6.2.2	 15K U[1]	 18K U[1]	 16K U[1]	 17K U[1]

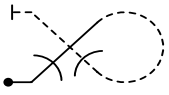
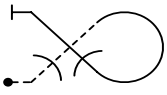
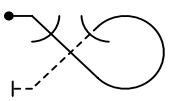
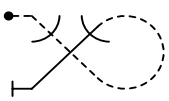
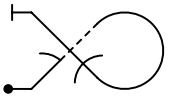
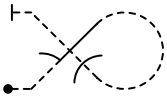
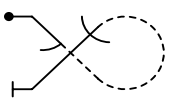
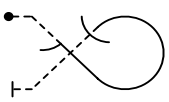
1) Snap rolls are not permitted on vertical up lines.

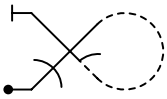
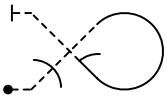
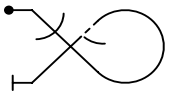
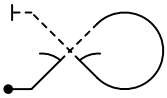
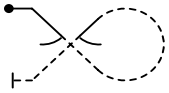
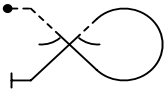
37.2.10 Sub-Family 7.2 – Half Loops

	1	2	3	4
7.2.1	 6K $I^1A^1U^1$	 8K A^1U^1	 8K A^1U^1	 6K $I^1A^1U^1$
7.2.2	 6K $I^1A^1U^1$	 9K A^1U^1	 8K A^1U^1	 7K $I^1A^1U^1$
7.2.3	 8K A^1U^1	 7K $I^1A^1U^1$	 6K $I^1A^1U^1$	 9K A^1U^1
7.2.4	 8K A^1U^1	 6K $I^1A^1U^1$	 6K $I^1A^1U^1$	 8K A^1U^1

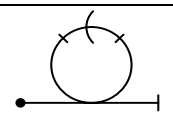
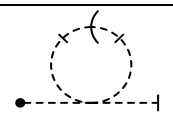
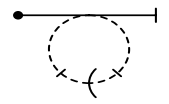
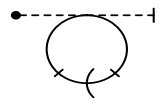
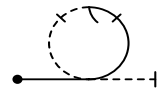
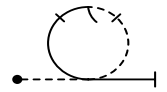
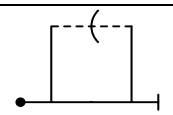
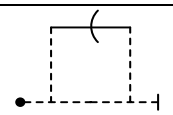
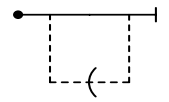
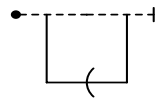
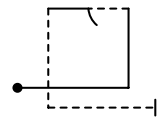
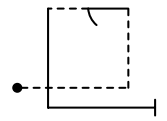
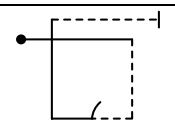
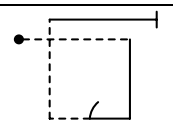
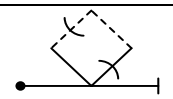
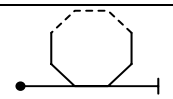
1) Snap rolls are not permitted on the lower horizontal line.

37.2.11 Sub-Family 7.3 – Three Quarter Loops

	1	2	3	4
7.3.1	 16K U	 14K AU	 14K AU	 16K U
7.3.2	 14K IAU	 18K U	 17K AU	 15K AU

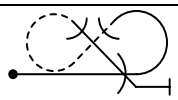
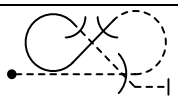
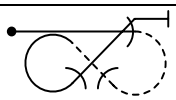
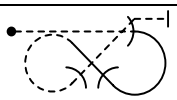
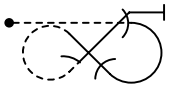
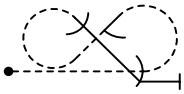
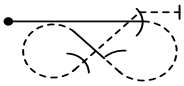
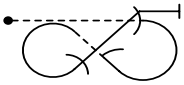
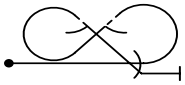
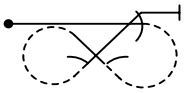
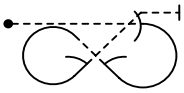
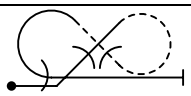
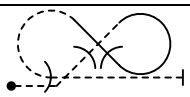
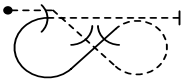
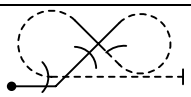
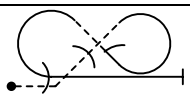
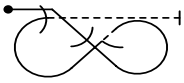
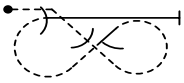
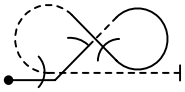
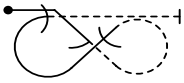
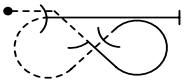
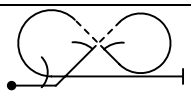
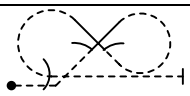
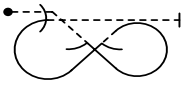
7.3.3	 17K U	 15K U	 14K IAU	 18K U
7.3.4	 16K IAU	 20K U	 19K U	 15K IAU

37.2.12 Sub-Family 7.4 – Whole Loops

	1	**2**	**3**	**4**
7.4.1	 10K $I^{1}A^{2}U$	 15K $A^{3}U$	 14K U^{4}	 11K U^{4}
7.4.2	 12K AU	 12K AU		
7.4.3	 14K $I^{5}A^{6}U$	 19K $A^{6}U$	 18K U^{7}	 14K U^{7}
7.4.4	 17K U	 17K U	 17K U^{7}	 17K U^{7}
7.4.5	 15K $A^{5}U^{8}$			 16K U^{8}
7.4.6	 19K AU			

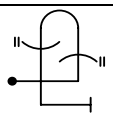
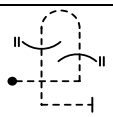
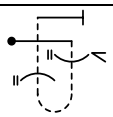
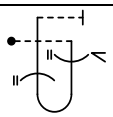
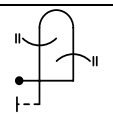
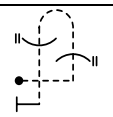
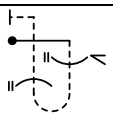
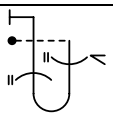
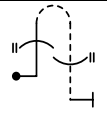
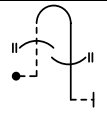
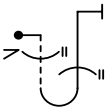
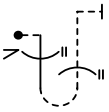
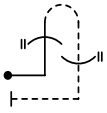
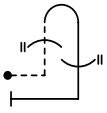
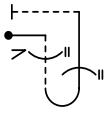
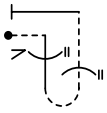
1) 9.4.3.4 is not permitted.
2) Maximum rotation is 360 degrees.
3) Only 9.1.3.4 is permitted.
4) Neither snap rolls nor eight-point rolls are permitted.
5) Rolls are not permitted.
6) Neither opposite nor unlinked rolls are permitted.
7) Snap rolls are not permitted.
8) Snap rolls are not permitted on the lower 45 degree line.

37.2.13 Sub-Family 7.8 – Horizontal 8's

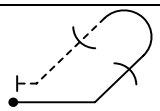
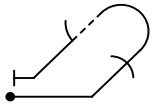
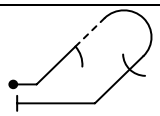
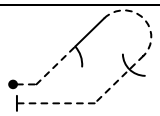
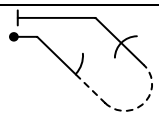
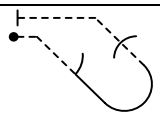
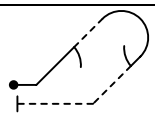
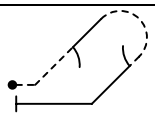
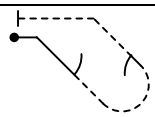
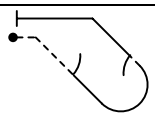
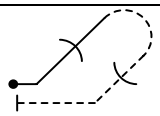
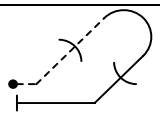
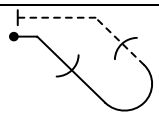
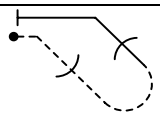
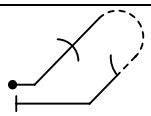
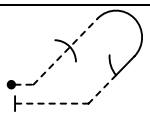
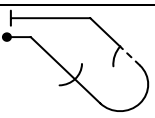
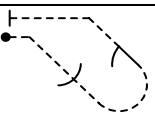
	1	2	3	4
7.8.1	 20K A^1U^1	 20K A^1U^1	 20K AU	 20K AU
7.8.2	 22K A^1U^1	 20K A^1U^1	 21K AU	 22K AU
7.8.3	 19K $I^2A^1U^1$	 23K U^1	 24K U	 19K I^3AU
7.8.4	 19K $I^4A^1U^1$	 26K U^1	 25K U	 20K IAU
7.8.5	 20K A^1U^1	 20K A^1U^1	 20K AU	 20K AU
7.8.6	 24K U^1	 19K A^1U^1	 18K I^5AU	 24K U
7.8.7	 21K A^1U^1	 22K A^1U^1	 21K AU	 21K AU
7.8.8	 19K $I^1A^1U^1$	 26K U^1	 25K U	 20K I^4AU

1) Snap rolls are not permitted on the horizontal entry/exit line.
2) Rolls are permitted only on the first 45 degree line. No other line may contain rolls.
3) Rolls are not permitted on second 45 degree line. No other line may contain rolls.
4) Rolls are not permitted on the horizontal entry/exit line.
5) Rolls are permitted only on the second 45 degree line. No other line may contain rolls.

37.2.14 Sub-Family 8.4 – Humpty Bumps

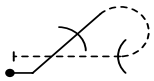
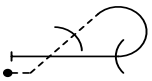
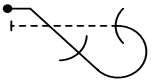
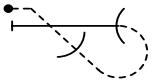
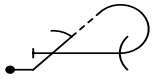
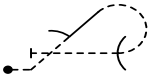
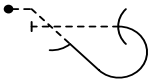
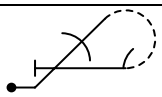
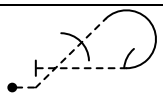
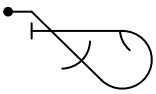
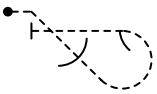
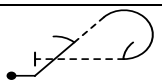
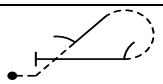
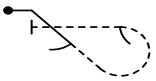
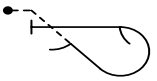
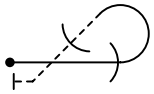
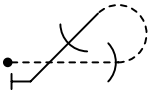
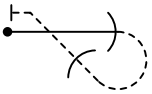
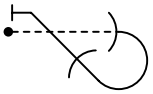
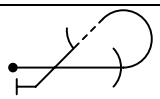
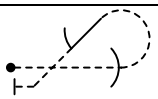
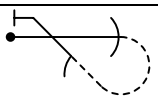
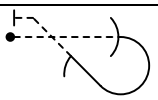
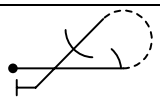
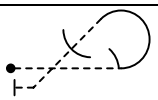
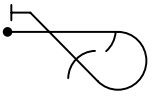
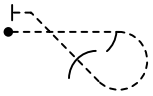
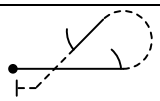
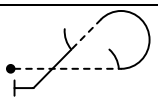
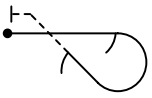
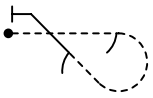
	1	2	3	4
8.4.1	 13K IAU	 18K AU	 17K U	 13K U
8.4.2	 14K AU	 17K AU	 17K U	 14K U
8.4.3	 15K IAU	 16K AU	 15K U	 16K U
8.4.4	 16K AU	 14K AU	 14K U	 16K U

37.2.15 Sub-Family 8.4 – Diagonal Humpty Bumps

	1	2	3	4
8.4.13	 11K A^1U			
8.4.14	 12K A^1U			
8.4.15	 12K I^2A^3U	 16K AU	 15K U	 13K U
8.4.16	 14K A^3U	 16K AU	 16K U	 14K U
8.4.17	 13K U	 11K U	 11K U	 13K U
8.4.18	 14K AU	 14K A^3U	 13K U	 15K U

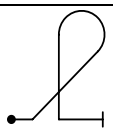
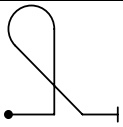
1) Snap rolls are not permitted.
2) Rolls are not permitted on the 45 degree down line.
3) Snap rolls are not permitted on the 45 degree down line.

37.2.16 Sub-Family 8.5 – Half Cubans

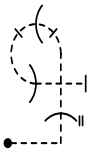
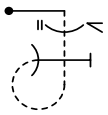
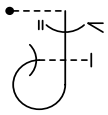
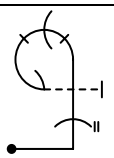
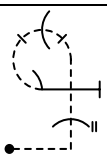
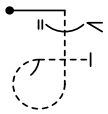
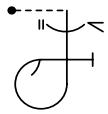
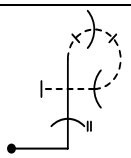
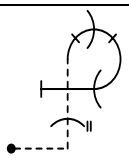
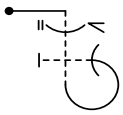
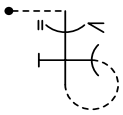
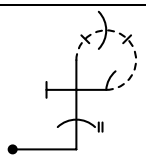
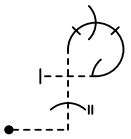
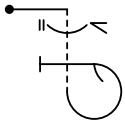
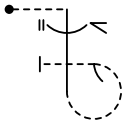
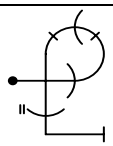
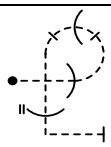
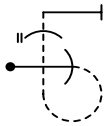
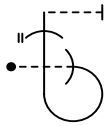
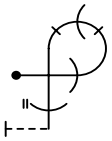
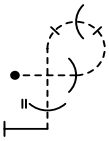
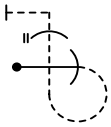
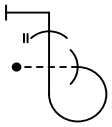
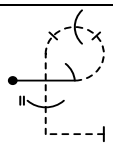
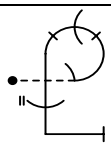
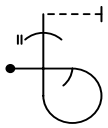
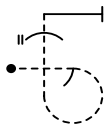
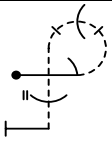
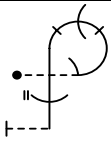
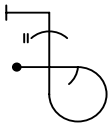
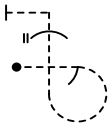
	1	2	3	4
8.5.1	 12K A^1U^1	 10K A^1U^1	 10K I^2AU	 12K A^3U
8.5.2	 10K $I^1A^1U^1$	 14K A^1U^1	 13K AU	 11K I^2AU
8.5.3	 12K A^1U^1	 11K A^1U^1	 10K I^4AU	 13K A^3U
8.5.4	 11K $I^1A^1U^1$	 14K A^1U^1	 14K AU	 11K IAU
8.5.5	 10K $I^{1+4}A^1U^1$	 12K A^1U^1	 12K U	 10K I^4AU
8.5.6	 10K $I^1A^1U^1$	 14K A^1U^1	 14K U	 11K IAU
8.5.7	 12K A^1U^1	 11K A^1U^1	 10K I^4AU	 13K U
8.5.8	 14K A^1U^1	 11K IA^1U^1	 11K IAU	 14K U

1) Snap rolls are not permitted on the horizontal entry/exit line.
2) Rolls are not permitted on the horizontal exit line.
3) 9.2.4.4 is not permitted on the 45 degree line.
4) Rolls are not permitted on the 45 degree line.

37.2.17 Sub-Family 8.5 – Vertical 5/8ths Loops

	1	2	3	4
8.5.9	 12K I			
8.5.17	 12K I			

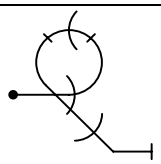
37.2.18 Sub-Family 8.6 – P Loops

	1	2	3	4
8.6.1	 11K $I^{1+2}A^{2+3}U^{2+4}$	 16K U^{2+4}	 15K U	 12K $I^{1}AU$
8.6.2	 12K $I^{1}A^{2+3}U^{2+4}$	 16K U^{2+4}	 16K U	 12K $I^{1}AU$
8.6.3	 15K $A^{2+3}U^{2+4}$	 13K $A^{2+5}U^{2+4}$	 13K $I^{6}AU$	 14K U
8.6.4	 14K $A^{2+3}U^{2+4}$	 13K $A^{2+5}U^{2+4}$	 13K $I^{6}AU$	 15K U
8.6.5	 11K $I^{2+7}A^{2+8+9}U^{2+10}$	 16K U^{2+10}	 16K U	 12K $I^{1}U$
8.6.6	 12K $A^{2+8+9}U^{2+10}$	 15K $A^{2+8+9}U^{2+10}$	 15K U	 13K $I^{1}U$
8.6.7	 16K U^{2+10}	 12K $I^{11}A^{2+8+9}U^{2+10}$	 12K $I^{1}U$	 16K U
8.6.8	 15K $A^{2+8+9}U^{2+10}$	 13K $A^{2+8+9}U^{2+10}$	 12K $I^{1}U$	 15K U

1) Rolls are only permitted on the horizontal entry/exit line.
2) Snap rolls are not permitted on the horizontal entry/exit line.
3) Only 9.1.1.1, 9.1.1.2, and 9.4.1.2 are permitted on the vertical up line. Rolls are not permitted on the ¾ loop.

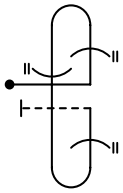
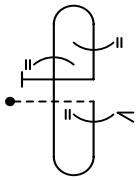
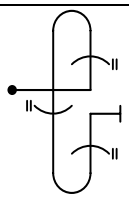
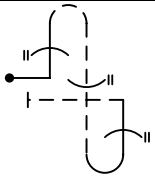
4) Snap rolls are not permitted on the ¾ loop when preceded by a vertical roll exceeding either 3 stops or 360 degrees of rotation.
5) Rolls are not permitted on the vertical up line, nor on the ¾ loop.
6) Must incorporate a 9.11.1 spin.
7) A maximum of one roll may be used. If a roll is used on the ¾ loop, it must be either 9.1.3.4, 9.2.3.4, or 9.9.3.4.
8) Snap rolls are not permitted on the vertical down line if preceded by a roll on the ¾ loop.
9) Rolls on the ¾ loop may not exceed 360 degrees of rotation.
10) Snap rolls are not permitted on the vertical down line if preceded by a hesitation roll on the ¾ loop.
11) If a roll is used on the ¾ loop, it must be either 9.1.3.4, or 9.9.3.4. Rolls are not permitted on the vertical downline.

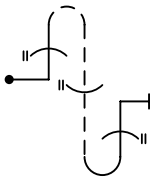
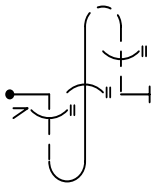
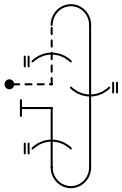
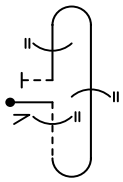
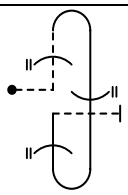
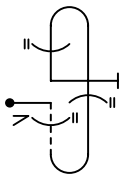
37.2.19 Sub-Family 8.7 – Q Loops

	1	2	3	4
8.7.5	 11K I^1			

1) A maximum of one roll may be used. Snap rolls are only permitted on the top of the 7/8 loop. If a roll is used on the 7/8 loop it must be either 9.1.3.4, 9.2.3.4, or 9.9.3.4.

37.2.20 Sub-Family 8.8 – Double Humptys

	1	2	3	4
8.8.1	 18K A^1U^1			 18K U^1
8.8.2	 19K A^1U^1			
8.8.5	 21K A^1U^1			

8.8.6	 21K A^1U^1		 21K U^1	
8.8.7		 21K A^1U^1	 20K U^1	
8.8.8		 20K A^1U^1	 19K U^1	

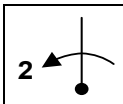
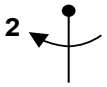
1) A maximum of one Family 9 roll is allowed on each vertical line.

37.2.21 Sub-Family 9.1 – Aileron Rolls

		¼	½	¾	1	1¼	1½	1¾	2
9.1.1		6K IAU	8K AU	10K A^1U	12K U	14K U			
9.1.2		4K U	6K IAU	8K U	10K IAU	11K U	12K U		
9.1.3		2K AU	4K IAU	6K AU	8K IAU	9K U	10K IAU	11K U	12K AU
9.1.4			4K IAU		8K IAU		10K U		
9.1.5		2K IAU	4K IAU	6K A^2U	8K U				
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

1) Must not be followed by a level fly-off.
2) Must not be followed by a negative recovery.

37.2.22 Sub-Family 9.2 – 2-Point Aileron Rolls

	¼	½	¾	1	1¼	1½	1¾	2
9.2.1 				13K U				
9.2.2 				11K AU		14K U		
9.2.3 				9K IAU		12K AU		15K AU
9.2.4 				9K IAU				
9.2.5 				9K U				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

37.2.22.1 Sub-Family 9.4 – 4-Point Aileron Rolls

	¼	½	¾	1
9.4.1 		9K A[1]U	12K U	15K U
9.4.2 		7K IAU	10K U	13K AU
9.4.3 		5K IAU	8K AU	11K IAU
9.4.4 		5K IAU		11K U
9.4.5 		5K A[2]U	8K U	
	1	**2**	**3**	**4**

1) Must not be followed by a level fly-off.
2) Must not be followed by a negative recovery.

37.2.23 Sub-Family 9.8 – 8-Point Aileron Rolls

	¼	½	¾	1
9.8.1 	7K AU	11K U		
9.8.2 	5K U	9K AU		
9.8.3 	3K AU	7K IAU		15K AU
9.8.4 		7K U		
9.8.5 	3K AU	7K U		
	1	**2**	**3**	**4**

37.2.24 Sub-Family 9.9

Positive Flick (Snap) Rolls

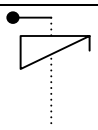
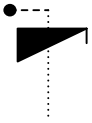
		½	¾	1	1¼	1½
9.9.1		15K U	15K U	15K U		
9.9.2		13K IAU		13K AU		
9.9.3		11K AU		11K IAU		14K AU
9.9.4		11K AU		11K AU		14K U
9.9.5		11K AU	11K AU	11K U		
9.9.6		17K U	17K U	17K U		
9.9.7		15K U		15K U		
9.9.8		13K U		13K U		
9.9.9		13K U		13K U		
9.9.10		13K AU	13K U	13K U		
		2	**3**	**4**	**5**	**6**

37.2.25 Sub-Family 9.10

Negative Flick (Snap) Rolls

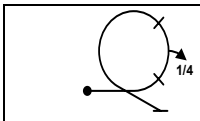
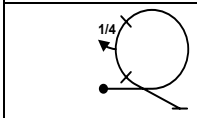
		½	¾	1	1¼	1½
9.10.1		17K U	17K U	17K U		
9.10.2		15K U		15K U		
9.10.3		13K U		13K U		16K U
9.10.4		13K U		13K U		
9.10.5		13K U	13K U	13K U		
9.10.6		19K U	19K U	19K U		
9.10.7		17K U		17K U		
9.10.8		15K U		15K U		
9.10.9		15K U		15K U		
9.10.10		15K U	15K U	15K U		
		2	**3**	**4**	**5**	**6**

37.2.26 Sub-Family 9.11 and 9.12 – Positive and Negative Spins

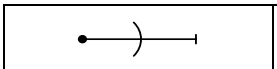
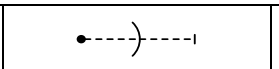
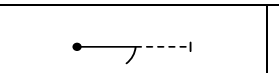
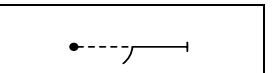
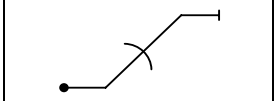
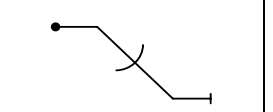
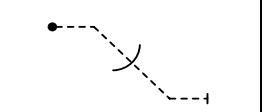
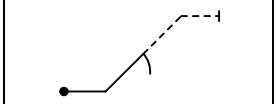
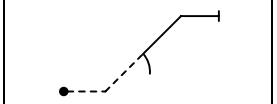
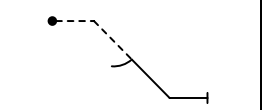
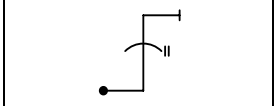
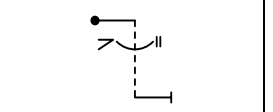
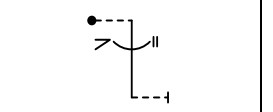
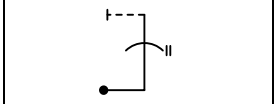
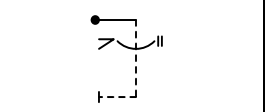
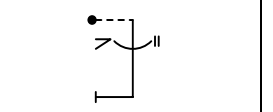
			1	1¼	1½	1¾	2
9.11.1		Upright Entry Line	5K IAU	4K IAU	3K IAU		
9.12.1		Inverted Entry Line	7K AU	6K AU	5K AU		
			4	**5**	**6**	**7**	**8**

37.3 Allowable Figures for Gliders

37.3.1 Family 0 – Quarter-Clovers

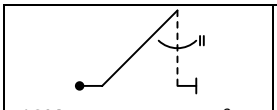
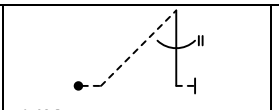
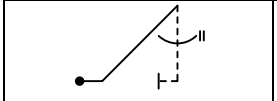
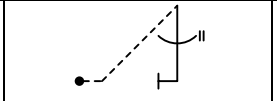
	1
0.1	 16K I
0.2	 13K I

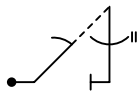
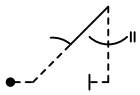
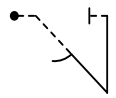
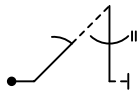
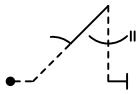
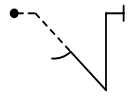
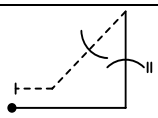
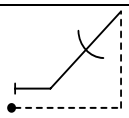
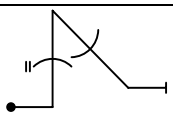
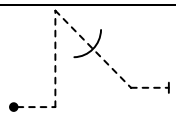
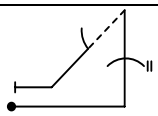
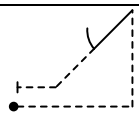
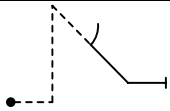
37.3.2 Sub-Family 1.1 - Single Lines

	1	2	3	4
1.1.1	 2K IAU	 3K IAU	 2K IAU	 2K IAU
1.1.2	 7K $I^1A^1U^1$	 8K A^1U^1	 7K I^1A^1U	 8K A^1U
1.1.3	 7K IAU	 8K AU	 8K AU	 7K IAU
1.1.6	 10K A^1U		 10K I^2AU	 10K U
1.1.7	 9K A^1U		 11K U	 9K AU

1) Rolls are not permitted.
2) Must incorporate a 9.11.1 spin.

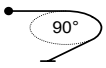
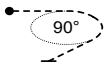
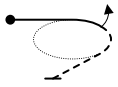
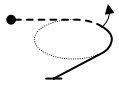
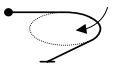
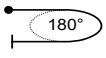
37.3.3 Sub-Family 1.2 – Two Lines

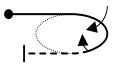
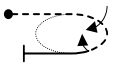
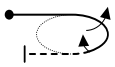
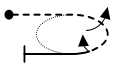
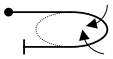
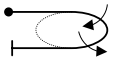
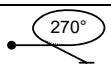
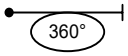
	1	2	3	4
1.2.1	 13K I^2AU	 14K U		
1.2.2	 14K U	 13K AU		

1.2.3	 12K I²AU	 16K U		 12K AU
1.2.4	 13K U	 14K AU		 13K AU
1.2.5	 14K A¹U	 16K U		
1.2.6	 14K A¹U	 16K U		
1.2.7	 13K A²U	 17K U		
1.2.8	 16K A²U	 15K U		

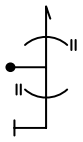
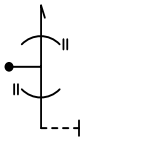
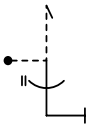
1) Rolls are not permitted.
2) Rolls are not permitted on the vertical line.

37.3.4 Family 2 – Turns and Rolling Turns

	1	**2**	**3**	**4**
2.1.1	 3K IAU	 4K IAU		
2.1.2	 19K U	 19K U	 21K U	 21K U
2.1.3	 19K IAU	 20K U	 21K U	 22K U
2.2.1	 4K IAU	 5K AU		
2.2.2	 36K U	 37K U	 40K U	

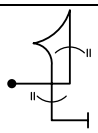
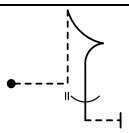
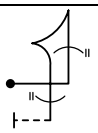
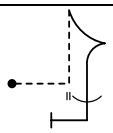
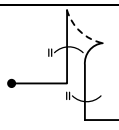
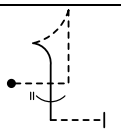
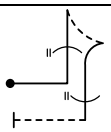
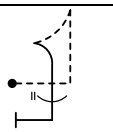
2.2.3	 31K U	 31K U	 35K U	 35K U
2.2.4	 37K U	 37K U	 39K U	 39K U
2.2.5	 30K U	 31K U	 34K U	 35K U
2.2.6	 37K U	 38K U	 37K U	 38K U
2.3.1	 5K IA	 7K AU		
2.4.1	 6K IAU	 8K AU		

37.3.5 Family 5 – Stall Turns

	1	**2**	**3**	**4**
5.2.1	 17K I^1A^1U	 23K U	 18K U	 22K U

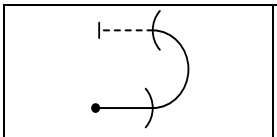
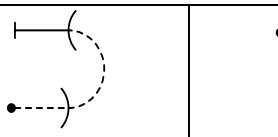
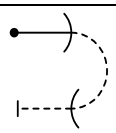
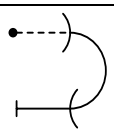
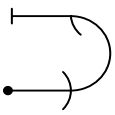
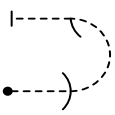
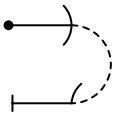
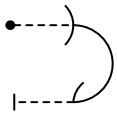
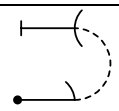
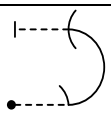
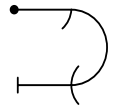
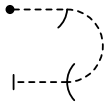
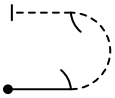
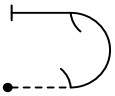
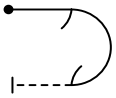
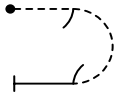
1) Rolls are not permitted on the vertical up line.

37.3.6 Family 6 - Tailslides

	1	**2**	**3**	**4**
6.2.1	 17K A^1U	 23K U	 18K U	 22K U
6.2.2	 17K A^1U	 23K U	 18K U	 22K U

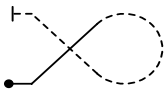
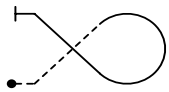
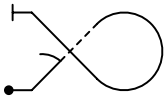
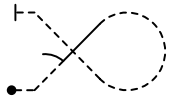
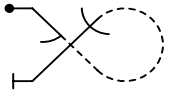
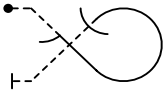
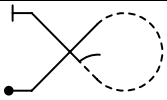
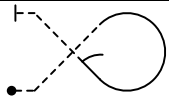
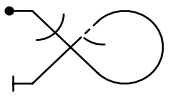
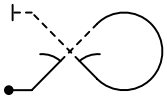
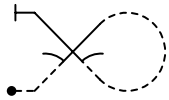
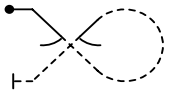
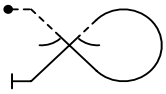
1) Rolls are not permitted on the vertical up line.

37.3.7 Sub-Family 7.2 - Half Loops

	1	2	3	4
7.2.1	 6K I^1AU^2	 8K U^2	 8K U^2	 6K IAU^2
7.2.2	 6K IAU^{2+3}	 9K U^{2+4}	 8K U^2	 7K IAU^2
7.2.3	 8K U^2	 7K I^1AU^2	 6K IAU^2	 9K U^2
7.2.4	 8K U^{2+4}	 6K AU^{2+3}	 6K IAU^2	 8K U^2

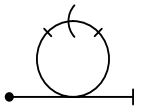
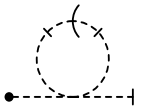
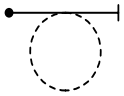
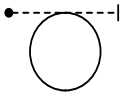
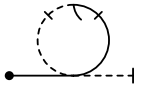
1) Rolls are not permitted on the top line.
2) Snap rolls are not permitted on the lower horizontal line.
3) Positive half snap rolls are not permitted
4) Negative half snap rolls are not permitted.

37.3.8 Sub-Family 7.3 – Three-Quarter Loops

	1	2	3	4
7.3.1	 16K U	 14K AU	 14K A^1U	 16K U
7.3.2	 14K IAU	 18K U	 17K U	 15K A^2U
7.3.3	 17K U	 15K AU	 14K I^3A^3U	 18K U
7.3.4	 16K IAU	 20K U	 19K U	 15K IAU

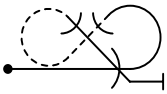
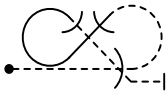
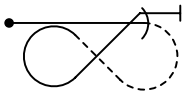
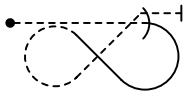
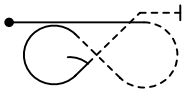
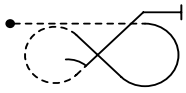
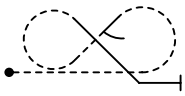
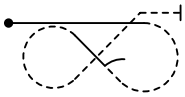
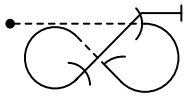
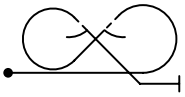
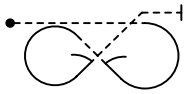
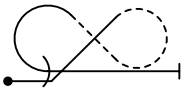
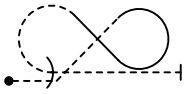
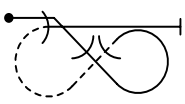
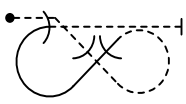
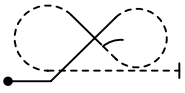
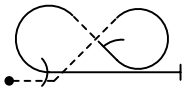
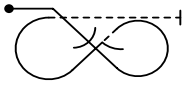
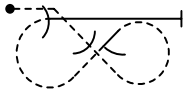
1) Rolls are not permitted.
2) Rolls are not permitted on the second 45 degree line.
3) Rolls are not permitted on the first 45 degree line.

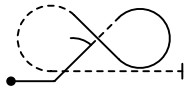
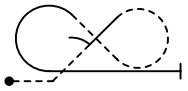
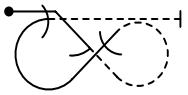
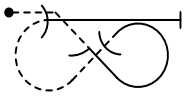
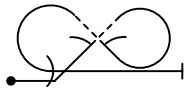
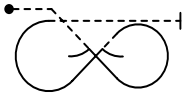
37.3.9 Sub-Family 7.4 – Whole Loops

	1	2	3	4
7.4.1	 10K I^1AU	 15K U^2	 14K U	 11K AU
7.4.2	 12K U			

1) Rolls are not permitted.
2) Hesitation rolls are not permitted.

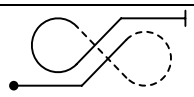
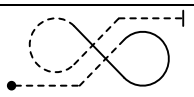
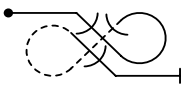
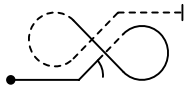
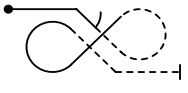
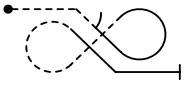
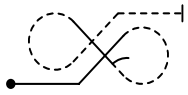
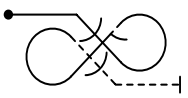
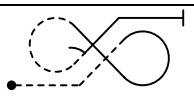
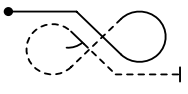
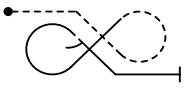
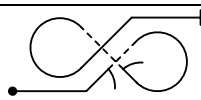
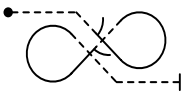
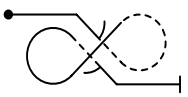
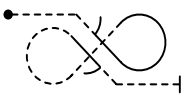
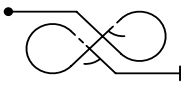
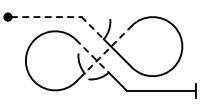
37.3.10 Sub-Family 7. 8 – Horizontal 8's

	1	2	3	4
7.8.1	 20K U^1	 20K U^1	 20K U	 20K U
7.8.2	 22K U^1	 20K U^1	 21K U	 22K U
7.8.3	 19K A^2U^1	 23K U	 24K U	 19K I^5A^2U
7.8.4	 19K IAU	 26K U		 20K IAU
7.8.5	 20K U^1	 20K U^1	 20K U	 20K U
7.8.6	 24K U	 19K A^4U^1	 18K I^4A^4U	 24K U

7.8.7	 21K U	 22K U	 21K U	 21K U
7.8.8	 19K IA^1U^1		 25K U	 20K IAU

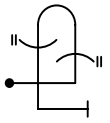
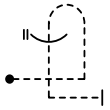
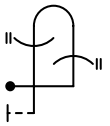
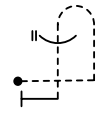
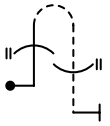
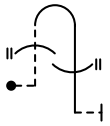
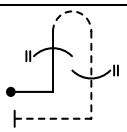
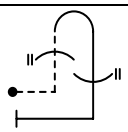
1) Snap rolls are not permitted on the horizontal entry/exit lines.
2) Rolls are permitted only on the first 45 degree line. No other line may contain rolls.
3) Rolls are permitted only on the second 45 degree line. No other line may contain rolls.
4) Rolls are not permitted on the second 45 degree line.

37.3.11 Sub-Family 7. 8 – Super 8's

	1	**2**	**3**	**4**
7.8.9	 23K U	 24K U	 23K U	 24K U
7.8.10	 25K U	 26K U	 25K U	 24K U
7.8.11	 28K U	 23K AU	 22K A^1U	 27K U
7.8.12	 25K U	 26K U	 25K U	 24K U
7.8.13	 23K I			 25K U
7.8.14			 26K U	 27K U
7.8.15			 23K IAU	
7.8.16	 25K I			 24K I

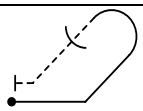
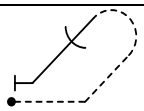
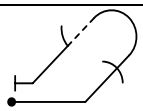
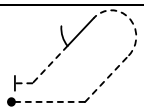
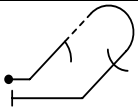
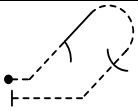
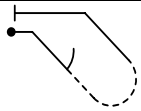
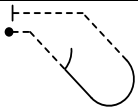
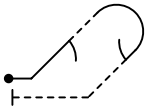
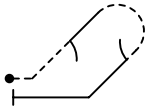
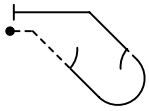
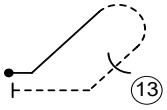
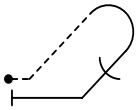
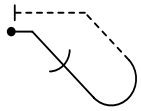
1) Rolls are permitted only on the second 45 degree line. No other line may contain rolls.

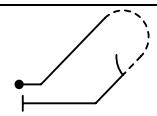
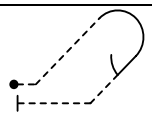
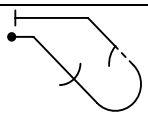
37.3.12 Sub-Family 8.4 – Humpty Bumps

	1	2	3	4
8.4.1	 13K I^1A^2U	 18K U		
8.4.2	 14K U	 17K U		
8.4.3	 15K I^1A^2U	 16K U		
8.4.4	 16K U	 14K U		

1) Rolls are not permitted.
2) Rolls are not permitted on the vertical up line.

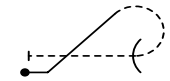
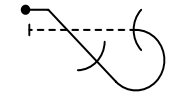
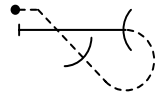
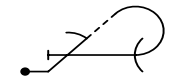
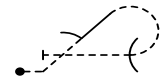
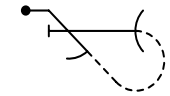
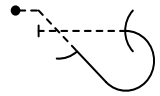
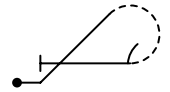
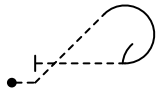
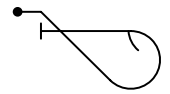
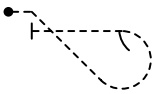
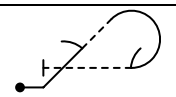
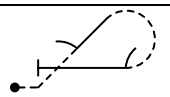
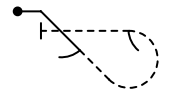
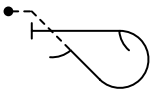
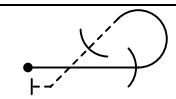
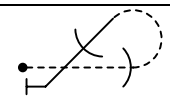
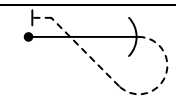
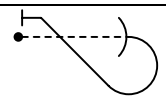
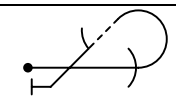
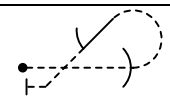
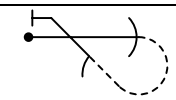
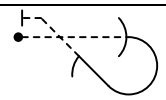
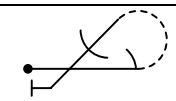
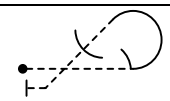
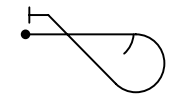
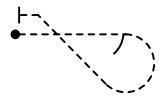
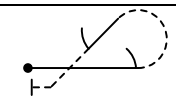
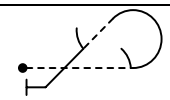
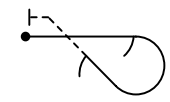
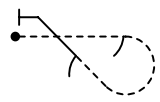
37.3.13 Sub-Family 8.5–Diagonal Humpty Bumps

	1	2	3	4
8.4.13	 11K A^1U	 13K U		
8.4.14	 12K A^3U	 16K U		
8.4.15	 12K I^2A^2U	 16K U^4	 15K U	 13K AU
8.4.16	 14K AU	 16K U^4		 14K AU
8.4.17	 13K U^4	 11K A^1U	 11K I^1A^1U	

8.4.18	 14K U^4	 14K AU	 13K A^3U	

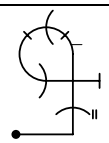
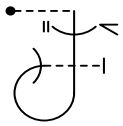
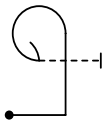
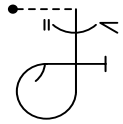
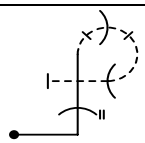
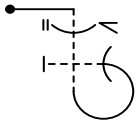
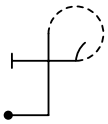
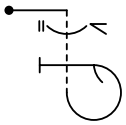
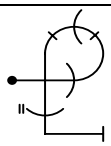
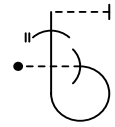
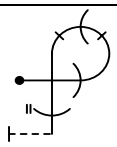
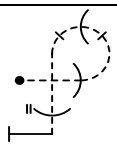
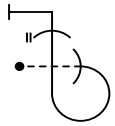
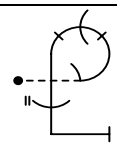
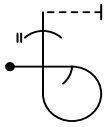
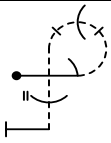
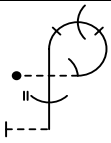
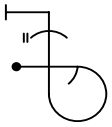
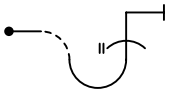
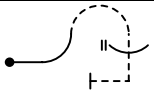
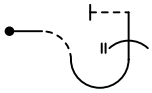
1) Rolls are not permitted.
2) Rolls are permitted only on the first 45 degree line.
3) Rolls are permitted only on the second 45 degree line.
4) No snap rolls on the down 45 degree line.

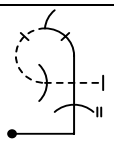
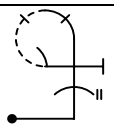
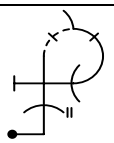
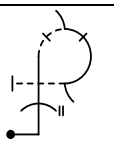
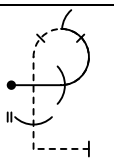
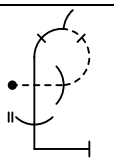
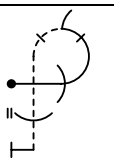
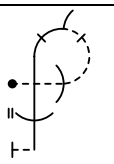
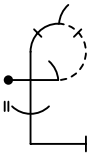
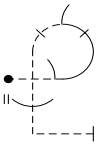
37.3.14 Sub-Family 8.5–Half Cubans

8.5.1	 12K U^3	 10K AU^3	 10K I^1A^2U	 12K U
8.5.2	 10K IAU^3	 14K U^3	 13K U	 11K IAU
8.5.3	 12K U^3	 11K AU^3	 10K IAU	 13K U
8.5.4	 11K IAU^3	 14K U^3	 14K U	 11K AU
8.5.5	 10K A^2U^3	 12K U^3	 12K U	 10K IAU
8.5.6	 10K IAU^3	 14K U^3	 14K U	 11K IAU
8.5.7	 12K U^3	 11K A^2U^3	 10K IAU	 13K U
8.5.8	 14K U^3	 11K AU^3	 11K AU	 14K U

1) Rolls are not permitted.
2) Rolls are not permitted on the 45 degree line.
3) Snap rolls are not permitted on the horizontal entry/exit line.

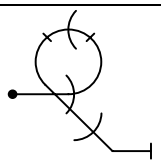
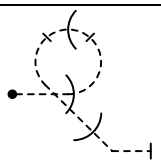
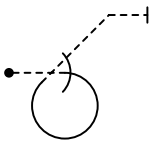
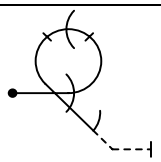
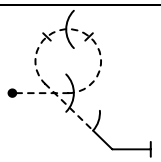
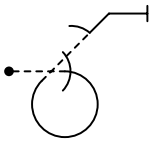
37.3.15 Sub-Family 8.6 – P Loops and Reversing P Loops

	1	2	3	4
8.6.1	 11K $I^1A^2U^{3+4}$			 12K AU
8.6.2	 12K AU^4			 12K AU
8.6.3	 15K U^{3+4}		 13K AU	
8.6.4	 14K U^4		 13K AU	
8.6.5	 11K AU^{4+5}			 12K A^2U
8.6.6	 12K U^{4+5}	 15K U^{4+5}		 13K A^2U
8.6.7		 12K AU^{4+5}	 12K A^2U	
8.6.8	 15K U^{4+5}	 13K U^{4+5}	 12K A^2U	
8.6.13	 13K AU	 14K U	 13K A^1U	
8.6.14	 15K U	 12K U	 13K A^1U	

8.6.17	 14K U^{6}			
8.6.18	 13K U^{6}			
8.6.19	 12K $A^{7}U^{6}$			
8.6.20	 13K $A^{7}U^{6}$			
8.6.21	 14K U^{6}	 14K U^{6}		
8.6.22	 13K AU^{6}	 15K U^{6}		
8.6.23	 13K U^{6}	 14K U^{6}		

1) Rolls are not permitted.
2) Rolls are permitted only on the horizontal entry/exit line.
3) Rolls are not permitted on the ¾ loop if preceded by a roll on the vertical up line.
4) Snap rolls are not permitted on the horizontal entry/exit line.
5) Snap rolls are not permitted on the vertical line if preceded by a hesitation roll on the ¾ loop.
6) Snap rolls are not permitted on the horizontal entry/exit line.
7) Rolls are not permitted on the vertical line.

37.3.16 Sub-Family 8.6 – Q Loops

	1	2	3	4
8.7.5	 11K $I^2A^3U^1$	 16K U^{1+4}		 12K AU^1
8.7.6	 13K U^1	 16K U^{1+4}		 14K U^1

1) Snap rolls are not permitted on the horizontal entry line.
2) Rolls are not permitted.
3) Rolls are not permitted on the 45 degree line.
4) Hesitation rolls are not permitted on the 7/8 loop.

37.3.17 Sub-Family 9 – Aileron Rolls

	¼	½	¾	1	1¼	1½	1¾	2
9.1.1 	9K U							
9.1.2 		9K IAU						
9.1.3 		6K IAU		12K IAU		15K AU		18K AU
9.1.4 		6K IAU		12K U				
9.1.5 	3K IAU	6K U						
	1	2	3	4	5	6	7	8

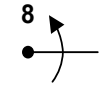
37.3.18 Sub-Family 9.2 – 2-Point Aileron Rolls

	¼	½	¾	1	1¼	1½	1¾	2
9.2.3 				14K IAU				
	1	2	3	4	5	6	7	8

Sub-Family 9.4 - 4-Point Aileron Rolls

		¼	½	¾	1
9.4.2			11K AU		
9.4.3			8K IAU		17K AU
9.4.4			8K IAU		
		1	**2**	**3**	**4**

Sub-Family 9.8 - 8-Point Aileron Rolls

		¼	½
9.8.3			11K AU
		1	**2**

37.3.19 Sub-Family 9.9

Positive Flick (Snap) Rolls

		¼	½	¾	1
9.9.2			15K U		
9.9.3			12K U		16K U[1]
9.9.4			12K U		16K U
9.9.5			12K U	14K U	16K U
9.9.8			15K U[2]		
9.9.10			12K U	14K U	16K U
		1	**2**	**3**	**4**

1) Permitted only at the apex of upward looping figures.
2) Permitted only on figures 7.2.2.2 and 7.2.4.1.

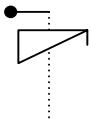
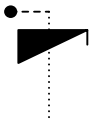
37.3.20 Sub-Family 9.10

Negative Flick (Snap) Rolls

		¼	½	¾	1
9.10.2			18K U		
9.10.3			15K U		
9.10.4			15K U		19K U
9.10.5			15K U	17K U[1]	19K U[1]
9.10.8			18K U[2]		
9.10.10			15K U	15K U[1]	15K U[1]
		1	**2**	**3**	**4**

1) Not permitted on figures with an inverted exit.
2) Permitted only on figures 7.2.2.1 and 7.2.4.2.

37.3.21 Sub-Family 9.11 and 9.12 – Positive and Negative Spins

			1	**1¼**	**1½**	**1¾**	**2**
9.11.1		Upright Entry Line	5K IAU	6K IAU	7K IAU		
9.12.1		Inverted Entry Line	7K U	8K U	9K U		
			4	**5**	**6**	**7**	**8**