

2014



INTRODUCTION TO AEROBATIC JUDGING

Student Handout

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Welcome to the International Aerobatic Club's

Introduction to Aerobatic Judging

Introduction to Aerobatic Judging

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Meet your Instructor:

Introduction to Aerobatic Judging

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Getting to Know You

- Name?
- Where are you from?
- Active Competitor?
- Reason for taking this Course?
 - Become a Judge, and/or
 - Learn rules and criteria to improve critique



Course Materials

IN YOUR PACKET:

- Registration Form
- Student Handout
- Regional Judge Exam – Online version available at:
<https://www.iac.org/legacy/iac-judge-examinations>
- Judging Log
- Judges School Analysis form (please fill out and turn in at end of course)

YOU SHOULD ALSO OBTAIN:

- IAC Official Contest Rules available for FREE download at:
<https://www.iac.org/download-contest-rules>
- Aresti System Aerobic Catalogue (optional) available for purchase from the Aresti family's company (see www.arestisystem.com)



Course Outline

Today:

- ❑ Review of Requirements for becoming an IAC Judge
- ❑ Overview of the Competition Arena
- ❑ Introduction to the Aresti System Aerobatic Catalogue
- ❑ Constructing Aerobatic Figures
- ❑ Review of Aresti Aerobatic Catalogue Families

Tomorrow:

- ❑ Contest Flight Programs
- ❑ Checking a Competitor's Free Program
- ❑ Cross-Box Figures and Direction of Flight on X and Y axes
- ❑ Judging Criteria
- ❑ Judge Certification and Currency

Introduction to Aerobatic Judging

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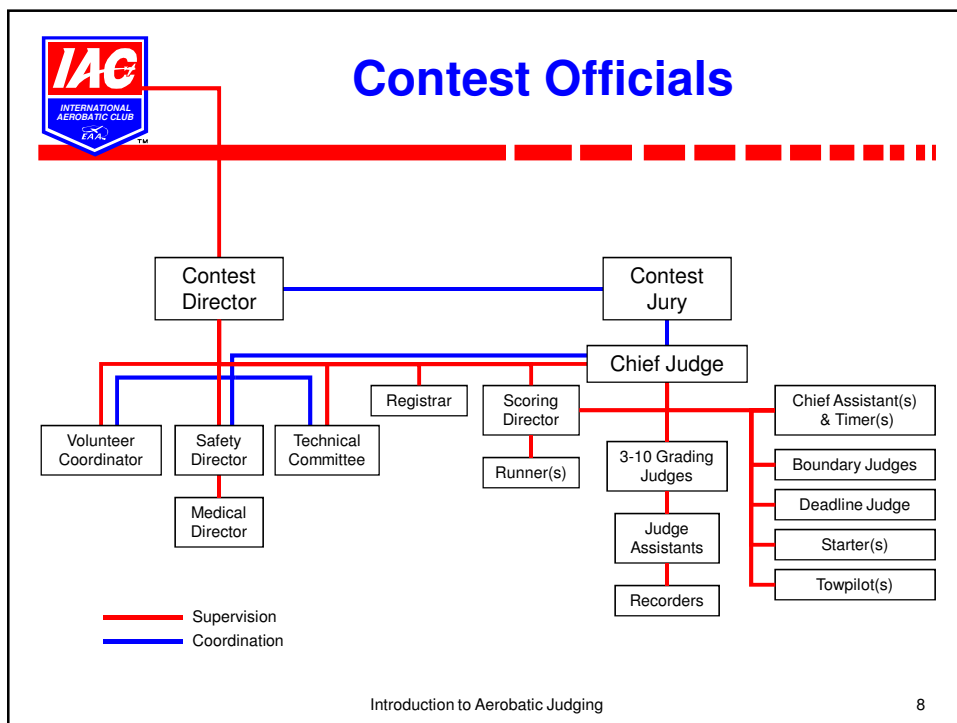
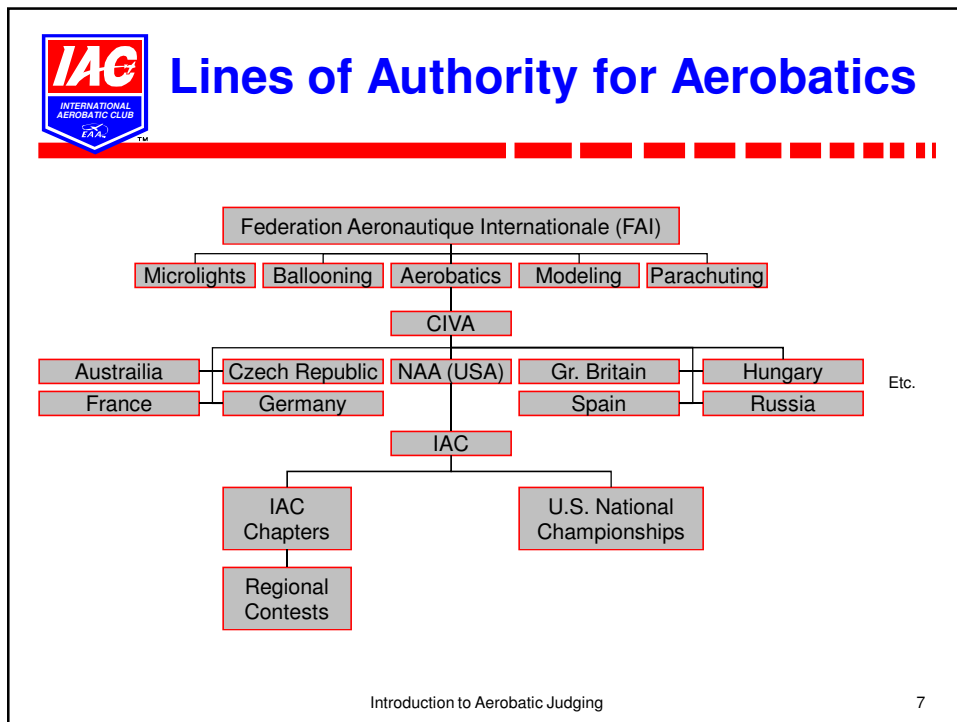


How To Become A Regional Judge (2.6.1)

1. Within current or previous contest year prior to application:
 - a. Attend this school
 - b. Complete the Regional Judge Exam (*received* a passing grade of 80% or higher)
 - c. Serve as an Assistant to a Grading Judge for:
 - » 40 competitor flights minimum
 - » at least 10 in Advanced or Unlimited (waived for an applicant who has competed in Advanced or Unlimited in the current or previous year)
2. AFTER completing 1.a – 1.c above, pass a Practical Exam administered by a National Judge and another Judge (Regional or National)
3. Send completed [Regional Judge Application](#) form to the Judges Certification Chair (contact info shown on application form)

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Judges Line (2.5 - 2.9)

- Chief Judge supervises:
 - Chief Judge Assistants
 - Grading Judges - Min of 3 to Max of 10 each with:
 - Judge Assistant
 - Recorder
 - Boundary & Deadline Judges
 - Scoresheet Runner



Power Aerobatic Competition Categories

POWER COMPETITION FLIGHT PROGRAMS			
Table 5.1.1			
CATEGORY	KNOWN	FREE	UNKNOWN
Primary			
Sportsman		 (See 5.1.3)	
Intermediate			
Advanced			
Unlimited			

- CD option for scheduling a 3rd Primary or Sportsman flight
- For competitors flying a Free Program in Sportsman:
 - Known Program, Repeat Known or optional Free Program
 - If 3rd flight program flown, must repeat program flown on 2nd flight
- CD may schedule Optional 4 Minute Free Program for Unlimited and *qualified* Advanced competitors



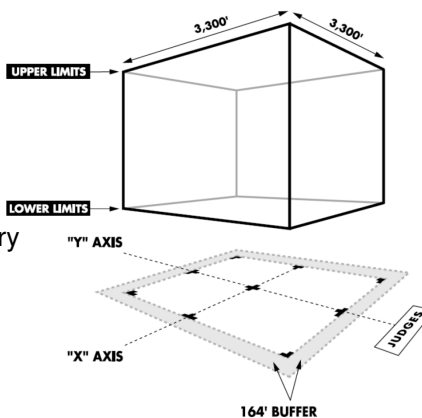
Power Aerobatic Box

Upper Limits

3280 ft AGL – Unlimited
3609 ft AGL – Advanced
3500 ft AGL – All Others

Lower Limits

1500 ft AGL – Sportsman & Primary
1200 ft AGL – Intermediate
656 ft AGL – Advanced
328 ft AGL – Unlimited



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Glider Aerobatic Competition Categories

GLIDER COMPETITION FLIGHT PROGRAMS

Table 5.1.2

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

- Sportsman – 2 flights (CD option for scheduling a 3rd flight):
 - Known Program, Repeat Known or optional Free Program
 - If 3rd flight program flown, must repeat program flown on 2nd flight

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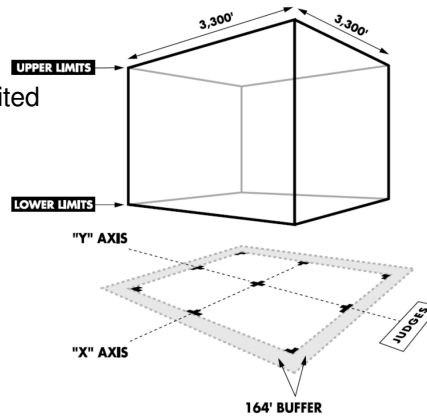
Glider Aerobatic Box

Upper Limits

3937 ft AGL – Advanced & Unlimited
4000 ft AGL – All Others

Lower Limits

1500 ft AGL – Sportsman
1200 ft AGL – Intermediate
656 ft AGL – Advanced
656 ft AGL – Unlimited



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Contest Judges' Forms (Appendix 7)

- Chief Judge's Penalty sheet
- Form A: Scoresheet
- Forms B and C: Sequence ("Flimsy")

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Aresti Aerobatic Catalogue

Part I: Description of the Catalogue

- Introduces the Families
 - » Basic Figures (Families 1 through 8)
 - » Complementary Figures (Family 9)
- Provides definitions of:
 - » Conventions Used in Drawing Basic and Complementary Figures
 - » Extent of Rotations of Complementary Figures (Family 9)
 - » Catalogue Numbering System

Part II: LIST OF FIGURES

- Family 1 - Lines & Angles
- Family 2 - Turns & Rolling Turns
- Family 3 - Combinations of Lines
- Family 5 - Stall Turns (Hammerheads)
- Family 6 - Tail Slides
- Family 7 - Loops & Eights
- Family 8 - Combinations of Lines, Angles & Loops
- Family 9 - Rolls and Spins

Part III: Method of Evaluation - Provides a rigorous method of evaluating the elements of figures to determine proper difficulty coefficients (K-factors)

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Aresti Symbols: Key Concepts

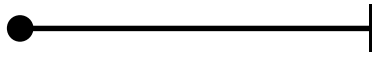
- Basic Figures come from Families 1 through 8 (912 possibilities)
- Complementary Figures (rotational elements) come from Family 9 (280 possibilities)
- Simple Numbering System to Locate Figures in Catalogue
 - All figures have 4 numbers separated by periods:
F.S.F.R.C = Family, Sub-Family, Row, Column Ex: Let's find [figure](#) 1.1.2.3
 - Family 9 figures are organized into tables of roll types: Ex: Let's find [figure](#) 9.1.3.4
- Character of Figures and Figure Elements
- Unspecified Rotations in Families 1 - 8 vs. Specified Rotations from Family 9
 - Catalogue shows locations in Family 1 - 8 figures where Family 9 rotational elements may, and sometimes must be added (i.e., Unspecified)
 - Addition of a "specific" Family 9 rotation to a Family 1 – 8 Figure completes the figure
- Preservation of Character in Basic Figures
 - Added rotations must preserve character
 - Some basic figures require rotations to preserve character
 - Effect of 90°, 180°, 270°, and 360° Rotations on Vertical Lines (no change of character)

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Character of Aresti Symbols (Glossary)



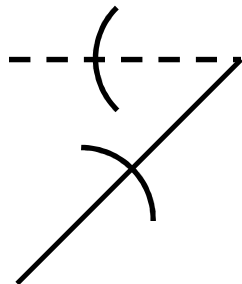
A solid line represents positive loading or angle of attack (character).



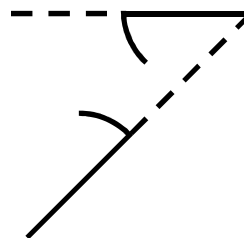
A dashed line represents negative loading or angle of attack (character).




Unspecified Rotations (Rolls on Horizontal and 45° Lines)



Optional 360°
change of attitude

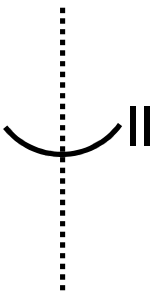
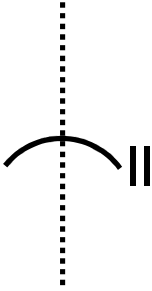


Mandatory 180°
change of attitude




Unspecified Rotations (Rolls on Vertical Lines)

Vertical Optional Rotation Symbol

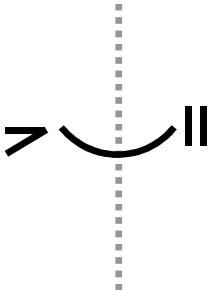


Rotation going Up Rotation going Down

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Unspecified Rotations (Roll or Spins on Vertical Down-Line)



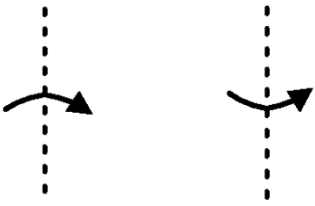
The Optional Spin (or vertical Roll down) Symbol

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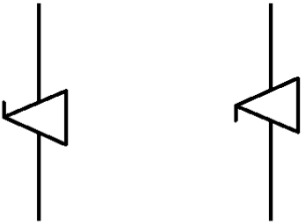
Specified Rotations: Rolls

Aileron rolls




UP DOWN

Snap rolls

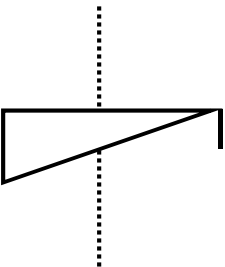


UP DOWN

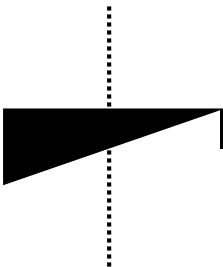
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Specified Rotations: Spins




UPRIGHT

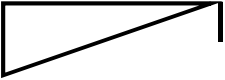


INVERTED


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
Aresti Symbols: Spins vs. Snap Rolls




UPRIGHT SPIN



INVERTED SPIN




POSITIVE SNAP

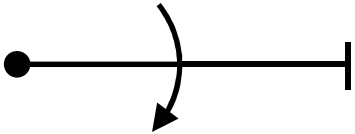


NEGATIVE SNAP

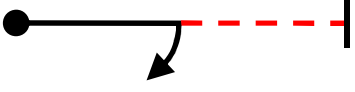
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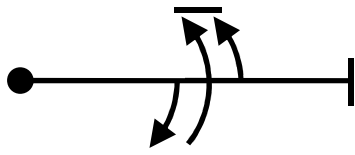
Aerobic Figure Construction



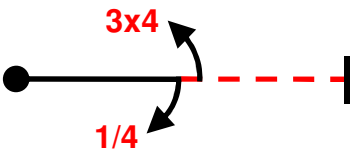
Optional full roll symbol on 1.1.1.1
requires family 9 figure(s) of a
multiple of 360° total rotation



Mandatory half roll symbol on 1.1.1.3
requires family 9 figure(s) of a
multiple of 180° total rotation



Optional full roll symbol on 1.1.1.1
requires family 9 figure(s) of a
multiple of 360° total rotation



Mandatory half roll symbol on 1.1.1.3
requires family 9 figure(s) of a
multiple of 180° total rotation

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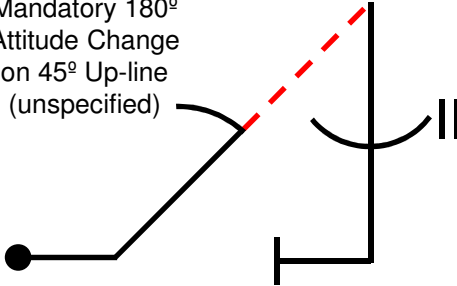


Figure Construction: Start with Basic Figure

Mandatory 180°
Attitude Change
on 45° Up-line
(unspecified)



Catalogue #:	K-factor:
1.2.3.1	12

Optional 90° Attitude Change
On Vertical Down-line
(unspecified)

||

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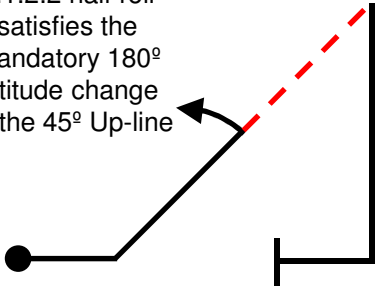


Figure Construction: Completed by Adding Rolls

“Specifying” a
9.1.2.2 half roll
satisfies the
mandatory 180°
attitude change
on the 45° Up-line



Catalogue #:	K-factor:
1.2.3.1	12
+ 9.1.2.2	<u>+ 6</u>
	18

This is a complete figure!

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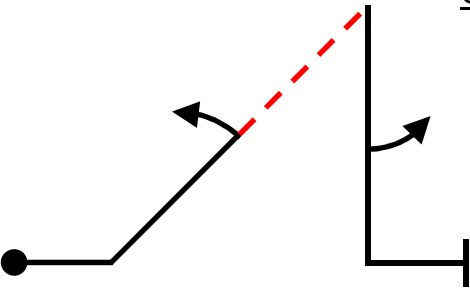


Figure Construction: Completed by Adding Rolls



<u>Catalogue #:</u>	<u>K-factor:</u>
1.2.3.1	12
+ 9.1.2.2	+ 6
+ 9.1.5.2	<u>+ 4</u>
	22

This is also a complete figure but different from the previous slide (note the change of direction)

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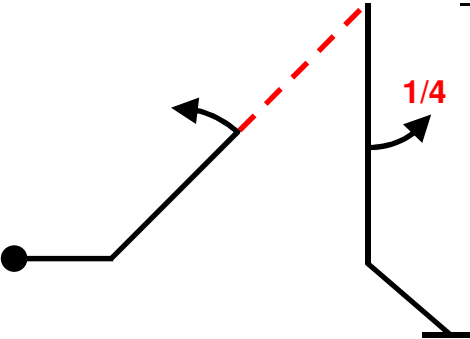


Figure Construction: Completed by Adding Rolls



<u>Catalogue #:</u>	<u>K-factor:</u>
1.2.3.1	12
+ 9.1.2.2	+ 6
+ 9.1.5.1	<u>+ 2</u>
	20

Again a complete figure but different from the previous slides (note the change of axis)

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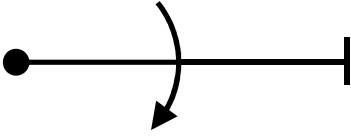
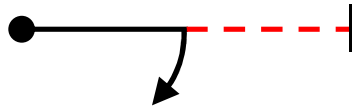


Figure Construction



<u>Catalogue #:</u>	<u>K-factor:</u>
1.1.1.1	2
+ 9.1.3.4	<u>+ 8</u>
	10



<u>Catalogue #:</u>	<u>K-factor:</u>
1.1.1.3	2
+ 9.1.3.2	<u>+ 4</u>
	6

Note: Some kind of roll or roll combination is required on 1.1.1.1 or 1.1.1.2 by rule (no plain horizontal lines allowed)

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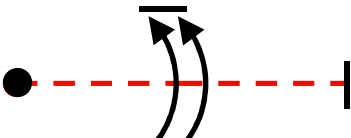
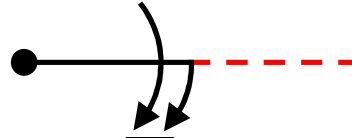


Figure Construction



<u>Catalogue #:</u>	<u>K-factor:</u>
1.1.1.2	3
+ 9.1.3.8	<u>+ 12</u>
	15



<u>Catalogue #:</u>	<u>K-factor:</u>
1.1.1.3	2
+ 9.1.3.6	<u>+ 10</u>
	12

Note: Some kind of roll or roll combination is required on 1.1.1.2 by rule (no plain horizontal lines allowed in competition)

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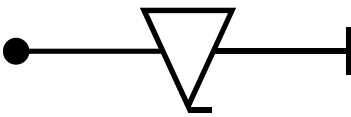



Figure Construction




<u>Catalogue #:</u>	<u>K-factor:</u>
1.1.1.1	2
+ 9.9.3.4	<u>+ 11</u>
	13



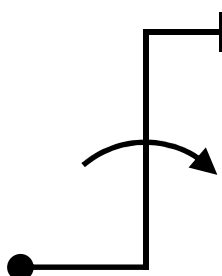
<u>Catalogue #:</u>	<u>K-factor:</u>
1.1.1.3	2
+ 9.9.3.2	<u>+ 11</u>
	13

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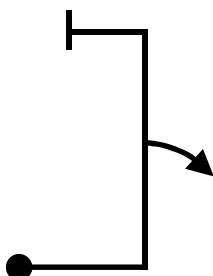


Effects of Adding Different Family 9 Rolls

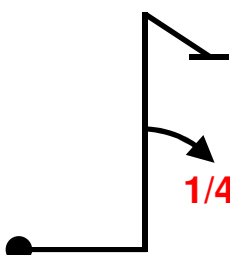
EXAMPLES:



1.1.6.1
+ 9.1.1.4
(Full Roll)




1.1.6.1
+ 9.1.1.2
(1/2 Roll)

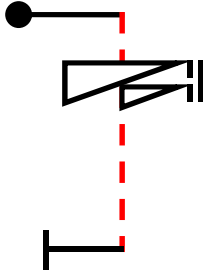


1.1.6.1
+ 9.1.1.1
(1/4 Roll)

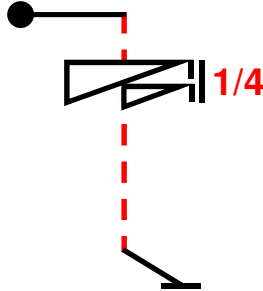
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Effects of Adding Different Family 9 Spins




1.1.6.3 (10K)
+ 9.11.1.6 (3K)
(1 ½ Turn Spin)



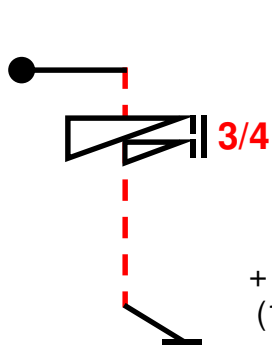
1.1.6.3 (10K)
+ 9.11.1.5 (4K)
(1 ¼ Turn Spin)

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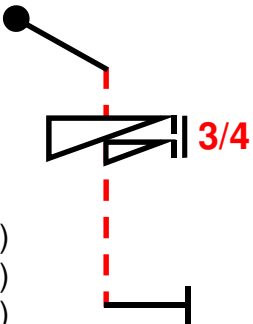
33



Effects of Adding Different Family 9 Spins



X-axis entry
Y-axis exit



Y-axis entry
X-axis exit

1.1.6.3 (10K)
+ 9.11.1.7 (3K)
(1 ¾ Turn Spin)

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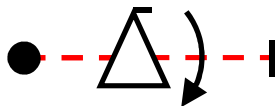
Multiple Rolls

Rotations must be flown as drawn!



1st roll direction arbitrary,
2nd roll must be same direction

OR



1st roll direction arbitrary,
2nd roll must be opposite direction

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Multiple Rolls



Aileron or Snap Rolls may be added after Spins

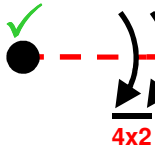
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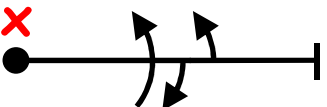


Rules for Multiple Rolls


✓ Legal and ✗ Illegal Constructions



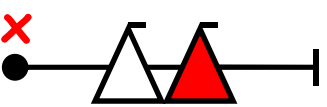
4x2



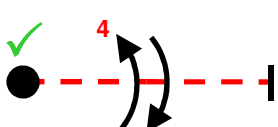
✗



✓

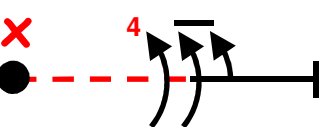


✗



✓

4




✗

4

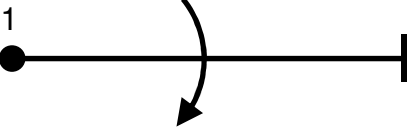
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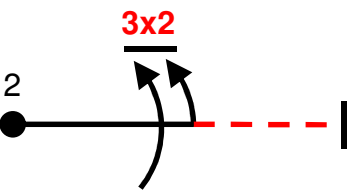


Quiz: Determine Catalogue Numbers and K-factors

1

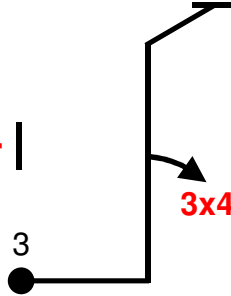


2



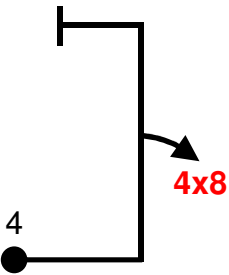
3x2

3



3x4

4



4x8

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Family 9.9-9.10: Snap Rolls Which Catalogue Number?

GENERAL RULES

- Catalogue number and K-factor recognize difficulty of each Snap Roll
 - Positive snap from positive loading is easier; harder from negative loading
 - Negative snap from negative loading is easier; harder from positive loading
- The aircraft's loading (or AoA), positive or negative, at the initiation of the snap determines the correct catalogue number of the snap
- For snaps on vertical lines, the loading on the airplane required to establish the vertical line determines the correct catalogue number of the snap
- Two exceptions to these general rules (zero AoA and knife-edge snaps) will be discussed shortly

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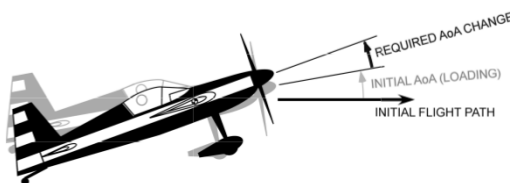


Family 9.9-9.10: Snap Rolls Which Catalogue Number?

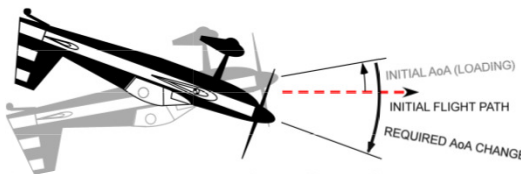
Catalogue number and K-factor recognize the difficulty associated with the required Angle of Attack (loading) change to initiate the snap



1.1.1.1 (2K)
+ 9.9.3.4 (**11K**)



1.1.1.2 (3K)
+ 9.9.8.4 (**13K**)



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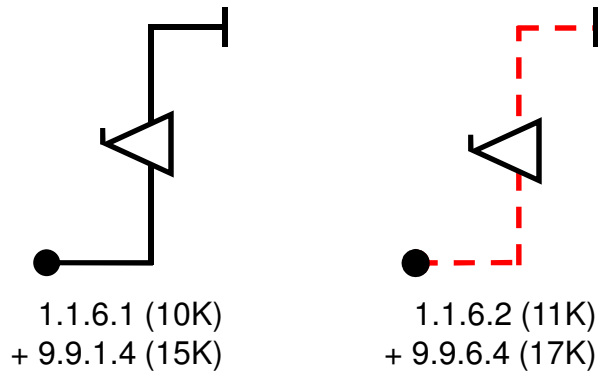
40



Family 9.9-9.10: Snap Rolls

Which Catalogue Number?

Vertical lines retain the loading (AoA) required to establish the line

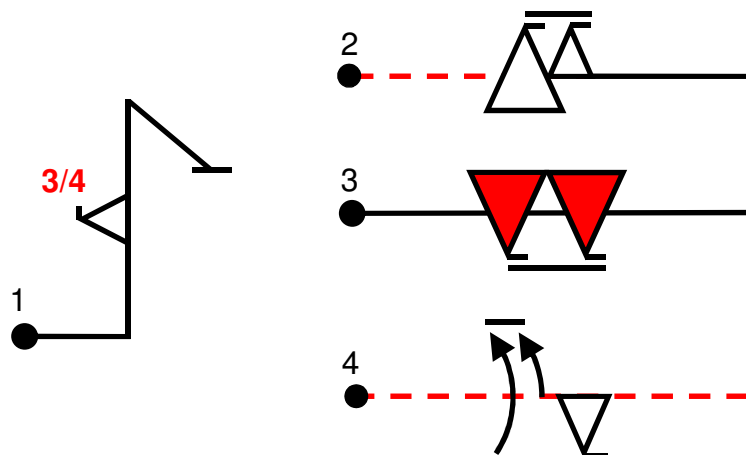


Introduction to Aerobic Judging

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Determine catalogue Numbers and K-factors



Introduction to Aerobic Judging

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Family 9.9-9.10: Snap Rolls Exceptions (6.10)

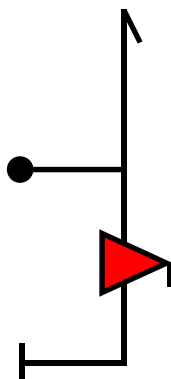
- There are two exceptions where the loading (positive or negative) of the line does not determine the catalogue number of the snap:
 - Exception 1: When the angle of attack (AoA) is explicitly defined as zero, or
 - Exception 2: When the snap is initiated from knife-edge flight
- There are four situations where “AoA is explicitly defined as zero”:
 1. Snaps on the down-line of a hammerhead
 2. Snaps on the down-line of a tailslide
 3. Snaps after a vertical roll
 4. Snaps after a spin
- There are two situations affecting difficulty of snaps from knife-edge:
 1. Snaps initiated with top rudder
 2. Snaps initiated with bottom rudder

Introduction to Aerobatic Judging

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Family 9.9-9.10: Snap Rolls Exception 1 - Situation 1 of 4



5.2.1.1 (17K)
+ 9.10.5.4 (13K)

NOT 9.10.10.4 (15K)

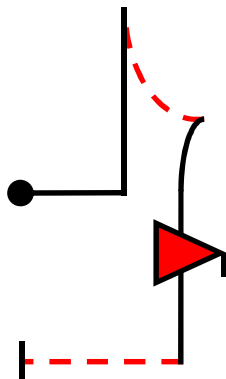
**Since AoA is explicitly
zero on the down-line
of a hammerhead**

Introduction to Aerobatic Judging

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Family 9.9-9.10: Snap Rolls Exception 1 - Situation 2 of 4



6.2.2.3 (16K)
+ 9.10.5.4 (13K)

NOT 9.10.10.4 (15K)

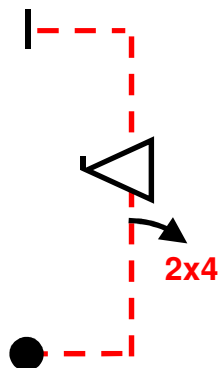
Since AoA is explicitly
zero on the down-line
of a tailslide

Introduction to Aerobatic Judging

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Family 9.9-9.10: Snap Rolls Exception 1 - Situation 3 of 4




1.1.6.2 (11K)
+ 9.4.1.2 (9K)
+ 9.9.1.4 (15K)

NOT 9.9.6.4 (17K)

Since AoA is explicitly
zero after any vertical
roll

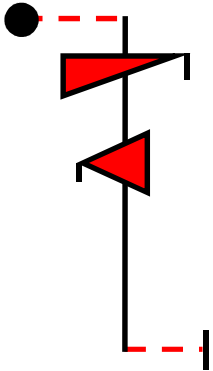
Introduction to Aerobatic Judging

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Family 9.9-9.10: Snap Rolls

Exception 1 - Situation 4 of 4




1.1.6.4 (10K)
+ 9.12.1.4 (7K)
+ **9.10.5.4 (13K)**

NOT 9.10.10.4 (15K)

Since AoA is explicitly zero after a spin

Introduction to Aerobatic Judging

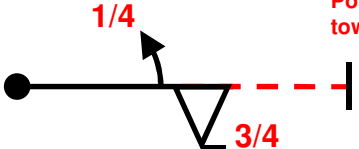
47



Family 9.9-9.10: Snap Rolls

Exception 2 – Snaps from Knife-Edge

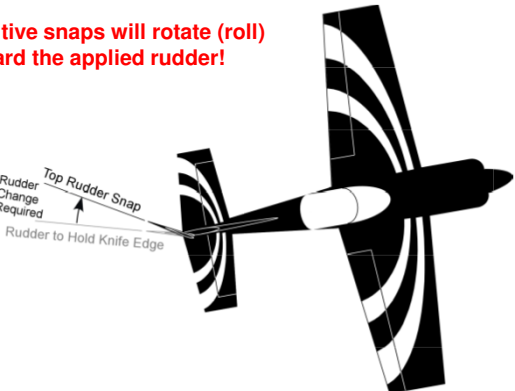
Top Rudder Snap: A snap initiated with top rudder is less difficult than a snap initiated with bottom rudder, so the lower K-factor catalogue number applies



1.1.1.3 (2K)
+ 9.1.3.1 (2K)
+ opposite 9.9.x.3 (?K)
Requires TOP rudder
So **9.9.3.3 (11K)**

NOT 9.9.8.3 (13K)

Positive snaps will rotate (roll) toward the applied rudder!



Introduction to Aerobatic Judging

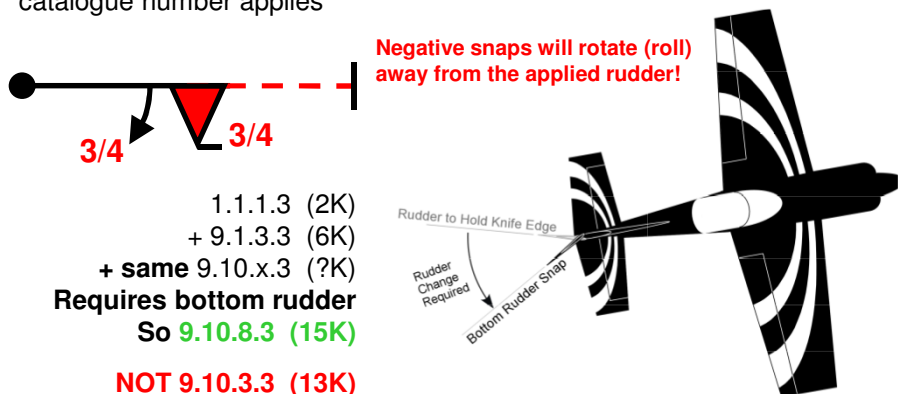
48



Family 9.9-9.10: Snap Rolls

Exception 2 – Snaps from Knife-Edge

Bottom Rudder Snap: A snap that must be initiated with bottom rudder is more difficult than a snap initiated with top rudder, so the higher K-factor catalogue number applies



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AID FOR CORRECT K-FACTOR OF KNIFE-EDGE SNAP ROLLS

RUDDER REQUIRED FOR SNAP FROM KNIFE EDGE					
Table 6.10.1					
Attitude Preceding Initial Roll	Initial Roll	Positive Snap		Negative Snap	
		Same Direction	Opposite Direction	Same Direction	Opposite Direction
Upright	1/4 or 1 1/4	Bottom Rudder (higher K)	Top Rudder (lower K)	Top Rudder (lower K)	Bottom Rudder (higher K)
	3/4 or 1 3/4	Top Rudder (lower K)	Bottom Rudder (higher K)	Bottom Rudder (higher K)	Top Rudder (lower K)
Inverted	1/4 or 1 1/4	Top Rudder (lower K)	Bottom Rudder (higher K)	Bottom Rudder (higher K)	Top Rudder (lower K)
	3/4 or 1 3/4	Bottom Rudder (higher K)	Top Rudder (lower K)	Top Rudder (lower K)	Bottom Rudder (higher K)

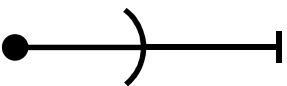
Introduction to Aerobatic Judging


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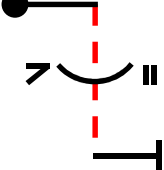


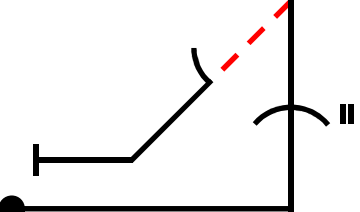
Family 1:

Lines and Angles

1.1.1.1 


1.1.1.3 

1.1.6.3 

1.2.7.1 

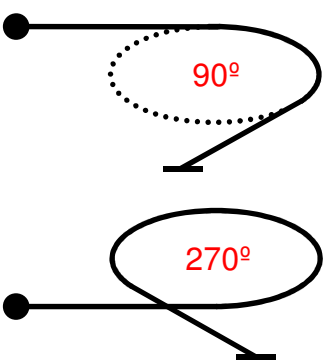
Introduction to Aerobatic Judging

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Family 2:

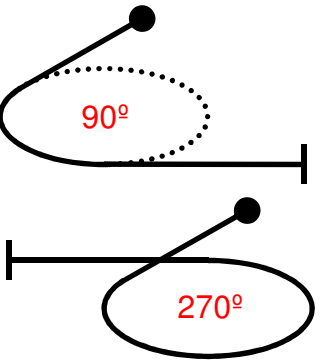
Turns & Rolling Turns



90°

270°

X to Y Axis Turns
Direction is pilot's option




90°

270°

Y to X Axis Turns
Must exit in correct direction

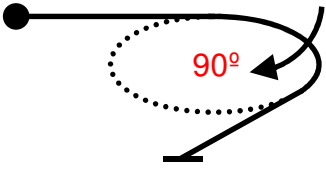
Introduction to Aerobatic Judging

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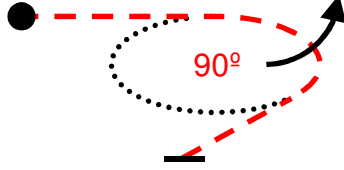
Family 2:

Turns & Rolling Turns



2.1.3.1

"90° Roller, One Roll INSide, End [on Y-Axis]"




2.1.3.4

"Inverted 90° Roller, One Roll OUTside, End Inverted [on Y-Axis]"

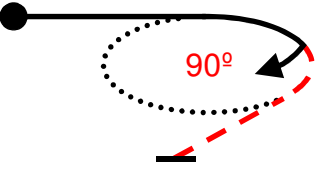
Introduction to Aerobic Judging

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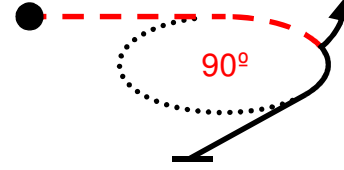
Family 2:

Turns & Rolling Turns



2.1.2.1

"90° Roller to Inverted, ½ Roll IN, End Inverted [on Y-axis]"



2.1.2.4

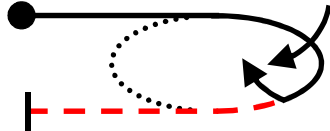
"90° Roller to Upright, ½ Roll OUT, End Upright [on Y-axis]"

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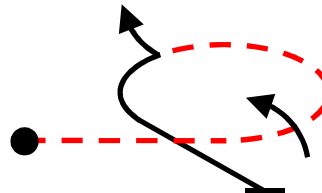


Family 2: Turns & Rolling Turns



2.2.3.1

*"180° Roller to Inverted, 1½ Rolls IN,
End Inverted"*



2.3.3.2

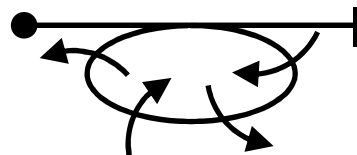
*"270° Roller to Upright, One Roll IN, ½
Roll OUT,
[End Upright on Y-Axis]"*

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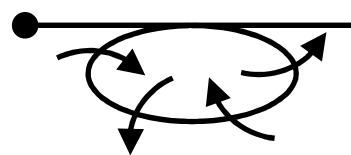


Family 2: Turns & Rolling Turns



2.4.8.1

*"360° Opposite Roller, First Roll IN,
Roll OUT, Roll IN, Roll OUT, End"*




2.4.8.3

*"360° Opposite Roller, First Roll OUT, Roll
IN, Roll Out, Roll IN, End"*

Introduction to Aerobic Judging

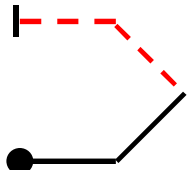
56



Family 3

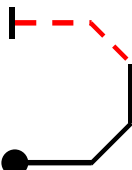
Combinations of Lines

Family 3.3 – Three Corners



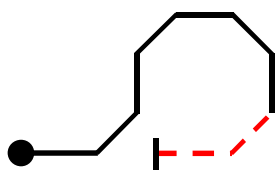
3.3.1.1

Family 3.4 – Four Corners



3.4.1.1


Family 3.8 – Eight Corners



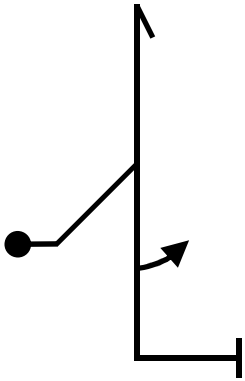
3.8.1.1

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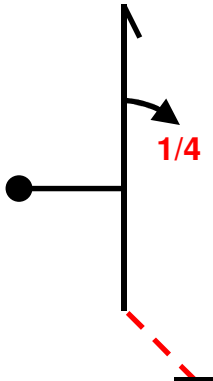
57



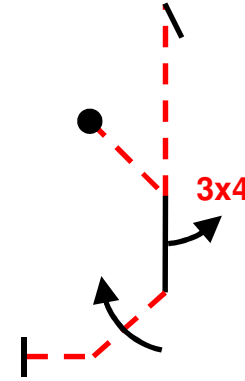
Family 5: Hammerheads



"45 Up, Hammer,
½ Roll Down,
End"




"Hammer, ¼ Roll Up,
Push Out on Y-Axis, End"



"Hammer, 3 of 4 Down,
Push 45 down to the left,
Full Roll, Push Out, End"

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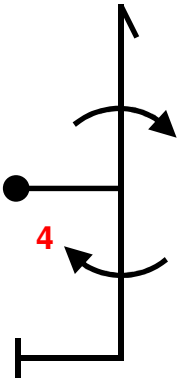
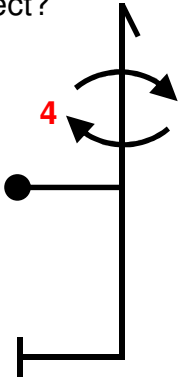
58



Family 5: Hammerheads


Drawing Convention

Which drawing is correct?

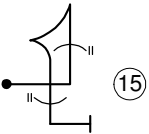
Introduction to Aerobic Judging

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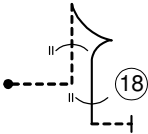
Family 6: Tailslides

6.2.1



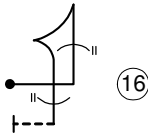
15

6.2.1.x "Wheels-Down" or "Canopy-Up"



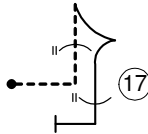
18

6.2.1



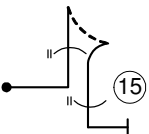
16

6.2.1



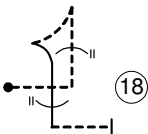
17

6.2.2



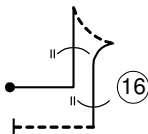
15

6.2.2.x "Wheels-Up" or "Canopy Down"



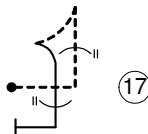
18

6.2.2



16

6.2.2



17

1

2

3

4

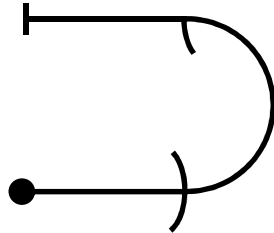
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Family 7: Loops and Eights

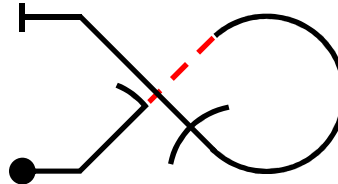
Family 7.2 – Half Loops



7.2.2.1

“ ___ Roll, Half Loop Up,
___ Roll, End Upright”

Family 7.3 – Three Quarter Loops



7.3.2.1

“45 Up, ___ Roll, 3/4 Loop to 45 Up,
___ Roll, End Upright”

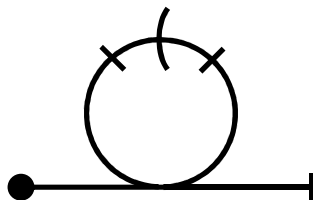
Introduction to Aerobatic Judging

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Family 7: Loops and Eights

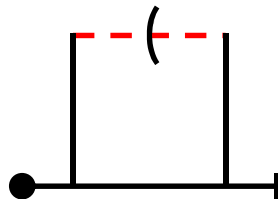
Family 7.4 – Full Loops



7.4.1.1

Full Loop

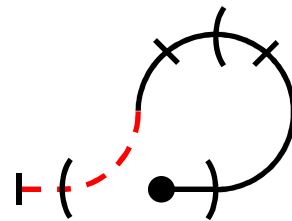
(Optional Full Rotation)



7.4.3.1

Square Loop

(Optional Full Rotation)



7.4.7.1

Reversing Loop

(Optional Full Rotations)

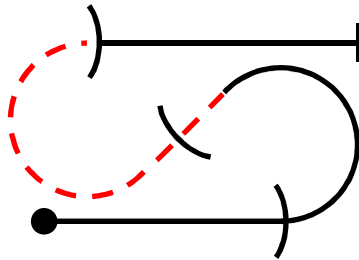
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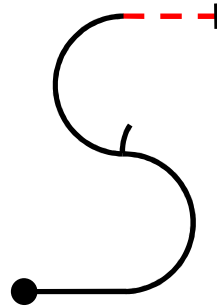


Family 7: Loops and Eights

Family 7.5



7.5.1.1
Horizontal S
(Optional Rolls)



7.5.10.1
Vertical S
(Mandatory Half Roll)

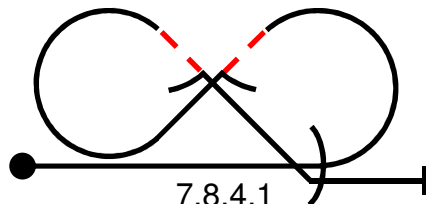
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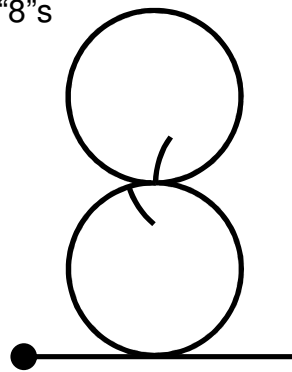


Family 7: Loops and Eights

Family 7.8 – Horizontal and Vertical “8”s



7.8.4.1
Horizontal-8



7.8.20.1
Vertical-8

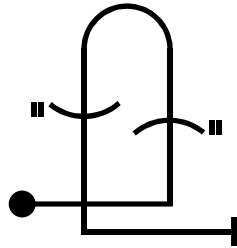
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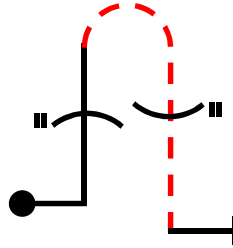


Family 8: Combinations of Lines, Angles and Loops

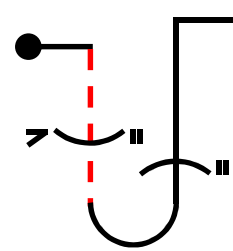
Family 8.4 – Humpty Bumps



8.4.1.1
"Humpty, Pull Vertical,
___ Roll, Pull Down, ___ Roll,
Pull Out to your Right, End"



8.4.3.1
"Humpty, Pull Vertical,
___ Roll, Push Down, ___ Roll,
Pull Out to your Right, End"



8.4.3.3
"Down-Humpty, Push Down,
___ Roll, Pull Vertical, ___ Roll,
Push Out to your Right, End"

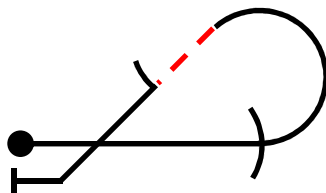
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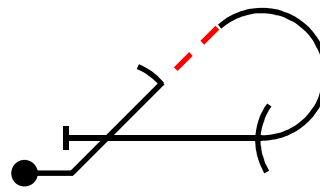


Family 8: Combinations of Lines, Angles and Loops

Family 8.5 – 5/8th Loops



8.5.6.1
"___ roll to 5/8th loop to
45 down, ___ roll, end"
[basis of "Half-Cuban"]



8.5.2.1
"45 up, ___ roll, 5/8th loop to ___ roll, end"
[basis for "Reverse Half-Cuban"]

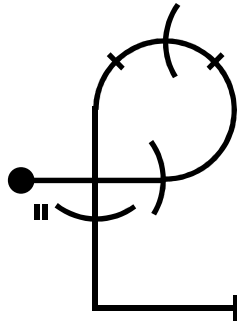
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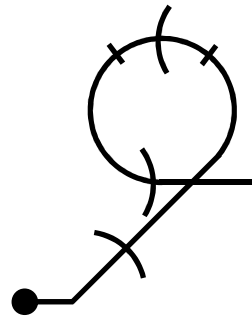
Family 8: Combinations of Lines, Angles and Loops

Family 8.6 – “P” (6/8th) Loops Family 8.7 – “Q” (7/8th) Loops



8.6.5.1

“P-Loop, __ roll, ¾ Loop
w/ __ roll on top, __ roll down, end”



8.7.1.1

“45 up, __ roll, 7/8th loop,
__ roll on apex, __ roll, end”

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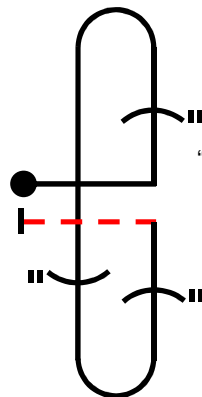
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Family 8: Combinations of Lines, Angles and Loops

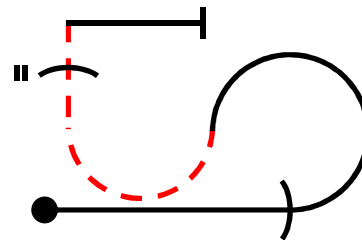
Family 8.8 – Double Humptys

Family 8.10 – Reversing 1 ¼ Loops



8.8.1.1

“Vertical Up, __ roll,
½ Loop to vertical
down, __ roll,
½ Loop to vertical
up, __ roll, out
positive, end”




8.10.1.1

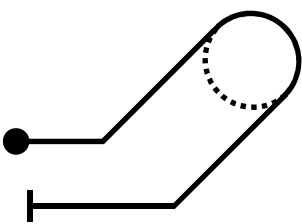
“__ roll, ¾ loop to ½ loop,
__ roll up, out positive, end”

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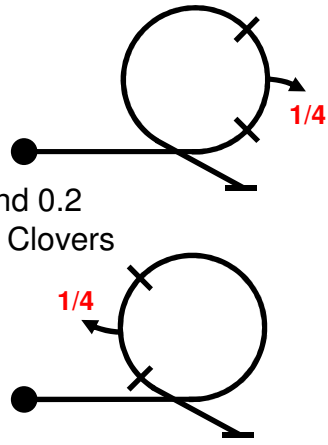
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Additional Figures: IAC Family 0 (pg 8-10)




0.0
Wingover



0.1 and 0.2
Quarter Clovers

Introduction to Aerobatic Judging

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Additional Figures: GAF Catalogue Family 9.13

GLIDER FAMILY 9.13 SUPER SLOW ROLLS

9.13

3



	$\frac{1}{2}$		1		$1\frac{1}{2}$		2
	8		16		20		
1	2	3	4	5	6	7	8

Introduction to Aerobatic Judging

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POWER COMPETITION FLIGHT PROGRAMS (5.1)

Category	Known ⁽¹⁾	Free	Unknown ⁽⁴⁾	4 Minute Freestyle ⁽⁵⁾
Primary	✓ ⁽²⁾			
Sportsman	✓	✓ ^{(2), (3)}		
Intermediate	✓	✓	✓	
Advanced	✓	✓	✓	✓ ⁽⁵⁾
Unlimited	✓	✓	✓	✓

- Notes: 1. The Known compulsory, or "qualification" flight must be flown first. (5.2)
 2. Primary flies the Known Program for all flights (up to three flights). Instead of a Free program, Sportsman may repeat the Known sequence for the second flight (5.1.3)
 3. A 3rd Sportsman flight, if scheduled, must repeat sequence flown on 2nd flight (5.1.4.c)
 4. Unknowns must be made available to contestants by the CD no later than **12** hours prior (5.5.4)
 5. The 4-Minute Freestyle is a separate trophy event for Unlimited-Power (or Glider), and *qualified* Advanced category competitors ONLY (5.1.1 and 5.6.1)

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GLIDER COMPETITION FLIGHT PROGRAMS (5.1)

Category	Known ⁽¹⁾	Free	Unknown ⁽³⁾
Sportsman	✓	✓ ⁽²⁾	
Intermediate	✓	✓	✓
Advanced	✓	✓	✓
Unlimited ⁽⁴⁾	✓	✓	✓

- Notes: 1. The Known compulsory or "qualification" flight and must be flown first (5.2)
 2. A 3rd Glider Sportsman flight, if scheduled, must repeat the program (Known or Free) flown on 2nd flight (5.1.4.c)
 3. Unknowns must be made available to contestants by the CD no later than **12** hours prior to when that flight is scheduled (5.5.4)
 4. Unlimited Gliders may participate in the Unlimited 4-min Free Program

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KNOWN COMPULSORY FLIGHT PROGRAMS

- SPORTSMAN and INTERMEDIATE Category Known Proposals:
 - Generated by the membership and sent to IAC Rules Committee Chair, who refers them to a *Known Sequence Review Committee*
 - Proposed Known Programs are then published for membership comment
 - The IAC Policy and Procedure Number 221 3.C.(2) now states:
 - » SPORTSMAN: "...shall be *flyable* by aircraft with performance similar to the 115 hp Citabria"
 - » INTERMEDIATE: "...shall be *flyable* by aircraft with performance similar to the Great Lakes" (although the 2009 IAC Board considered the Super Decathlon as a more prevalent standard)
- ADVANCED and UNLIMITED Categories:
 - Each country submits proposal to CIVA
 - CIVA selected "Known Programs" are reviewed by IAC Rules Committee, and unless changes are warranted, they become the IAC Known Programs
 - IAC Policy and Procedure Number 221 paragraph 3.C.(4) now states:
 - » ADVANCED: "...shall be *flyable* by aircraft with performance similar to the Pitts S-2A"
- IAC BoD approves selected Known Programs at the fall BoD Meeting

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Free Programs (Tables 6.2.1 & 6.2.2)

Created by each contestant and approved by a current Judge

Power

Glider

Category	Max # of Figures	Max K-factor ¹	Presentation K-factor	Max # of Figures	Max K-factor ²	Presentation K-factor
Sportsman	No limit	Same as current Known	6	No limit	Same as current Known	15
Intermediate	15	190	8	No limit	140	15
Advanced	12	300	12	10	175	35
Unlimited	9	420	26	10	230	35

Note 1) Power Free Programs - Actual K allowed use of a "Floating Point" to meet the Max K limit by reducing the highest K figure by 1K (see 6.2)

2) Glider Free Programs – Actual K can be up to 3K higher than these limits but a "Floating Point" must be taken from the highest K figures, starting with the highest K, and continuing with next lowest K, until listed Max K is reached (see 6.2.1)

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Free Program Rules (Chapter 6)

- ❑ Advanced and Unlimited requirements aligned with CIVA
- ❑ Required Versatility (6.3)
- ❑ Start and Finish Attitudes (6.4)
- ❑ Allowable Figures and Documentation (6.5 and 6.6)
- ❑ Definitive Criterion (6.7)
 - Before Free Program is in progress (1st competitor to taxi) - Form A is definitive
 - After Free Program is in progress - Form in use (B or C) is definitive
- ❑ Repetition of Figures (6.8)
- ❑ Forms A, B, and C must be certified compliant by an IAC Judge (6.14)
- ❑ Penalties prescribed for non-compliance (6.15 and 6.16)
- ❑ Judge's checklist for checking compliance (6.16)
 - Must be completed by a current IAC Judge before signing Forms A, B, and C
 - No requirement for new signature each year unless rule changes affect legality
 - Also used by Contest Jury to adjudicate non-compliant Free Programs
 - **All Free Programs with hesitation rolls must use the AxB notation!**
 - **Verifying catalogue numbers of snaps, especially snaps from knife-edge, is always a challenge!**

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Unknown Programs

- Allowable Unknown Figures
 - Appendix 3 (Power)
 - Appendix 4 (Glider)
- Supplied by membership to Rules Committee Chair
 - Can be submitted ANYTIME during the contest year
 - Design Limitations Provided (5.5)
- Provided to each Contest Director by IAC HQ
 - Must be made available to competitors no less than 12 hours prior to when the Unknown flight is scheduled to be flown (5.5.4)
 - May be modified by the Contest Jury if deemed necessary for safety (1.4.2.c)
 - A safety pilot competing in the same category must fly the Unknown Program before acting as a safety pilot for another competitor flying that Unknown Program (2.2)

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Unknown Program Design Limits (5.5)

- Unlimited Power (5.5.6):
 - 10 to 14 figures not exceeding 400K
 - Maximum of 6 snaps (no more than 4 snaps from same family and at least one in a vertical climbing figure)
- Unlimited Glider (5.5.6):
 - 7 to 9 figures not exceeding 190K
 - No single figure may exceed 40K
- Advanced (5.5.7):
 - 10 to 14 figures not exceeding 275K
 - Minimum of 2 and Maximum of 4 snaps from Family 9.9.x.x
- Advanced Glider (5.5.7)
 - 7 to 9 figures not exceeding 145K
 - No single figure may exceed 35K
- Intermediate (5.5.8):
 - Power: 6-12 figures not exceeding 175K
 - Glider: 6-9 figures not exceeding 110K

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Signaling Defined (4.16) Program Start, Interruption, and Resumption

- Proper "signal" defined as "visible and distinct dipping of the wings" (4.16) and required for:
 - a) Beginning a flight program
 - b) When a competitor *explicitly* interrupts the flight program
 - c) Resuming a flight program after a competitor initiated *explicit* interruption (an interruption signaled with wing dips)
- *Explicit* Program Interruption (4.16.2) is defined by any interruption to the flight program initiated by the competitor
- *Implicit* Program Interruption (4.16.3) occurs when:
 - a) Correcting a heading deviation of 90° or more *between* figures.
 - b) Using a one half slow roll to correct an improper attitude (upright or inverted) *between* figures.
 - c) Deliberately climbing *between* figures or flying any figure in a way such that the obvious intent is to regain altitude (the competitor still gets the benefit of the doubt, though)
- No signal required for "implicit" program interruption (4.16.3)
 - ✓ Maneuvers meeting one of the conditions described in 4.16.3(a)-(c) will be interpreted as an "Implicit Interruption, NOT an added figure!"
 - ✓ Competitor always receives the benefit of the doubt (see 7.3.1(b))
- Improper program resumption after a competitor initiated explicit interruption shall incur no more than one additional penalty per program interruption
- Penalties for program interruptions are assessed by the Chief Judge

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Judging Aerobatic Figures: General Grading Criteria

- A grade of “10” is given to the PERFECT figure
- The grade for less than perfect figures must be reduced consistently and accurately downward from 10.0 using the prescribed criteria (8.2.2)
 - Each figure is assumed to start as a “10” and downgraded in 0.5 point increments for each deviation observed *as they occur*
 - Waiting for the entire figure to be completed and then scoring from “memory replay” is neither accurate nor consistent
- Do not confuse generosity with fairness
 - The same criteria are applied to a novice pilot and the experienced pilot

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Judging Aerobatic Figures: General Grading Criteria

- Cumulative grading criteria of each component:
 - ✓ Aircraft heading alignment with X or Y axis
 - ✓ Horizontal lines show “flight path” or “trajectory of the CG” (CGT) level with horizon (glider horizontal may be ascending or descending, but must be constant)
 - ✓ Vertical and 45° lines show correct pitch attitude of “zero lift axis” (ZLA)
 - ✓ Roll attitude compared with horizon
 - ✓ Rolls must be centered on line (with certain exceptions)
 - ✓ Radius of loops and part-loops must be constant (and sometimes identical)
- Errors in roll, pitch, and yaw are downgraded using a 1 point per 5° schedule

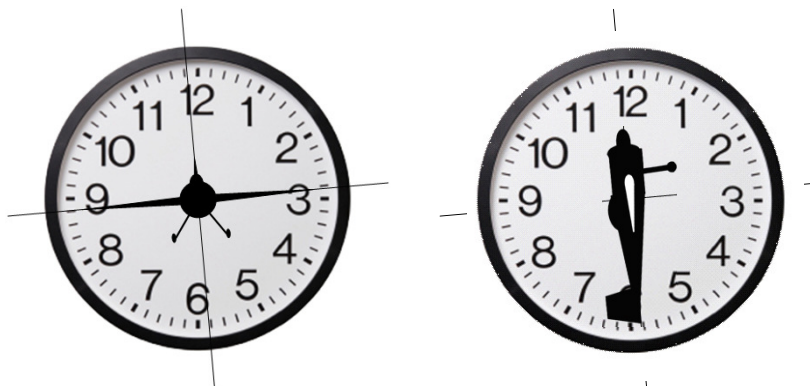
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Judging Aerobic Figures: So, what does a 5° error look like?

Remember that 1 minute on a clock = 6°



Most judges underestimate angular error, sometimes by a lot!

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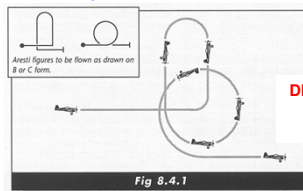
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Judging Aerobic Figures: Beginning and End of Figure (7.2)

- All figures BEGIN as soon as the airplane departs horizontal, wings-level flight path
- All figures END as soon as the airplane returns to horizontal, wings-level flight path
- Figures must be separated by a distinct horizontal line (see glider horizontal)
 - The absence of a distinct straight, horizontal flight path between figures requires a deduction of 1 point for each figure for “no line between”

EXCEPTION: **GRADING** of 7.7 “square” or 7.8 “octagon” loops ends when the last line is flown of equal length as the 1st line (discussed in detail later)



DEDUCT 1 POINT
FROM EACH
FIGURE

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Judging Aerobatic Figures: General Grading Criteria (cont)

- Length of lines is NOT a grading criterion
- Size of loops and part-loops is NOT a grading criterion as long as the radius is constant (except in comparing part-loops within a figure)
- Rate of roll is NOT a grading criterion as long as it's constant
- Correcting errors in exit flight path, bank angle, or heading between figures is NOT a downgrade for the subsequent figure
 - ✓ Deductions already applied to previous figure
 - ✓ However, once corrected, any subsequent change in flight path, bank angle, or heading, requires a 1 point per 5° downgrade to the next figure

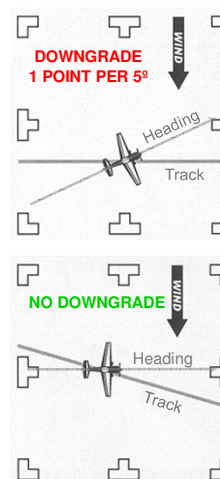
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Judging Aerobatic Figures: General Grading Criteria: Heading

- Aircraft's heading (not track) must remain in a plane parallel with the X or Y axis, except during Family 2 turns
- Deduct 1 point for every 5° of visible "crabbing"
- Heading corrections *between* figures are not a downgrade to the subsequent figure (deduction already applied to previous figure).
 - However, once corrected, any further deviations in aircraft heading requires a 1 point per 5° downgrade to the next figure
 - Heading corrections of 90° or more between figures will also result in an "Interruption Penalty" (see 4.16.3)



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Judging Aerobatic Figures: Cross-Box Figure Elements

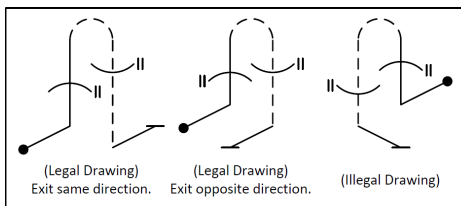


Fig 6.13.1

Depiction of Cross-Box Figure Elements

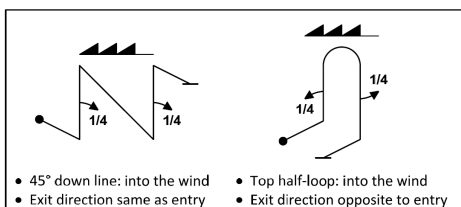


Fig 6.13.2

Directionality in Y-Y Figures

- The X axis is parallel to the official wind
- X axis entry and/or exit lines must be flown in the direction as drawn into or away from the official wind
- The Y axis is perpendicular to the X axis and is non-directional (may be entered from either direction on the Y-axis)
- Turns/rolls back onto the X axis must be flown in the X-axis direction as drawn
- Figures with a Y-axis entry and a Y-axis exit must be flown as drawn, *including internal X-axis elements and exit same or opposite relative to entry direction*

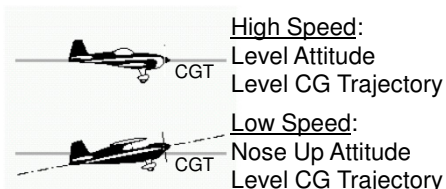
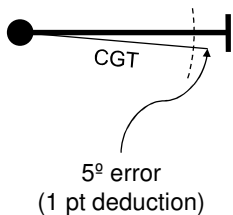
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Judging Aerobatic Figures: Horizontal Lines

- All Horizontal Lines are Judged on Flight Path defined by the Trajectory of the Center of Gravity (CGT)
- NOT judged by aircraft's attitude
- Deduct 1 point per 5° of error between CGT and horizontal



No points deducted from either of these!

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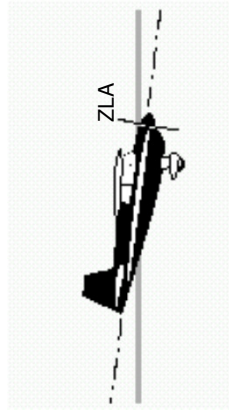
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Judging Aerobatic Figures: Vertical Lines

Vertical Lines Judged on
Attitude of the Zero-Lift
Axis (ZLA)

NOT
The "Apparent"
Longitudinal
Axis



ZLA must be Vertical
to Horizon

Wings must be
parallel to horizon

1 point deduction for
each 5° error in the
ZLA attitude

Note: Where the terms "CGT" and "ZLA" appear, they indicate the appropriate
reference for judging an element of a figure

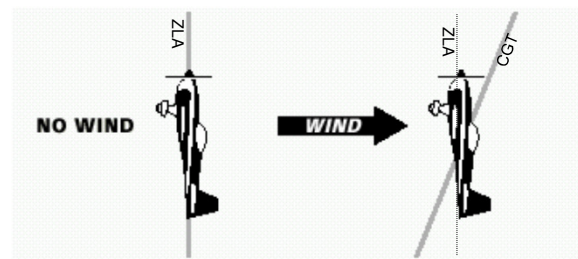
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Judging Aerobatic Figures: Vertical Lines

Vertical lines are NOT Wind Corrected
Zero Lift Axis (ZLA) must be vertical, wings parallel to horizon



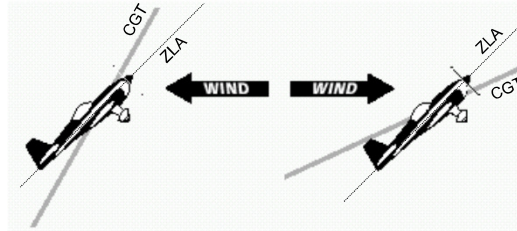
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Judging Aerobatic Figures: 45 Degree Lines

45° Judged by Attitude of the Zero Lift Axis (ZLA) Relative to Vertical plus or minus 45°

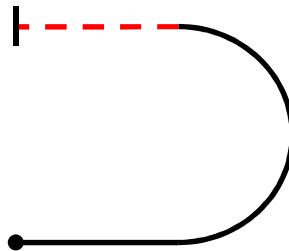


45° lines are NOT Wind Corrected
(i.e. NOT judged on Flight Path or CG Trajectory)



Judging Aerobatic Figures: Loops and Part-Loops

- Judged by Flight Path of the Aircraft's CG Trajectory (CGT)
- The radius of any looping segment must be constant
- In some figures the radii of some or all part-loops must be identical
- Graphic added to rule book to summarize when radii of part-loops must be identical and when they can be different ([Fig 8.4.8](#))





Judging Aerobatic Figures: Errors in Line Lengths (8.4.1.f)

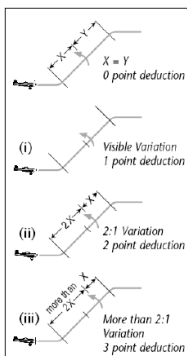


Fig 8.4.4

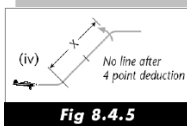


Fig 8.4.5

No line between figures:

- 1 point from each figure

Errors in Line Length:

- 1 point - visible variation
- 2 points - 2:1 variation
- 3 points - greater than 2:1 variation
- 4 points - no line before or no line after roll
- 2 points - no line before and no line after

Note: These deductions apply to:

- errors in length of different lines within a figure that are required to be equal (e.g., square loops) AND to
- errors in roll placement on a line

Exceptions for Gliders:

- Snap rolls need not be centered on interior lines

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Judging Aerobatic Figures: Two Types of Zero

Two Types of Zero based on the reason for giving the zero:

a) Hard Zero (HZ) - given for "matters of fact" errors (7.3.1)

- Annotated on the Form A with the mark "HZ"
- Reason for applying the HZ in the Remarks column

Examples: Added figure (HZ), Incorrect figure (HZ), wrong direction (HZ)

b) Numeric Zeros (0.0) – given for matter of subjective perception, rather than clearly demonstrable fact; therefore 0.0 grades are not subjected to majority rule (7.3.2)

- Figure that contains a number of smaller errors that cause the grade to fall to zero by accumulation of downgrading points

Example: Combinations of flight path, heading, and/or roll attitude deviation(s) of 50° or more result in a "numeric" zero (0.0)

- The judge perceives that the pilot has failed to meet a relevant criteria for a maneuver that is not a clearly demonstrable matter-of-fact

Examples: "Did not spin" (0.0), "did not snap" (0.0), "did not slide" (0.0), snap during a rolling turn (0.0)

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Majority Rule for Hard Zeros

- Applied for every Figure and Presentation grade
- Majority Hard Zeros (HZs more than 50%) result in remaining non-zero grades changed to HZ automatically by the scoring software (7.3.3)
- Minority Hard Zeros (HZs 50% or less) will be changed to the numeric average grade of the majority judges automatically by the scoring software (7.3.4)
- Chief may conference Judges (see 7.3.6) when difficulties occur in interpreting the correct application of HZ mark AND the Chief Judge believes when there is a compelling doubt on matters-of-fact:
 - ✓ No conference permitted for unanimous zeros (HZs or 0.0's) or a mix of zeros (HZ and 0.0) and Averages only
 - ✓ One of three possible revision of grades after a conference of the facts:
 1. Judges may leave scoresheets as originally marked (including 0.0)
 2. Judges may revise their mark downward to a hard zero (HZ); or
 3. Judges may revise their hard zero (HZ) mark to a "C" (Conference Average) to signify that their mark resulted from a conference discussion of the facts

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Grading Judge Hard Zero (HZ) 7.3.1 (a) – (e)

- a) Omitting a figure in the program
- b) Adding a figure unless it is to correct heading or attitude, in which case an interruption penalty will be given (see 4.16.3.c)
- c) Flying a figure that deviates from that on Form B or C, whichever is in use
- d) Flying a figure, or any part of a figure, in the wrong direction on the X axis
- e) Flying the exit line of a figure with both a Y axis entry and exit not in the direction, same or opposite, of the entry as depicted on the Form B or C, whichever is in use

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Chief Judge/Jury Hard Zero (HZ)

7.3.1(f) – (k)

- f) Any figures flown entirely outside the box prior to initial entry (see 7.3.5)
- g) Any figure started behind the Judges line
- h) Any figure or part of figure flown over the deadline
- i) Super Slow Roll (Gliders) flown faster than 10 seconds per 360° of roll
- j) Any figure interrupted for a technical fault ruled to be invalid (see 4.18.3)
- k) Any figure from a Free program which the Contest Jury, using the Judge Checklist, found to be illegal after becoming “final” (see 6.15 and 6.16)



“A” is for AVERAGE (7.4)

- Mark the figure as “A” if you miss seeing the figure, or any part of the figure such that a grade cannot be given with FULL confidence
- Not a sign of failure - more fair than “faking” it
- “A” grades set aside when assessing majority rule for Hard Zero (HZ) grades
- “A” grade calculated by scoring program (average of majority grades, including 0.0 grades)

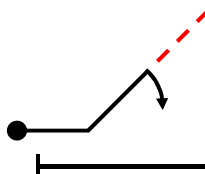
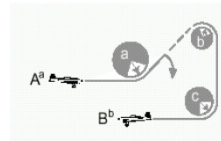


Judging Aerobatic Figures:

Family 1 - Lines and Angles

GRADING CRITERIA:

- Constant radii, but need not be equal (CGT)
- Horizontal lines judged on flight path (CGT)
- 90° and 45° lines judged on attitude (ZLA)
- If present, rolls must be centered
- Exit altitude may be higher or lower than entry altitude.



Ex: 1.2.3.1
+ 9.1.2.2

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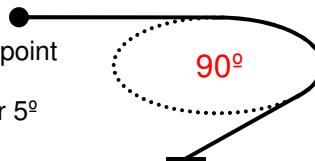


Judging Aerobatic Figures:

Family 2 – Turns

GRADING CRITERIA:

- Minimum bank angle of 60° established *before* heading change: – 1 point per 5° under
- Rate of roll-in determines rate of roll-out: – 1 point deduction for a difference
- Constant bank angle during turn – 1 point per 5° change
- Constant rate of turn: ≤ 1 point per variation
- Constant altitude:
 - – 1 point per 5°, or
 - – 1 point per 100 ft variation
- Final heading established *before* rolling wings level – 1 point per 5° heading error or roll integration
- NOT wind corrected; 360° turns will not finish over the same point if there is any wind – no downgrade



Ex: 2.1.1.1

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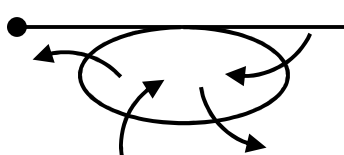
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Judging Aerobatic Figures: Family 2 (cont) - Rolling Turns

GRADING CRITERIA:

- Constant altitude:
 - – 1 point per 5°, or
 - – 1 point per 100 ft variation
- Constant rate of roll: – ≤ 1 point per deviation
- Constant rate of turn: – ≤ 1 point per deviation
- No stoppage of roll: – 1 point for each stop
- Correct number and direction of rolls – hard zero (HZ) if incorrect
- Rolls in Rolling Turns are slow rolls: numeric zero (0.0) figure if a snap roll is perceived
- In opposite rolling turns:
 - Each roll reversal must occur at wings level attitude: – 1 point per 5° of under/over rotation at reversal
 - Minimal pause between opposite rolls, as in hesitation rolls (rate of turn will likely also pause between opposite rolls – no deduction)
- Finish on heading:
 - – 1 point for each 5° of roll remaining at exit heading
 - – 1 point for each 5° of turn remaining at completion of last roll



Ex: 2.4.8.1

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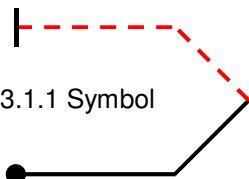


Judging Aerobatic Figures: Family 3 - Combinations of Lines

GRADING CRITERIA:

- Identical radii of all part-loops (CGT)
- Identical length lines within the figure
 - 1st non-horizontal line sets the length by which all subsequent lines are judged

Ex: 3.3.1.1 Symbol



$$A = B$$

$$a = b = c$$

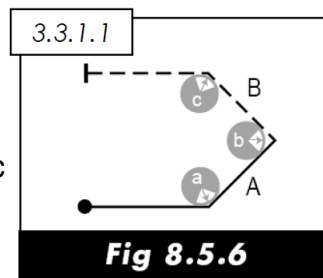


Fig 8.5.6

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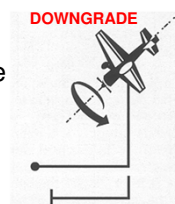
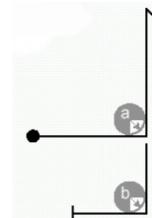


Judging Aerobatic Figures

Family 5 – Hammerheads

GRADING CRITERIA:

- Part-loop radii can all be different
- All vertical and 45° lines can be different lengths
 - ✓ Therefore, altitude of horizontal entry/exit lines may be different
- Rolls centered on 45° and vertical lines
- Pivots within a “½ wingspan radius circle”
 - ✓ Downgrade by 1 point for each ½ wingspan the pivot is completed outside the “½ wingspan radius circle”
 - ✓ Downgrade “fly-overs” and “late pivots” or “wing-slides”
- Wings and the ZLA remain in the vertical geometric plane during the pivot
 - ✓ Downgrade by 1 point per 5° of error (torqueing) in pitch or roll



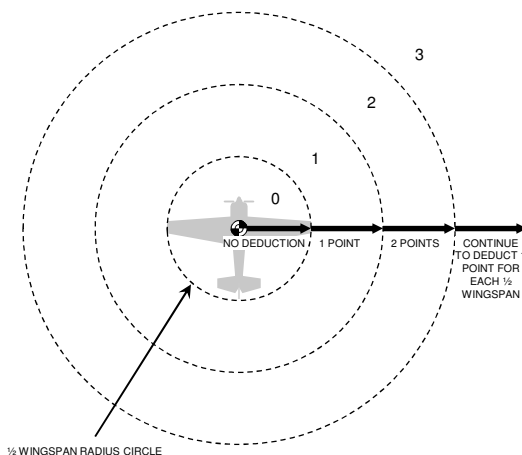
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Judging Aerobatic Figures


Family 5 - Hammerheads (cont)



- This figure illustrates the concept that the pivot may occur anywhere in a “½ Wingspan Radius Circle” (centered on the ideal pivot point) before downgrades for pivot location would be applied
- This concept allows for an “early kick” or “fly-over” but also allows for a “late kick” or “wing-slide”
- Deduct 1 point for each ½ wingspan the pivot is completed outside the “½ Wingspan Radius Circle”

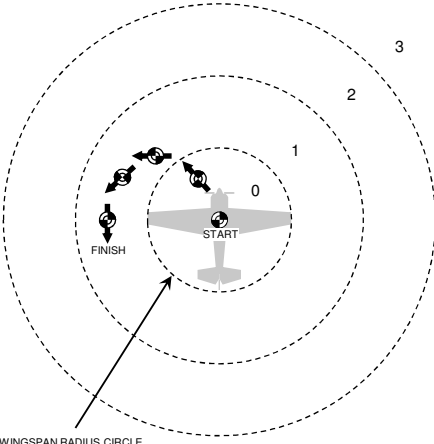
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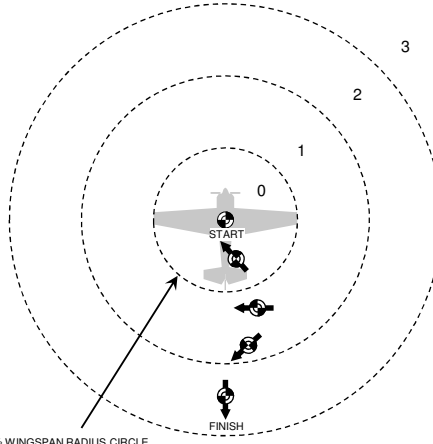
Judging Aerobatic Figures

Family 5 - Hammerheads (cont)



1/2 WINGSPAN RADIUS CIRCLE

EXAMPLE OF AN "EARLY KICK" OR "FLY-OVER"
1 POINT DEDUCTION




1/2 WINGSPAN RADIUS CIRCLE

EXAMPLE OF A "LATE KICK" OR "WING SLIDE"
2 POINT DEDUCTION

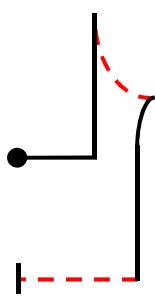
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Judging Aerobatic Figures

Family 6 – Tailslides



Ex: 6.2.2.3

GRADING CRITERIA:

- Entry and exit part-loop radii can be different
- Vertical up-line, slide, and down-line (ZLA), wings level
- Vertical lines can be different lengths
 - ✓ Therefore, altitude of horizontal entry/exit lines may be different
- Rolls centered on up and down lines
- Slide backwards at least 1/2 fuselage length for Power (for Gliders - just a visible slide) – numeric zero (0.0) if not
- Falls in correct direction – hard zero (HZ) if it doesn't
- Falls with wings level in correct plane: – 1 point per 5° error in roll or yaw
- No downgrade for pendulum after slide

Introduction to Aerobatic Judging

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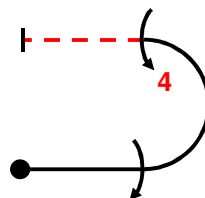
Judging Aerobatic Figures

Family 7 - Loops and Eights

FAMILY 7.2: Half-Loops

GRADING CRITERIA:

- Constant radius (CGT) - Must be wind corrected!
- Horizontal flight-path (CGT) must be maintained at exit - 1 point per 5° of flight path error
- No visible lines between rolling and looping portions of the figure
 - Drawing a line [between a looping segment and an adjacent rolling element] requires a deduction of at least 1 point, depending on the length of the line drawn

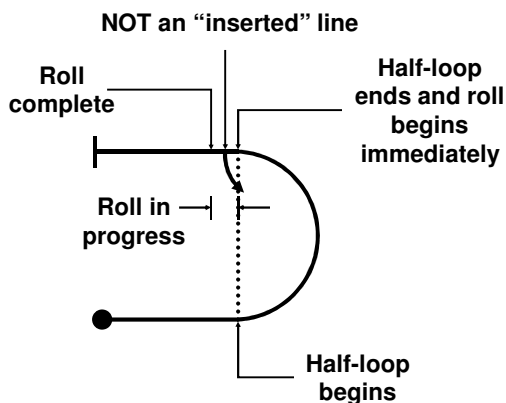


Ex: 7.2.1.1
+ 9.1.3.4
+ 9.4.3.4



HALF-LOOPS WITH ROLLS

DON'T BE TRIGGER HAPPY!





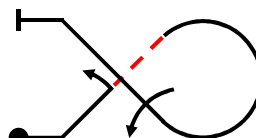
Judging Aerobic Figures

Family 7 - Loops and Eights (cont)

FAMILY 7.3: Three-Quarter Loops

GRADING CRITERIA:

- All part loop radii may be different (CGT)
- Entry and exit altitude can be different than the top and bottom of the loop (length of 45° lines bear no relation to the size of the loop)
- Any rolls on 45° lines must be centered



Ex: 7.3.2.1
+ 9.1.2.2
+ 9.1.2.4



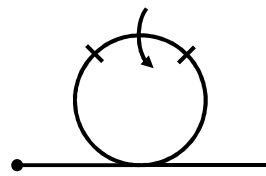
Judging Aerobic Figures

Family 7 - Loops and Eights (cont)

FAMILY 7.4.1 – 7.4.2: Full Loops

GRADING CRITERIA:

- Wind corrected to have a constant radius (CGT must appear perfectly round to the judge)
 - Note: With any crosswind, the loop will not occur within same vertical plane and is not a judging criterion (no deduction should result as long as it appears round)
- If rolls are present, they must be centered about the apex (or nadir) - 1 pt per 5° of asymmetry
 - Minimum 2 point deduction for line during roll (must be integrated in loop)
 - Roll or roll combination must be centered (not the pause between)



Ex: 7.4.1.1
+ 9.1.3.4



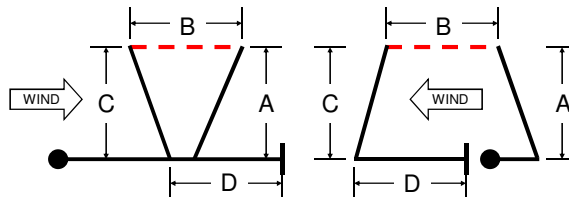
Judging Aerobatic Figures Family 7 - Loops and Eights (cont)

FAMILY 7.4.3 – 7.4.6: Square, Diamond, and Octagonal Loops

GRADING CRITERIA:

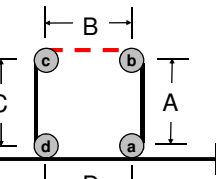
- 90° and 45° lines are judged on attitude (ZLA)
- Horizontal lines judged on flight path (CGT)
- Identical line lengths, set by length of 1st 45° or 90° line
- Identical radii of all part-loops (CGT)
- If rolls are present, they must be centered on the line

Examples of flight path of "perfect" square loops in different wind conditions:



$$A = B = C = D$$

$$a = b = c = d$$



Ex: 7.4.3.1

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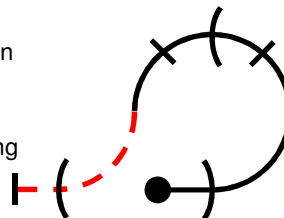


Judging Aerobatic Figures Family 7 - Loops and Eights (cont)

FAMILY 7.4.7 – 7.4.14: Reversing Whole Loops

GRADING CRITERIA:

- Both the 1/4 and 3/4 loop segments must be round (wind corrected) and of identical radius (CGT)
- Continuous looping figure with no visible line between 1/4 and 3/4 loops
 - ✓ at least 2 pt deduction if line is seen
- No line between entry/exit roll and following/preceding loop (see 8.4.2.c)
- Roll or roll combination at apex/nadir must be integrated in loop and start and stop symmetric about apex/nadir
 - ✓ Minimum 2 point deduction for line during roll
 - ✓ Deduction of 1 pt per 5° of asymmetry of roll or roll combination



Ex: 7.4.7.1

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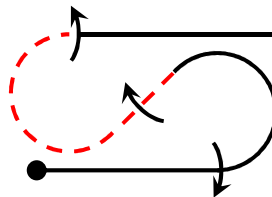
Judging Aerobatic Figures

Family 7 - Loops and Eights (cont)

FAMILY 7.5.1 – 7.5.8: Horizontal “S”s

GRADING CRITERIA

- Identical radii for $\frac{5}{8}$ th loops
- Top and bottom of loops occur at entry and exit altitudes
- Any rolls on 45° lines must be centered (downgrade according to 8.4.1.f)
- No line after a roll on an entry line or before a roll on an exit line (downgrade according to 8.4.2.c)



Ex: 7.5.1.1
+ 9.1.3.4
+ 9.1.4.4
+9.1.3.4



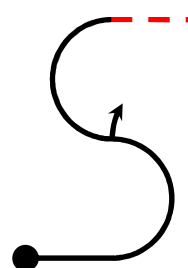
Judging Aerobatic Figures

Family 7 - Loops and Eights (cont)

FAMILY 7.5.9 – 7.5.10: Vertical “S”s

GRADING CRITERIA:

- Both loops must be round (wind corrected) and of identical radius (CGT)
- Loops must be one above the other unless there is a half roll between them
- Half rolls between loops performed on a line but no line before or after (not integrated with the loop) – again, don't be trigger happy



Ex: 7.5.10.1
+ 9.1.3.2

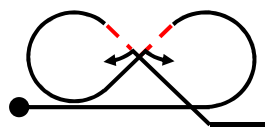


Judging Aerobatic Figures Family 7 - Loops and Eights (cont)

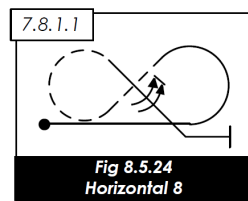
FAMILY 7.8.1 – 7.8.8: Horizontal “8”s

GRADING CRITERIA

- Entry/exit radii of 1/8th loops may be different from each other and from 3/4 loop radii (CGT)
- Identical 3/4 and 5/8th loop radii and must occur at the same altitude (different altitude ok in gliders)
- Entry and exit altitude *must be identical* (except in gliders) unless:
 - ✓ 7.8.1.x-7.8.4.x: there are *multiple* rolls on the final 45° line, or
 - ✓ 7.8.5.x-7.8.8.x: there are *multiple* rolls on the first 45° line
- Any rolls on 45° lines must be centered



Ex: 7.8.4.1
+ 9.1.4.2
+ 9.1.4.2
“Cuban-8”



• Example of a 7.8.1 – 7.8.4 figure with a multiple roll on the last 45 degree line

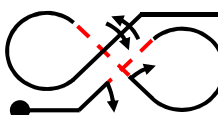


Judging Aerobatic Figures Family 7 - Loops and Eights (cont)

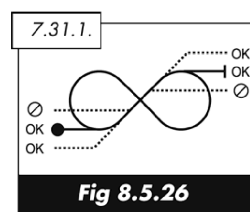
FAMILY 7.8.9 – 7.8.16: Horizontal Super “8”s

GRADING CRITERIA:

- Entry/exit radii of 1/8th loops may be different from each other and from 3/4 loop radii (CGT)
- Identical 3/4 loop radii (CGT)
- For Power Competition: Entry and exit altitudes and the top and bottom of the 3/4 loops must all coincide, except if there are multiple rolls on the first and/or last 45° lines, these lines may be extended but not shortened (“OK” dotted lines in Figure 8.5.26)
- For Glider Competition: There is no relation between entry/exit altitude and the altitude limits of the 3/4 loops so all 45° lines can be of different lengths.
- Any rolls on 45° lines must be centered (except snap rolls in gliders, see 8.4.1.e)



Ex: 7.8.13.1
+ 9.1.2.2
+ 9.1.2.2
+ 9.1.2.4
+ 9.1.2.4



• Combination 8



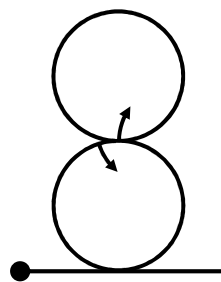
Judging Aerobic Figures

Family 7 - Loops and Eights (cont)

FAMILY 7.8.17 – 7.8.22: Vertical “8”s

GRADING CRITERIA:

- Both loops must be round (wind corrected) and of identical radius (CGT)
- Loops must be one above the other unless there is a half roll between them
- Half rolls performed on a line but no line before or after (not integrated with the loop) – again, don’t be trigger happy
- Entry and exit altitude must be the same



Ex: 7.8.20.1
+ 9.1.3.2
+ 9.1.3.2



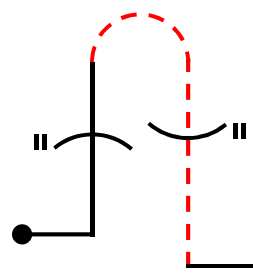
Judging Aerobic Figures

Family 8 - Combination of Lines, Angles and Loops

FAMILY 8.4: Humpty Bumps

GRADING CRITERIA:

- All part-loop radii may be different (CGT)
- 1/2 loop must be wind corrected for constant radius (CGT)
- All vertical and 45° lines can be different lengths
 - ✓ Therefore, altitude of horizontal entry/exit lines may be different
- Rolls must be centered on the line



Ex: 8.4.3.1
Pull-Push-Pull
Humpty



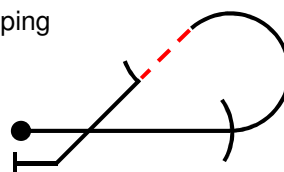
Judging Aerobatic Figures Family 8 - Combination of Lines, Angles and Loops (cont)

FAMILY 8.5: 5/8th Loops

GRADING CRITERIA:

- All part-loop radii may be different (CGT)
- Roll must be centered on the 45° line
- No visible line between looping portion and rolls on horizontal lines preceding or following that looping portion

- Altitude gain/loss is not a grading criterion



Ex: 8.5.6.1

Basic figure for "Half-Cuban"



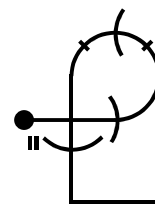
Judging Aerobatic Figures Family 8 - Combination of Lines, Angles and Loops (cont)

FAMILY 8.6: 6/8th "P" Loops and Reversing "P" Loops

GRADING CRITERIA:

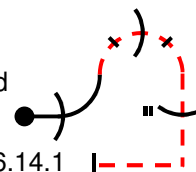
- Radii of all looping portions may be different (CGT), except in 8.6.13 to 8.6.16 reversing P Loops, where adjacent 1/4 and 1/2 loop portions must be identical
- Reversing "P" Loops flown as one continuous figure (no line between adjoining looping segments)
- No visible line between looping portion and rolls preceding or following that looping portion
- Rolls must be centered on vertical lines
- Rolls at apex/nadir of a 1/2 or 3/4 loop must be centered

- Altitude gain/loss is not a grading criterion



Ex: 8.6.5.1

"P" Loop



Ex: 8.6.14.1

Reversing "P" Loop



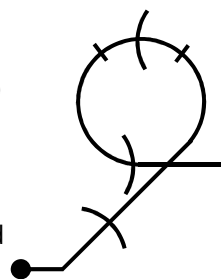
Judging Aerobatic Figures

Family 8 - Combination of Lines, Angles and Loops (cont)

FAMILY 8.7: 7/8th or “Q” Loops

GRADING CRITERIA:

- Radii of all looping portions may be different (CGT)
- No visible line between looping portion and rolls preceding or following that looping portion
- Rolls must be centered on 45° and vertical lines
- Rolls at apex/nadir of a 7/8th loop must be centered
- Altitude gain/loss is not a grading criterion



Ex: 8.7.1.1



Judging Aerobatic Figures

Family 8 - Combination of Lines, Angles and Loops

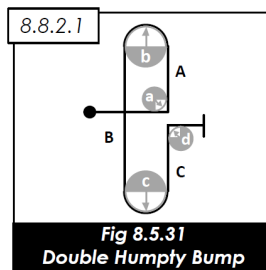
FAMILY 8.8: Double Humpty Bumps

GRADING CRITERIA:

- Radii of all part-loops may be different (CGT)
- Rolls must be centered on the line
- Entry and exit altitudes need not be the same

$$a \neq b \neq c \neq d$$

$$A + C \neq B$$





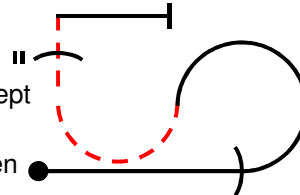
Judging Aerobatic Figures

Family 8 - Combinations of Lines, Angles and Loops (cont)

FAMILY 8.10: Reversing 1 ¼ Loops

GRADING CRITERIA:

- Identical radii of all looping portions (CGT) except final ¼ loop to the exit line
- Flown as one continuous figure (no line between adjoining ¾ and ½ loop segments)
- No visible line between looping portion and rolls preceding or following that looping portion
- Rolls must be centered on vertical lines
- Altitude gain/loss is not a grading criterion



8.10.1.1
Reversing 1 ¼ Loop



Judging Aerobatic Figures

Family 9 - Rolls and Spins

GENERAL GRADING CRITERIA FOR ALL ROLLS (SLOW ROLLS, SNAP ROLLS, AND SPINS):

- Constant rate of rotation (except spins)
- During the slow rolls and snap rolls, aircraft must continue to project the prescribed plane of rotation and direction of flight (CG tracks the shape of the underlying figure)
- Stops precisely after stated number of rotations
- Linked rolls must be flown as one continuous figure
- Unlinked and opposite rolls must have a brief but perceptible pause between the rolls



Judging Aerobatic Figures

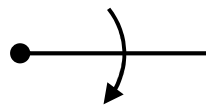
Family 9 - Rolls and Spins (cont)

SLOW ROLLS (9.1.x.x)

SUPER SLOW ROLLS (GAF 9.13.x.x)

GRADING CRITERIA:

- Constant roll rate: – 1 point per variation
- No roll stoppage: – hard zero (HZ) if the rotation stops such that the roll can be considered a hesitation roll
- Aircraft should continue to project the same plane of rotation and direction of flight during the roll
- Aircraft attitude in horizontal rolls is not a grading criterion (must change to maintain level CGT)
- THE GLIDER SUPER SLOW ROLL is judged by the same criteria
 - Roll timed by the Chief Judge
 - Not less than 10 sec per 360° roll



Ex: 1.1.1.1
+ 9.1.3.4

Introduction to Aerobatic Judging

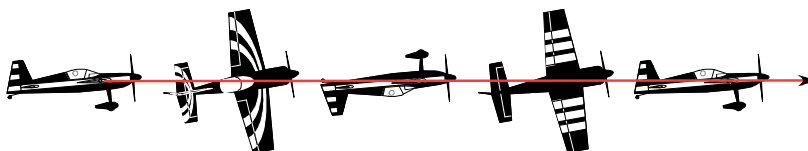
123



Judging Aerobatic Figures

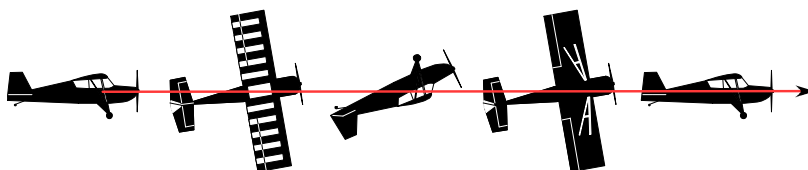
Family 9.1 - 9.8 Aileron Rolls

- ❑ Attitude change required to fly constant trajectory



- ❑ These are not “barreled” rolls!

FLIGHT PATH



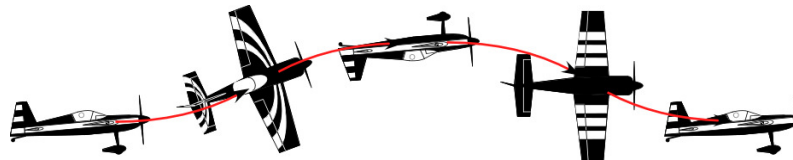
Introduction to Aerobatic Judging

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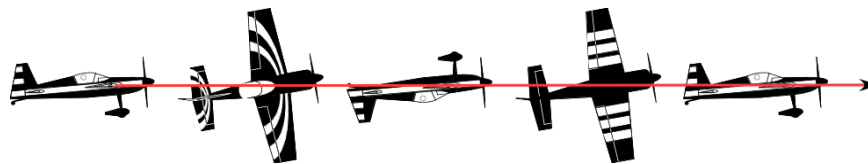


Judging Aerobatic Figures Family 9.1 - 9.8 Aileron Rolls

- ❑ This “barreled” aileron roll trajectory must be downgraded!



- ❑ This aileron roll trajectory must NOT be downgraded



Introduction to Aerobatic Judging

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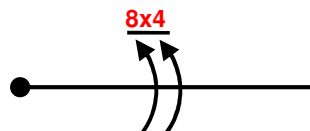
Judging Aerobatic Figures Family 9 - Rolls and Spins (cont)

HESITATION ROLLS (9.2.x.x - 9.8.x.x)

GRADING CRITERIA

- Constant rate of roll and rhythm: – 1 point for visible variation
 - Hesitations must be of identical duration
 - Hesitations must be recognizable – hard zero (HZ) if no point is seen
- Correct degree of rotation between each hesitation: – 1 point per 5° of error at hesitation

Ex: 1.1.1.1
+ 9.4.3.8



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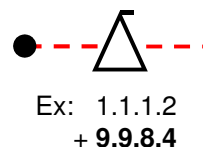


Judging Aerobatic Figures Family 9 - Rolls and Spins (cont)

SNAP ROLLS (9.9.x.x - 9.10.x.x)

GRADING CRITERIA:

- Rapid pitch in correct direction to near critical AOA:
 - Positive (inside) snaps – nose moves towards canopy
 - Negative (outside) snaps - nose moves towards wheels
 - If nose moves wrong direction, hard zero (HZ)
- Aircraft begins to “auto-rotate” with clearly visible yaw just after or simultaneously with rapid pitch to near critical AOA:
 - Deduct 1 point per 5° of roll and/or yaw observed before the autorotation begins
 - No autorotation results in numeric zero (0.0)
- Constant rate of rotation and plane of rotation:
 - Deduct 1 point per variation of “character” (e.g., rate of rotation or nose moving more onto the flight path, etc.)
 - However, “buried the snap” is not a criterion and not downgraded
- Aircraft must exit auto-rotation upon reaching required degree of roll:
 - Readopts the attitude or flight path that conforms to the underlying figure
 - Deduct 1 point per 5° of under/over rotation when auto-rotation stops



Introduction to Aerobatic Judging

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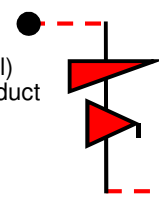


Judging Aerobatic Figures Family 9 - Rolls and Spins (cont)

SPINS (9.11.x.x - 9.12.x.x)

GRADING CRITERIA:

- Horizontal flight path before stall (CGT)
- At stall, nose must fall (pitch) simultaneously with wing drop (roll) and yaw in direction of spin (all three axes simultaneously) - deduct 1 point per 5° of deviation observed before the stall
- Aircraft remains in auto-rotation until stopped on prescribed heading: – deduct 1 point per 5° of under or over-rotation
- Establish 90° vertical down line (ZLA), wings level attitude after stopping on heading: – deduct 1 point per 5° of error
- If a roll follows the spin, there should be a perceptible pause between the spin and roll, and the roll direction (same or opposite) is determined by the roll component of the spin
- Constant ¼ loop radius to horizontal flight (CGT)
- Pitch attitude in the spin and rate of auto-rotation are not grading criterion (i.e., the spin may be oscillatory)



Introduction to Aerobatic Judging

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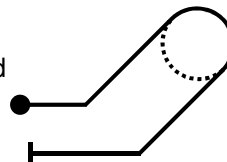
Judging Aerobatic Figures

Family 0

WINGOVER (0.0)

GRADING CRITERIA:

- Coordinated turn begins immediately after climb initiated
- Heading at top of climb 90° off original heading and wings perpendicular to horizon at top of climb: – deduct 1 pt per 5° of heading or attitude deviation
- Second half of turn is on descending flight path
- Rate of turn and roll must be constant - 1 point per variation
- Any stoppage of turn or roll during figure - 1 point per stoppage



Introduction to Aerobatic Judging

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Judging Aerobatic Figures

Family 0 (cont)

QUARTER-CLOVERS (0.1 and 0.2)

GRADING CRITERIA:

0.1 Quarter-Clover:

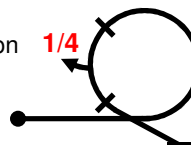
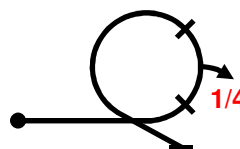
- Roll begins simultaneous with pitch up
- Roll integrated with 1st half loop such that the aircraft reaches the top of the loop inverted with fuselage horizontal and wings level with the horizon, 90° from the start direction – deduct 1 pt per 5° deviation in attitude or heading

0.2 Quarter Clover:

- Roll begins immediately upon reaching the apex of the loop
- Roll integrated with 2nd half loop such that the aircraft reaches the bottom of the loop in wings-level horizontal flight, 90° from the start direction – deduct 1 pt per 5° deviation in attitude or heading

For both Figures:

- Roll rate must be constant – deduct 1 pt per variation
- Start and finish altitude must be equal
- Loops must be round (CGT)



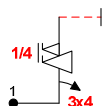
Introduction to Aerobatic Judging

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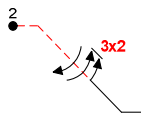


Judging Complex Figures Bias

Consider the following three figures:



- Snap ovr rot (15°) = -3.0
- Grade = $10 - 3.0 = 7.0$



- 45 line after (-10°) = -2.0
- Varied roll rate once = -1.0
- Grade = $10 - 3.0 = 7.0$



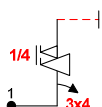
- 4x4, 2 pts ($+5^\circ$ @) = -1.0
- Exit off hdg (10°) = -2.0
- Grade = $10 - 3.0 = 7.0$

Introduction to Aerobatic Judging

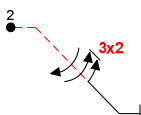
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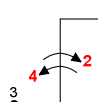
Judging Complex Figures Bias



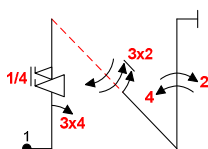
- Snap ovr rot (15°) = -3.0
- Grade = $10 - 3.0 = 7.0$



- 45 line after (-10°) = -2.0
- Varied roll rate once = -1.0
- Grade = $10 - 3.0 = 7.0$



- 4x4, 2 pts ($+5^\circ$ @) = -1.0
- Exit off hdg (10°) = -2.0
- Grade = $10 - 3.0 = 7.0$



If combination figure flown exactly the same as individual figures, grade = ????

1.0! Yet common to see not less than a 6.5 or 7.0, or even an 8.0, because judges have a subconscious bias against giving very low scores to highly experienced pilots!

Low marks do not necessarily indicate poor flying!
This is a demanding sport flown against very high standards.

Introduction to Aerobatic Judging

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Presentation Grade Judging Criteria (8.6)

GRADING CRITERIA:

- Sequence should achieve a sense of balance between the left and right of the Y-Axis but not required to use entire box
- Sequence should be flown in a manner that presents each figure at its optimal viewing distance and angle
- Sequence should be harmonious by clearly separating individual figures but each following the one before at similar intervals in time
- Grade must take into account the placement of individual figures, the balance of the sequence as a whole, and the harmony of execution
- Judges must apply presentation criteria in a consistent manner to every pilot flying the program



Unlimited Four-Minute Freestyle Judging Criteria (5.6.8)

- **4-Minute Freestyle:** Created by each Unlimited competitor who chooses to enter this optional and separate trophy event
 - Figures do not have to come from the Aresti Aerobatic Catalogue
 - Grading criteria different than for the other contest flight

GRADING CRITERIA:

- **Technical Merit (160K):**
 1. Complete use of Flight Envelope (40K)
 2. Exploitation of Aerodynamic & Gyroscopic Forces (40K)
 3. Execution of Individual Maneuver Elements (40K)
 4. Wide Variety of Figures Flown on Different Axes and Flight Paths (40K)
- **Artistic Impression (160K):**
 5. Pleasing and Continuous Flow of Figures (40K)
 6. Contrasting Periods of Dynamic and Graceful Maneuvers (40K)
 7. Presenting Individual Figures in their Best Orientation (40K)
 8. Presenting Individual Figures in the Optimal Position (40K)
- **Positioning (80K):**
 9. Symmetry (40K)
 10. The Performance Zone (40K)



Rulebook Change Process

- ❑ Send proposals for Rule Changes to the Rules Committee by 1 September
- ❑ Rules Committee deliberates on proposals and decides which to forward to membership for comment.
 - Deadline for member comment is 1 October
- ❑ Rules Committee then forwards their recommendations Rule changes to IAC Board of Directors for approval at Fall BoD Meeting

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How Scores are Computed

- ❑ JaSPer (Straight Average Method) Adopted in 2005 for Regional Contests
 - Replaced IAC Approved statistical scoring S/W, which was MS DOS Based with cumbersome user interface and S/W maintenance issues - abandoned in 2005
 - IAC Owned (donated) S/W written in “JAVA”
 - ALL marks used (no discarding of high/low marks) and then averaged
 - Judge Performance Indices (JPI) are not available with straight averaging
 - *Very strong interface with Online Contest Results and IAC Judge Databases!*
- ❑ Fair Play System (Statistical Processing Method) – used ONLY at the U.S. National Championships, where the CIVA Software is used
 - Scores based on statistical processing of grades with the intent of addressing intentional and unintentional judge bias
 - Replaced the CIVA/IAC Approved “TBLP” statistical scoring S/W first instituted in 1978, which was MS DOS Based with cumbersome user interface and S/W maintenance issues
 - CIVA maintained S/W and is Windows Based; outdated algorithms were modernized in 2005, Judge Performance Indices (JPI) added in 2004
 - *No interface with IAC Online Contest Results or IAC Judge Databases*

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Straight Average Scoring Should it Matter to Judges?

- ❑ Judges **MUST NOT** let opinion of scoring method impact their application of the criteria to determine grades!
 - Pilot's final score on each figure will be the average ALL judges scores (high and low scores ARE NOT discarded)
 - With straight average scoring, scores significantly different (high or low) from other judges may have a larger impact on the outcome than in statistically based scoring systems
- ❑ So it is very important that:
 - Judges **MUST BE ACCURATE** in applying the criteria and deduct from "10" in 0.5 pt increments to arrive at the correct grade
 - Judges **MUST NOT CHANGE** their method of grading to avoid being the "outlier"

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THE TEN COMMANDMENTS OF GRADING

The Standard Is Perfection
Be Fair
Be Ethical
Be Consistent Competitor-to-Competitor
Give the Benefit of the Doubt
Be Accurate in Applying Criteria - Don't Get in a Rut
If You Didn't See Anything Wrong, It's a 10
Avoid the HALO effect
Don't Adjust For Difficulty
GRADE ONLY WHAT YOU SEE!

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The Next Steps - - - - -

- ✓ Pass the Regional Judge Exam (80%)
 - ✓ Assist a *Grading Judge*:
 - 40 flights total
 - 10 flights in Advanced or Unlimited (waived for an applicant who has competed in Advanced or Unlimited in the current or previous year)
 - ✓ Then Pass the Practical Exam
 - ✓ Forward signed [application](#) to Judge Program Chair
- Then when Certified as an IAC Regional Judge:
- ✓ Maintain/regain currency for the Following Contest Season (2.6.3)!
 - ☐ Judge 30 competition flights each year (25 if at least 5 were ADV or UNL Free) or have to go back to "refresher portion (2nd day) of Intro" school or "Advanced" school
 - ☐ Pass the Revalidation and Currency Exam
 - ✓ Consider becoming a [National Judge](#) when you've gained enough experience (2.6.2)

Note: National Judges must have attended a school within previous 3 calendar years or performed as a judge at the U.S. Nationals in the previous contest year to regain currency as a National Judge

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What are your questions?

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