Aresti Made Simple

by
Barry Wegman
JR SCAT Series Administrator

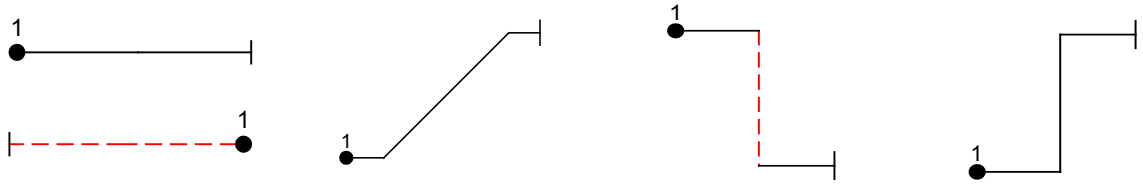
I was practicing a sequence with a stick plane using the posted narrative because I hadn't seen it before and wanted to verify it was correct. I found myself stopping the flow of the sequence, reading the next maneuver and then questioning what was meant before returning to "perform" the next maneuver. I then pulled out the Aresti. One glance at the figure and I knew what was needed.

Every year I see new pilots requesting a narrative because they don't understand how to read the Aresti diagram. Sometimes its more advanced pilots that need narratives. This article will attempt to make sense of the Aresti diagrams. However, it will not tell you how to do a maneuver or how it will be scored. For that information, you will need to refer to a judging and scoring manual. This is strictly to help the reader understand the Aresti figures.

Colonel Jose Luis de Aresti Aguirre published his *Sistema Aresti* in 1961, and the FAI adopted it in 1962. This system of diagramming aerobatic figures came about because pilots competing internationally needed a way to communicate, even if they didn't speak the same language. The simplicity of the diagrams made the system work and it has been accepted worldwide as the system of drawing aerobatic figures.

Most of the diagrams are pretty straightforward. A diagram of a loop looks like a loop. But before we get to the particulars of specific figures, let's talk about some of the conventions used in drawing Aresti figures.

Either a solid line or a dashed line represents the line of flight. Solid lines demonstrate upright flight, dashed lines show inverted flight. Looking at Fig. 1, you can see that Aresti figures start with a dot and end with a perpendicular line. Each figure will be numbered in the order they are to be flown. Looking at any Aresti sequence, it should be clear that all maneuvers start and end in level flight, whether upright or inverted. Lines can also be drawn on 45° or 90° angles, though figures will not end in anything other than level flight. The same rules apply here. If you push to enter a 90° downline, it is a dashed line. If you pull, it's a solid line. However, if you push from a vertical up line into upright flight, it's a solid, not a dashed line.



Upright and Inverted lines | 45° up line | 90° down line | 90° up line

Fig. 1

A curved line running through a line shows rolling figures. The figure is always shown with the direction of flight into the "cup" of the curved line. A curved line completely through a line with an arrow at one end shows a single roll, but does not indicate which direction the plane should roll. Direction of roll is at the pilot's discretion. See Fig 2.

Roll from upright flight from left to right

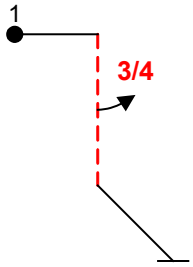
Roll from inverted flight from right to left

Fig. 2

If the arrow only meets the line, it is a half roll. Again, the arrow does not indicate direction of roll. See Fig. 3. Note that if the line starts upright, a half roll results in finishing the line inverted. You already know this, but this is how it looks when diagramed.

Fig. 3

If the maneuver requires a ¼ or ¾ roll, it is drawn as a half roll with a fraction identifying how much of a full roll is to be flown. See Fig. 4 shows a ¾ roll.



¾ roll on down line

Fig. 4

Rolls can also be performed in sections, as in a point roll. A point roll is shown as a full roll with a number adjacent to the arrow. See Fig. 5a. The number indicates the number of points required, whether 2, 4 or 8. A partial point roll ending less than 360° is shown by using a half roll figure with a small number adjacent to the arrow indicating the number of points, and a fraction, indicating the number of points required. A half roll figure with a 4 and ¾ indicates 3 points of a 4-point roll. See Fig. 5b.

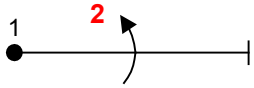


Fig. 5a
Two point roll

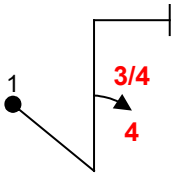


Fig. 5b
3 of 4 points on up line

Note that a ¼ or ¾ roll on a down line will take the plane off the X-axis (left to right, right to left) and put it on the Y-axis (into or away from the flight line). This is a cross-box figure. It will usually be joined with another cross-box figure that will put you back on the X-axis. The diagonal lines in Figs. 4 and 5b are how cross-box maneuvers are drawn. Fig. 4 could be flown directly into Fig. 5b.

Rolls can be combined either in the same direction, or in opposite directions. When they are in the same direction a small line is drawn over the arrows. These rolls are "linked," and both rolls are flown as one figure in the same direction. See Fig. 6a. Where the arrows are in opposite sides of the line, the rolls are flown in opposite directions. See Fig 6b. These combinations can include a full roll with a half roll. See Fig 6c.

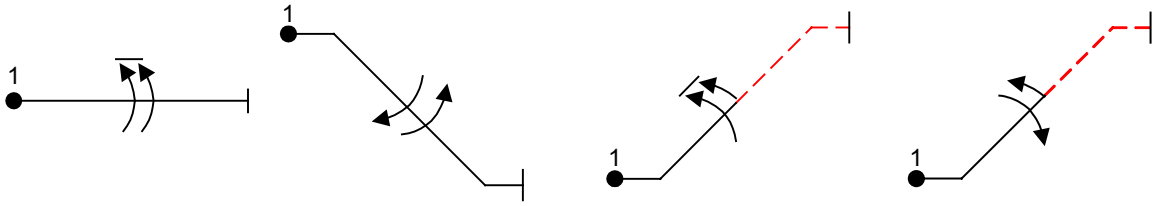
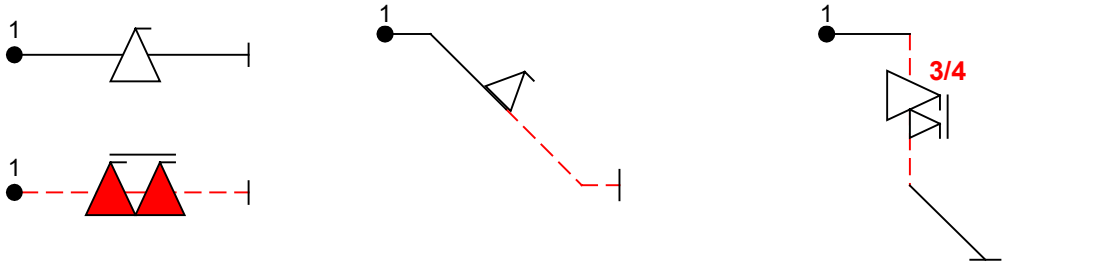


Fig. 6a Linked rolls

Fig. 6b Unlinked Opposite rolls

Fig. 6c Linked and opposite 1½ rolls

Snaps are shown as a triangle with a short line, drawn from one corner in the direction of flight. Just like the rolls, snaps can be linked or unlinked. (Rule of construction: You should never see more than 2 linked figures.) Half snaps are shown with a small triangle that does not cross the line on which it's drawn. These can be linked or not as well. Solid color snaps represent negative snaps. Open triangles are positive snaps. See Fig. 7.



Full snaps

Half snap

1¾ Snaps into Cross-box

Fig. 7

Rolls and snaps can be combined, in the same direction or opposition directions, on any of the three angles on which lines can be drawn. See Fig. 8.

Same direction snap and 2 of 4 pt. roll

Opposite ¾ snap and 3 of 4 pt. Roll

Fig. 8

Spins are shown as right triangles across the line, with a short line pointing down. Half spins are shorter triangles that don't cross the line on which they are drawn. Linked spins are flown as one figure. The color of the spin figure determines if it is positive (white) or negative (red or black). See Fig. 9

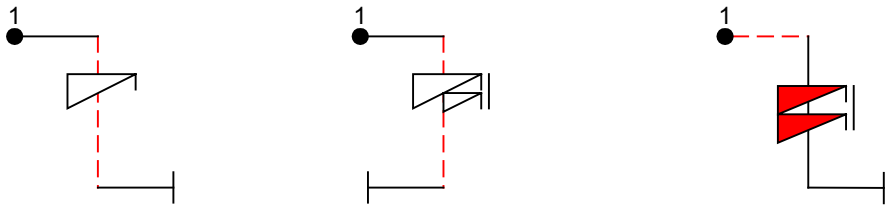
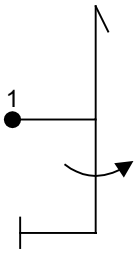
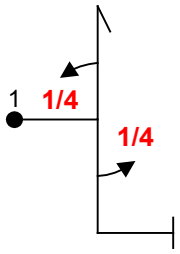


Fig. 9

Hammerhead or stall turns are drawn as a vertical line with a line angled off the top. Fig. 10a. Rolls and snaps can be put on the vertical line. Fig 10b. The line at the top does not indicate the direction of rotation of the plane.



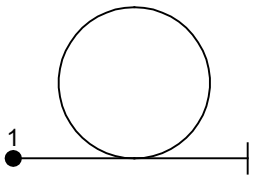
Turnaround figure
Fig. 10a.



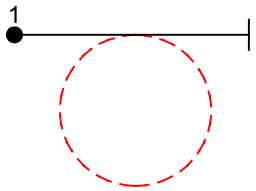
Center box figure
Fig. 10b.

A turnaround figure is usually an end box maneuver, designed to reverse the direction of flight.

Loops are drawn, as loops. Inside loops are solid lines, outside loops are dashed lines. Fig. 11a. Loops can have rolls or snaps placed on them. Fig. 11b.

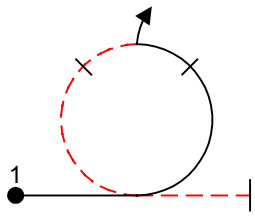


Inside loop



Outside Loop

Fig. 10a



Inside/Outside Loop with half roll at apex

Fig. 10b

Loops can be partial as well. Fig. 11c shows a half loop. Some very common maneuvers involve a partial loop, such as an Immelman, which couples a half loop with a half roll. See, Fig. 11d. Other variations on loops include square loops, diamond loops and 8 sided loops. You will not see 3 sided loops.

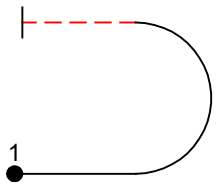


Fig. 11c

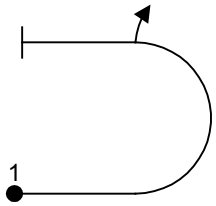


Fig. 11d
Immelman

That is the basics. All the fancy maneuvers in sequences are nothing but combinations of the above. Lets look at a few of them.

Just as the Immelman is a half loop followed by a half roll, the Split "S" is a half roll followed by a half loop. See Fig. 12.

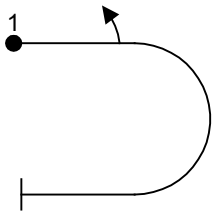
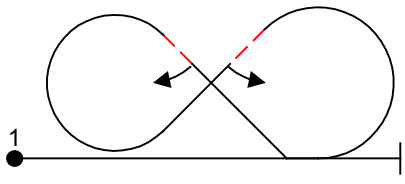
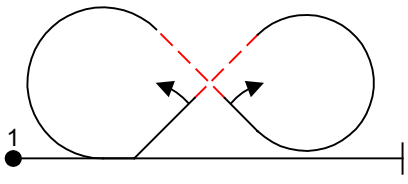


Fig. 12

A Cuban 8 is a 5/8 inside loop to a 45° down line with a half roll followed by another 5/8 inside loop to a second 45° down line with a half roll. A reverse Cuban 8 just does this in reverse: 45° up line with a half roll to a 5/8 inside loop followed by another 45° up line with a half roll. Fig. 13a and b. Roll elements can be changed, but this is the essence of a Cuban 8.

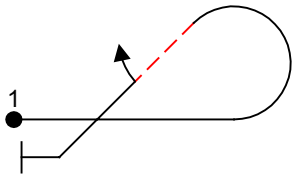


Cuban 8
Fig. 13a

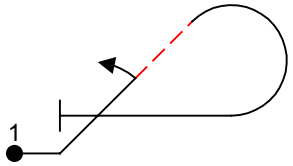


Reverse Cuban 8
Fig. 13b

The Half Cuban 8 starts out straight and level, then pulls into a 5/8 inside loop into a 45° down line with a half roll before pulling out straight and level. The reverse half Cuban 8 begins with a 45° up line with a half roll into a 5/8 loop ending with straight and level flight. Fig. 14a and b. Again, other roll combinations can be used.

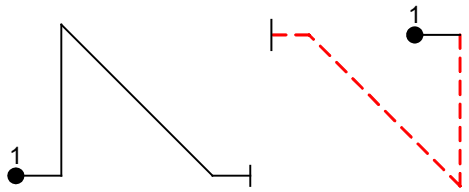


Cuban 8
Fig. 14a

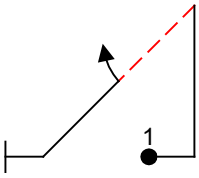


Reverse Cuban 8
Fig. 14b

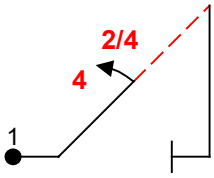
A Shark's tooth is a pull or push to a vertical line, followed by a pull or push to a 45° line. It is common to see these with a half roll on the 45° line, but any roll combinations to the 45° line or the vertical line are permitted. A reverse Shark's tooth is a 45° line with a pull or push to a vertical line. Fig. 15a and b.



Shark Tooth



Shark Tooth
with half roll on
45° down line

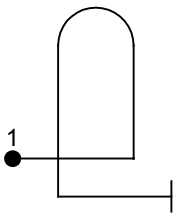


Reverse Shark Tooth
with a 2 of 4 point
roll on a 45° up line

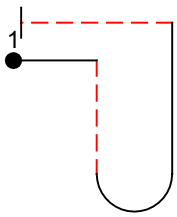
Fig. 15a

Fig. 15b

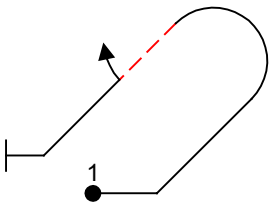
The humpty bump has an up or down line followed with an arc to a down or up line. Rolls and snaps can be placed on the up or down lines, which can be vertical, or 45° lines. When they are on 45° lines they are called lay down humpties. Fig. 16. It is not uncommon to find a ¼ or ¾ roll on the first line so that the arc is flown cross-box, with another ¼ or ¾ roll element on the second line to put the plane back on the X axis.



Pull-pull-pull



Push-pull-pull



Pull to 45°- pull top to 45°
down line -half roll-pull

Fig. 16

Turns are shown as an oval circle, with a starting line and ending line. The type of turn is sometimes indicated within the oval as 90°, 180°, 270° or 360°. Fig. 17a. Rolls can be added to these turns as well. Usually it is one roll per 90°, but 1 per 120° or 180° is not uncommon. Rolls can be in the same direction or opposition direction. Fig. 17b.

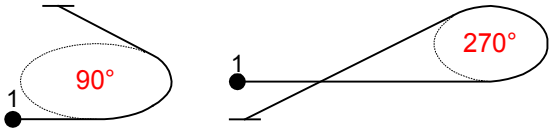


Fig. 17a

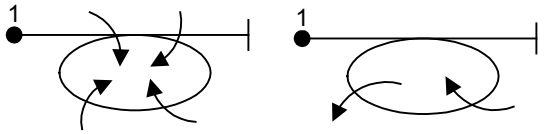


Fig. 17b

Tailslides are flown so that after the actual slide, they either flop to the canopy (or wheels up) (Fig. 18a) or the belly (or wheels down) (Fig. 18b). They can also have rolls or snaps on the vertical lines (Fig 18c).

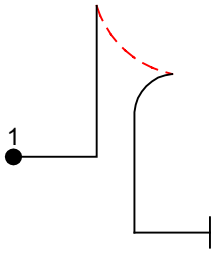


Fig. 18a
Wheels up tailslide

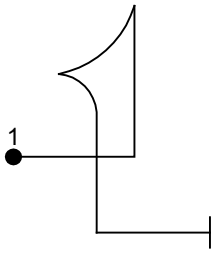


Fig. 18b
Wheels down tailslide

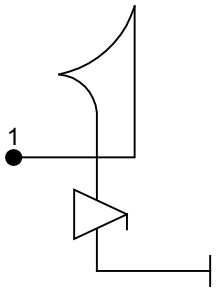


Fig. 18c
Wheels down with
snap on down line

All of these variations on lines, angles and loops can be done inverted as well as upright. Half rolls can become 2 of 4 points or even a 1½ roll or maybe just a half snap. The combinations are endless. I have not shown every combination possible, as there are literally thousands of combinations. Here is how some more common figures are drawn, in both upright and inverted forms:

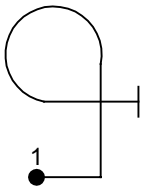
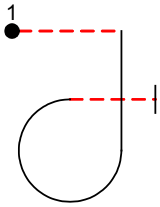
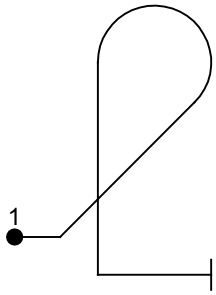
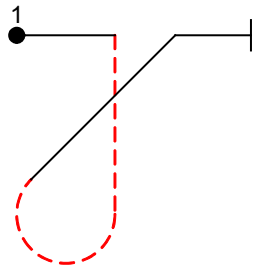


Figure "9"

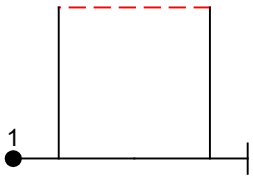


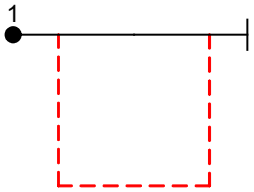
Inverted Figure "9"
start from inverted



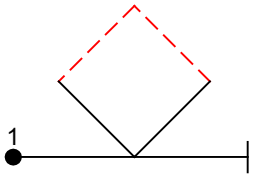


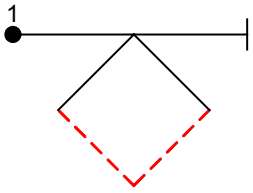
Teardrop



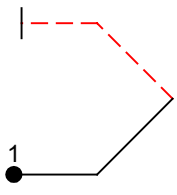


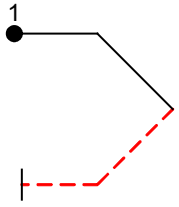
Square loop



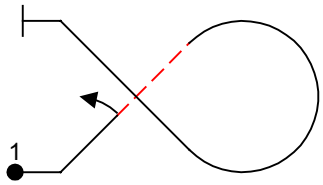


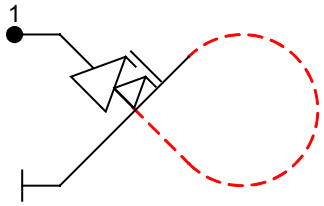
Diamond Loop





Half Diamond Loop





Goldfish

Knowing how these figures are drawn takes the mystery out of the Aresti diagram. Once you become familiar with the rudiments of drawing the figures, you really don't have to know it's called a Cuban 8, an Immelman or a hammerhead. You can figure out what the maneuver requires including all the elements contained in the figure by looking at the drawing. And you can create your own narratives if you wish. About the only thing I ever really need to write on my Aresti sequence is whether I need to roll to the left or right to finish the figure. (Roll the wrong way on a vertical downline and you could be headed for the next state instead of center box.)

Now that you have a better understanding of Aresti diagrams, the only thing you really need to do is practice, practice, and practice.

If you are interested in reading more about Aresti and the FAI Catalog upon which all scale aerobatic figures are created, including the rules for sequence creation, you can download the Catalog at the CIVA web site:

http://www.fai.org/aerobatics/catalog/