

# Aerobatic Competition 102

**PREVIOUSLY**, the Competition Loop was discussed – and you may have been surprised to read there is more to a basic, garden-variety loop than meets the eye. The same is true for all the manoeuvres in competition aerobatics, especially if you want to really impress the judges and waltz off home with the silverware. Herein lies the difference between recreational aerobatics (impress yourself or your passenger), display aerobatics (impress the crowd) and competition aerobatics (impress the judges). A basic understanding of the scoring system helps competitors and spectators alike, as does knowing the criteria for determining the scores. The criteria varies for the different elements of a figure and is objectively described in the competition rules to be subjectively applied by the judges. This can lead to variation of opinion on the judging line, as different judges interpret the judging criteria differently, or see different things that they like - or dislike - in a manoeuvre. We don't live in a perfect world!

## Scoring Aerobatic Sequences

The scoring system used throughout the world scores each figure of a sequence between 0 and 10. Ten is perfection, and zero is... well, not good. You can actually get less than zero, where the accumulation

of downgrades totals up to less than zero, but being such kind creatures the judges will round that up to zero, lest the competitor become demoralised! If we convert the 0-10 scale into percentages, as we do at competition, most category winners are achieving overall scores of between 70 and 80%, meaning they are averaging sevens for the figures within a sequence.

At this year's Nationals a few 10s were handed out, a few too many 0s were also given, but mostly the scores ranged from 5 to 8.

A score sheet lists all the figures a competitor will fly, which may be set in advance (the Known sequence), submitted within certain guidelines by the competitor (the Free sequence) or given to the competitor just prior to flying with no practice allowed (the Unknown sequence). The last one sorts out the men/ladies from the boys/girls!

As a judge views each figure flown, a score is recorded on the score sheet which is later totalled and presented as the overall percentage for that competitor's sequence. The judges also make comments about what they see, which are recorded on the score sheet - this helps with post-flight review of the scores by the judge. The score sheets are eventually handed over to



Terry Johnson and David Wilkinson judging at the 2015 Nationals.

British Aerobatic Association										2012		Form A	
Standard Known												13	
No	Symbol	Cat No	K	Total K	Remarks	Pos	Item	K	Grade				
1		8.6.1.1	11	11	7 0 Tight third quarter					15	7 0		
2		8.5.6.1 9.1.4.2	10	14	6 5 Short line before roll shadow after								
3		5.2.1.1	17	17	7 0 Very nice, 2nd Rad slightly smaller								
4		7.3.2.1 9.1.2.2	14	20	7 5 Both 45° shallow short line after roll								
5		2.3.1.1	4	4	8 5 Bank angle not less than 10°								
6		1.1.2.1	7	7	7 0 Quite nice, maybe < 45°								
7		1.1.6.3 9.1.1.4	10	15	7 2 Didn't stall, not a proper spin								
8		7.2.2.1 9.1.3.2	6	10	8 0 Early roll								
9		7.2.2.3 9.1.3.2	6	10	4 2 Did a 2nd roll								
10		1.1.1.1 9.4.2.4	2	11	6 0 Steeper quarter, bank 60° and								

Penalties

Too Low	
Unsettled	
Too High	
Out	
Stalled	
Too Fast	
Too Slow	
Final Freestyle	
Signature	Joe Briggs
Name	JOE BRIGGS
Number	7

BAeA

A typical judging form.

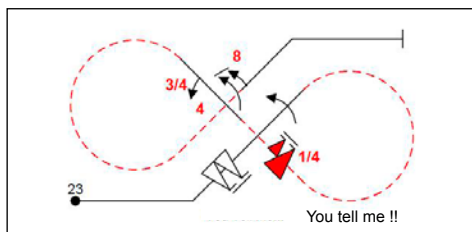


Grant Bennis performing a half Cuban in the Falco.

the pilots at the end of the competition and therefore the pilot can also use the comments to understand where they went wrong and consider areas for improvement.

## Figures

Throughout the previous paragraphs the term 'figure' has been frequently mentioned. This term refers to what a casual spectator may see from the ground as one individual manoeuvre, however for the purposes of composing, flying and judging a manoeuvre, it is broken down into separate components, with each component or element being identified by an Aresti Catalog number (more on that another issue, but Google that term if you are interested). Many figures comprise of just one element, such as a loop.



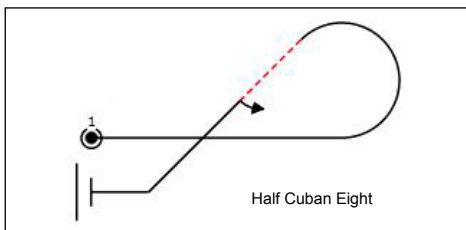
Surprisingly, level flight – the most basic manoeuvre? – is also a prescribed aerobatic element. Some figures contain multiple elements, more so in the higher categories...

A very basic figure that is seen in most competition sequences is the Half Cuban Eight, also flown in most aerobatic displays and by Sunday aerobatic pilots too.

## Half Cuban Eight

Named for no other reason than it was first flown by an American barnstormer in front of the Cuban Air Force during the early 1930s, this is a great 'turn-around' manoeuvre in that you can do a 180 degree direction change, to keep you within the aerobatic box or display area, whilst generally finishing the manoeuvre with the same energy (speed and height) you started

with. And of-course, it is an aerobatic manoeuvre – as opposed to just doing a 180 degree turn – and therefore looks cool. (Aerobatic pilots do like to look cool!)

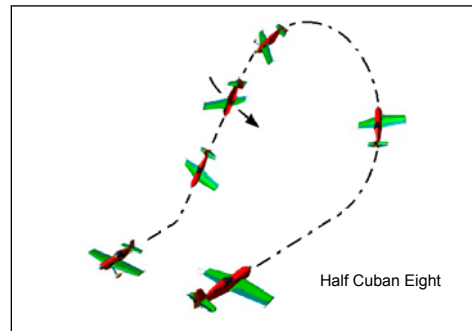


Drawn using Aresti notation, the official language of aerobatics, it contains two elements – a 5/8th loop, and a half-roll on the straight line at the completion of the main loop. These two elements when combined form the figure. However, from a scoring-perspective the judges are actually looking at a few more elements too – was the 'line' before the loop level, was the 5/8th loop a constant radius, was the 45 degree down-line flown at 45 degrees, was the half-roll centred on the 45 degree line, was the loop at the completion of the 45 degree line of equal radius? Huh, what loop you say?! Even though the figure is drawn with an abrupt 45 angle back to horizontal flight, no aircraft can actually fly like this and thus a curved pitching flightpath will always be present, which is a judge-able part-loop. Add all these elements up and you can imagine it is quite difficult to fly this relatively simple manoeuvre in a manner that will score a '10'. And so it is, in actual completion...

Flying the half Cuban Eight commences from horizontal flight, at the appropriate looping speed (or higher) for your aircraft type. As per the previous article on loops, getting the loop right in terms of a constant radius is the first challenge – not pinched at the top, on-heading, wings level throughout etc.

The change comes as you perceive the nose of the aircraft pointing into the

paddocks at a point where the flightpath of the aircraft is now around 45 degrees to the horizon and inverted. The rules actually require the 'zero lift attitude' to be flown, so for aircraft that have any angle of incidence built-in (all trainers and even some dedicated aerobatic planes) this will mean getting some good ground coaching to determine the correct attitude, as viewed from the cockpit, for the pilot to fly to achieve this.



From pulling back on the stick to perform the loop, you must now push the stick forward a tad to briefly maintain this inverted 45 degree attitude - cue momentarily 'hanging in your straps' and other engine/fuel/oil anomalies if your plane is not so equipped for inverted flight.

A half roll to upright is now commenced and, as the nose is pointing downhill and the airspeed is increasing, this is relatively easy to complete – but don't let the nose drop too much, or use too much elevator and 'pull' the nose off line. Ideally, if you look over the spinner as you commence the roll, the spinner (and the plane following it) should neatly roll around a point on the ground.

Once the roll has been completed the tendency is to immediately pull back on the stick to return the aircraft to level flight, however recall that the roll must be centred on the 45 degree line and therefore another short pause is required so that a 45 degree line, of equal length to that

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at the completion of the 5/8th loop but before the commencement of the roll, can be shown. Logically, the timing of this second line will be less than the first line, as the aircraft is now most likely going twice as fast. (*Have you got that? No? Start reading again from the beginning, like me. Ed.*) Developing a technique that works for you is recommended. Suggestion: say to yourself, as you complete the 5/8th loop, "push – 1 – 2 – roll – pause – pull". If you can do this with a metronome ticking in your head, all the better.

As mentioned above, the figure finishes with a constant-radius 3/8th loop to horizontal flight. This is actually a horizontal flightpath, so don't think you have to just put the nose on or slightly above the horizon... you may still be descending, and the judges see everything! In a future article 'lines' will be discussed further – yes, flying straight lines is an aerobatic skill and a discipline that can score handsomely, so dust off your instrument flying skills!

**Footnote:** These articles are intended to whet appetites for advanced flying and to offer tips to aerobatics beginners. Dual instruction and observance of CAA rules is a must-have – especially for safety and also for learning correct techniques and finesse of manoeuvres for the particular aircraft you are flying. For more information, enquire about aerobatics instruction at your local aero club or go to [www.aerobatics.co.nz](http://www.aerobatics.co.nz)

## Planes of the NZ Aerobatic Club: The Laser 230

**THE** Laser 230 is a plans - or kit-built aircraft originally called the Stephens' Acro after the designer, Clayton Stephens. The first Acro flew in 1967 and the design was one of the original competition aerobatic monoplanes

that changed the face of aerobatics, once dominated by bi-planes such as the Pitts Special. The Stephens Acro and Laser series of aircraft provided the inspiration for other subsequent aircraft such as the Extra 200 and 300 series.

Owned by ex-pat American Fred Zayas, ZK-LZR was built in 1992 by Sam Fry of Louisiana, USA. Strictly speaking, this plane is a Laser 200, but the engine makes it a 230. The Lycoming HIO-360 (actually a helicopter engine, however which Fred considers it an AEIO-360), has been



Laser 230 owned by Fred Zayas

significantly modified for aerobatic use with inverted fuel and oil systems, 4-into-1 exhaust and various tweaks to produce a healthy 230-odd horsepower. This is quite a bit for a plane that weighs 1045 lbs empty and 1400 lbs at take-off, so with regard to climb rate Fred comments "I don't know, sorry... how about 'pretty good'?" The airframe is good for +/-10g and will do 180kts at full power. One thing is for sure, aerobatic judges love watching the Laser fly, with its nice lines and decent size.

It sounds great too!

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