

SPORT *Aerobatics*

OFFICIAL MAGAZINE of the INTERNATIONAL AEROBATIC CLUB

July 2012



Competition Scoring

- The Dangers of CO
- Finding Instruction
- Metrics



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Trying to "be the best" in any human skill-based activity—especially when we need some measurable proof of it—is a recurring theme in all walks of life, and right at the core of most competitive sporting endeavours.

—Nick Buckenham

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THE COVER

Troubleshooting the dangers of carbon monoxide could save your life. Cover photo by John Heilmann with photo pilot Dale Hiltner.

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REGGIE PAULK

COMMENTARY / EDITOR'S LOG

July is More Than AirVenture Month

Grabbing life's opportunities

THIS JULY MARKS MY FOURTH year with the IAC and my fifth AirVenture. In the summer of 2008, I noticed the editor position was open with the organization. I interviewed with president Vicki Cruse and then manager Lisa Popp, and was initially turned down for the position. For whatever reasons, it soon opened again, and I got my chance.

dream come true. I was going to the big show, and I didn't have to do anything but say, "Yes!"

I packed my bags, grabbed my camera gear and got on a plane for Milwaukee. That next week was intense. I was juggling trying to cope with the sheer immensity of AirVenture, impressing Vicki Cruse and Lisa Popp and generally running around like a chicken with my head cut off. Let's just say that being scrutinized while attending a show that's been the focus of a life-long dream was just a tad bit stressful!

Not one year has gone by where some aspect of the show in Oshkosh hasn't outdone the year before. In 2008, Boeing sent its enormous Dream Lifter based on the 747 airframe. In 2009, we got to see the Airbus A380. Jim and Jean Taylor scored VIP tours for a few of us lucky souls. Virgin Galactic's SpaceShip II came in 2010, and last year we got to see *Fifi*—a B-29 Stratofortress and Boeing's new 787 Dreamliner. I can't wait to see the star of the show for 2012.

At the end of the day, all of these wonderful experiences and all of the wonderful people I've met are thanks to you members who care enough to pay a premium to receive Sport Aerobatics in your mailbox every month. As we produce this magazine, not a day goes by when I don't think of you and give thanks for the gift of being the editor of a magazine that represents one of the preeminent aviation clubs in the world.

IAC

Not one year has gone
 by where some aspect
 of the show in Oshkosh
 hasn't outdone the
 year before.

The phone rang, and it was the editor of Sport Aviation, David Hipschman, calling to ask if I'd be willing to jump on a plane in a couple of days for a trial-by-fire at AirVenture. I wasn't even given a chance to sleep on it; it was now or never. He said there were no guarantees, but if I showed up and worked hard, I could possibly get the job. Never having been to AirVenture, it was like a

Please submit news, comments, articles, or suggestions to: reggie.paultk@gmail.com



DOUG BARTLETT

COMMENTARY / PRESIDENT'S PAGE

A Big Thank You

What has aerobatics taught you?

IT WAS NEVER A GOAL OF MINE to be an aerobatic competitor. I just wanted to do a roll, loop and spin for the experience. Now, a full ten years later, I'm at the end of my term as president of the IAC. It is a great time to think back on how aerobatic and IAC experiences have changed my life.

The most important gift the IAC has given me is the knowledge there is always a home I can return to, no matter my age. The IAC is a wonderful place where friends can easily be made and you can find any level of excitement you want. To have friends in all corners of the country is something really special.

When you take someone up for an aerobatic ride, try to make it the most wonderful experience of their life, not yours.

Aerobatics taught me that I will not panic when things are going very wrong. This is a wonderful thing to know about yourself. Many of us have had events in an aircraft where we had a choice to either let fear overwhelm us or push panic aside and work our way through the problem. I find it comforting

to know panic is an enemy I can quickly defeat.

Aerobatics also taught me to practice what you fear until there is no more fear in the cockpit. This is a bit different than practicing maneuvers you do not do well. For me it was the inverted 1-¼ right foot spin. This maneuver scored well but there was always a bad feeling in my gut when I knew it was coming. I practiced this spin until the fear and its related feelings were gone. Aerobatics taught me to practice what you do poorly, but practice what you fear first. This lesson will follow me the rest of my life.

A few thoughts I want to leave you with: When you take someone up for an aerobatic ride, try to make it the most wonderful experience of their life, not yours. Leave them wanting to go again thinking aerobatic pilots are well-trained very safe professionals. When something just does not seem right with your aircraft, take it down for maintenance and find the problem. If you think there is something wrong, there probably is. Airplanes do not fix themselves. Always practice new aerobatic maneuvers with plenty of altitude. Practice down low only when there is a good reason to do so.

I would like to say thank you to several great volunteers in the IAC. Brian Howard spends hundreds of hours a year managing our rule book, supplying unknown sequences, working with CIVA on international rules and much more. Greg Dungan quietly supports the

judging program year after year. Bob Buckley supports our scoring program. Lorrie Penner, DJ Molny, and Randy Owens spend countless hours behind the scenes not only on website development but several other programs as well. Jim and Jean Taylor have been volunteering every day for years at our pavilion during AirVenture. Many members assist at contests just like Ann Salcedo or Fred and Lisa Weaver have for many years. All of our officers and directors are volunteers spending large amounts of time on our behalf and deserve a big thank you. I would like to say thank you to all of the people who have volunteered their time and efforts to support the IAC and its members. It would take pages to list them all. The IAC simply could not exist without this tremendous support.

Our annual meeting of members will be held on Friday July 27th at AirVenture. The meeting will take place after the air show at the Nature Center Event Tent #1. Please join us for some food, drinks and good friends. We will announce the new officers and directors of the IAC and discuss important upcoming events. It is always a fun time so please plan on joining us.

Well it is time for me to say thank you to all of the members of the IAC. It has been a wonderful experience being the IAC president for the last three years. I look forward to staying involved as a member of the club and will see many of you again soon on the competition circuit.

IAC

Scoring at Aerobatic Events

A purely personal view

BY NICK BUCKENHAM

Trying to “be the best” in any human skill-based activity—especially when we need some measurable proof of it—is a recurring theme in all walks of life, and right at the core of most competitive sporting endeavours. Usually this process requires two key elements to be in play: the competitors who strut about the stage and do what they do to the best of their ability, and a group of largely unseen others whose duty is to judge the strutting and rank who is the best, who is second best...and so on. In most sporting activities picking the winner is relatively straightforward; the first car across the line, the team with the most runs, the fastest person against the stopwatch. A few sports, however, require trained judges to evaluate the skills on display, and the complex gyrations of competition aerobatics provide a sharp example—not only is the flying extremely difficult, but scoring it to provide reliable results is not so simple either. How then did our sport get from its barnstorming origins to the technical tour de force that we now enjoy so much?

First a little history lesson is in order...Why do we fly and judge aerobatics the way we do now?

Riding on the huge popularity of aerial displays and military exhibition flying around the world between the two great wars, the notion of true aerobatic competition between the most



Paris 1934

skilled pilots of the day emerged during the 1920s in the United States and Europe, and later as far east as the Soviet states. These early events were generally run to locally prescribed rules that favoured flights that displayed imagination, bravery, and grace but rather less of what we would expect to see today as a systematically measurable standard. In August 1927 a flying meet at Zurich in Switzerland included what was billed as the world's first significant international aerobatic competition, with 30 competitors and an eight-minute compulsory programme that included two loops, left- and right-handed rolls, steep turns, and a spot landing. In 1947 Gulf Oil sponsored the ground-breaking Miami All-American Air Maneuvers National Aerobatic Championship, while a decade later the prestigious Lockheed Trophy in the United Kingdom epitomised the freestyle approach for a decade, the rules for the inaugural 1955 event being:

Scope (range of aerobatic manoeuvres): 20
 Pilotage (getting the best from the aeroplane): 20
 Accuracy in execution of the manoeuvres: 25
 Artistry and positioning (sequence of manoeuvres etc.): 25
 Originality: 10
 Total: 100

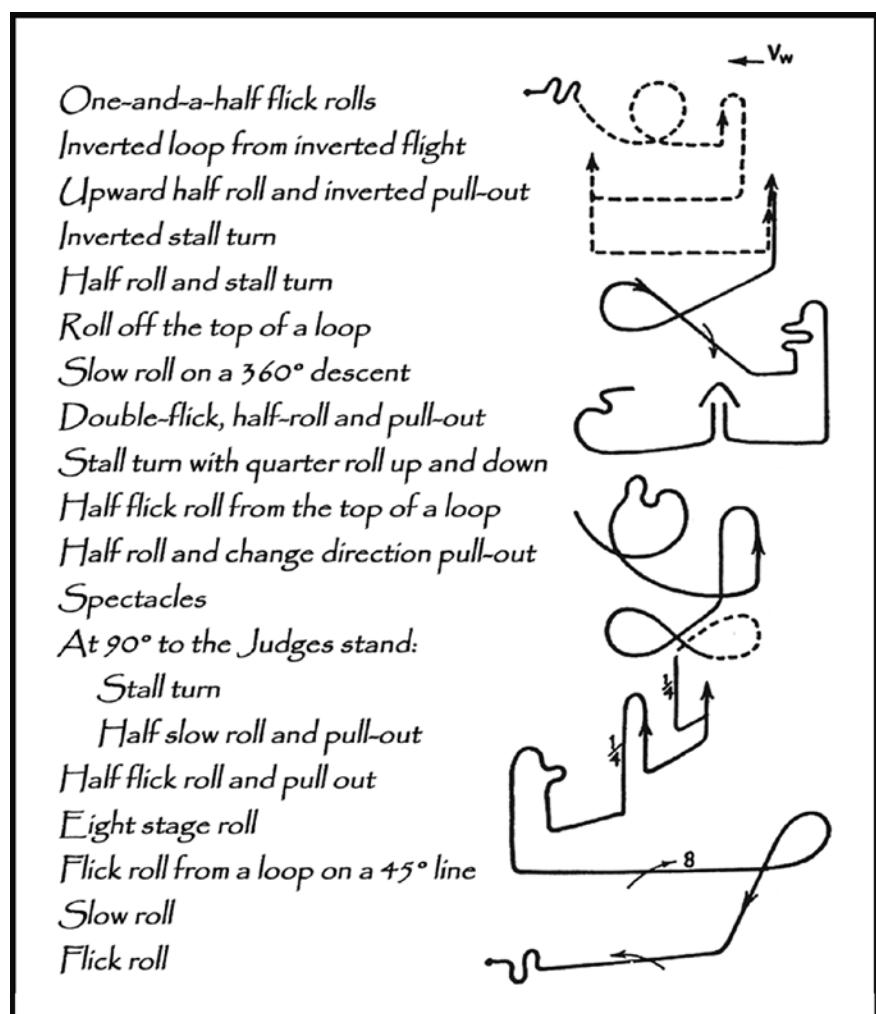
Contestants were allowed three minutes from the commencing takeoff run to climb to height before beginning their five-minute sequence. This was a free format event except for the inclusion of a compulsory slow roll, loop, and half-roll on top of a loop in the contests until 1958. The French were dominant—Leon Biancotto's Stampe being victorious the first year with fellow countrymen Hisler (in a Sipa MiniJet!) and d'Huc Dressler close behind. A certain José Aresti also qualified for the final sequence, with Dressler and others beginning the subsequent move to formalise the figures into the format that we know so well today. For the 1960 event Americans Frank Price and TJ Chandler came

over with their Great Lakes, and Frank flew a Jungmeister the following year, sadly neither of them making it into the fly-off by the final seven.

The first World Aerobatic Championships took place at Bratislava in 1960, but this too seems to have been run to a relatively free set of rules. At this stage the FAI stepped in with a view to establishing more regular judging criteria, and following a 1961 meeting attended by many leading pilots of the day, including Spaniard José Aresti, Mike Murphy and Bevo Howard from the United States, contestants at the 1962 World Aerobatic Championships were asked to draw their sequences for the judges even though there was still no universal figure drawing system in use. By 1964, however, the Aresti Dictionary had established itself as the most widely

used over alternate methods from pilots such as Dressler (the inventor of Aerocryptography), and that year the FAI World Aerobatic Championships in Spain marked the beginning of the structure that we use to this day. Along with all this came a formalised approach to how we should expect the whole thing to be flown and marked, with fixed difficulty coefficients or K-factors to show which figures are worth more (or less...) when the pilot flies well, and so the basis for today's scoring system was born. Fly the figures, judge their accuracy, write down the marks, do the calculations, and there you have the winner—how hard could it be? Well—at the top of the sport it was probably not that different from the way it is now, and that's how it was for quite a while.

With a formal set of rules to apply



Leon Biancotto's 1960 Lockheed sequence in Dressler notation.

you might expect that some stability would ensue and the results should closely reflect the skills of the pilots involved. The basic requirement of our scores calculation system is that we take each judge's grade for each figure and multiply it by the figure difficulty or K-factor to get the judge's score for that figure. The scores from all the judges are subsequently added together for each pilot and divided by the number of judges to find the equivalent total score for an average judge. Where judges have mildly different opinions or grades for a figure, then we would normally expect the higher grades to be offset by the lower ones and an even-handed result reached with no judge having more or less influence than the others. It would thus be reasonable to expect the result to have been fairly reached. If major grade differences between judges occur, however, their impact could be quite significant, and more care may be needed to secure an equitable solution; a judging line conference while the detail can be freshly recalled is probably the only effective way to reach consensus and identify the most likely correct solution, unless video can be used to reveal the truth of the matter. So far, so good.

With the criteria to measure accurate flying fixed to a common standard, however, at international championships it soon became apparent that the judges themselves were in a position to strongly affect the results, and the dilemma of how to counter this undesirable tendency was born. It should be no great surprise that most coun-

tries' judges tend to favour their own pilots—who could resist such normal and “unconsciously” driven behaviour? In purely domestic events it may be reasonable to expect that judges will be sufficiently impartial to award grades centred on generally the right level for each figure so that their partiality is lost in the normal spread of grades awarded, but when the diversity of teams or nations involved becomes broader, these issues are hard to ignore.

The human race is blessed with many remarkable qualities, but we are all different in all sorts of ways. Experience shows that getting a closely matched stream of judgements from any group of people about what they see at some memorable occasion—especially one as complex and dynamic as an aerobatic sequence—is not the simple task

you might imagine. There will inevitably be relatively minor differences between them, and maybe some surprisingly major ones, too. In the great scheme of things the big question is—do they really matter? Surely that old trick of averaging all the judges' marks will sort out the bumps and hollows. Isn't that what everybody does in these situations to make sure we have a good enough answer?

A not-so-obvious but quirky side effect of our adopted “10 down” judging process lies in the subtractive or fault-driven method we use to derive the final grade for each figure—measuring badness of the performance if you like rather than the more usual human preference for measuring goodness. When we observe flight path, attitude, and geometry errors and subtract the appropriate downgrades from the per-



Over the years the technical capabilities of aerobatic aeroplanes and the flying skills of their pilots have become a good deal more refined . . .

fect start point of 10, a curious thing happens...well-practiced judges with a keen grasp of the rules naturally see more errors and award larger downgrades than their less-experienced colleagues, who are more likely to miss subtle mistakes and may also be fearful of applying the harsher elements of the rule book to hero pilots. If we take 7.5 as an overall average figure mark during the sequence, it is clear that an experienced judge has perhaps three times more scope to exercise his critical judgement than more benign colleagues and as a consequence will tend to award lower marks in a broader range, while more timid newcomers on the panel are likely to give generally higher marks but in a narrower band. This is not quite the balanced situation that at first sight appears to be the case, and it may be that simply averaging all the judges' grades is not the kindest solution for the pilot.

Over the years the technical capabilities of aerobatic aeroplanes and the flying skills of their pilots have become a good deal more refined, and it is not unusual now to see the top places at major events separated by only the slimmest margin. It follows that our judges and their scoring system must also strive to match the high standards and reliability we require, or a degree of uncertainty over who really was the best pilot on the day, the second best, etc. will be hard to avoid.

A closer look at judges' grade differences can be very revealing. We have lots of stored marks and con-

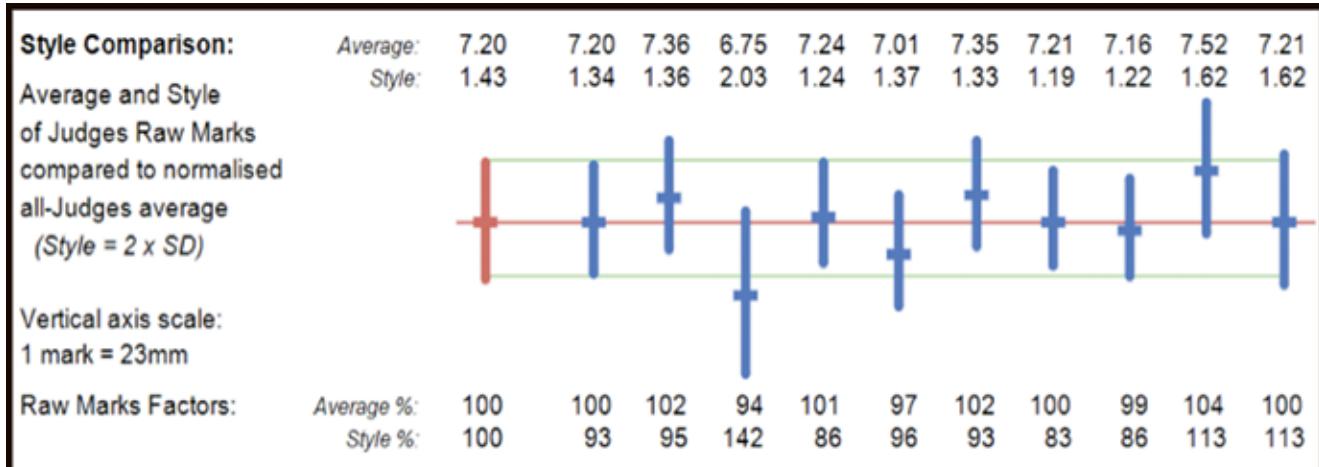
test results that we can examine at our leisure, from events tiny to grand and with few to many judges, so rather than rely on popular opinion we can quite easily find out what the reality tells us. One thing we'll lack here is an explanation of just why each particular mark was selected and awarded, but that's not really our concern—the primary task is to take the grades as recorded and work out the rank order of the competitors from best to, well, not best!

One area where we should perhaps pay close attention is in distinguishing between how we handle the mark for "wrongly flown" figures and for those occasions when the pilot makes a recognisable attempt at the demanded figure but the result is so poor that the cumulated downgrades are greater than the perfect 10 that we start with. These are two quite different situations, and even if we agree that they should both receive a zero, it is surely not helpful to record them in the same way. Otherwise, how can anyone after the event determine what was really meant by the given mark, and more importantly, this isn't likely to encourage pilots to see and correct the error of their ways.

On a rather more positive note, how should we reward stylish and imaginative flying that extracts the very best from those Aresti rules, as opposed to duller routines that do the job but don't set the pulse rate up a notch? The aerobatic pilot's task is comparable to that of an actor on the

stage, in that each routine is a solo act in front of his assembled peers. There's a strutting aspect to the performance that says, "Hey, look at me, aren't I the best..."? Not always, for sure, but we should at least accept that to human eyes a dashing flown sequence with a few minor errors might be expected to fare better than a dull one that's a bit closer to the book but lacks the pizzazz of the other approach. Strutting is strutting, after all.

Finally, before we look at what actually happens in scoring rooms around the world, wouldn't it be a good idea if the marks collected from our judges could subsequently be reviewed by them from a "How did we do?" point of view, so that not only the judges but also the chief judges and even the rule-book writers could assess them and learn from reality. Without some formal data-driven feedback it is hardly realistic to expect chief judges to accurately assess what standard they are actually achieving with their panel; a quick look through the returned Form A's between each flight at best provides a simple overview, not much in the way of sensitive comparisons between the judges for each pilot and also between the marks awarded for apparently similar flights. It's never easy to remember why a particular grade was given, but if we can also see what the other judges did, then surely it can only be a good thing to be able to look back and reassess what was done in the heat of the moment. And judges certainly are different; here's



a snapshot comparison between the 10 judges' raw marks styles at the recent WAC 2011 for the Free sequence. No names here, just a blue bar for each judge and an orange bar at the left to show the panel's overall average style. Judges 3 and 9 are both highly respected for their ability, but aren't they different? This sort of open analysis might be an issue for some people, secrecy in human judgements often being a contentious area, but history usually shows that unnecessarily hiding the facts is more likely to cause argument and disbelief than making them openly available, however awkward the prospect might seem.

Let's take a look now at what goes on in the administration headquarters of a typical aerobatic event, a busy place that is usually out of bounds to most pilots. The IAC way is normally to separate the generation of registration and judging line paperwork from what goes on in the scoring office; whereas, at CIVA events everything downstream of the registration desk is the responsibility of a single experienced team. However this division of duties is made, storing the key data in one central computer utility rather than dividing it into spreadsheet islands—or even worse using scraps of paper—is the best way to ensure that accurate and up-to-date information is always available and used. Practical experience here shows that while most participants at an aerobatic event can screw up their whole day with a single unforced error, a mistake in the scoring office can be equally dramatic and critically embarrassing to the whole team. The scoring director is thus a key appointment; managing the receipt and circulation of contest information, competently running it through the computer systems available, and smoothly dispensing pilot details, judging rosters, flying orders, and all the other stuff to officials, competitors, and the web is a major responsibility. This is a "hot seat," not one for those of a timid disposition. Beside the entry of thousands of marks and distribution of the check sheets and results, there are many other big tasks

here full of opportunity for disastrous sanfus—the timely assembly of Free and Free Unknown judging forms in their correct order for distribution to the judging line being perhaps the most obvious, but the sheer amount of paper printed during any event is often a real eye-opener to outsiders.

Ideally our scoring software should handle pretty much everything that stems from the receipt of contest entries, Free sequences, and the like. At major events it's a real timesaver and an aid to accuracy if it can "import" as much as possible from previous simi-

judges communicate, chief judges do their thing, and runners bring stapled sets of pilots' score sheets back to the scoring office. We need now a slick set of routines to allow the scorer to enter the marks swiftly and accurately, then check sheets can be printed for pilots to approve. Once this is done the results can be updated for distribution via the channels in place, usually on paper for smaller events or via the web when this is pre-established for the more significant championships. It sounds simple, though usually the reality is a bit more complex.



Judging line conference at WAC 2011.

lar events, the entry of names, aeroplane types, and membership details consistent with those used before being a must. Once assembled this data can be circulated to the contest director, flight directors, and chief judges to smooth their tasks, and the PR machine can begin to make good use of pilot information, photos, and the like. In this context a software package that also collates pilots and official photos to present them with their team or national flags in printouts and web pages is a real boon, adding personality and colour to the normally monochrome columns of words and numbers so that later on we can look back and relive the event in detail.

In due course briefings are completed, schedules published, the flying starts, judges toil, scribes write, corner

So how does a major national club like the IAC tackle its scoring duties, and why should this approach be any different from the way for example that CIVA does it? Within the United States—indeed any individual culture—the "style" differences between judges are normally ironed out simply by averaging their collective input and are not thus a matter of primary importance. IAC judging schools provide thorough and well-structured training on how to assess aerobatic flights and judge the figures, and it is a reasonable assumption that the highs and lows of aerobatic figure judgements will pretty much balance each other out. An experienced IAC chief judge will anyway have the opportunity to take further steps if necessary to encourage judges to award grades that are fair

and appropriate, though usually such intervention is rightly minimal. The comprehensive IAC rule book provides solid guidance to pilots, judges, and administrators alike in all relevant areas of contest management, aerobatic flight conduct, and Aresti figure judgements, thereby underpinning the high standard that everyone should expect. As a result the scoring software can be relatively straightforward, primarily a collection point for all the necessary data and blessed with a simple arithmetic results calculation system that anyone can understand.

When score sheets are received from the judging line, the grades will be input exactly as authorised by the chief judge, including any revisions or conference averages set during post-flight discussions where any extreme differences of opinion between judges should have been addressed; these changes can be required as a result of varying interpretations of major errors, the chief judge normally giving the benefit of any doubt to the pilot. The one area where the software is expected to make selective use of the judges' grades is when one or more zeros are awarded to a figure by some but not all judges; in these cases the computer applies a simple majority rule—if more than half of the judges award a zero to a figure, then all grades for that figure are set to zero, but if half or less give a zero, then those zeros are replaced by an average of the non-zero grades, to the nearest half-mark. This ensures that minority opinions on questionable major errors are always discarded, and pilots benefit from the view that is most likely to be the correct one. This is a straightforward “what you see is what you get” approach that makes for robust and easily comprehensible results listings, with direct linkage between pilots' score sheets and their final results rankings.

Why then should CIVA—or anyone else for that matter—see the need to do something rather different with their software? Their judging rules are pretty much the same as the IAC's, the key difference being to clearly dif-

ferentiate the recording of what they call “hard” zeros (HZs are awarded for major errors) and “perception” zeros (PZs are for when you think a snap, slide, or spin didn't really snap, slide, or spin) from just plain numeric zero (when an ill-flown figure gets 10 or more downgrades). The pilots aren't that different, culture and training regimes aside. We use the same aeroplanes, generally...what is it then about the statistical treatment of judges' marks that works for them, and should we pay attention to see what that's all about?

The key difference at world and European championships lies in the great

variety and clash of national flavours and preferences that are everywhere, and the need to blend together many countries' judges in a truly international environment where English is often not their first language, and national fervour and home-grown training regimes are bound to add their own flavour to the stream of marks from the judging line.

For “own flavour” we have to start using the “bias” word, because that's what it really is—for better or worse each judge will come pre-loaded with some pretty strong ideas about how this and that manoeuvre should ideally be flown, which may not coincide

European Aerobatic Championship 2012											Form A
Pilot No		Unlimited Programme Q									Flight #
No	Symbol	Cat. No.	K	Total K	Grade matrix		Remarks	Pos	Item	K	Grade
1		8.4.16.1 9.1.2.6 9.10.9.6	14 12 19	45	80	OK			Positioning	40	75
2		8.4.2.2 9.1.1.4 9.9.10.4	17 12 13	42	65	Over-flick 10deg			Fig K	Total K	342 342
3		1.3.11.1 9.2.1.4 9.8.4.2 9.9.1.4	20 13 7 15	55	PZ	No flick!	L		Penalties		
4		8.6.1.4 9.12.1.7 9.4.3.4	12 5 11	28	70	Spin OK Early roll			Too Low		
5		2.2.5.4	25	25	40	Str line x2 Roll stopped FF			Disqual Fig		
6		5.2.1.4 9.10.5.3	22 13	35	85	2nd rad bigger	F		Too High		
7		8.4.1.1 9.1.5.6	13 10	23	90	Nice			Outs		
8		7.3.1.1 9.10.7.4 9.1.2.8	16 17 15	48	75	Shallow 45 2nd rad+	R		Interruption		
9		7.2.1.4 9.9.8.4 9.8.3.3 9.1.3.7	6 13 11 11	41	HZ	Rolls same direction			Insertions		

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So there you are—the whole subject laid open, warts and all. Could we do better?

precisely with the official CIVA interpretation, and quite naturally for each of them it will be hard to avoid ingrained preference for the way their nation's pilots fly. Also they will know their team members well and instantly recognise their aeroplanes... most after all will be team friends in a foreign place, and pressure from their trainer and feelings for the mother country's flag will be just too hard to push into the background. To expect international judges to be truly impartial is a big ask.

After some years working with the TBL and then TBPL systems and their quirky behaviour that was eventually just a bit too awkward to ignore, CIVA has with its FairPlay system developed an extremely robust solution that not only fixes bias and judging nuances very effectively but in its ACRO software provides a wealth of valuable and detailed analysis of how the judges' marks all fit together, giving us a clear view of the interesting differences between them. FairPlay again uses quite simple statistical techniques to analyse and rebalance the figure-based sets of judges' grades, but this time in a much better structure than the TBPL solution so we can be satisfied, as far as is humanly possible, that the results rankings are fair and arguably not influenced by bias or "unusually different" grades. Together with CIVA's carefully developed chief judge procedures for the conduct of post-flight conferences, the FairPlay system

(FPS) has effectively eliminated the influence of unintentional bias and selective judging, and provides what is generally accepted as a logically impartial solution. A key feature of CIVA's strategy is the publication not only of the results rankings but of all judges' grades and the adjustments made to them by FPS as well, so that everyone can see each judge's original marks and whether the chief judge (in post-flight HZ conferences) or FairPlay has seen fit to reject them for a more appropriate grade. This policy of complete openness is also a great help in ensuring that favouritism or meanness, whether intentional or not, simply can't be hidden, and adds real pressure to aspiring judges to maintain a clear and impartial approach to their allotted tasks.

As already mentioned, FPS' other great strength lies in its ability to look back through the recorded marks and provide analysis to the judges and their chief, showing clearly how the panel members have worked as a team, and where they are deemed to have awarded grades and/or scores that were sufficiently different from their colleagues to be identified for replacement by carefully calculated substitutes. This individual feedback is distributed after every sequence to each judge, with a separate report for the chief judge showing the overall picture. Where a grade or an overall score has been rejected by the FPS bias engine, a supplementary sheet shows

the other judges output, so that meaningful comparisons can be drawn with those who conformed to the accepted view or may even have been similarly treated. The analysis also includes the background data from which calculation of the judges' "ranking index" (RI) is built, showing how closely (or not!) their individual "raw" ranking of all pilots has matched the published results after FPS. Here a small RI number is good, the larger it becomes the more the judges' rankings have differed from the published result and hence the more out-of-step he or she was. This index later provides valuable information to CIVA's international judge selection panel when the time for championship judge appointments comes around each year, ensuring that only those judges with a demonstrably good record at recent events are considered for duty—a feature that should go some way toward allaying the fears of any pilot who questions the competence of those who judge him.

Is there a downside to the more complicated CIVA FairPlay methodology? The clear and simple IAC approach, with no computer-based interventions save evaluation of majority/minority zero reckoning where this is necessary, has an instant clarity that is hard to beat. If you truly believe that your judges will on average provide the right answer, then for results production nothing else is required—the old saw "Keep it simple!" is absolutely appropriate. Few significant improvements in life are truly free, however, and to make real progress in the more complex international arena there are inevitably additional measures to take on board. With FPS the results for each sequence can't be "final" until the last pilot has flown and all the grades have been entered, and at local events this might be a hurdle to overcome. In CIVA championships the FPS results output is continually published to the web with interim raw grades pop-up sheets for each pilot until all have flown, when the raw pages are replaced by final FairPlay pop-ups with all the added process information.

For chief judges and trainers at judging seminars, however, the whole field of FPS analysis is pure gold and in our experience continually opens eyes, even in domestic competitions, to the subtle but very real differences between judges who appear mostly to promote only the party line but in reality should all come with a set of instructions headed “complicated normal human being” just like the rest of us. A quick look through completed Form A’s by the chief judge before they go to the scorer is absolutely no substitute for this. To European eyes the IAC’s lack of published grades data for each pilot seems curiously secretive; CIVA has certainly found that once its free publication policy was adopted, opening all judge grades to pilot and public scrutiny quickly improved confidence all round—nothing can be hidden any more, even the contest files and the scoring software are freely available to everyone for download after each event. Internationally there has to be a robust judge selection procedure for major championships, and in this tough area the RI system keeps proving to be of fundamentally sound value. Overall, therefore, this paper isn’t really about who has the better scoring solution; it is much more an issue of a suitability or horses for courses where perhaps “Keep it as simple as possible!” should be our real guiding principle.

Given that we now have at least two pretty well-established scoring systems in the world, are there any compelling reasons to engage in discussion about a bit of collaboration? We need to carefully distance ourselves from “Not invented here” syndrome,” “Our way is better than yours,” that sort of thing—in their established home territory each system will have perfectly good reason to be trusted and used, and complicating things for the sake of it has no appeal. Apart from the bias question, which may or may not actually be a significant factor in your neck of the woods, the feature that stands out as truly appreciated by followers of the FPS way of life is its ability to provide sensible analysis of the

similarities and differences between the judging panel members in their figure grading. In practice with small numbers of judges and pilots FairPlay does little besides balancing the judge styles, and the feedback is unlikely to be meaningful. At perhaps five judges and pilots typical patterns will start to emerge, and at major championships the analysis is very often insightful and unambiguous. Entirely separate and more easily interpreted in any situation is the ranking index system; this is in effect a complement to FPS, relying simply on a direct comparison between each judge’s raw sequence ranking (i.e., before any zeros are resolved) with the final results ranking—a judge who gets all pilots in the “correct” order scores a perfect zero, the index number rising as the rank order and score misfits become less acceptable. If all our judges managed to get their ducks in exactly the right order each time, then of course we could do the job with just one, but they’re humans and so it hardly ever happens that way. The CIVA software embodies the raw-grade IAC system as an “either/or” sequence option to the statistical approach, but at present the analysis and the RI are confined to FPS users—it would be interesting to investigate what we might do to change that, and whether an RI based solely upon raw data would be able to provide a usable result in a manner comparable to FPS.

So there you are—the whole subject laid open, warts and all. Could we do better? That is of course quite likely. Have we lost the plot anywhere...are our preferred solutions fit for purpose? For sure enough effort has gone into the respective system developments over the years, so if we aren’t happy, then we have only ourselves to blame. Is the attractive simplicity of a pure raw grades approach to scoring, with majority zero assessment, sufficient to dispel doubt and underpin the effectiveness of IAC’s well-established judge training regimes, or would a more recursive approach make a worthwhile difference? If you are an active pilot or just love to spend

your time working anywhere around the aerobatic competition scene, then all these questions should be a matter for proper consideration. If you have a moment, go online and compare the CIVA championship results website and the British web contest results pages with IAC’s own web results service; you may be surprised at how the diversity of cultural backgrounds has led to similar but different interpretations of what is fundamentally the same material.

With luck this short essay has provoked a little curiosity about how things are done “over the water,” and why this might be the case. If any Sport Aerobatics readers have comments to air, axes to grind, or even a better solution to some irritating problem, then we’d be very interested to hear from you. We all get such a buzz from sport aerobatics (no pun intended!) that we tend to take results processing as a fixed part of the scenery; setting aside some time to learn a bit more about the nuts and bolts of this process can at least fill in a few gaps about the whys and wherefores, and anyway—it’s interesting! **IAC**

ABOUT THE AUTHOR

Nick Buckenham has extensive experience around the British aerobatic scene, competed at Fond du Lac in the early '90s, was several times an advanced world and European championship competitor in a Yak-55M, is an international judge and will be CJ at EAC in Slovakia this year, is a CIVA vice president and scoring director, and also is the author of the widely used ACRO scoring software package.

Online you can find the CIVA results web at www.CIVA-Results.com.

British Aerobatic Association contest results are at www.Aerobatics.org.uk/results/2012.htm.

ACRO software and many contest files are at www.Exploit-Design.com/AeroSoftware/ACRO-software.htm.



Is your aircraft safe?

BY JOHN HOUSLEY
(IAC 433114)

Would you believe that with four forward-facing vents, all open and flowing fresh air into the front and rear cockpits of a Pitts S-2B at roughly shoulder level, that carbon monoxide poisoning could still be

a problem? Do you think it's actually possible for exhaust flow to enter the fuselage from openings near the tail and migrate forward at the same time the vents are flowing? If you answered yes, you're correct. If you're doubtful, read on to learn how this problem was discovered.



Carbon Monoxide

Troubleshooting

AERIAL PHOTOS BY JOHN HEILMANN
AND MIKE PICCIRILLI

and corrected.

In May 2011, I flew roughly 2.5 hours to reach the Armed Forces Memorial Aerobatic Contest in Grenada, Mississippi. The flight was relatively stress-free, although it was hot. I flew a practice flight after checking in and was performing so poorly that I did not even finish one sequence. Was it fatigue? Dehydration? A combination of factors? When I operated the smoke system, I noticed that after about five seconds, smoke began to fill the cockpit regardless of cowl flap position. If smoke was getting in, then perhaps carbon monoxide (CO) was as well.

I did some online research about the effects of CO and current standards for exposure limits. According to the World Health Organization (Reference 1), normal subjects can be exposed to these levels and durations with no ill effects:

- 100 mg/m³ (87 ppm) for 15 minutes
- 60 mg/m³ (52 ppm) for 30 minutes
- 30 mg/m³ (26 ppm) for 1 hour
- 10 mg/m³ (9 ppm) for 8 hours

Exposures at 100 ppm or greater can be dangerous to human health. The other vexing thing about CO poisoning is that it has a long half-life, meaning it takes three to

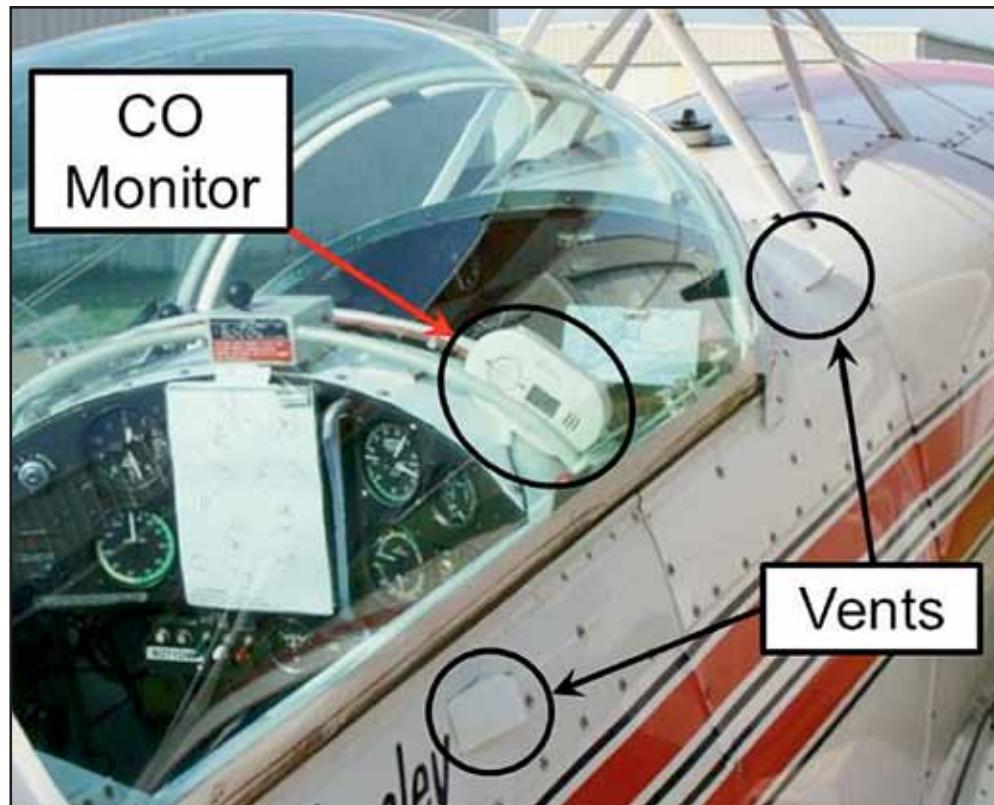


DIAGRAM 1

four hours of breathing air (at rest) to reduce the level of carboxyhemoglobin to half of its current value.

The next step was to gather some data to see what the CO levels were in the cockpit. Ideally, you'd use a sensitive CO detector such as the CO Experts Model 2002 low-level CO monitor (available from Reference 2). As I was operating with a budget constraint, I used a Kidde battery-pow-

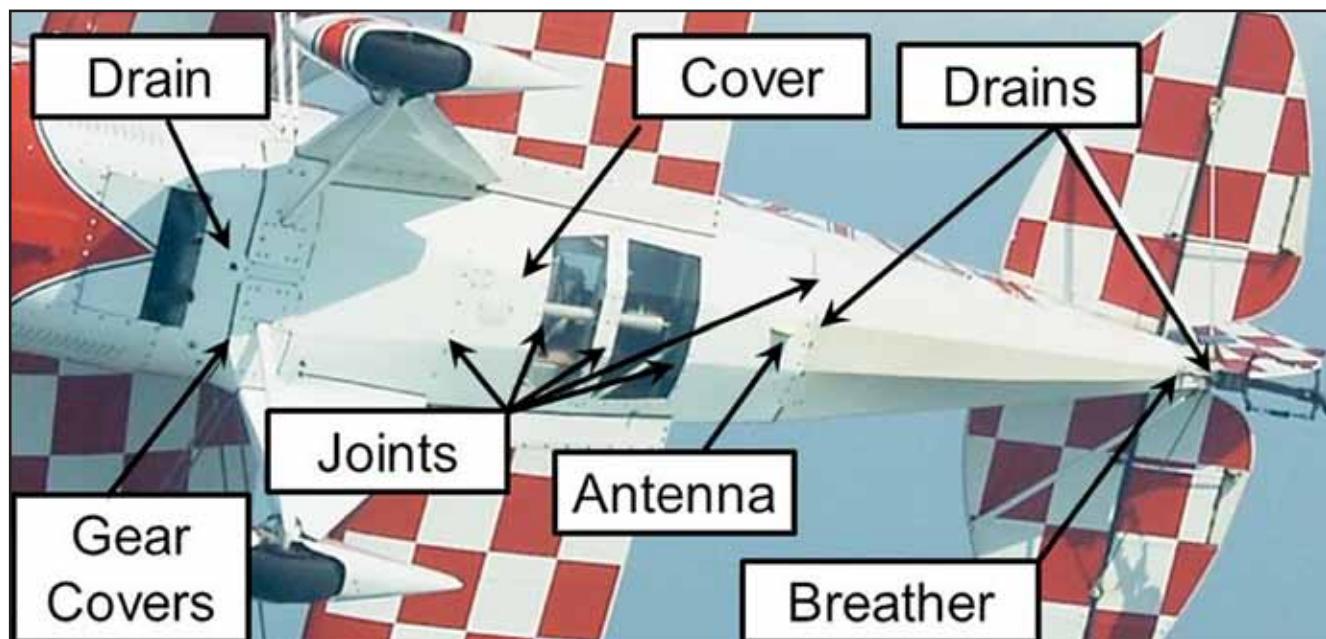


DIAGRAM 2



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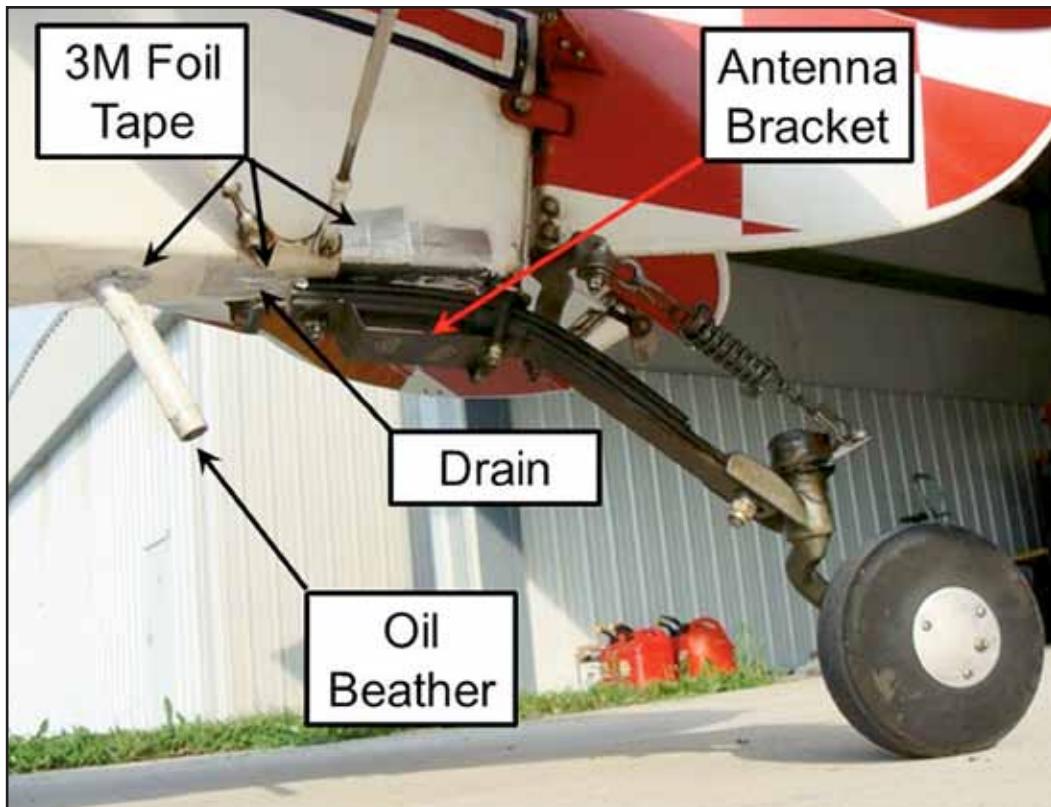


DIAGRAM 3

ered Nighthawk with digital display available for about \$30 at the local Home Depot (Reference 3). Mike Busch wrote an excellent article on the merits and limitations of these detectors (Reference 4) if you are interested. As shown in Diagram 1, I mounted the detector to the canopy cross tube.

The initial readings were 0 ppm. As you can see, the detector is fairly well aligned with the front cockpit right side vent. When I moved the detector to a location in front of my face, the CO reading peaked at 97 ppm. This confirmed what the smoke was telling me: CO was getting into the cockpit somehow.

From the photo at the beginning of the article, we can see that any opening along the underside of the aircraft could be a contributor.

Peering along the underside of the Pitts fuselage (Diagram 2), we can see these potential CO entry points:

- Fuel filter drain
- Landing gear closeouts (huge gaps)
- Sheet metal joints
- Inspection cover
- Plexiglas floor to sheet metal joints
- Sheet metal to fabric transition joint
- Transponder antenna
- Drain holes in the fabric (4)
- Oil breather line fabric penetration

I started working my way from rear to front. Closing off (with 3M foil tape—very durable, good for 250°F, and sticky) the oil breather line to fabric gap and the drain hole just ahead of the tailwheel spring helped some, but

did not solve the majority of the problem. I then closed off the drain holes and joint between the sheet metal and fabric just aft of the cockpit. Finally, I mummified the bottom of the aircraft from the firewall back to the fabric and had a chase plane observe the condition of the tape before I turned the smoke on (the tape around the landing gear closeouts had broken at some point between takeoff and landing on earlier test flights). Chase verified the tape was intact, and again, the cockpit filled with smoke after about five seconds. Chase confirmed the smoke was not rising up to the rudder cable openings, the elevator cross tube, or the aft fuselage inspection covers. So where was it coming from?

As shown in Diagram 3, there once was apparently a VOR antenna installed on the aircraft on a bracket below the tailwheel spring. Above the tailwheel spring, there was now an opening in the fabric (covered by foil tape in the photo). This opening may have been created for the antenna coax, or it may have just developed over time due to exposure to the exhaust flow.

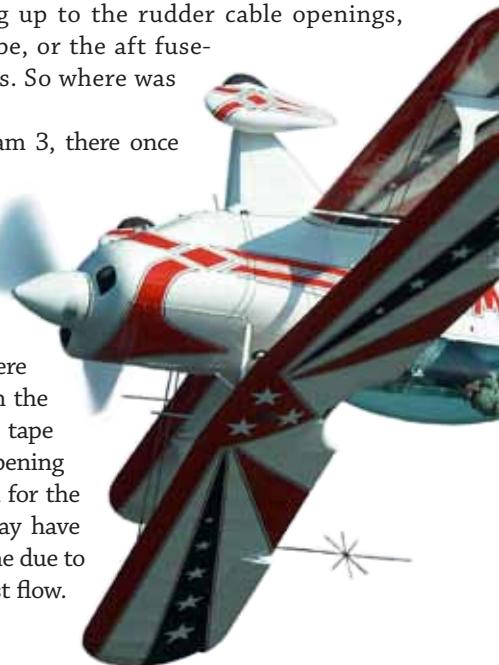




DIAGRAM 4

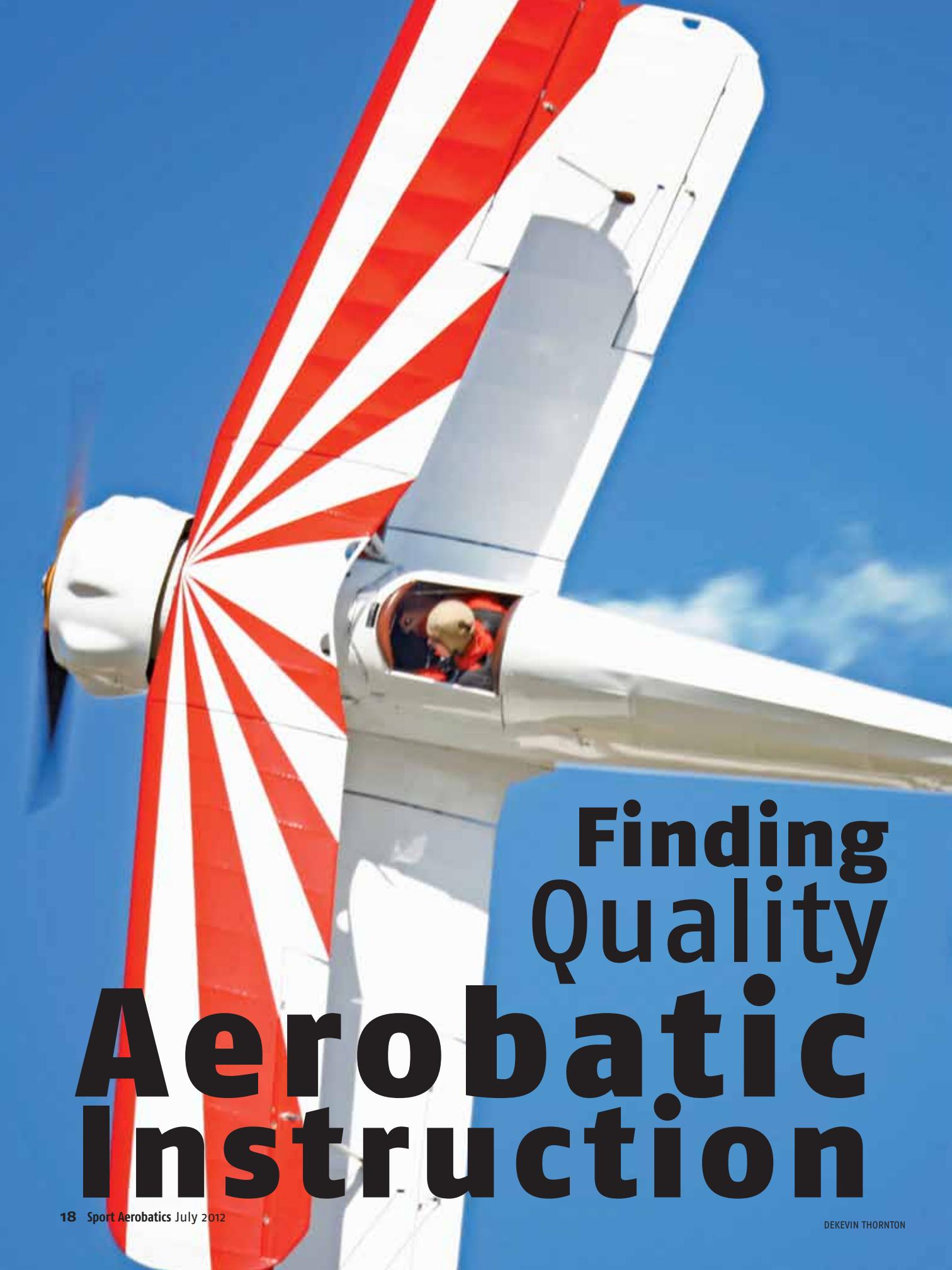
After closing this opening off (with the rest of the tape still in place), the smoke no longer entered the fuselage/cockpit. I removed the rest of the tape, retested, and found that I needed to reapply the tape to the drain holes and lap joint between the sheet metal and fabric just aft of the cockpit to keep the smoke (and CO) out. The huge gaps at the gear leg closeout covers, fuel filter drain, sheet metal to Plexiglas joints, and inspection cover were not measurable contributors to the CO/smoke contamination.

When we're flying (especially aerobatics), we need to ensure that all the blood that reaches our brain (sometimes challenged by pulling positive g's) has as much oxygen as possible. The affinity between hemoglobin and carbon monoxide is approximately 230 times stronger than the affinity between hemoglobin and oxygen so hemoglobin binds to carbon monoxide in preference to oxygen. Once the CO bond has been made, it takes several hours (with clean air or oxygen) to return to normal. Please check your fuselages, vents, and exhaust to be sure that you're breathing pure air at all times.

IAC

References:

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http://en.Wikipedia.org/wiki/Carbon_monoxide_poisoning
2. Sensitive CO detector:
www.Aeromedix.com/CO_Experts_Low_Level_Detector_Model_2010.html
3. Low-cost Kidde Nighthawk CO detector: www.HomeDepot.com/Electrical-Fire-Safety-Carbon-Monoxide-Alarms/Kidde/h_d1/N-bmgkZuaZ5yc1v/R-100311681/h_d2/ProductDisplay?catalogId=10053&langId=-1&storeId=10051
4. Mike Busch article on CO poisoning & detectors:
www.Aeromedix.com/aeromedix_articles/co/index.html



Aerobatic Instruction

Finding Quality

What you may want to consider before choosing instruction

BY MIRIAM LEVIN

Choosing an aerobatic flight school/instructor is an important decision. The more confident you are in your choice of an aerobatic instructor, the more successful and enjoyable your training experience will be.

Following are some guidelines and suggestions for what to consider and how to go about making that decision.

What Are Your Aerobatic Flight Training Goals?

Before looking for an instructor, decide just what type of aerobatic training you want. Perhaps you are looking for a CFI spin endorsement or upset/unusual attitude training to become a safer GA pilot. Or you might want to learn recreational aerobatic flying to have some fun on Sunday afternoons.

Many pilots want competition aerobatic training either at an entry level or to prepare for the next higher category of competition flying. If air show flying is your goal, you might want to develop an air show routine or qualify for a low-level waiver.

Whatever your aerobatic flying goal is, it is essential to take a comprehensive spin training course to prepare for any single-pilot aerobatics.

Where to Look for Aerobatic Schools/Instructors

Quality aerobatic training can be

offered by a flight school or by an instructor who operates independently.

The International Aerobatic Club provides a Directory of Aerobatic Schools on its website: www.IAC.org. These schools/instructors are not rated or endorsed by the IAC. Each student must apply his/her own selection criteria. Suggestions for how to select an aerobatic instructor are listed below.

You can get recommendations from your local IAC chapter. If you are not an IAC member, become one by visiting www.IAC.org. Experienced IAC members will be able to offer suggestions.

The best aerobatic flight school and/or instructor for you may be located some distance from your home airport. So don't exclude the possibility of spending some vacation time learning aerobatics in a state far from home.

Aerobatic Training Aircraft

Think about what kind of aircraft you want to train in and find out what aircraft are flown by the flight school/instructor you are considering. Ask if you will need a tailwheel endorsement. If you have your own plane and want to use it, find out if it is certificated for the type of training you want.

If you would like to rent an aerobatic aircraft for solo flight or competition, be sure to ask the flight school/

instructor about that possibility. Renter's insurance is usually required.

If instruction will be obtained in an experimental aircraft, make sure the owner has a LODA (Letter of Deviation Authority) from the FAA, which allows instruction in an experimental aircraft.

How to Evaluate an Aerobatic Instructor

Interview each prospective instructor using a list of questions you develop. Following are some suggestions:

Does the instructor offer the type of training you are looking for?

How many hours of aerobatic flight time has the instructor logged?

How many hours of aerobatic instruction has the instructor logged?

Is the instructor a CFI? As a CFI the instructor will have experience teaching from the passenger seat and will know how to develop a syllabus.

Does the instructor have a written syllabus for aerobatic training and is she/he willing to modify it to meet your needs?

Are ground school, emergency parachute use, and post-flight debriefing included in the training program?

In what aircraft is the instructor experienced and qualified to train?

Will the instructor train in your aircraft?

Will the instructor teach from the passenger seat?



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Ask the instructor for references, preferably a list of his/her students you can contact.

If your goal is competition, the following questions are important:

How much competition experience does the instructor have and in what category?

Does the instructor have experience critiquing, i.e., providing students with feedback on flight performance?

If air show flying is your goal:

How many air shows does the instructor do a year?

What is his/her ICAS floor?

Did the instructor have competition experience prior to air show flying? Competition experience creates a strong basis for disciplined, safe flying.

Compatibility between the instructor and student is important for a successful learning experience.

Find out what the instructor's teaching style is. Try to get a sense of it in your interview and ask for references. Is she/he calm or excitable, supportive or critical? Does she/he give clear, concise instructions?

Does the instructor seem to be sensitive to your personality and learning style?

If possible, take a trial lesson from the instructor before signing up for a



ANGIE CAMBRE

block of time.

If you don't feel you and the instructor are a match, explore other options.

Here's wishing you great success in finding the best aerobatic flight instructor for you!

FARs Relevant to Aerobic Flying/Instructing

FAR 23.3 Airplane Categories. Describes maneuvers that can be performed by utility and aerobatic aircraft.

FAR 23.221 Spinning.

FAR 61.31 (i) Additional training required for operating tailwheel airplanes. Provides requirements for a tailwheel endorsement.

FAR 91.303 Aerobatic Flight. Defines where aerobatic flight may be conducted. Gives definition of aerobatic flight.

FAR 91.307 Parachutes and Parachuting. Describes when parachutes must be used. Defines repacking requirements.

FAR 91.319 (a) (2) Describes operating limitations on aircraft having experimental certificates. 91.319 (h) Relief from paragraph a. Deviation authority. **IAC**

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My insurance company covered me, a low-time, low-tailwheel-time pilot in a single-hole Pitts largely because I went to Budd for my training. -Tom P.

...the engine failed at low altitude and the accident investigators said that my fundamentals saved me. Thanks my friend. -Maynard H.

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Interpreting Flight Results

Continuing our discussion of judging metrics

BY DOUG LOVELL

In the April issue article about judge metrics, we saw that IAC now has a number of measures of judge performance in addition to measures of pilot performance. We showed that:

- Judge metrics on flight results tell us which judges agreed about the pilot performances on that particular flight;

- No one can draw conclusions from one flight about whether a judge will agree with the judge panel on another flight; and

- No one can draw conclusions from one flight about the quality of a judge in general.

We promised to look more closely at the individual flight results and what they reveal.

In order to explore what flight results reveal, we'll look at one of the flights posted at <http://www.iaccdb.org>. The flight is ancient history; but, in order to keep peace, we're stripping away the names. Always remember one flight does not make or break a pilot or a judge. Consistent performance over time is the telling factor.



Pilot	J1	J2	J3	J4	Score	Pnlt	Result
P1	2498.50 (1)	2521.50 (1)	2243.00 (2)	2573.50 (1)	2459.13	74.75% (1)	30 2429.13 (1)
P2	2343.50 (2)	2391.00 (2)	2414.50 (1)	2520.50 (2)	2417.38	73.48% (2)	60 2357.38 (2)
P3	2246.50 (3)	2239.50 (3)	2017.50 (3)	2246.00 (5)	2187.38	66.49% (3)	120 2067.38 (3)
P4	1982.00 (5)	1935.00 (5)	1845.50 (4)	2354.50 (4)	2029.25	61.68% (5)	0 2029.25 (4)
P5	2160.50 (4)	1946.00 (4)	1838.50 (5)	2462.50 (3)	2101.88	63.89% (4)	90 2011.88 (5)

	ρ	ri	γ	Np	Npp	Nf	Fza	Ng	Ka	Mz	Mg
J1	100	0.00	100	5	10	1	5.00	50	32.90	0	0
J2	100	0.00	100	5	10	1	5.00	50	32.90	0	0
J3	80	9.20	60	5	10	1	5.00	50	32.90	0	0
J4	70	11.63	60	5	10	1	5.00	50	32.90	0	0

G H I J

ρ = Rho
 ri = RI
 γ = Gamma

SCREEN 1

Let's look at the five-pilot, four-judge flight in Screen 1. The first thing to note is that the ordering of the pilots in agreement with the judge panel is 1-2-3-5-4 (See 'E'). That is because the fourth place pilot according to the judges took ninety penalty points ('F'). Because the fourth and fifth ranked pilots are close in points, ninety penalty points are sufficient to drop the pilot ranked fourth below the pilot ranked fifth by the judges. When we look at judge performance we com-

pare each judge with the results before penalties.

Judges J1 and J2 ranked the pilots in agreement with the four panel. You'll see ('B') that they don't give necessarily higher scores or even produce much more of a range of scores. They aren't dominating the judge panel in any way. It's simply that, when you add up the scores from each judge, the result ranking agrees with the ranking given by J1 and J2.

Agreement on the fourth and fifth ranked pilots is poor. There

is not unanimous, but at least majority, agreement on the three top-ranked pilots.

The Rho (ρ), RI (ri), and Gamma (γ) metrics show that judges J1 and J2 were in agreement with the ranking ('G'). They have perfect 100 Rho and Gamma, perfect zero RI. For judges J3 and J4 we see by Gamma they each got the same number of paired rankings correct ('J'). RI was tough on J4 ('I'). Rho shows also that J4 rankings had the least strong correlation with the panel ('H').

Looking at the rankings of judges J3 and J4 ('C') we see that J4 had the top two pilots ranked in agreement. Judge J3 thought P2 was the better pilot. Note that if pilot P2 looks only at scores ('A'), it appears judge J4 liked him better than judge J3. Judge J4 gave pilot P2 a higher score than any other judge. The rankings reveal that judge J3, not J4, is the judge who most favored pilot P2.

Judge J4 gets into trouble with the Rho and RI numbers by ranking the third place pilot last ('D'). Rho and RI pick that up. (Gamma picks up only that both judges J3 and J4 correctly ranked eight of the ten pilot pairings. Judge J3 has rank disagreements for P1 v. P2 and P4 v. P5. Judge J4 has rank disagreements for P3 v. P5 and P4 v. P5.)



DEKEVIN THORNTON

P3	A	B	C	D				
F	J1	J2	J3	J4	Avg	K	PtsLoT	
1	8.5 (1)	8.5 (1)	8.0 (1)	8.0 (3)	8.3 (1)	43	75.2	
2	7.0 (5)	8.0 (2)	7.0 (3)	7.5 (4)	7.4 (4)	36	94.5	
3	5.5 (5)	4.5 (5)	4.5 (5)	6.0 (5)	5.1 (5)	40	195.0	
4	8.0 (1)	8.5 (1)	7.0 (1)	9.0 (1)	8.1 (1)	24	45.0	
5	7.5 (3)	8.0 (1)	7.5 (1)	7.5 (3)	7.6 (1)	49	116.4	
6	8.0 (1)	8.5 (1)	8.0 (1)	7.5 (1)	8.0 (1)	22	44.0	
7	0.0 (4)	0.0 (4)	0.0 (4)	0.0 (4)	0.0 (4)	28	280.0	
8	8.0 (1)	6.5 (3)	5.0 (3)	8.0 (2)	6.9 (2)	42	131.2	
9	7.5 (4)	8.0 (1)	8.0 (3)	7.5 (5)	7.8 (4)	25	56.2	
P	7.5 (3)	7.5 (3)	6.0 (3)	6.0 (5)	6.8 (3)	20	65.0	
Points	2246.5 (3)	2239.5 (3)	2017.5 (3)	2246.0 (5)	2187.38 (3)			
E	F			Penalty	120			
				Points Earned	2067.38 (3)			
				Max Possible	3290.00			
				Percent of Possible	62.84			

SCREEN 2

The next important question to ask is what judge J4 can learn from this. If you are judge J4, you can see your ranking for pilots P3 and P5 ('D') are the ones which disagree the most. Screen 2 shows the grades for pilot P3.

In Screen 2, you're looking for figures graded lower than the other judges. In particular, lower than judges J1 and J2 since they were the judges in agreement. Looking at the grades ('C'), we find nothing. Your grades are for the most part equal to or higher than the grades of the other judges. To get any information, you have to look at the ranks.

You can see by the rankings for figures one, nine, and presentation ('A', 'E', 'F') you (judge J4) gave relatively worse scores to pilot P3 than did the other judges. The error on figure one ('A') causes the most damage, because that is the figure with the highest K value ('D'). Your (judge J4) eight was lower than the score you gave two other pilots, unlike judge J3's eight ('B'). Judge J3's eight is the highest grade given by J3 on that figure.

As judge J4, you can conclude that you might be missing something on the first figure of the flight—

caught. It's probably too late to ask them exactly what they saw for that pilot on that day; but, you could ask them what they look for on that particular figure.

Numbers, numbers,
numbers. As one
person said when
they looked at these,
"That's a lot of
numbers."

something the other judges saw when grading the other pilots. To confirm, look at the pilot P5 grades in Screen 3. The P5 grades clarify the picture. As judge J4 you gave Pilot P5 your best score on the first figure ('B') while the other judges gave pilot P5 their worst score ('A'). Clearly, you missed something on the first figure that the three other judges

After consultation you might conclude that the other three judges had something funny for breakfast; that you had it right. Remember that the numbers tell you where you differed and whether you were in the majority or the minority. They don't tell whether you were right or wrong. If you are one out of four, however; the likelihood is high that you missed something.

P5	A	B	C	D	E	F		
F	J1	J2	J3	J4	Avg	K	PtsLoT	
I	7.0 (5)	5.0 (5)	6.0 (5)	8.5 (1)	6.6 (5)	43	145.1	
2	7.5 (4)	8.0 (2)	4.0 (5)	9.5 (1)	7.2 (5)	36	99.0	
3	8.0 (1)	8.5 (1)	7.5 (1)	9.0 (1)	8.2 (1)	40	70.0	
J	7.0 (3)	7.5 (3)	7.0 (1)	8.5 (4)	7.5 (3)	24	60.0	
K	7.5 (3)	7.5 (3)	6.0 (3)	8.0 (2)	7.3 (3)	49	134.7	
6	6.0 (2)	7.0 (2)	6.0 (3)	7.5 (1)	6.6 (3)	22	74.2	
L	0.0 (4)	0.0 (4)	0.0 (4)	0.0 (4)	0.0 (4)	28	280.0	G
M	6.0 (4)	2.0 (5)	5.0 (3)	7.0 (4)	5.0 (5)	42	210.0	H
8	8.0 (1)	7.5 (4)	8.5 (1)	8.0 (2)	8.0 (2)	25	50.0	
P	7.5 (3)	6.5 (5)	6.0 (3)	7.0 (3)	6.8 (3)	20	65.0	
Points	2160.5 (4)	1946.0 (4)	1838.5 (5)	2462.5 (3)	2101.88 (4)			
E				Penalty	90			
				Points Earned	2011.88 (5)	N	O	
				Max Possible	3290.00			
				Percent of Possible	61.15			

SCREEN 3

We must take care as judges that we don't try to get good match numbers. We don't want to go out with the attitude of trying to game our statistics, perhaps by restricting the range of our grades or trying to guess which pilots the other judges will favor. The best judges are the judges who judge frequently, and who fairly apply consistent criteria. The statistics are a device for finding insight, not an end in themselves. The judge "leader board" posted at <http://iaccdb.org/leaders/judges/> primarily highlights judges who are most actively judging-- judges who judge a lot.

Let's switch gears now and look at what Screen 3 can tell the pilot. You are pilot P5 looking at your grades for the flight. First, note that the seven from judge J3 on figure four ('K') is not the same as the seven from judge J1 ('J'). Judge J1's seven is a third place seven. Judge J3's seven is a first place seven. Likewise, on the same figure four, the eight-five from judge J4 ('L') is not the

most favorable grade. It is in fact nearly the worst grade from that judge for that figure. That is merely to point out that raw grades don't tell the whole story, or even much of the story. To get the real picture you have to look at ranks. So as pilot P5, how can you improve your dismal performance? Where will you gain the most benefit from practice and improvement? First, look at the good stuff. All of the judges thought figure three was flown better than any other pilot flew figure three ('I'). Almost the same for figure nine ('M'). Whatever you're doing on figures three and nine, keep it up. Next look for figures ranked especially low. Figures one, two, and eight were ranked last ('D', 'C', 'N'). Of those, figures one and eight have the highest K value ('E', 'O'). Check the comments on figures one and eight. Work on those. At last, look at the "PtsLoT" column. That's "points left on the table." Obviously it never helps to zero a figure ('G'), even though one other pilot did the same on this known flight.

Going beyond the zero, it's evident that improvement on figure eight has the most to gain in terms of getting points back ('H'). Figure one is a close second ('F'). Points is what it's all about. More points win. Figure-out what you need to improve to score better on figures one and eight. Work on that in practice. Get that right and the next outing will have a better outcome.

Numbers, numbers, numbers. As one person said when they looked at these, "That's a lot of numbers." In the movie "Moneyball" with Brad Pitt (based on the documentary book by Michael Lewis) the manager of the Oakland A's baseball team gets to the World Series in 2002, with a very uncompetitive player budget, by using the numbers to select a winning team. If you made it through this article, you've picked up some tools to improve your results. As a pilot, you can get more value from gallons of fuel invested. As a judge, well, you didn't have much of anything to go on before. Now you do.

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TECH TIPS

UPSIDE DOWN IN A PITTS

REPRINTED FROM THE INTERNATIONAL AEROBATICS CLUB TECH TIPS MANUAL

ORIGINALLY RUN IN THE JANUARY 1988 ISSUE OF *SPORT AEROBATICS*

The IAC Tech Safety Committee recently heard from an IAC member who was caught by a sudden wind shift and ended up inverted on the ground in a Pitts S2A. The report is as follows:

"This was a routine flight in the local vicinity of the airport. There were thunderstorms in the area, but not encountered during flight or in the vicinity of the airport before the accident.

"On arrival at the airport a standard pattern was flown with the windsock checked on base leg. Windsock indicated to be from the south at approximately 10K. "The approach to runway 18 was normal with regard to speed of aircraft. With the Pitts being blind as to forward vision over the nose, it is necessary to judge landing speed with side vision. This appeared to be within normal landing speed limits.

"Aircraft touched down in the first third of the runway and skipped slightly. In order to avoid any stress on the main gear a small amount of power was added. Up to this point I did not feel there was any problem with the landing.

"The aircraft at this time seemed to be floating further for the amount of power added. A check on side vision definitely indicated the same thing. I felt I immediately had to make a choice of whether to attempt to go around or to try to stop. Neither of the choices were good ones considering how far down the runway I was.

"To go around meant I would either have to clear the approximately 60-foot power lines or go under them. To go under them also meant I would have to clear a corn field on the other side of the road.

"I chose to remain on the ground, power at idle, and applied heavy breaking, knowing I would probably go off

the end of the runway. This still seemed to be the best choice to have made.

"When the aircraft went off the end of the runway it went into freshly worked ground which had been worked up to seed for a cover crop. The aircraft settled down in the loose ground, prop caught and flipped over. I shut the fuel and power off. No fuel leakage occurred and no fire problems were encountered.

"With no one around to give assistance to get out, I managed to open the canopy part way, but did not seem to be able to get it to release completely. It was very possible in my haste to exit the aircraft I was not thinking clearly enough to have applied the proper release methods for removal of the canopy. After releasing the belts and getting out of my parachute I was able to maneuver around enough to get a screwdriver out of the turtledeck and proceeded to break the canopy to exit the aircraft.

"After exiting the aircraft it was noted that the wind was from the north at 10-12 knots. It remained from this direction for nearly an hour until the passage of a small thunderstorm, after which it again became southerly.

"I tried very hard to be explicit in my report to NTSB. I'm sure they will still classify it as a weather related incident; however, I DID CHECK WINDS PRIOR to landing! If there is any of this you can use to somehow help someone from repeating the same thing, please feel free to use any of it.

"Since this happened, I have talked with numerous pilots who have had the same experience — upside down in a Pitts! In one way I have been relieved to hear there have been so many who have had this type of experience and, on the other hand, I sure wouldn't

wish anyone to have to go through it.

"I'm convinced that if I had not been in the habit of tightening the shoulder harness before landing I would have had more than just bruises and burns from the harness. As fast as I went over, I really believe I could have been thrown out of the airplane without the harness on and snug!

"I am giving serious thought to putting in some type of Halon extinguisher system which can be activated from the cockpit. Even if I had had a fire-retardant suit on, as long as it took me to get out if there had been a fire, it wouldn't have made a difference. I did shut the fuel and everything else off. I feel it also helped to have put new hoses throughout the installation. Had I had even a hint of fuel odor, I surely would have panicked. If I can't have a complete system, I will have at least a handheld extinguisher mounted in the cockpit where I will have easy access to it.

"Another item I now feel is a must for a Pitts — a canopy breaking tool, fastened under the instrument panel, perhaps. Without the screwdriver I don't feel I would have been able to get out alone. I would also recommend something better than a screwdriver. The only cuts and scrapes I had were from breaking the canopy.

"I realize we have a great number of Pitts pilots out there who are excellent pilots, but to sit back and think that the unexpected won't happen to them is just about like the bird who hides his head in the sand! I came out of it with some pretty good bumps and bruises and a very big dent in my pride as a pilot, but that can be rebuilt as well as the airplane."

In the June 1983 issue of *Sport Aerobatics* (also reprinted in IAC TECH-

NICAL TIPS MANUAL II), there were two articles on canopy breaker tools. For those IACers considering a canopy breaker tool, these articles would make good review as would a June 1980 IAC Tech Safety article (also in TIPS II) entitled, "Egress."

In one of the above-mentioned articles Sam Burgess stated, "There are very few emergency landing fields where a Pitts would not go over on its back." Many, many reports received by the Tech Safety Committee, and as again noted in the first part of this article, conclude with the aircraft lying on the ground inverted.

After the tragic Amos Buettell accident in February 1985, reported on in June 1985 SPORT AEROBATICS, many people were very concerned about aircraft fires and there was much talk about onboard fire extinguishing systems. IAC member Art Bianconi did quite a bit of research into extinguisher systems. Working with Art, the IAC Tech Safety Committee made several inquiries trying to find someone who had installed a working onboard system into a small aero aircraft. To date, no one has reported on a complete and working system.

Now might be a good time to again ask for input regarding onboard fire extinguishing systems suitable for installation in small aero aircraft. Any information received by the IAC Tech Safety Committee will be relayed through the pages of SPORT AEROBATICS to the IAC membership. Can you help?

To the IAC member who submitted the above accident report and who shared her observations with the rest of us, we send a large IAC thank you. Only by working together can we keep our sport fun-filled and safe. **IAC**

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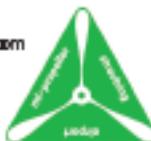
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CONTEST CALENDAR

Mark your calendars for these upcoming contests. For a complete list of contests and for the most up-to-date contest calendar, visit www.IAC.org. If your chapter is hosting a contest, be sure to let the world know by posting your event on the IAC website.

Michigan Aerobic Open (Mid-America)

Saturday, July 7 – Sunday, July 8, 2012
Practice/Registration: Monday, July 2 – Friday, July 6
Power: Primary through Unlimited
Location: Reynolds Field (JXN): Jackson, MI
Region: Mid-America
Contest Director: Don Weaver
Contact Information: Primary Phone: 989-859-7237
Alternate Phone: 989-859-7237
E-Mail: donflies@chartermi.net
Website: <http://iac88.org/contest.html>

Revenge of the Aerobatist (Southwest)

Saturday, July 14 – Saturday, July 14, 2012
Practice/Registration: Friday, July 13
Rain/Weather: Sunday, July 15
Power Categories: Primary Sportsman
Location: Redlands Municipal (REI), Redlands, CA
Region: Southwest
Contest Director: Casey Erickson
Contact Information Primary Phone: 619-417-0839
E-Mail: Casey@allwaysair.com

Green Mountain Aerobatics Contest (Northeast)

Friday, July 13 – Sunday, July 15, 2012
Practice/Registration: Thursday, July 12–Friday, July 13
Power: Primary through Unlimited
Location: Hartness State Airport (vsf), Springfield VT
Region: Northeast Contest
Director: Bill Gordon
Contact Information Phone: 802 533 7048
E-Mail: wsgordon@earthlink.net

High Planes Hypoxia Fest (South Central)

Saturday, July 14 – Sunday, July 15, 2012
Practice/Registration: Friday, July 13
Power: Primary through Unlimited
Location: Sterling Municipal Airport (STK): Sterling, CO
Region: South Central
Contest Director: Dagmar Kress
Contact Information Primary Phone: 303-887-4473
E-Mail: dagmarkressbassett@mac.com
Website: www.iac12.org

Robert L Heuer Classic (Mid-America)

Saturday, July 14 – Sunday, July 15, 2012
Practice/Registration: Friday, July 13
Power: Primary through Unlimited
Location: DeKalb Municipal Airport (DKB): DeKalb, IL
Region: Mid-America
Contest Director: Jim Klick
Contact Information Primary Phone: 815-258-0047
Alternate Phone: 815-609-7165
E-Mail: jimklick@sbcglobal.net
Website: iacchapter1.org

CanAm at Cut Bank (Northwest)

Friday, July 27 – Saturday, July 28, 2012
Practice/Registration: Thursday, July 26
Power: Primary through Unlimited
Location: Cut Bank International Airport (KCTB): Cut Bank, Montana
Region: Northwest Contest
Director: Bob Harris, Dave Barbet
Contact Information: Primary Phone: 503-550-1496
E-Mail: flyhran@aol.com

Hoosier Hoedown (Mid-America)

Friday, August 3 – Sunday, August 5, 2012
Practice/Regist.: Thursday, August 2–Friday, August 3
Power: Primary through Unlimited
Location: Kokomo Municipal Airport (OKK), Kokomo, IN
Region: Mid-America
Contest Director: Mike Wild
Contact Information Primary Phone: 765-860-3231
Alternate Phone: 765-864-0096
E-Mail: mike.wild@comcast.net
Website: www.hoosierhammerheads.com

Doug Yost Challenge (Mid-America)

Friday, August 10 – Sunday, August 12, 2012
Power: Primary through Unlimited
Location: Spencer Municipal Airport (SPW): Spencer, IA
Region: Mid-America
Contest Director: Justin Hickson
Contact Information Primary Phone: 651-338-3345
E-Mail: jhisbatman@yahoo.com
Website: www.iac78.org/Index.html

Kathy Jaffe Challenge (Northeast)

Friday, August 17–Sunday, August 19, 2012
Practice/Registration: Thurs., August 16–Fri., August 17
Power: Primary through Unlimited
Location: South Jersey Regional & Flying W (VAY), Lumberton, NJ
Region: Northeast Contest
Director: Mark L. Mattioli
Contact Information Primary Phone: 609-634-0327
Alternate Phone: 609-634-0327
E-Mail: ce2n6gk@gmail.com
Website: www.iac52.org

Harold Neumann Barnstormer (South Central)

Saturday, August 18 – Sunday, August 19, 2012
Practice/Registration: Friday, August 17
Power: Primary through Unlimited
Location: New Century AirCenter (IXD), Olathe, KS
Region: South Central
Contest Director: Grant Wittenborn
Contact Information Primary Phone: (913) 369-5569
E-Mail: Grant.Wittenborn@gmail.com
Website: www.iac15.org

Beaver State Regional (Northwest)

Friday, August 24 – Saturday, August 25, 2012
Practice/Registration: Thursday, August 23
Rain/Weather: Sunday, August 26
Power: Primary through Unlimited
Location: Eastern Oregon Regional Airport (PDT): Pendleton, OR
Region: Northwest
Contest Director: John Smutny
Contact Information: Primary Phone: 2063997097
E-Mail: johnsmutny@gmail.com
Website: <http://iac77.eachapter.org/>

Upper Canada Open (Mid-America)

Saturday, August 25–Sunday, August 26, 2012
Practice/Registration: Friday, August 24
Power: Primary through Unlimited
Location: Hanover/Saugeen Municipal (CYHS), Hanover, Ontario
Region: Mid-America Contest
Director: Mike Tryggvason
Contact Information Primary Phone: 519-873-0327
Alternate Phone: 519-873-0327
E-Mail: aerobaticscanada.ch3@gmail.com
Website: <http://aerobaticscanadachapter3.blogspot.com>

Happiness Is Delano (Southwest)

Saturday, September 1 – Sunday, September 2, 2012
Practice/Registration: Friday, August 31
Rain/Weather: Monday, September 3
Power: Primary through Unlimited
Location: Delano Municipal Airport (DLO), Delano, CA
Region: Southwest
Contest Director: Steve DeLaCruz
Contact Information Primary Phone: 760 963 6426
E-Mail: DelanoCD@iacChapter26.org
Website: IACChapter26.org

Hill Country Hammerfest (South Central)

Saturday, September 1–Sunday, September 2, 2012
Practice/Registration: Friday, August 31
Power: Primary through Unlimited
Location: Llano Municipal (AQO), Llano, TX
Region: South Central
Contest Director: John Harlan
Contact Information Primary Phone: 512-632-9588
Alternate Phone: 512-259-9028
E-Mail: jmhrlan@earthlink.net
Website: www.iac107.org

Ace's High Aerobatic Contest (South Central)

Saturday, September 8 – Sunday, September 9, 2012
Practice/Registration: Friday, September 7
Power: Primary through Unlimited
Location: Newton City Airport (KEWK): Newton, KS
Region: South Central
Contest Director: AJ Hefel and Ross Schoneboom
Contact Information: Primary Phone: 316-648-5057
E-Mail: ahefel@cox.net schoneboomr@prodigy.net
Website: <http://www.iac19.webs.com/>

East Coast Aerobic Contest (Northeast)

Saturday, September 8–Sunday, September 9, 2012
Practice/Registration: Friday, September 7
Power: Primary through Unlimited
Location: Warrenton–Fauquier (HWY), Midland, VA
Region: Northeast
Contest Director: Scott Francis
Contact Information Primary Phone: 703-618-4132
Alternate Phone: 703-327-3135
E-Mail: s.francis@ieee.org

US National Aerobatic Championship (South Central)

Sunday, September 23 – Saturday, September 29, 2012
Practice/Registration: Saturday, September 22
Rain/Weather: Sunday, September 30
Glider Categories: Sportsman through Unlimited
Power: Primary through Unlimited
Location: North Texas Regional Airport (KGYI),
Sherman, TX
Region: South Central
Contest Director: Aaron McCartan
Contact Information Primary Phone: (515) 570-3537
E-Mail: aaron.mccartan@gmail.com
Website: <http://www.iacusn.org/Nationals/>

Borrego Springs Akrofest (Mid-America)

Thursday, October 11–Sunday, October 14, 2012
Practice/Registration: Thursday, October 11
Rain/Weather: Sunday, October 14
Power: Primary through Unlimited
Location: Borrego Valley Airport (L08), Borrego
Springs, CA
Region: Mid-America
Contest Director: Gray Brandt
Contact Information Primary Phone: 970 948 0816
E-Mail: graybrandt@yahoo.com
Website: www.iac36.org



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UNSHACKLED

Configuring my Pitts (SIE) with the auxiliary fuel tank is no big deal. Hose through the hole, two "L" fittings with cotter keys in back and the front end hooked over a small brace. Piece of cake.

This task is nothing new. We've seen them on a number of midwings and Pitts at contests. They look like a napalm can or bomb. The tank is mounted between the gear below the pilot. Some pilots even carry two of them — one for fuel and one for a liquor hit — er, I mean tool kit.

Having a couple of hours of extra gas is a luxury when either going long distance or fighting weather. Going to the third Okie Twistoff in Oklahoma from Denton, Texas, I had planned the trip with the tank because of the weather and not the distance (about 207.5 sm). I used every gallon staying ahead of a woolen bugger, got within 40 miles of SWO and had to settle for a night in TUL. When you're in the scud and you run out of visibility you go to the alternate. Everybody knows that.

The weather going back to HVA on Sunday was about half Hotel Sierra. So I put my tank on, filled it with 100 LL and shook it real good to see that it was okay. Somebody talked to me about this time saying that these tanks have fuel jettison capabilities, now. Fuel dumping from my Pitts? Naaugh! That's airline talk—B.S. This stuff costs me \$1.75 a gallon!

This was my 13th contest. I was not listening. I just wanted to go home—had to mow the lawn.

After takeoff it took a few minutes, to observe that more left rudder was needed than normal. I couldn't see anything bent—maybe someone warped my trim tab again.

Then the motor sounded funny. When it sucks from the auxiliary it sounds like or the same as it does when blowing smoke. Then the oil temperature went above 220 degrees. Whiskey, tango, foxtrot! I've got a problem!

Or I Learned My Lesson!

By GARY HEARTSILL
IAC # 6856



JEAN SORG

I looked at the auxiliary fuel line coming up through the belly and to my horror saw that the hose had ripped the metal back. The #&* + @#\$ tank is loose! Three dits, four dits, two dits, dah! What do you do with a half-filled, unshackled, auxiliary tank on a Pitts at 1500 feet over green trees in Oklahoma?

Plan A — land.

Plan B — land with tank.

Plan C — land smoothly with tank.

Plan D — If tank unshackles any farther, use Plan A.

Plan E — bail out.

Don't like E. My humble third place trophy might get scratched. Plan D gets into test pilot stuff and I don't want to use any of my superior skills doing experimental aviating. Plan C is about 30 miles away — Westheimer Field in Norman. I turn to go direct.

Well, the tank didn't come off in spite of my not so smooth and unannounced landing on the SW runway. After "re-configuring," the tank passed the shake test and I was southbound and down. The guys in the tower were nice and bought my story of needing to land more than talking to someone about it.

My half-hearted job of securing the auxiliary tank taught me these following items (for what it's worth):

1. Don't take simple things that work all the time for granted. I LOOKED, but didn't SEE that the clamp was ON the brace.

2. Holding additional control input means something has changed. I had a problem and flat ignored it!

3. Next time I'm calling the tower on 121.5 and ordering a fire truck. It was stupid to think I could land and not need help.

One last thing, if you know what an unshackled auxiliary tank will do to the flying characteristics of a Pitts, don't tell me. Write your own story for the rest of the world to know because I've learned my lesson! It flat scared me — plum . . . ! **IAC**

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NEWS BRIEFS

Changes to the Technical Inspection Form

Based on the recent recommendations from the NTSB regarding the Reno Air Race accident last fall, we have made slight changes to the Technical Inspection Form.

Reno racers go through a technical inspection similar to the inspections we do at IAC Contests, and one of the NTSB recommendations was to develop a method of determining if race aircraft had corrected any technical inspection faults discovered prior to the race. Anticipating that similar requirements would fall on us as well, we have modified the IAC Technical Inspection Form so the inspector may note any faults found on an aircraft, and can document the corrective actions taken to eliminate the fault. This will "close the loop" and provide documentation of faults (both in aircraft structures and paperwork) found and corrected, prior to an aerobatic flight at a contest.

If no faults are found, there is one check box for "no faults found." The inspector can just check this box, and the paperwork is done.

If faults are discovered, the inspector should note those on the Technical Inspection Form, and return the form to the pilot or aircraft owner. Once the faults are corrected, the pilot or aircraft owner can get the Inspector to review the corrections. If satisfactory,

the inspector may note the fixes on the form and sign the form to allow the pilot to complete registration.

Pilots, please note that an airworthy aircraft, along with current paperwork, is the responsibility of the pilot in command; not the technical inspector. Don't expect the inspector to fix your airplane for you. Bring an airworthy aircraft to the contest. As things do break unexpectedly, the technical inspectors are wonderful resources at contests, but remember they must inspect all the airplanes, and may not have time to devote to one airplane.

Steve Johnson, IAC Safety Chair

Vicki Cruse Emergency Maneuver Training Scholarships To Be Awarded at IAC Banquet.

As a tribute to World Aerobatic Champion, IAC President and Ninety-Nines member, Vicki Cruse, two EMT memorial scholarships will be awarded at the IAC banquet on Friday July 27, 2012.

The 99s Amelia Earhart Memorial Scholarship Fund will award its first Vicki Cruse Memorial Scholarship for Emergency Maneuver Training. This perpetual scholarship provides women pilots with financial assistance for emergency maneuver and aerobatic training. The 99 were so impressed by the large number of well qualified applicants for this scholarship that they

will fund a second Vicki Cruse EMT scholarship in 2013 from the proceeds of their biannual raffle.

CP Aviation will also award an EMT scholarship in memory of Vicki Cruse. This scholarship aims to promote aviation safety through unusual attitude and aerobatic training.

Vicki was devoted to educating pilots about the safety benefits of emergency maneuver and unusual attitude training. Through these scholarships, Vicki's accomplishments and memory will serve as an inspiration to future generations of pilots and encourage others to become more precise and safer pilots.

IAC

Call for Photos

We're looking for cool photos to adorn the pages of the new and improved IAC web site and the magazine. Colorful, action-oriented pictures are preferred. Don't worry about cropping or resizing, we'll handle that. Email your best pics to Reggie Paulk at reggie.paulk@gmail.com for the magazine and Laurie Zaleski at artzgraphics@comcast.net for the web, along with the date, location, and names of people if possible.

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