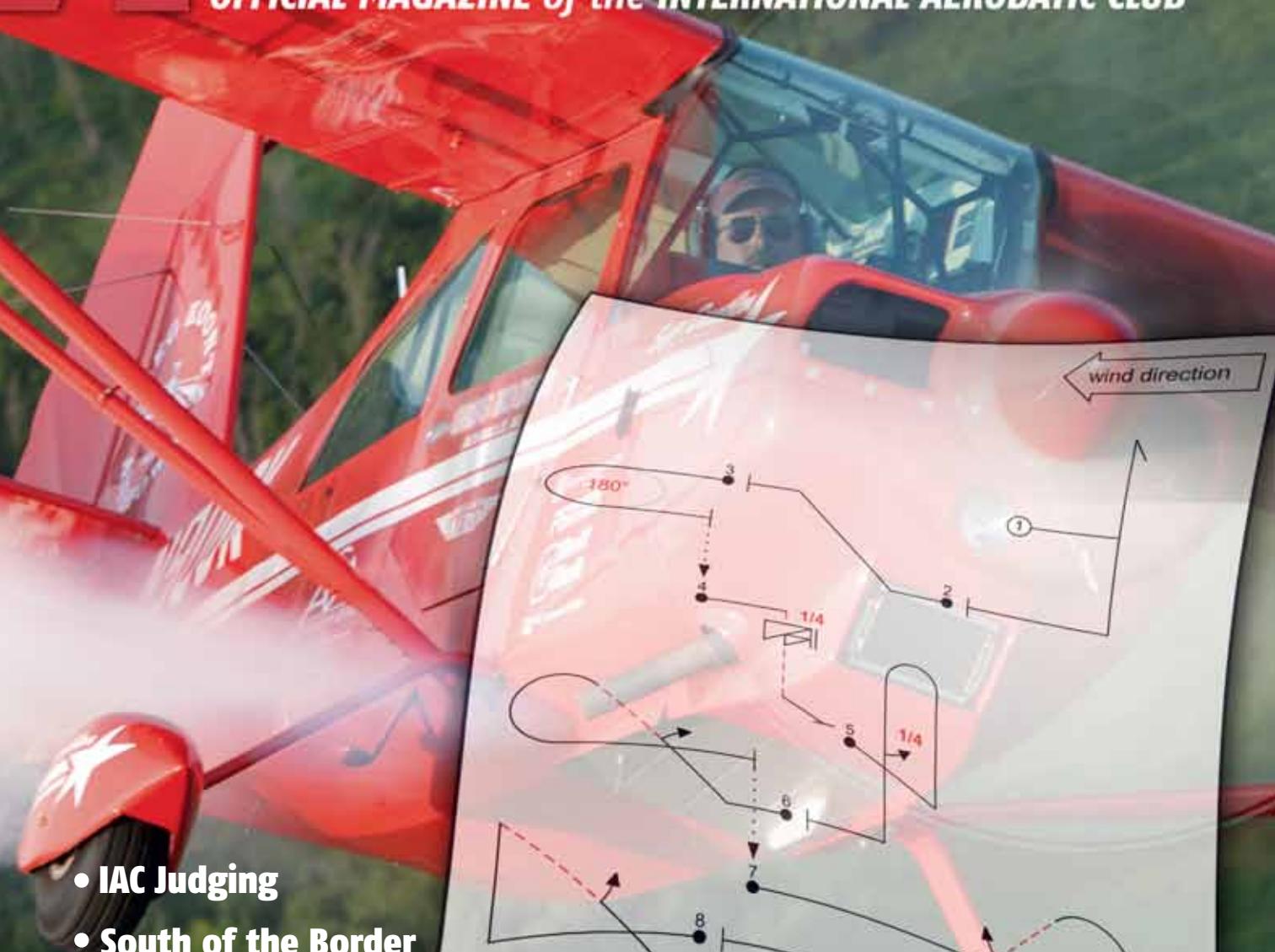


SPORT *Aerobatics*

APRIL 2012

OFFICIAL MAGAZINE of the INTERNATIONAL AEROBATIC CLUB



- IAC Judging
- South of the Border

Flying the **2012**
Sportsman
Sequence





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It is reasonably friendly to high-drag/low-horsepower airplanes like the 150-hp Decathlons and Citabrias, yet it still has some interest for the Pitts Specials out there.

—Gordon Penner

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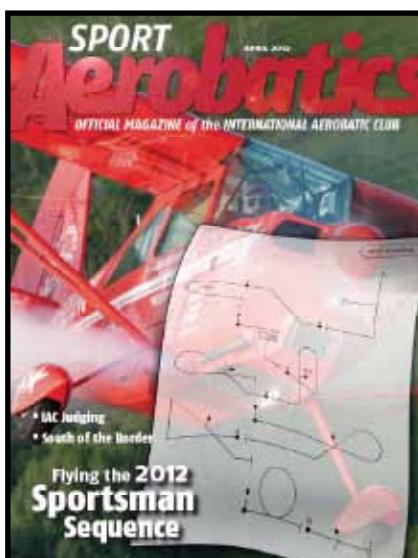
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BONNIE KRATZ



THE COVER

Each aerobatic figure of the Sportsman Sequence is detailed on page 4.
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REGGIE PAULK

COMMENTARY / EDITOR'S LOG

Welcoming Our New Art Director

LAST MONTH WAS my first time working with our new art director, Olivia 'Livy' Trabbold. March was her first full issue of Sport Aerobatics magazine, and I want to take the opportunity to welcome her aboard.

Livy has been working on a number of division publications, and after the EAA's big shuffle, she replaced Phil Norton as our art director. I'd been working with Phil for nearly four years and was apprehensive about the change. I shouldn't have been. Livy has adeptly filled the role, and the magazine looks as good as ever. Please join me in extending her a warm welcome as we continue to bring *Sport Aerobatics* to you each month.

Livy has been working on a number of division publications, and after the EAA's big shuffle, she replaced Phil Norton as our art director.

From the moment I came aboard the IAC, the website has been an old dinosaur. The IAC's leadership recognized the challenges of our old website and decided to tackle them head-on. Wayne Roberts has been instrumental in playing a leadership role on the WEB development team by keeping us on task and on time. He is passionate and focused on bringing only the best to our membership, and I wanted to make sure to give him a personal thank-you for taking on that responsibility with such character.

You'll notice this month's Sportsman feature by Gordon Penner is a big piece. I asked Gordon if he'd do us the honor of covering the Sportsman Known sequence, and he did not disappoint. Instead of running it in two separate issues of the magazine, I decided to run the whole thing. Gordon does a superb job of helping visualize each maneuver as it's performed, and it's a great read on the basics—from entering the box properly to adjusting for torque and P-factor. As you read the article, just remember that Gordon wrote a large part of this piece during a stopover in Shanghai. In addition to teaching aerobatics, he flies cargo on 747s for a living.

IAC

The IAC is developing an entirely new website, and I've had the honor of working on the team in charge of that effort. The volunteers on the team are creating a product that will make the old website look like ancient history, and that's a good thing!

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



DOUG BARTLETT

COMMENTARY / PRESIDENT'S PAGE

How Your Member Dues are Being Spent

THIS YEAR, A DECISION has been made by our finance committee to raise the fee paid to headquarters for competing pilots at a regional contest from \$25 to \$40. This may sound like the start of a boring President's Page but the subject affects all members, so please read on.

Over the last two years, IAC Treasurer Bob Hart and I have been working on an activity based costing system for the IAC. The purpose of this system is to not only look at our funds from a financial point of view but also from an activity point of view. We want each activity to "pay" for itself. This financial model allows us to analyze many different options quickly, see how it changes the activities, and determine who is paying for those activities.

First, please note only about 10 percent of our members are competition pilots. Ninety percent of our members are grass roots aerobatic enthusiasts. For the past five years, we've tried to ensure member dues do not pay for competition activities. Because last year's competition activities ran at a loss, they were effectively subsidized by member dues. Some changes had to be made "in practice" and "in concept." Additionally, we felt the burden of attracting and retaining qualified judges should fall on the group using them most—the competition pilots.

The biggest jump in our headquarter (HQ) competition fees came from moving the cost of judges' training from the judge to the competition pilot. In the past, HQ charged chapters a fee for each judge attending a class. This year, no such fee is charged by HQ. The cost of training those judges will be paid for by the competition pilots through higher HQ competition fees. Any fees now charged to individuals wanting to become judges are being paid to the local

chapters or entities holding the classes and none of it goes to IAC funding.

What was the amount of this fee and how was it determined? First, we round to the closest \$5 for ease of computation and discussion. Next we make some assumptions:

1) The number of judges going to classes will be the same as last year.

2) The number of competition pilots will be the same as last year.

Then we take the total revenues received at HQ from judges' schools and mathematically move it from the number of student judges to the number of competition pilots expected. This came up to about \$10.

For the competition events to have broken even last year, approximately \$15 per pilot per contest would need to have been charged. That is on top of the \$10 for judges' schools. This would bring the total to \$50 this year instead of the \$25 charged last year. The finance committee felt that, although this was fair to all club members, it would be too big a move in one year for competitive members. We decided to raise it by only \$5. This change was the "in practice" part. We justified only raising it by \$5 by moving some of the member dues from club activities to competition activities based on the belief that competition members (a small percentage of total members) and some member volunteers would want a portion of their dues to go toward supporting competition activities. In the past, no part of member dues was assigned to competition activities; not even the dues paid by competition members. This change was the "in concept" part.

This gave the IAC a budget that runs at a two percent profit level for this year (EAA guidelines want three percent). Competition activities are much closer to break even but are still slightly subsidized

by member dues at less than one percent.

The approximate breakdown of the \$40 competition fee charged by HQ is: \$30 allocated to regional competition and \$10 allocated to judges' school development and expenses. I would also like to point out that just a few years ago, HQ charges for insurance and sanctioning fees amounted to about \$1,400 per contest, regardless of size. Over a three-year period we have modified this to \$40 per pilot. In the past, on average, it was \$50 per pilot and it did not include the subsidy associated with the judging schools. I feel this is a much fairer system of fees for competition pilots and volunteering judges, and has helped increase the number of contests throughout the country. We hope our strategy continues to reduce the burden on both current and potential judges and enhances the probability that more will eventually choose to participate in this important activity.

Here are a few take away points. The finance committee feels that member's dues are fairly divided between aerobatic enthusiasts and competition pilots with 90 percent or more going to non-competition activities and their assigned indirect costs. None of the fees being charged to volunteers going to IAC judges' schools in 2012 are going to headquarters. For every regional contest in 2012, \$40 per pilot will be forwarded to headquarters to fund regional competitions and judges' school activities and their assigned indirect costs. Anything above \$40 per pilot stays with the contest.

The budget for this year is available to all members upon written request to headquarters. I feel all allocations of revenue and expenses are fair to all members but no budget is ever perfect. If anyone has any questions, please feel free to contact me.

Blue skies call; see you later! **IAC**



Flying the 2012 Sportsman Sequence

JULIE WEGNER



by Gordon Penner
FAA Gold Seal CFI
Former Master CFI-A

AS WE MOVE INTO THE 2012 COMPETITION SEASON I find I'm pretty happy with this year's Sportsman Known sequence. It is reasonably friendly to high-drag/low-horsepower airplanes like the 150-hp Decathlons and Citabrias, yet it still has some interest for the Pitts Specials out there. It has a nice energy flow, so let's dig into it!

As I unpack this sequence I do so mostly from the point of view of the fairly new Decathlon- or Citabria-type pilot. The challenge of any sequence will be greatest for those with high drag and low horsepower. Now that I am a Pitts S-1 driver, however, there will be some Pitts tidbits in here as well.

As an instructor in many areas as well as aerobatics, I have learned to look for the big picture views, or strategic ideas, of a thing first, before digging into the details. I want to first touch on a few of these ideas, as they will affect the overall quality of your flying efforts. Then we will get into the individual maneuvers.

The first strategic idea I want to point out is the pilot's mental view of how the flight controls *really* work. Having the correct view of flight control usage makes aerobatics so much easier.

The second big picture idea to aerobatics, as said by World Champion Charlie Hillard in the EAA video *Getting Started in Aerobatics*, is "...where to look and when." Aerobatic coach John Morrissey calls it "deep focus." As we will see later, ideas one and two go together in aerobatics, especially in the aileron roll.

The third strategic idea is that, mathematically, the roll is the thing. As John Morrissey pointed out in his excellent February 2012 *Sport Aerobatics* article, "The Roll," aileron roll quality directly affects 25-30 percent of the K factors and indirectly affects 50 to 80 percent of the K factors. A pilot would do well to get on top of this most frustrating of maneuvers.

The fourth strategic idea is for the Sportsman pilot to mentally prepare him or herself to "take a break" during a sequence. By this I mean that it is better to take a break, and take the penalty, than it is to fly a truncated maneuver that scores badly. The penalty points hurt a lot less mathematically. More importantly, the flying of a chopped-up maneuver by new (and not so new) pilots, in an attempt to stay in bounds, is what frequently causes unsafe flying. Beware, and be ready to take a break. Your flying will not only be safer; you will also score higher.

HOW FLIGHT CONTROLS REALLY WORK

Former Flight Instructor of the Year and Master CFI Rich Stowell said it best when he stated that the flight controls work in relation to the *pilot*, not the *horizon*. Pitch is a head-to-foot motion of the nose of the airplane, not "up and down." Yaw is an ear-to-ear motion of the nose of the airplane, not "left and right." "Up and down" and "left and right" references in relation to the horizon only work in upright flight with less than 40 degrees of bank. Unfortunately, that is how most pilots are initially taught. These "up and down" and "left and right" ideas in relation to the horizon do not work in knife-edge flight and inverted flight.

In knife-edge flight, pulling the stick aft moves the tip of the nose toward the pilot's head, but it doesn't move the nose "up" in relation to the horizon. Instead, the nose movement will change the aircraft's heading. Stepping on the right rudder pedal moves the tip of the nose toward the pilot's right ear, but does not move the nose "right" across the horizon.

Also, the controls do not work "backward" when inverted. That statement just makes me crazy. Pulling the stick toward you moves the tip of the nose toward your head, unless you pull so much you stall the aircraft. Pushing the stick away from you pushes the nose of the aircraft toward your feet. These control ideas work in any attitude.

The airplane does not know the horizon exists. It can only feel relative wind and gravity, and it can only move around the lateral, longitudinal, and vertical axes. Those three axes move with the airplane; they don't hold position in relation to the horizon. That means all the airplane knows is pitch, roll, and yaw—period.

Understanding the concept that "pitch is head-to-foot" and "yaw is ear-to-ear" is the key to making the aileron rolls work out, as you'll see later. John Morrissey, in his article, said, "...this evolved the phrase I use when teaching any aerobatic maneuver, especially the roll—GIWIT. This acronym means 'give it what it takes.' And that

means one is to use whatever control it takes *in the moment* to achieve proper movement about the three axes and do so without worrying about being smooth." Well said.

WHERE TO LOOK AND WHEN

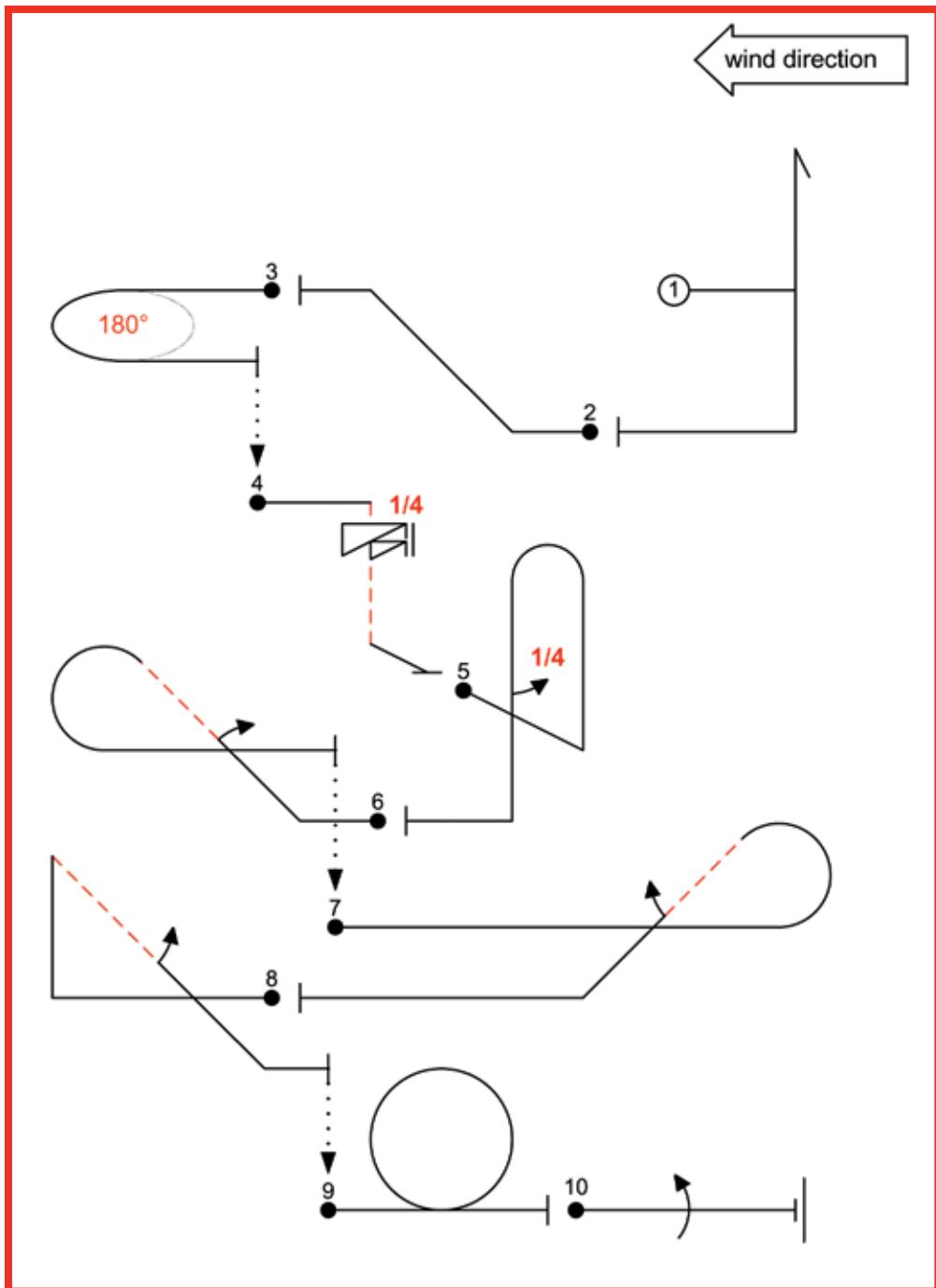
As an instructor I have seen that a pilot's flying gets better the further away they focus from the airplane. It is not natural for them, however, and they must be taught to do it.

The eyes at rest will go to what is called infinity focus. They focus on a spot about three feet in front of them. This brings peripheral vision detection to a higher level, probably unconsciously looking for predators. We are all naturally antelopes at the water hole, trying to get a drink of water without getting killed and eaten. Infinity focus must be overcome to look effectively for traffic and to perform aerobatic maneuvers. The second you relax your focus your eyes will naturally go back to the infinity focus position.

Morrissey maintained that a "...clear and distinct focus to the furthest point ahead of the aircraft's flight path must be maintained. I refer to this as deep focus..." In level flight he wants them to be focused on a spot 20 miles away. When they are vertical down, he said, "...I want them to pick out blades of grass. This is the beginning of situational awareness in all axes of flight."

We have both observed that in rolling the aircraft a student's focus quickly goes to some part of the airplane instead of a spot on the horizon. As they concentrate on control movements they take their concentration away from maintaining deep focus. As a result the eyes go back to their "at rest," or infinity focus, position. If they are not looking to the horizon, they cannot make the nose draw British Aerobatic Champion Alan Cassidy's "sacred circle."

Morrissey said, "If pilots were having any difficulty with their rolls during the years I was team trainer, all I asked them to do was to remember their deep focus. Without fail, that small reminder immediately cleared up any problem they were having with their rolls."



Now let us get into individual maneuvers.

BOX ENTRY

Yes, the box entry and the wing-wags are a maneuver. New people do not spend near enough time practicing the box entry. In a contest they come into the box in a low energy manner, with half-hearted wing-wags. What the pilots don't realize is

that the first impression they are giving to the flawed human judges is the entry and the wing-wags. So come in fast, loud, strong, and snappy! Make a good first impression. Announce to the world that you are here to fly and here to win!

Treat box entry like maneuver number 1A and practice it as much as you do any other maneuver. Let's call the first printed maneuver 1B. When you

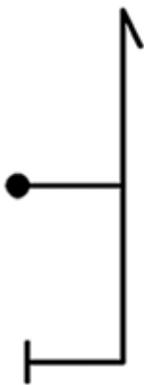
practice the whole sequence, with all the maneuvers together, include the box entry as well.

Please, please, please make your wing-wags at least 45 degrees of bank. Also, set up your box entry in such a way that your aircraft is exactly at the speed and altitude desired for the initial pullup into the first printed maneuver, or 1B. That takes some practice.



JULIE WEGNER

"...where to look and when." Aerobatic coach John Morrissey calls it "deep focus."



THE HAMMERHEAD

The hammerhead is fun to do. It is also a maneuver that can induce an inverted spin if mishandled. It is the upline and the rotation we must discuss.

First, the more vertical the upline the better the rotation. What I have found is that once the vertical line has been set, the stick cannot be frozen in position. The Decathlon, for instance, will slowly creep on its back (negative) as it goes

uphill. The stick must be moved in pitch (head-to-foot) as necessary to maintain a perfect vertical until the time of the pivot, or "kick," as some call it.

In this discussion we're in a left hammerhead with a clockwise (from the pilot's perspective) turning engine. The engine at full power will "torque" the aircraft as it slows. This will cause the aircraft to roll, which is a downgrade. Put in right aileron as necessary to prevent any rolling on the upline. Air show and competition pilot Brett Hunter has commented that, in the Pitts Specials, if the pivot is begun before any aileron is needed, the pivot was done too early. If full aileron is needed to prevent the torque effect, the pivot was done too late!

The "kick," or pivot, is really not a kick, but a rapid and smooth push of the rudder to the stop, followed a split-second later by opposite aileron, followed by forward stick. These movements are not to be done simultaneously, but sequentially. The aircraft type will deter-

mine the timing. The rudder is effective immediately because it is in the prop slipstream. The aileron only becomes effective once the wingtip is moving in yaw and has some relative wind over it.

The rudder begins the left yaw motion, which yaws the right wingtip up, giving it more relative wind. This pulls the right wingtip into a left roll. The opposite aileron input, in this case right aileron, is added to prevent this roll. Enough aileron must be added so that the aircraft yaws "in plane" with no rolling motion present. Any roll is a downgrade.

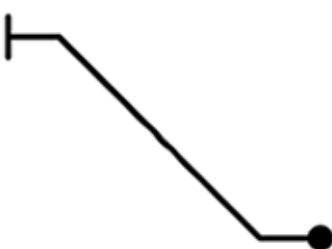
Now here is where we enter the possible inverted spin zone. The left yaw motion causes gyroscopic forces in the propeller to pitch the airplane on its back. Pushing the stick forward cancels out this pitching to keep the aircraft yawing "in plane." Preventing an inverted spin entry is all about not overdoing the forward stick input.

Rich Stowell taught me a neat visual trick that helps the pilot use the correct amount of forward stick. At

the end of the vertical line the pilot is usually looking at a sight gauge or some other part of the aircraft structure in relation to a spot on the left horizon, in the case of a left hammerhead. It is natural for the eye to want to follow the wingtip or sight gauge down across the ground as the rotation begins, but you must resist it. Instead, keep the eyes on that spot on the horizon and let the wingtip(s) drop away out of sight. Then, apply just enough forward stick to put the tip of the nose through the same spot on the horizon the wingtip or sight gauge just vacated.

It is very hard to keep the Pitts Specials from torquing around during the rotation. I was taught to pull power a little bit after the rotation begins, which really helps. Don't pull power too much, though, or the second half of the rotation will stop working. It sure takes a lot more forward stick to counteract the gyroscopic pitching in the Pitts than it did in the Decathlon.

When the nose reaches straight down, just neutralizing the rudder pedals will bring about a "pendulum" effect. To avoid this, put in full opposite (right) rudder when about 30 degrees away from straight down, then quickly go to neutral. That will stop the nose quite smartly, with it pointing straight down. Once the rotation stops, you don't need as much forward stick, so ease off. Avoid pushing negative on the downline.



THE 45-DEGREE UPLINE

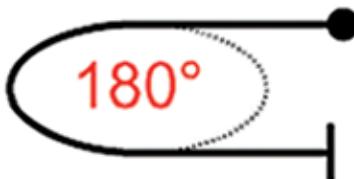
The 45-degree lines are not only in this maneuver, they are also part of maneuvers 6, 7, and 8. Forty-five degree up- and downlines require ground coaching; there is just no way around

that. You are flying for flawed human judges. *Remember, your job is not to fly perfectly. Your job is to present the illusion of flying perfectly.* You fly for the judges, not yourself. Ground coaching is essential.

So, how do you know if you are on a 45-degree upline? This will vary from airplane to airplane and from pilot to pilot. Everything depends on the pilot's eye position. Whatever sighting system is used, it is very important that the pilot be absolutely anal about seating position. Always use the same seat position and the same cushions so that your eye position, and its relation to the sighting system or airplane structure, is the same every flight.

When flying up the 45-degree line, leave some energy for the top. The judges must see that the 45 upline ended and that the aircraft began a segment of level flight. If you are very slow at the top, they cannot tell. In this sequence you must also leave some energy for performing the 180-degree aerobatic turn.

Also, when it comes to 45-degree lines, most new people are shallow. Getting ground coaching would be the best, but if you can't get it, being a little steep is better than being a little shallow.

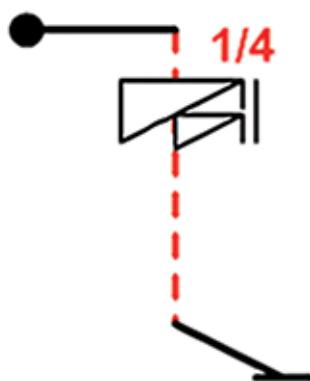


180-DEGREE AEROBATIC TURN

Most new people don't hold enough bank in aerobatic turns. The judging criteria require that the turn be 60 degrees of bank *minimum*. Since you are flying for humans, they better not think you are shallow.

There must also be an observable pause between the roll, the turn, and the rollout. Also, the roll in and the roll out must be at the same roll rate. The rookie mistake is to roll in fast and roll out slow.

To coordinate, or not to coordinate, that is the question. Actually, both are correct. The steps in the maneuver are: 1) a coordinated roll to 60 degrees of bank or more, 2) an uncoordinated *pause*, using elevator to maintain the roll-in heading and top rudder to hold altitude, 3) a coordinated pull, with *constant* bank and ball back in the center, to the new heading, 4) an uncoordinated *pause*, again using pitch to maintain the finish heading and top rudder to hold altitude, and 5) a coordinated roll back to wings level. Altitude must be maintained throughout.



ONE AND ONE-QUARTER TURN SPIN

There are a million techniques out there to entering the spin and getting out on heading; most of them airplane-specific. A pilot simply cannot come to a contest without spin training, and airplane-specific spin training abounds. I will talk, instead, about what the judges must see.

Again, to quote "the good book," "When the aircraft stalls, the aircraft must simultaneously move around all three flight axes: 1) the nose will pitch toward the ground, 2) the nose will yaw in the direction of spin, and 3) the wingtip will drop in the direction of the spin. Failure to achieve simultaneous motion about all three axes will be downgraded 1 point per 5 degrees of deviation on each axis (emphasis added.)."

Four things must be kept in mind for spins. First, don't settle or climb on the entry line. I watch my altimeter as



DEKEVIN THORNTON

I am slowing down toward the beginning of the spin departure. The second thing is the entry criteria, which was covered earlier.

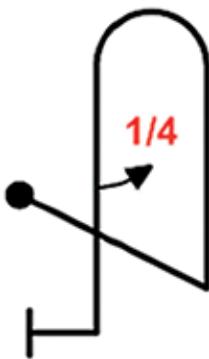
Third, the spin exit must be practiced enough so that a finish on heading is reliable, and the pilot must maintain orientation throughout. This is critical. I can't count how many times I've seen a spin finished 45 to 90 degrees early or late and watched the competitor charge off, unknowingly, in a "zero-inducing" direction. Keep your situational (directional) awareness.

Fourth, get reliable ground coaching to make sure your downlines are *straight* down. Setting the trim before the sequence begins (and leaving it there throughout) at something slightly above looping speed will help in this area. Otherwise the trim will be trying to pitch you off your downline. Holding a good downline is a perception thing, which is why you need ground coaching and practice. A lot of new people tend to push too much going downhill, getting "negative," or over on their backs. When your headset is flying "up" off your head you *may* be pushing too much!

Since the spin is 1-1/4 turns, the aircraft will exit the spin with a low wingtip. The spin must be stopped on

heading, but as the downline is being established, the rudder must be utilized to get the wings back to level.

Lastly, the second you finish the spin and begin the downline, hammer the power! You need to feed a lot of energy into the next maneuver. If you have full power, you will gain speed quicker while losing less altitude (believe it or not!), and your elevator will work better for the pullout.



THE PULL-PULL-PULL HUMPTY

If you spin right, you will roll right on the humpty downline. If you spin left, you will roll left. In the future, make sure you work those kinds of things out before the flight so you don't fly off in the wrong direction, zeroing many other figures in the process.

Under the heading of "Lines," the rulebook says that the length of the lines in a humpty bump does not need to be equal. Under the heading of "Humpty Bumps," the rulebook says, "...the radii of the first and last partial loops must be equal. However, the half loop in the middle of the figure can be of a *different radius*. These half loops must still have a constant radius from the time they depart the vertical or 45-degree line. This requires a change in angular velocity during the half loop."

Those last two sentences illuminate the main problem of flying the humpty bump. The half-loop in the middle of the maneuver must be a perfect half-circle, and the half-loop must be completed directly across from the point where it began. If the half-loop finishes after, or lower, than that point, it is called "finishing late," which is a downgrade. Since the speed of the aircraft is changing quite a bit throughout the half-loop, quite slow at first, then faster and faster, the pilot must change the pitch rate throughout to match it.

That is precisely where the difficulty comes in. Considering just the pitching, the first part of the half-loop is slow as you are still going uphill. As a result the pitch rate, or speed of pitch change, is low and you must fly a widened arc across the top. Make sure you enter the maneuver with enough speed to perform the upline *and* the beginning of the half-loop. In part two of the half-loop the airspeed is increasing, so the pitch rate must be increased with it to continue to draw a constant radius and avoid finishing late.

As you pull faster and faster, the gyroscopic forces of the propeller induce a yaw force. The yaw then induces a roll due to yaw-roll coupling. A right yaw during the pull will give an un-commanded right roll. These forces conspire to pull the aircraft off course. The aircraft must stay on heading, or "in plane," throughout the maneuver, and it must not have a low wing.

There won't be much yaw initially when the pitch rate is low. The required rudder won't be much different than



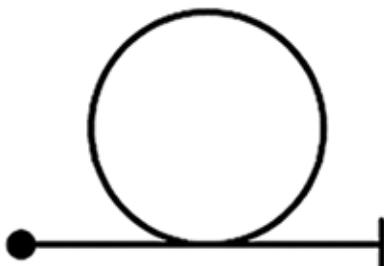


JULIE WEGNER

that needed to prevent a low wingtip when on the uphill line. However, when on the down side of the half-loop with an American engine, more and more *left rudder* will be required on an *inside* half-loop.

More speed at the beginning of the half-loop would give more airflow over the vertical tail and the sides of the fuselage, resisting the yaw force. The rudder will also be more powerful. Ground coaching will help you find when to begin the half-loop.

I like the humpty maneuver. With a $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$ roll in it, the humpty bump is a high-energy way to go from one direction to another with a lot of smash being fed into the next maneuver. This makes it a great maneuver for a freestyle. Get to the $\frac{1}{4}$ roll quickly, but remember to center it on the downline. Watch your airspeed redlines!



THE LOOP

The loop is maneuver No. 9, but the reason I am getting out of sequence is that by discussing the loop we are laying the groundwork for later explaining maneuvers 6 and 7.

We fly the loop in thirds, but we must analyze it, and judge it, in quarters. Quarter No. 1 is free and sets the standard. Whatever radius is drawn during the initial pullup in quarter 1 must be re-created in quarters 2, 3, and 4. Quarters 2 and 3 are the hardest to draw over the top of the loop as the airplane's energy state is at its lowest, with No. 3 being "the downgrade zone."

The first key, especially in a low-performance airplane, is to make quarter 1 small. Keep quarter 1 small enough that you can duplicate it three more times. It is very important to pull enough *g* in the first quarter, at least 3.5g for you Decathlon/Citabria drivers,

The loop is maneuver No. 9, but the reason I am getting out of sequence is that by discussing the loop we are laying the groundwork for later explaining maneuvers 6 and 7.

or you won't have enough energy left over to make quarters 2 and 3 look good.

Quarter 3 is where "segmenting," or flat spots, are commonly seen, and where the radius is not constant. This quarter must be rounded out with a smooth, gentle push, and only ground coaching can tell you when and how much. As a starting point, put the gentle push in (smoothly) before you hit the middle of quarter 3. The middle is too late. As stated previously, if you don't have the energy, the push won't help.

As you finish the loop pull just a little less *g* at end of the quarter 4 than you did in 1. The aircraft is going a little slower in quarter 4, and most people tend to finish the loop high. This means the exit altitude was higher than the entry altitude, which is a downgrade.

Loops, and parts of loops, must also be wind-corrected. That means the loop must look round to a ground observer, whatever the wind. When presented with a strong head wind or tail wind you can make an adjustment, widening out into the wind and tightening up with the tail wind. Just don't overdo it. A 5-10 percent adjustment should do it.

Loops are hard to do well and usually suffer under the judges' pens. I highly recommend that every Sportsman pilot get a freestyle, even if they borrow it from someone else. And the first thing I do on my freestyles is get rid of the loop! If you look in the rulebook, the loop is not required in the freestyle. Most airplanes like angles better. Why do the loop three times?



THE AILERON ROLL

I am doing the aileron roll, maneuver No. 10, out of order also because its elements and techniques apply to the half-rolls in the Cubans and the wedge. Competition aileron rolls, which are really slow rolls in technique, are one of the harder things to teach in the basic aerobatics course. You must not pitch first before initiating the roll.

Luckily for maneuver 10, the airplane will be screaming into the roll with bags of speed acquired from the exit of the loop, which makes it easier to fly. Maneuvers 7 and 8 have rolls on the 45-degree downline, which gives them good roll energy. On maneuver 6, you should have enough energy as you come out of the humpty.

The main problem in this maneuver is that people do not maintain the straight and level path before, during, and after the roll. Sinking during the roll is quite common, especially in the inverted and second knife-edge portions of the roll. That means they didn't have enough top rudder in the knife-edge or enough push when inverted. Another problem is not maintaining a constant roll rate. People also end up off heading, usually to the right in a left roll.

The key to a good competition aileron roll is picking a spot on the horizon, and then drawing Alan Cas-



DEKEVIN THORNTON

sidy's "sacred circle" with the tip of the nose around that spot. John Morrissey's deep focus must be maintained throughout the roll, which will be a challenge in and of itself.

If we consider a left roll, the tip of the nose starts at 6 o'clock on the sacred circle; rotates counterclockwise up to 3 o'clock for the first knife-edge; continues up to 12 o'clock when inverted; down to 9 o'clock for the second knife-edge; then back to 6 o'clock. The controls must be manipulated in such a way to fly that "sacred circle" with the tip of the nose around that point on the horizon. Remember our earlier conversation about pitch being a head-to-foot motion and yaw being ear-to-ear motion of the nose of the aircraft? That will apply here in spades.

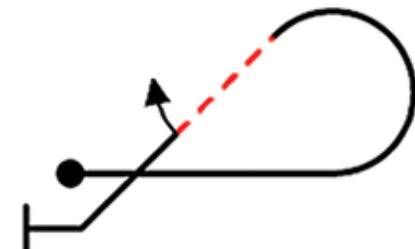
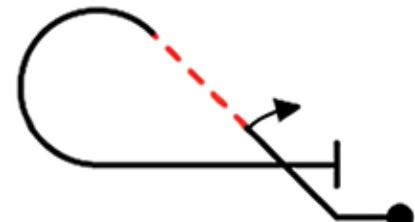
Airplanes with a high angle of incidence (angle the wing is attached to the aircraft), like the Decathlon, need a higher nose attitude when inverted at the 12 o'clock position on the sacred circle. That makes the sacred circle tall at the 12 o'clock point, which is why I sometimes call the sacred circle the "sacred egg." To find this 12 o'clock attitude, the pilot must first fly inverted at the expected speeds and see how high the nose has to be above the horizon while holding an altitude.

When rolling past 3 o'clock on the sacred circle, on the way to 12 o'clock, there must be enough push added to get the nose up to the correct inverted attitude. Blend this push in; don't try to put the push in all at once at 12 o'clock or you may get an inverted stall or mush, especially in the Citabria.

Enough knife-edge practice must be flown to determine how much top rudder is needed to maintain altitude at the selected speeds. Since an aircraft in a slow roll is basically in a slip at the first knife-edge, it is losing energy throughout. That is why the second knife-edge always takes a little more top rudder than the first one.

A good trick taught to me was to not switch the rudders (when switching to the 'other' top rudder) when passing through 12 o'clock, but to wait until about the 10:30 position. Additionally, as it says in Alan Cassidy's book *Better Aerobatics*, a little push toward your feet about the same time as the feet are switched on the rudders (10:30) will also keep the nose pointed in the right direction as the rolling motion continues, rounding out the second half of the "sacred circle." This push will fix the problem of ending off

heading to the right all the time. Additionally, once the rudder pedals are switched the roll rate will increase, which is a downgrade. Ease off the aileron deflection a bit when the rudder pedals are switched so the roll rate stays the same.



THE HALF-CUBAN AND THE REVERSE HALF-CUBAN

Both of these maneuvers have three elements that must be conquered. First, you must make the 5/8 of a loop with a constant radius without pinching the top. The other two elements are those

Now you see why I talked about the full loop, the 45 lines, and the full roll first.

darn 45s and centering the roll.

Now you see why I talked about the full loop, the 45 lines, and the full roll first.

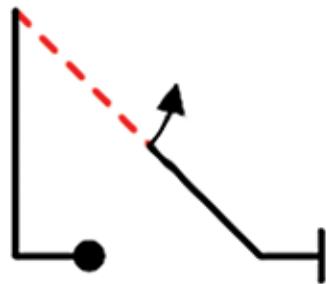
In maneuver 6, to keep from pinching the top you must have enough energy to leave the 45-degree upline and fly a wide arc over the top. Over the top is the second half of quarter 2 from the full loop, and all of quarter 3. Then, as you gain speed going downhill, you

must pull tight enough on quarter 4 so that it is the same radius as the top.

In maneuver 7, the technique is just like the regular loop. You are just exiting the loop in the middle of quarter 3 to do the 45-degree downline. As in the full loop, pull enough g in quarter 1 to make it small, enabling you to duplicate its size in quarters 2 and 3.

As for centering the roll, until ground coaching helps you make an adjustment, make the line before and the line after the roll equal in *time*. Judging perception will usually see equal time as an equal distance flown. It is not perfect but it is a place to start. Later, with coaching, you will find that you'll need to spend slightly longer time on the slower line than the faster line to make them equal in *distance*, but the timing difference is not a 2-for-1 ratio.

As for the 45-degree lines, they not only must be at an actual 45-degree angle, but also must have the same angle before, during, and after the roll. See the aileron roll about this.



THE WEDGE

Maneuver 8 is like the half-Cuban before it except for two things. The first is that, even though the vertical line does not have to be any minimum length, the judges have to see it. You must enter the maneuver with enough energy to show a vertical line.

Second, you can't just flop over the top to begin the 45-degree downline. You must have enough energy to draw a radius across the top, even though it doesn't have to be the same size as the other two.

I wish you all a good and safe season. Practice, practice, practice. Stay hydrated. Preflight diligently. Look for traffic. And please take your parachute.

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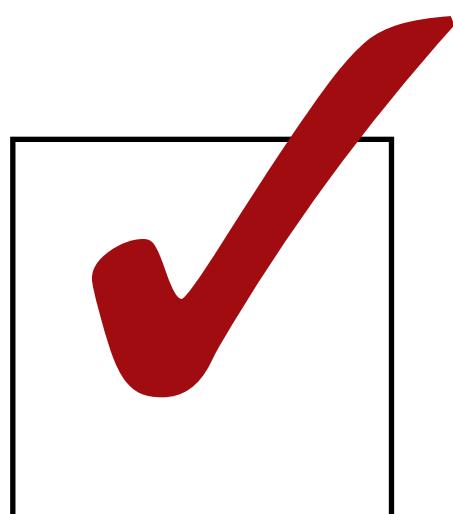
... the engine failed at low altitude and the accident investigators said that my fundamentals saved me. Thanks my friend. -Maynard H.

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MIKE STEINEKE

Just How Good Is IAC Judging?



A statistical look

BY DOUG LOVELL

The IAC is very fortunate to have a rich mine of aerobatic contest data. Thanks to Randy Owens, "Bwana" Bob Buckley, and our dozens of scorekeepers, we have just about every grade, from every judge, from every pilot, for every flight, in every IAC regional contest going back through 2005. That is almost 86,000 grades. More than is available from any other source.

With some prodding from a few other directors, including Klein Gilhouse, Tom Adams, and Wayne Roberts, I have compiled and processed this data in an attempt to get some meaningful information and measures of judging quality in the IAC. People talk more or less subjectively about whether the judging is any good. That usually goes along with their grades. If their grades are good, the judging is great! Here's an objective look at some numbers.

We came up with three different metrics with which to measure the performance of judges. All of them have to do with how closely the individual judge grading measures up against the collective, overall scoring result. The measures take into account two different comparisons of judge placement versus overall placement.

The first comparison is the actual score. We have the overall number of points achieved by a pilot versus the number of points given a pilot by the individual judge. The second comparison is the rank. A pilot's rank is the number of pilots who did better, plus one. The rank is commonly referred to as the placing. The first place pilot has rank one. The second place pilot, rank two, etc. We can compare the rank achieved by the pilot with the rank given by each individual judge.

A major advantage of using rank is that rank

strips away differences in scoring styles. A judge who gives generally lower grades might rank a pilot the same as a judge who gives generally higher grades. We ask judges to be consistent, and hope that each judge ranks the pilots fairly by applying consistent criteria in their grading.

The first of the three major judging quality measures we examined is RI (said "are eye"). RI is a formula invented by a few people at CIVA for evaluating international judges. A zero value for RI means the judge ranked the pilots exactly the same as the overall ranking, regardless of how that judge graded the pilots. When a judge ranks a pilot differently than the overall ranking, RI penalizes the judge to an extent measured by the difference in the judge's score and the overall score. Higher RI is bad. Zero or lower RI is good. RI makes no penalty for strange grading unless the judge gets the ranking wrong. When a judge gets the ranking wrong, RI penalizes strongly for grading differences.

The second of the measures we examined is Rho (said "row" as in "row your boat"). Rho is a standard textbook statistical metric developed by Charles Spearman, now in use for over a century. It is a distance formula that measures how far an individual judge's ranking of the pilots differs from the overall ranking.

A Rho value of 100 means the judge ranked the pilots in perfect agreement. A Rho value of minus 100 means the judge was perfectly upside-down. A Rho value of zero means the judge was neither in agreement or upside-down.

The last of our measures is Gamma (as in "gamma ray"). Gamma is a second textbook metric developed by Leo Goodman and William Kruskal at the University of Chicago in the 1950s. Kruskal served terms as president



RI is a formula invented by a few people at CIVA for evaluating international judges

of both the Institute of Mathematical Statistics and the American Statistical Association.

Gamma looks at every possible pairing of pilots in a flight. If both the judge and the overall ranking place pilot A before pilot B or vice versa, that is a “concordant pair.” If the judge puts pilot A before B while the overall ranking places pilot B before A, that is a “discordant pair.” The Gamma measures the proportion of concordant and discordant pairs for each judge. The interpretation of Gamma is the same as for Rho; 100 is perfect, zero is bad. Negative values are worse down to minus 100, which means the judge’s rankings were upside-down relative to the overall rankings.

You can view mathematical details in the notes pages at IACCDB.org: www.IACCDB.org/pages/notes#metrics.

It’s important to note the metrics don’t tell us which judge was right. It’s entirely possible that four judges agreed on ranking an inferior performance first while a fifth judge correctly gave a first ranking to a superior pilot. The judge with the lowest metric might, in some rare circumstance, be the only judge who saw the flight correctly. The metrics tell us only which judges were in agreement with the overall result. The only way to measure actual correctness of the judging is to compare with the judgments of an expert. If we could all agree who the expert is, we could put the expert on the judging line and let him or her



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decide the contest.

For all of the experiments, we took the judge metric data from all of the flights in which there were nine or more pilots. With fewer than nine pilots the data tends to get “noisy.” On two-pilot contests, for example, there are sometimes a couple of judges who have minus 100 and high RI because they ranked the two pilots opposite the overall result. The nine-pilot mark left us with almost 4,000 flights to look at. For a good statistical analysis, that is plenty.

First, we looked at the metrics themselves to compare them. Do they measure the same thing or something different? Figure 1 shows an x-y plot of the Rho and Gamma metrics. Each point has the value of Rho and the value of Gamma for one judge on one flight. It’s clear that if the value of Rho is high (good), the value of Gamma is also high (good). Rho and Gamma are what statisticians call “highly correlated.” They are comparable measures. If you know the value of one, then you can fairly predict the value of the other.

Next we looked at Rho together with RI. Do they measure the same thing or something different? Figure 2 shows an x-y plot of the Rho and RI metrics. Each point has the value of Rho and the value of RI for one judge on one flight. When Rho is high (good), RI tends to be low (good), but spreads in a range about five to seven points wide. As Rho gets lower, the RI spread becomes rapidly more pronounced.

You cannot very accurately predict the value of RI given Rho as Rho gets lower, nor can you predict the value of Rho given RI. Whatever RI is measuring, it isn’t exactly the same as what Rho (and by inference, gamma) is measuring. You can tell that very good Rho will share a corner with very good RI—sort of.

To answer this question we plotted, for each judge, all of their Gamma and RI values. Figure 3 shows the plot for RI. Figure 4 shows the plot for Gamma.

First, for any given judge, the values do not cluster around any particular value. This means that the value of RI or the value of Gamma on one flight

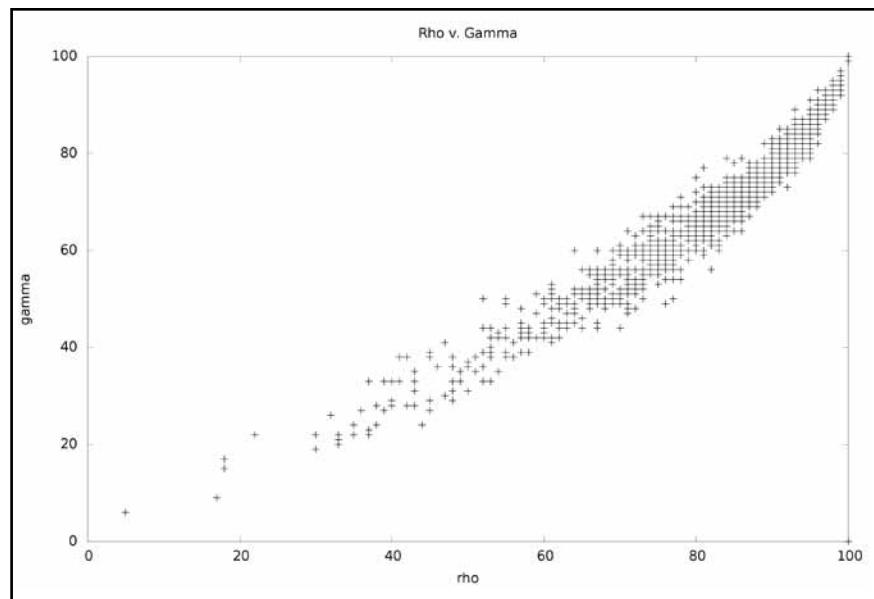


FIGURE 1

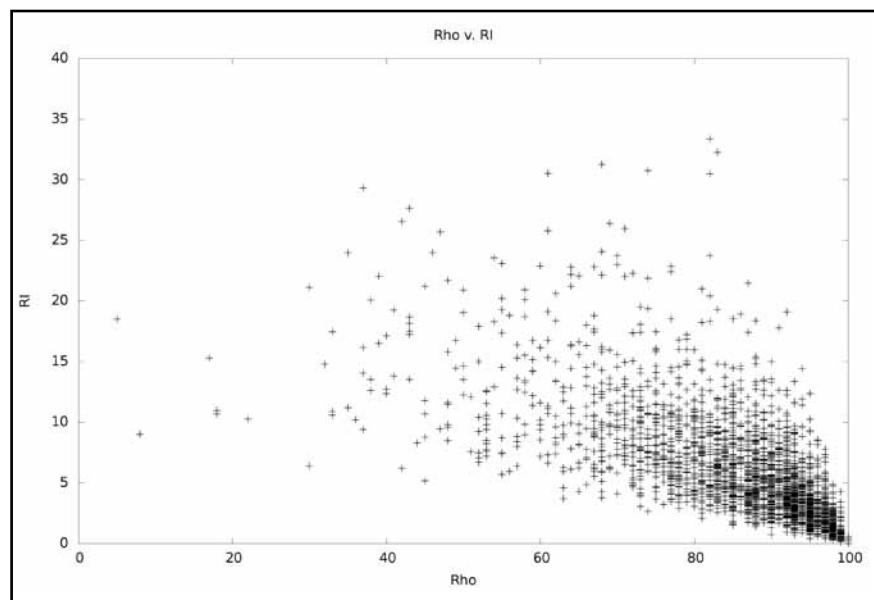


FIGURE 2

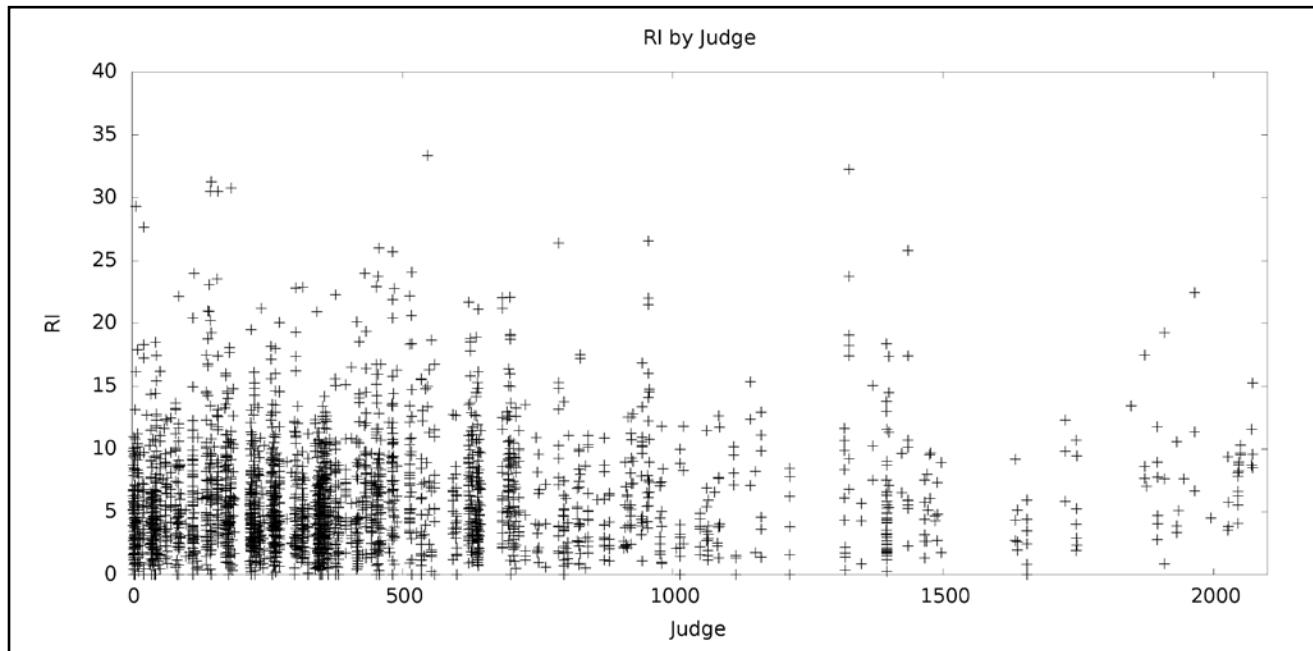


FIGURE 3

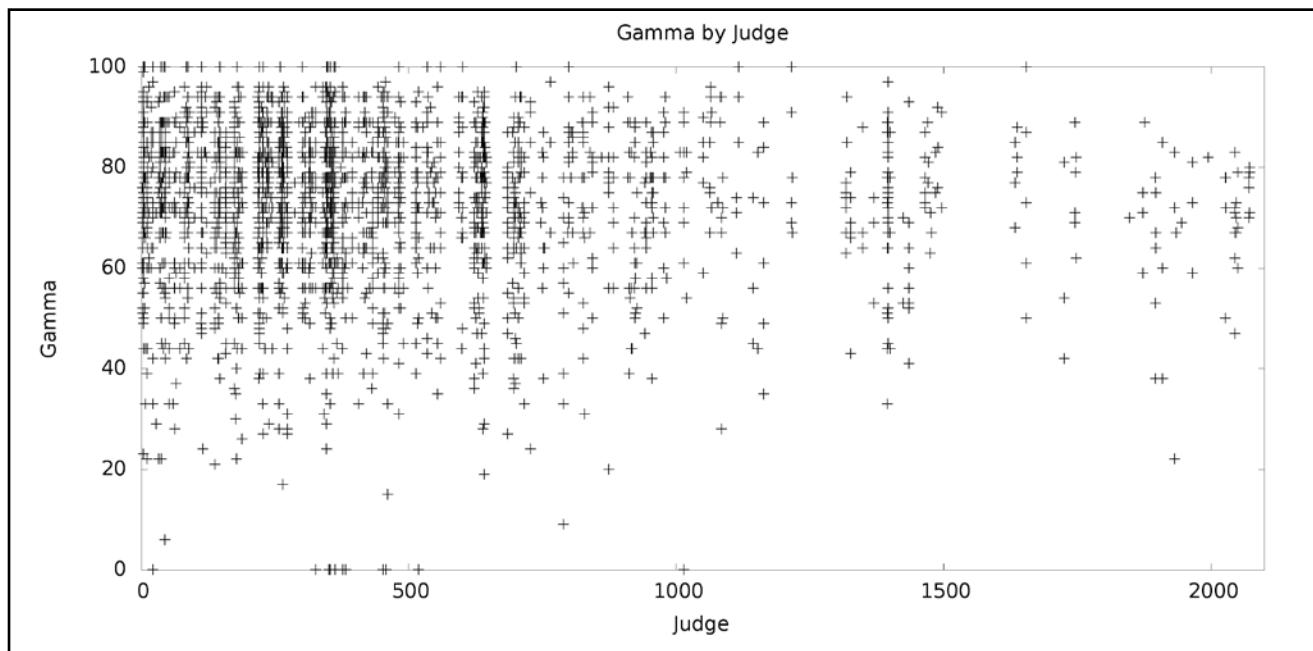


FIGURE 4

does not give any indication of how a judge will perform on the next flight. That a judge looks out of whack on one flight doesn't tell you they are a bad judge. Nor do zero RI and 100 Gamma tell you they're the best judge in the world. If they did that consistently on every flight judged they would be the best judge in the world. Doing it on one flight is good-great—for that flight.

Second, the values of RI and Gamma fall into

about the same range for every judge. There is really good news in this. For all of the judges, most of the values are in the 55 to 100 range for Gamma and below 15 for RI. The histogram in Figure 5 shows the distribution of Gamma values assigned all judges on all of the flights. It confirms that the agreement of the judges is pretty good most of the time. We are very fortunate in the IAC to have, with occasional excep-

tions, a panel of judges who agree on the pilot rankings. The IAC can train judges, place them on the line, and get very good results.

We see every IAC judge without exception out of whack with the judging line once in a while, spot on ranking the pilots nearly perfectly once in a while, and most frequently ranking about three-quarters of the pairs in agreement with the result. With a 75 percent confidence of one judge having any pair-wise ranking correct, there is an 84 percent confidence that a three judge agreement is correct, 90 percent confidence that a five judge agree-

ment is correct, and 93 percent confidence that a seven judge agreement is correct. The more judges who agree, the better our confidence in the result, and that's why we go to the trouble of fielding as many well-trained and competent judges as we can muster at a contest.

We can work with our training programs to improve the 75 percent number. We can monitor the number to verify improvement. Keep in mind that number is very good. On a 12 pilot flight there are 66 pair-wise rankings. Judges are getting about 50 of those in agreement with the panel.

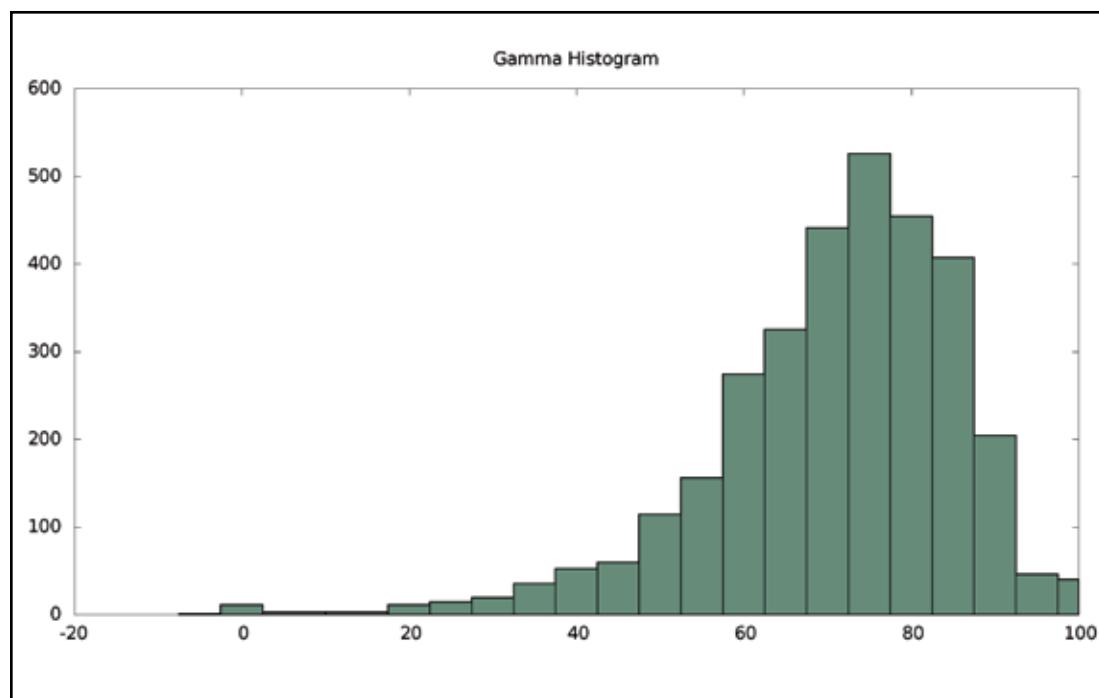


FIGURE 5

We'll look more in depth in another article at individual flight results and what they can tell us. The conclusions to draw from this article are these:

- We now have three metrics for every judge, on every flight, in every category, at every contest in the IAC. The Rho and Gamma metrics have a strong correlation, showing that they consistently measure something similar.
- The 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 how good the judge will be in general, or about whether a judge will agree

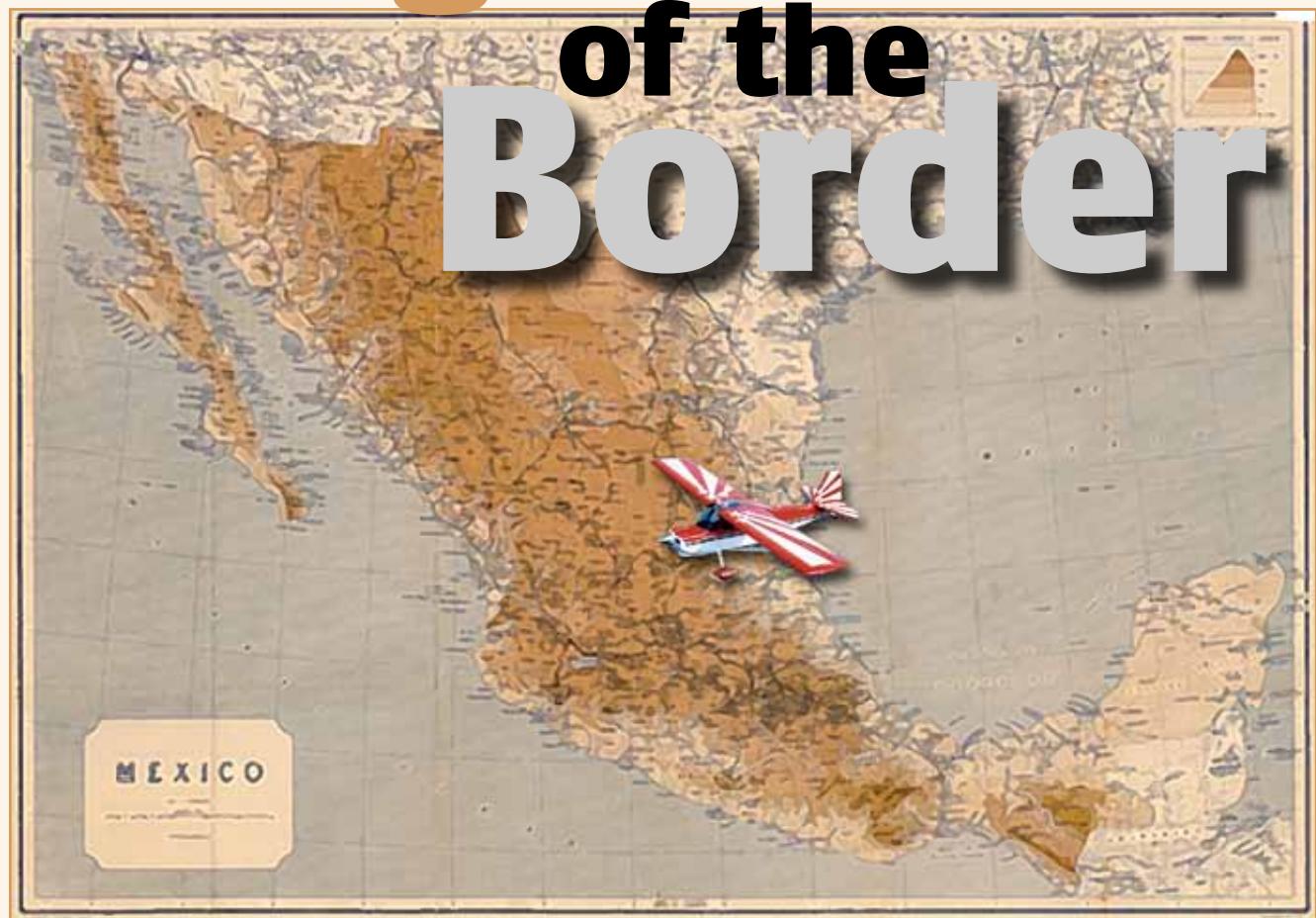
with the judge panel on another flight.

- Looking at thousands of flights, the judge metrics show that, in the IAC, every judge will agree more closely on some flights, not so closely on others, and acceptably well just about all of the time. In general, we have very good judging panels in the IAC.

My thanks to Tom Myers, Wayne Roberts, Tom Adams, Klein Gilhousen, and Don Peterson for their reviews of this article. The article benefited greatly from their questions, suggestions, and observations.

IAC

Going South of the Border



Overcoming language barriers in the name of aerobatics

BY GREG KOONTZ

PHOTOS COURTESY CAP. EUCARIO LEON

AEROBATIC INSTRUCTING IS sometimes an adventure. Oh yea, there's the occasional unexpected maneuver performed by a student trying hard to do what he thought you said you wanted. It happens. But that's more brief moments of excitement than what I mean when I say adventure. It becomes an adventure when you're stepping off an airline in a country you have never seen to meet people who so far are

only the words on an e-mail.

Recently, I was wired my fee to travel to Mexico City and check a new buyer out with some acro in his newly acquired Super Decathlon. With my usual blind faith I used his money to buy airline fair and soon headed south of the border. After arriving, I survived immigration by only being yelled at in Spanish for not removing my hat; it must be an issue there.

Walking out of the terminal, I was greeted by two nice gentlemen who spoke almost no English but held a sign with my name. These guys were not the client—but shuffled me off to a car and away we went.

This was my first experience in Mexico. The capital city is huge and like the Central American places I've been to fly air shows, the driving is crazy. After 30 minutes of riding in the back, curious



From left: Greg, Eucario, Carlos and Alain

about when we were about to turn into the hotel, I tediously inquired as to how long it is going to take to get there. The younger guy in the right seat turns around and says, "About four hours". Holy guacamole! Where are we going? They never understood that question.

With the crowded city behind us, we hit mountain roads along highway 150 southeast towards Tehuacan in Puebla. We seemed to be making good time. I mean, the curves were easily hitting 4 g's on the side load. Checking out a converter app on the iPhone, I quickly figured out that 175 kilometers is a good 108 mph. Right when I started to figure this guy could probably handle this (as long as nothing is stopped on the blind curves), it starts to rain cats and dogs! The lack of traffic braving the rain seemed to inspire more speed. And you thought the dangerous part of acro instruction was flat inverted spins!

After three hours of mountain flying in a Volvo, we hit a small village. The driver, Mario (probably Andretti), swerved left across the main drag then right into a dirt alley. This got spooky. I suddenly realized this whole thing had been an Internet scam. For a measly deposit and airline fair, these guys are now going to start contacting my wife for a ransom and sending her my thumbs as proof. While contemplating jumping from the car in a dramatic hit-and-roll in the alley, I suddenly saw this nice gas station. It had been a short cut to get gas. But then, who could have told me that? So I braved a badly needed trip to the men's room and, just to keep to the status quo, it started to rain again while I was in there—exposing a roof leak right over the place I decided to sit. If you are now ahead of me and expect me to say there was no TP in sight, you got it figured out. Ten minutes later,

these two guys dropped me off at a quaint little hotel in the beautiful city of Tehuacan that was really first-class nice. Who'd 'a figured?

Next day—Friday—8am. I get picked up by Alain, Mario's cohort, and we go to the Tehuacan airport to meet the owner, Eucario and his son Carlos. Much to my surprise, the Super 'D is in mint condition and just by coincidence, it is one serial number off my old 1993 model I used to own. This is good karma and none too soon. These guys are very nice and, with the exception of Alain, they speak good English. An hour and half of ground school goes smoothly with some interpretation for Alain. By lunch I've flown owner and son and we're celebrating great flights over club sandwiches for all at the hotel. Life is good.

After lunch the second flight with the owner goes well with loops and rolls and variations. Then I get into the plane with



Alain. He is a real nice guy and a thousand hour pilot. Nonetheless, there're no smiles in Mudville when there's poor communication. Even though I had the foresight to have Carlos make us up a little "terms and phrases" cheat sheet, our flight was a language

struggle and at this point I fear he is more frustrated than I am (if that could be possible). He drops me off at the hotel with an atmosphere of gloom. My job now is to turn this around tomorrow.

Saturday morning—Eucario's doing great. We progress through

hammerheads and inverted flight. Eucario is a 12,000+ hour corporate pilot turned successful entrepreneur, so he has flight experience on jets going all over the world. Except for a jet approach to landing his Super Decathlon, his flying is right on the mark. His





son Carlos has only 100 hours but has his dad's attention to detail. He is picking up tail wheel flying very well for a Cessna driver. Alain is young and eager with a military flying background. It's my observation from flying many people from foreign countries that military pilots are taught to memorize procedures. This makes for a lot of specific knowledge, but does not encourage free thinking from just knowing how things work. In

other words, they are generally very mechanical and fly by a memorized procedure. I guess the military feels it is better to follow the book procedure rather than know how to "wing it".

Aerobatics is more art than science. Yes, it takes a little of both for sure. But you can't pull out the checklist while doing a loop. You've got to be able to wing it sometimes. It's why I think acro brings the right balance of both

sides to a pilot. Alain is smart; he will do well with tail wheel and acro, but we're going to get him back to the fundamentals first. A task perhaps better suited to a Spanish-speaking instructor at this point.

Sunday—the scattered showers that were annoying yesterday are gone and have left winds to aggravate us today. Carlos and Alain are after a tail wheel check-out and neither, as it is here in

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the states, have been taught what to do with those rudder pedals under their feet! It shows up right on takeoff when they pitch up and p-factor pulls them left. Both try to steer the plane with ailerons only and on we go climbing out like our favorite Chinese pilot (Won Wing Lo). This is when I wish I had been here to teach them from the start. It is ten times easier to teach something right than to un-teach a bad habit; aggravated by having no knowledge of adverse aileron yaw. Trying to use those strange pedals on the floor to make a crosswind landing brought some real excitement. The good news is they had what it takes to be good learners.

Monday—the last day. Rudder pedals might not be figured out yet but they have definitely demanded some new respect. Everyone wants

spins while I'm here so we shift the focus to learning spins. We're flying from an elevation of 5,500 feet so we need to drag the Super D up to about 10 grand. All went surprisingly well as they learned cross-controlled stalls, left and right upright normal spins and accelerated spins. It was tough getting our boys to take out the opposite recovery rudder, so we got to do a few dramatic vertical slips. It's all in the learning. In the end, they all had it down pat. Eucario finished with a review flight. We got through cubans, Immelmanns, point rolls, barrel rolls as well as the fundamental loops, rolls, hammers and spins. From an eight flight course, he got a long way.

Now it's time to drive me back with Alain to Mexico City for my flight. Oh boy. You might not know this, but the way to pass a truck on a two-lane mountain road (with

deep ravine drop offs) is to make a new lane in the middle while traffic passes from the other direction! I'm not sure if he wasn't getting even for those wild crosswind landings, but he didn't kill me and I didn't kill him. Whatever the motivation, all's well that ends well.

All kidding aside, my trip to teach acro in Mexico was great. Like every trip I've had to Latin countries, these people live with a passion and hold family and friends in high esteem. I fell ill with another bronchial infection and before I knew it there was a doctor making a house call for me right at the airport. In the words of Eucario, "You are my guest so you are my responsibility." Try finding that kind of hospitality north of the Rio Grande! I recommend a trip to visit the real people of Mexico for anyone (just consider driving yourself!). Adios, amigos. **IAC**



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Webinar Questions

I'LL OPEN WITH A QUESTION FOR YOU.

How many of you saw my webinar on January 19? Two months before giving my online presentation I'd never heard of the word webinar. I must thank the EAA and IAC for setting this up, and a personal thanks goes to Lorrie Penner for planting the seed. Charlie, Trish and Jennifer, thank you for walking me through the process.

If you missed my presentation, it and many others are available by going to www.EAA.org/webinar and following the easy steps to listen to the many free presentations on the site.

There were so many great questions that came up during my presentation that I was not able to answer them all during the time allotted. Listed below are a few.



• What about the cable on my headset? Will it interfere with me exiting my aircraft during an emergency?

A: I wouldn't spend the rest of your life trying to unplug it, if that's the only thing stopping you from bailing out. I recently had a customer practicing his exit (on the ground), and his headset, which had a chin strap, jerked him back toward the aircraft when he reached the end of the cord. If you bailed out, your weight should not leave you dangling by the side of the aircraft. They're not that strong. However, if you're worrying about that, you might check into a weak link that some companies provide that leaves the majority of the comm cord in the aircraft. They break free with about

15 pounds of pressure. It could be a little more or less, but you get the idea. The one thing you might look into is how your comm cord plugs into your aircraft. If you bail out, is it a pretty straight pull to release it or will more than a 90-degree bend be put in the cord, at the plug? If yes and this is a concern of yours, you might try repositioning the plug for a straighter pull.



• My chute is rated at 188 pounds gross weight. What should I do? I weigh over that before I put on my parachute or other equipment.

A: You should be wearing a parachute suitable for your gross weight. That means with all your equipment on. I'll use 188 pounds for this example. I've had several customers tell me they weigh only 170 pound naked. The average parachute weighs in at around 15-18 pounds. I suppose if they flew naked that would work. Somehow, in my mind, that does not present a pretty picture, or a desirable solution. Even though most emergency parachutes on the market are tested to 1.2 times what they are placarded at doesn't mean you should push your luck. Some are tested to greater standards, but the figure 1.2 is good for the majority of pilot rigs out there. Could you imagine surviving a bailout and walking up to someone's door wrapped only in your parachute.



• Should I make a practice jump with my chute since I wear it all the time?

A: A practice jump at your local sky diving center is not necessary, but can be a lot of fun and will possibly lessen the chance of you hesitating or delaying your egress during an actual emergency. You will not be able to use your own parachute, though. When making an intentional jump you must wear two parachutes on a dual harness. Your parachute does not have a backup and is not on a harness equipped to accept a second parachute. This is why you treat your parachute rigger with tender loving care. Also, I don't know of any drop zone that uses round parachutes anymore. Don't confuse a round parachute (like 99 percent of you have) with a rectangular one. That's like saying apples and oranges are the same thing. Every drop zone that I know of has switched to ram-air parachutes many many years ago.

However, losing a wing, having a mid-air collision, or fire will speed up your decision-making. Trust me on this. If you have to bail out because something catastrophic has happened to your aircraft, you'll do everything you can to get out of your aircraft as quickly as you can. What you can do is something I've been preaching over and over year after year. Three simple words. *Practice, practice, practice* before and after each flight will probably reduce your egress time by as much as 50 percent or more. Emergency egress, of your aircraft, can only become second nature if you practice your emergency procedures over and over again. If you have to stop and think what to do while plummeting to earth, it may be too late.

Q

• What should I look for when purchasing a parachute for my passengers?

A: You should use the same standards choosing a chute for them as you

Sun 'n Fun, please come to my bailout presentation. It'll be at noon on Friday, March 30, at the new Central Florida Aerospace Academy building. If you can't make it, please stop by the Para-Phernalia booth in Building "B" and say hello. I'd love to meet you.



did when you purchased one for yourself. However, I do suggest a conventional harness for them (as opposed to the aerobatic type). It's so much easier to get it on and off them. I find having a thread-through chest strap and B-12 snaps on the leg straps works the best. The thread-through chest strap will allow you to adjust the harness tighter, especially if they are not too broad across the chest (see photo). This enables you to ensure the shoulder straps do not slide off their shoulders. This will prevent them from becoming a human torpedo, if they have a head-down opening. The B-12 snaps, on the leg straps, can be manhandled and abused, and they never seem to break.

See you next time. If you plan on attending

I'll leave you with a question. If you have a tandem-seated aircraft, do you have to get the front seat or rear seat person out first? Or does it matter? Can the issue of CG be a problem? I could use your help here. I'd like to hear your suggestions.

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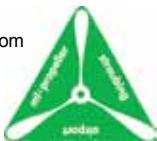
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CONTEST CALENDAR

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.

Borrego Hammerhead Roundup (Southwest)

Thursday, April 12 – Sunday, April 15, 2012
Practice/Registration: Thursday, April 12
Rain/Weather: Sunday, April 15
Power: Primary through Unlimited
Location: Borrego Valley Airport (L08), Borrego Springs, CA
Region: Southwest
Contest Director: Gray Brandt
Contact Information: Primary Phone: 9709480816
E-Mail: graybrandt@yahoo.com
Website: www.iac36.org

Los Angeles Gold Cup (Southwest)

Thursday, May 3 – Saturday, May 5, 2012
Practice/Registration: Thursday, May 3
Rain/Weather: Sunday, May 6
Power: Primary through Unlimited
Location: Apple Valley (APV): Apple Valley, CA
Region: Southwest
Contest Director: Casey Erickson
Contact Information: Primary Phone: 6194170839
Alternate Phone: 9093899020
E-Mail: Casey@allwaysair.com
Website: <http://www.allwaysair.com/AppleValley.html>

Sebring Aerobatic Championships (Southeast)

Thursday, May 3 – Saturday, May 5, 2012
Practice/Registration: Saturday, April 28 – Wednesday, May 2
Glider Categories: Sportsman through Unlimited
Power: Primary through Unlimited
Location: Sebring regional airport (SEF): Sebring, FL
Region: Southeast
Contest Director: Mike Mays
Contact Information: Primary Phone: 561-313-8503
Alternate Phone: 561-734-1955
E-Mail: Soaerobatics@aol.com
Website: IAC23.com

Armed Forces Memorial Aerobic Competition (AFMAC) (Southeast)

Friday, May 18 – Saturday, May 19, 2012
Practice/Registration: Thursday, May 17
Rain/Weather: Sunday, May 20
Glider Categories: Sportsman through Unlimited
Power: Primary through Unlimited
Location: Grenada Municipal (GNF): Grenada, MS
Region: Southeast
Contest Director: Chris Rudd
Contact Information: Primary Phone: 850-766-3756
E-Mail: akrudd@aol.com
Website: www.iac27.org

Jersey Skyland Aerobic Championship (Northeast)

Friday, May 18 – Sunday, May 20, 2012
Practice/Registration: Thursday, May 17 – Friday, May 18
Power: Primary through Unlimited
Location: Greenwood Lake (4N1)
West Milford, NJ
Region: Northeast
Website: <http://iac52.org/2012/jsc/index.html>

Carolina Boogie (Northeast)

Friday, May 18 – Saturday, May 19, 2012
Practice/Registration: Thursday, May 17 – Friday, May 18
Rain/Weather: Sunday, May 20
Power: Primary through Unlimited
Location: Wilson Industrial (W03) Wilson, NC
Region: Northeast Contest
Director: Eric Sandifer
Contact Information: Primary Phone: (919) 605-9585
Alternate Phone: (919) 605-9585
E-Mail: nioomp@yahoo.com
Website: <http://iac19.org>

Ben Lowell Aerial Confrontation (South Central)

Saturday, May 26 – Sunday, May 27, 2012
Practice/Regist.: Thursday, May 24 – Friday, May 25
Power: Primary through Unlimited
Location: Sterling Municipal Airport (STK): Sterling, CO
Region: South Central
Contest Director: Michael Forney
Contact Information: Primary Phone: 303-514-1609
E-Mail: mlforney1@msn.com
Website: <http://www.iac12.org/>

Lone Star Aerobic Contest (Southwest)

Friday, June 1 – Saturday, June 2, 2012
Practice/Regist.: Wednesday, May 30 – Thursday, May 31
Glider Categories: Sportsman through Unlimited
Power: Primary through Unlimited
Location: Grayson County (GYI): Sherman, TX
Region: Southwest
Contest Director: B J Boyle
Contact Information: Primary Phone: 214-697-5052
Alternate Phone: 972-306-5851
E-Mail: bj.boyle@att.net
Website: www.iac24.org

Southeastern Aerobic Open (Southeast)

Friday, June 1 – Saturday, June 2, 2012
Practice/Registration: Thursday, May 31
Giders Categories: Sportsman Intermediate
Power: Primary through Unlimited
Location: Henry County Airport (4A7), Atlanta, GA
Region: Southeast
Contest Director: Stan Moye
Contact Information: Primary Phone: 229-347-1616
Alternate Phone: 229-436-7791
E-Mail: moyestan@yahoo.com

Ohio Open (Mid-America)

Thursday, June 14 – Saturday, June 16, 2012
Practice/Registration: Thursday, June 14
Rain/Weather: Sunday, June 17
Power: Primary through Unlimited
Location: Union County airport (MRT): Marysville, OH
Region: Mid-America
Contest Director: Jeff Granger
Contact Information: Primary Phone: 574-721-4340
Alternate Phone: 614-505-6555
E-Mail: jgranger@columbus.rr.com
Website: www.iac34.com/

Midwest Aerobic Championship (South Central)

Friday, June 22 – Sunday, June 24, 2012
Practice/Registration: Friday, June 22
Power: Primary through Unlimited
Location: Seward Municipal (SWT): Seward, NB
Region: South Central
Contest Director: David Moll
Contact Information: Primary Phone: 402-613-5422
E-Mail: davidmoll66@gmail.com

Apple Cup (Northwest)

Friday, June 22 – Saturday, June 23, 2012
Practice/Registration: Thursday, June 21
Rain/Weather: Sunday, June 24
Power: Primary through Unlimited
Location: Ephrata (EPH): Ephrata, WA
Region: Northwest
Contest Director: Rochelle Oslick and Jerry Riedinger
Contact Information: Primary Phone: 425-442-8280
E-Mail: volez@earthlink.net
Website: www.iac67.org

U.S./Canada Aerobatic Challenge (Northeast)

Saturday, June 23 – Sunday, June 24, 2012
Practice/Regist.: Thursday, June 21 – Friday, June 22
Power: Primary through Unlimited
Location: Olean Airport (KOLE): Olean, NY
Region: Northeast
Contest Director: Patrick Barrett
Contact Information: Primary Phone: 716-361-7888
E-Mail: cspbmb@aol.com
Website: IAC126.com

Salem Regional Aerobic Contest (Mid-America)

Saturday, June 30 – Sunday, July 1, 2012
Practice/Registration: Friday, June 29
Power: Primary through Unlimited
Location: Salem – Leckrone Airport (SLO): Salem, IL
Region: Mid-America
Contest Director: Bruce Ballew
Contact Information: Primary Phone: 314-369-3723
E-Mail: bruceballew@earthlink.net

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/>

Ace's High Aerobic Contest (South Central)

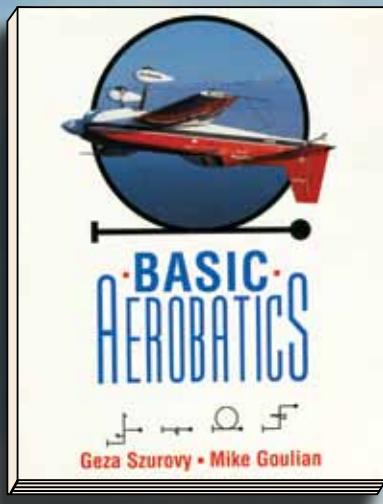
Saturday, September 8 – Sunday, September 9, 2012
Practice/Registration: Friday, September 7
Power: Primary through Unlimited
Location: Newton City Airport (KEWK): Newton, KS
Region: South Central
Contest Director: AJ Hefel and Ross Schoneboom
Contact Information: Primary Phone: 316-648-5057
E-Mail: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

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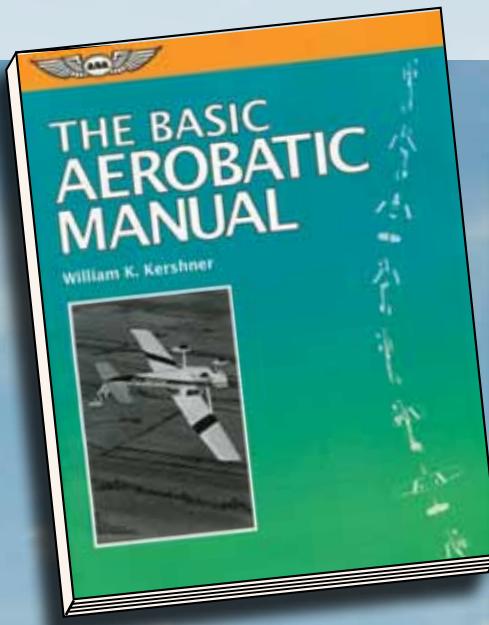
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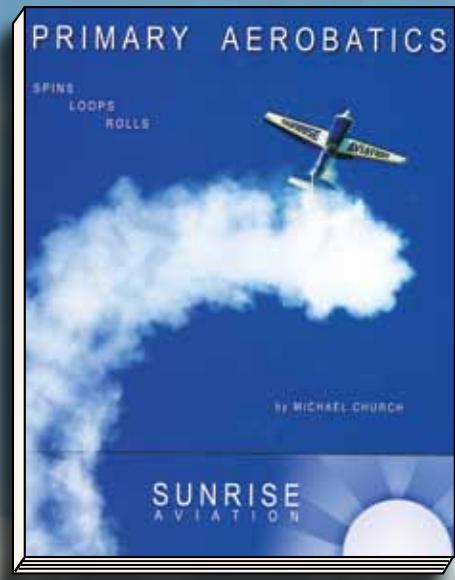
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