SPORT Aerobatics
June 2013
OFFICIAL MAGAZINE of the INTERNATIONAL AEROBATIC CLUB

A Danish Aerobat

- Competition Aerobatics:
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SPORT Aerobatics

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The Danish KZ VIII is a Gipsy-powered beauty. Photo by Thorbjørn Brunander.

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REGGIE PAULK
COMMENTARY / **EDITOR'S LOG**

The Old and the New

Curious or taking the leap with Aerobatics

SUMMER IS IN FULL SWING, the flying season is rolling along nicely and aerobatics are tops on the list. Warmer temperatures bring with them bumpy air and more violent weather, but they also facilitate flying in our shirtsleeves.

It's always fun to find aerobatic airplanes many people have never heard of.

This month's issue is meant to bring a focus on those who may be new to our sport, or just curious about what competition aerobatics is all about. Doug Lovell gives us a great primer on entry-level competitive aerobatics. I discovered Doug's piece floating around on the web, and he took the time to polish it up for publication in *Sport Aerobatics*.

IAC Hall of Fame inductee Giles Henderson brings us another perspective of entry-level aerobatic competition from the back seat of his Clipped-Wing J-3 Cub. He makes it quite clear that a competent pilot can be competitive in entry-level competition even if horsepower is limited and the aircraft lacks inverted fuel and oil systems.

Mark Benton's story describes the love affair that began when he met his first Pitts after a long day of flying as a commercial pilot. While working with Mark on the story, we were discussing his flying history and touched on the subject of the Boeing 727. His recollections of flying as a flight engineer on that airplane turned into an entirely separate story. Mark was kind enough to write about his experience in the 727 and we plan to run it in the July issue.

If you aren't familiar with it, the Aerobatics Exploder (*aerobaticsweb.org/iac_exploder.html*) is a subscriber-based email list focused on, of all subjects, aerobatics. Quite often, a subject will come up that piques my curiosity, and I'll follow up on the lead. Our story about the single-seat Danish KZ VIII is the result of that effort. If you saw the May issue of *In the Loop*, our mystery photo featured the airplane. I was surprised by the number of responses from Europe. Nearly all were correct. The responses I received from the Americas were almost all in favor of the de Havilland Chipmunk. It's always fun to find aerobatic airplanes many people have never heard of. It's even more so to find examples still flying.

Don't forget that the U.S. will be hosting the World Unlimited Aerobatic Championships in October. If you can make it, we'd love to see you there! *IAC*

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

The deadline for proposing 2014 Known sequences and rules changes is July 1, 2013.

IAC invites proposals for Sportsman and Intermediate Power and Glider Known sequences, which change each year (The Primary sequence changes very infrequently, but you're also welcome to propose one). Limited guidance for writing Known sequences is found in Policies and Procedures Manual 221 *https://www.iac.org/files/leadership/policy_and_procedures_manual.2013-03-27.pdf*

Propose sequences and rules changes via email to Brian Howard *BK@newattaero.com*, IAC's Rules Committee chair, and copy your IAC regional representative *https://www.iac.org/legacy/iac-leadership*. Feel free to share and discuss your proposals in the Unusual Attitudes Forum *http://eaaforums.org/forumdisplay.php?8-Unusual-Attitudes* of the EAA Forums website.

IAC usually adopts CIVA's Advanced and Unlimited Power and Glider Known programs; propose those through our CIVA delegate, Mike Heuer (*mike@mheuer.com*).

Find complete contact information for people named above in the IAC Yellow Pages *https://www.iac.org/yellow-pages*.

Jim Ward, IAC Secretary

Get Your Known Sequences Drawn up For Free

Daniel Wisehart will draw up your sequences—for no charge—in Alan Cassidy's Aresti Software. Send a written description of what you have in mind and he will send you back a PDF to review. When it is correct, you may then submit.

He commits to submitting at least one Power Sportsman and Power Intermediate sequence of his own design before the deadline, and encourages others to join him by designing their own sequences.

Contact Daniel, *dwisehart@gmail.com*

Call for Nominations for Annual Non-Flying Awards

Each year, the membership of the IAC nominates outstanding volunteers to be recognized for their contribution to the sport of aerobatics.

It's easier than ever to nominate this year—use the on-line form! Visit *https://www.iac.org/legacy/iac-award-nomination-petition* to make an on-line nomination. You can nominate your fellow IAC'ers for one of the five awards listed on the Non Flying Awards *https://www.iac.org/legacy/non-flying-awards* webpage.

This is an excellent opportunity to give recognition to an outstanding IAC member who spends their valuable time volunteering for the benefit of many. Let's recognize our unsung heroes!

Deadline is June 30, 2013, for nominations of volunteers who will be recognized for their efforts in the 2012 flying season.

Improved Waiver Form

Anyone who has filled out an FAA waiver application knows that the PDF file is read-only, preventing you from saving your work. IAC is pleased to offer a save-able version of Form 7711-2, available for download by visiting this link: *https://www.iac.org/files/FAA_Form_7711-2%20-%20IAC%20Saveable%20Version.pdf*

Many thanks to Wayne Roberts *https://www.iac.org/users/wayne-roberts* for fixing this headache! IAC

Early Single-Seat Aerobat

The Kramme & Zeuthen KZ VIII

BY BENT ESBENSEN
EAA CHAPTER 655 PRESIDENT (*WWW.AIRCRAFTSTORY.ORG*)

Although Denmark, by virtue of the inventor Ellehammer, has carved a small niche for itself in the annals of early aviation, we have never had a large-scale aircraft industry.

Our major civilian aircraft manufacturer was Skandinavisk Aero Industri (SAI), which built some 200 aircraft from 1937 to 1954. The aircraft types were called KZ—after the designers Viggo Kramme and Karl Gustav Zeuthen—and were mostly built out of wood or a combination of steel tube fuselages and wooden wings.

Outside of medevac aircraft for the Danish company Zonen and trainers and AOP aircraft for the air force and naval air services, SAI built a few quite special aircraft to order.

The Sylvest Jensens Luftcirkus was a traveling show, run by a Danish ex-army air corps lieutenant. The company was actually an air photo operation, flying KZ III aircraft from which the pilots took photos of farms and factories etc. which they, after processing, tried to hawk to the subjects. However, the idea of an air circus act (à la barnstorming) persuaded Sylvest Jensen and his gang of pilots to set to with a program comprising some stunts which, in hindsight, seem pretty motivated. Watch this video at *www.KZ-Fly.dk/sylvestjlc.html* and judge for yourselves.

Sylvest Jensen ordered some specialty aircraft from SAI. A replica Ellehammer-type that can be seen in the video and a single-seat aerobatic aircraft, the KZ VIII, that also appears in the video.

The KZ VIII is a small aircraft, with

THORBJØRN BRUNANDER PHOTOS

a large engine. Designed in 1949 by the Swedish designer Björn Andreasson (who later worked for McDonnell and Convair), the KZ VIII is built entirely out of wood in a monocoque construction, not unlike the de Havilland Mosquito. The engine, which was available for the purpose, was the de Havilland Gipsy Major. Two of the type were built by SAI.

The first aircraft, registered OY-ACB, flew for the first time on 14 November 1949. It was taken aloft by Mr. Zeuthen himself for the maiden flight.

The test flights were done by one of Jensen's pilots, Peter Steen. After the test flights and issuance of the CofA, the aircraft was flown by Sylvest Jensen's circus until 1952 when it was canceled from the Danish register. The registration HB-EPB was taken up in Switzerland. It is a bit unclear who owned the aircraft while in Switzerland, but old records show that a Mr. Gerhard Pawolka owned the plane and that he came in third in the German aerobatic championship of 1962 and that he participated in the World Aerobatic Championships competition with this aircraft. The German aerobatic pilot Arnold Wagner owned the plane for some time in the mid-'60s. He flew it for the 1968 World Aerobatic Championships in Magdeburg, Germany.

In 1969 the aircraft was sold to Britain and registered G-AYKZ. It still belongs to the original buyer Bob Mitchell.

The building of the second KZ VIII was also begun in 1949 but, for unknown reasons, never finished by SAI. The parts were sold to Germany in 1955 in exchange for a German glider. In 1959 it was finished and test-flown by Scheibe Flugzeugbau in Dachau (glider manufacturers). The owner was Walter Wolfrum, a German WWII fighter ace with 137 victories. It went through a succession of owners in Germany before returning to Denmark and obtaining the registration OY-DRR in 1972.

Passing through several owners in Denmark, it was lent to the Danmarks Flymuseum from 1989. In 2002, the owner donated the aircraft to the museum. It remains airworthy and is flown quite frequently by, among others, my pal Hardy. This is his account of the flying characteristics of the KZ VIII:

KZ VIII Flying Qualities Account

By Hardy Vad

Let me initially stress that this is no promo for the aircraft, but a critical honest impression of characteristics of the design! Also it should be noted that the airplane was designed on specifications to a touring flying

The first KZ VIII looks pretty good for a 64 year-old airplane

The Gipsy Major engine chosen to power the KZ VIII gives the airplane a decidedly Chipmunk look.

THORBJØRN BRUNANDER PHOTOS

circus (barnstormers), and should be able to operate from improvised airstrips. Furthermore, the design was constrained by postwar limitations, so the only available feasible engine was the Gipsy Major. To get the best possible performance the design was made very compact. The design that Bjørn Andreasson came up with resembles a small, single-seat DHC-1 Chipmunk—just made from wood instead of aluminum. Whether a bit of sneak-peeking has taken place or not I don't know. Many flight characteristics are also shared with the Chipmunk—just with much quicker response due to the lower inertia, and better performance with lower flying mass. Getting into the snug cockpit of the original Gipsy-powered KZ VIII of Danmarks Flymuseum, you'll notice that everything is well within reach except the fuel selector mounted on the floor (it has to be operated by foot). The engine is started by hand, so you need a helping hand, or you must swing the prop of the well-chocked airplane yourself before you climb onboard!

Once cranked up, you make your way toward the runway by means of differential braking from Piper Cub-style (Tost) hydraulic heel-operated pedals (original design was a purely mechanical system, but this was soon abandoned). Taxiing is no big problem, but a little S-turning has to be made to clear the way. With the few standard checks and oil temp on the rise, you are ready to go. With a significant P-

THORBJØRN BRUNANDER PHOTOS

effect that initially requires countering with a significant amount of rudder, you are well-advised to consider your crosswind, or you may find yourself running out of rudder with winds from your right. Differential braking may be needed for the initial takeoff run, but it should be carefully dosed on limited runways, as it can extend the takeoff run considerably!

Once in the air it is a responsive delight to fly, and climbing at a bit more than 1,500 feet/minute with full tanks, and despite the limited power, it can do many of the Aresti advanced maneuvers used today. Max roll rate is around 180 degrees per second, so much more than half a roll on the vertical line will spell problems with a controlled hammerhead or humpty. Level maneuvers like rolling circles in or out is a breeze.

Lubrication during inverted flight is facilitated through a valve system in the oil tank, but oil scavenging cannot take place, so oil is drained into a small upper collector tank, and after this is filled, the remainder will stay in the engine and eventually you will lose oil pressure. Fuel feed is from either of two wing tanks with flop tubes, through fuel pumps to a modified Czech Walter carburetor allowing inverted flight, but only at full power, as pressurized fuel is metered through a fixed jet (hole); if you retard throttle, your mixture will go over-rich and all power is lost!

Erect stalls are well-mannered with good warning (a little less so when flaps are extended). Inverted stalls are a bit special due to aerodynamic as well as geometric twist in the wings.

THORBJØRN BRUNANDER PHOTOS

When slowing down and increasing negative AoA, an eddy will move in over the aileron giving some jerking in the controls and some loss of lift (this can be perceived as a stall), but you can actually control the aircraft with rudder and push beyond this until you unmistakably get the full stall.

Upright spin entry is conventional

but recovery is where Achilles put down his heel. Just like in the Chipmunk, the tail configuration renders only little rudder authority at high angles of attack, so the Chipmunk got its strakes and the KZ VIII a larger elevator surface to break the stall after fully developed spins; accelerated one-turn flicks normally offer immediate recovery. Inverted spins are fairly slow and flat, with the nose coming up over the horizon once or twice during entry, but rudder is very effective at stopping rotation, and you hardly have to come back on the elevator to be flying again.

Bringing the aircraft back for landing is simple: You select best tank (carb heat is always on) at the equivalent of 75 knots (indication is in kilometers/hour). In smooth air you may extend the split-flap, and slow to 60, which is kept until threshold. Again you must prepare for actions to counter crosswinds, and this airplane prefers turf over hard surface, or at least its keeper does!

I personally liked the qualities of this bird so much that I scratch-built a replica with a 200-hp Lycoming with a valve-operated inverted oil system. This allows me to use a standard IO-360-C1C without internal modifications and a standard Hartzell propeller (low pressure to fine pitch) without ever having surges that disturb rpm-control, and minimal oil loss. Also fitted is tailwheel steering for better control on the ground.

Flight characteristics are very much like the original (except for the screw turning the opposite way around), and it does expose all the effects you have read about related to WWII tailwheel piston fighters.

Actually I owned and flew an original Laverda Falco Ser IV for 10 years, but whenever I didn't have any passengers, the KZ VIII got the airing, so eventually I sold the Falco.

I have flown this bird now for 17 years (and the one in the museum for more than 20) for air show, delight, and amusement.

Best of greetings from here! *IAC*

(Editor's Note: Visit *www.AircraftStory.org* to learn more about Mr. Esbensen's efforts to film a documentary about the history of Denmark's Messrs. Kramme and Zeuthen.)

Introduction to the Pitts

Experiencing an S-1T

BY MARK BENTON

It was midnight on July 16 in the late 1990s when Ron Spencer and I parked in front of my dark hangar at Orange County airport in New York. We were both still dressed in our airline pilot uniforms, as we had been flying all day. Spencer had been doing the "Boston shuttle" in the Mad-dog (MD-80), and I had flown my Boeing 757 (B-757) from Houston to Denver to San Francisco. I had then grabbed a jump seat on another company B-757 that was headed from San Francisco to Newark.

When I arrived, Ron was waiting for me, and off we went to the airport to see my "new" Pitts. We drove north for almost two hours before we arrived at Orange County, New York. It was dark and late . . . but I had to see my airplane that night. Ron made me wait outside the hangar as he went through the door, turned on the light, and made sure everything was in place for dramatic effect. He told me to come in.

I walked in. There sat my Pitts S-1T under bright lights, polished and gleaming. I had bought it sight unseen. Ron had test-flown it and found it to be "as advertised." I had never really seen a Pitts close up . . . but now I owned one, and there it sat. I was impressed by how small yet rugged and ready it looked. In my eyes, she looked fast just sitting there quietly, waiting.

Almost sheepishly, I told Ron I wanted to sit in the cockpit. Under his direction, I struggled in, hitting this part, smacking there, stepping in the wrong places. Once settled in, I put my left hand on the throttle and my right

hand on the stick. I couldn't believe this was my airplane, and that in a few days I would be flying it.

As a pilot with type ratings in the B-757, B-767, and MD-80, I had been thinking that this was going to be a blast, and something easily accomplished. As I sat in that tiny cockpit, however, wiggling around those four ailerons and trying to see over the nose, I started to suspect that this was going to be more than I had bargained for . . . perhaps even more than I could handle. I could not believe how small the wings looked, and silently I tried to roughly figure out the wing area that looked impossibly small to me. As we drove home to Ron's house that night, I must admit, I was deep in thought.

First Flight

The next day started early with a cup of coffee and a couple of excellent pancakes cooked up by Ron's daughter, Sarah. I stumbled into the kitchen, ate, and asked when we were off to the airport. Ron gave me a grin, told me to sit down, and he opened up the books. For the next four hours I felt like I was back in airline-style ground school.

We went through the flight manual, page by page, for the Pitts S-2B because it was Ron's aircraft and he was going to teach me how to fly a Pitts in his personal aircraft. Every nut and bolt was reviewed and then some. The airplane was so small that I couldn't believe there was so much to learn about it. Center of gravity charts for cross-countries and another for aerobatic flight, auxiliary fuel tanks, where to step and where not to, canopy release, harness hook-ups, preflight . . .. We went over everything with a fine-tooth comb, with a paper model of a Pitts for extra assistance.

Then we started to go over the general aviation items.

Ron asked me, "What's the normal traffic pattern at an airport if it's not depicted on the chart?"

I thought for second, *Hmm . . . a normal holding pattern is to the right . . . gotta be the same direction to stay consistent*.

"I would have to say it's to the right."

"You're wrong, Stupid, they're to the left."

Ron again, "How big is an air traffic control area around an airport with an operating control tower?"

I was thinking, *Well, you have to have three miles to maintain VFR so . . .*

"Uh, three miles?"

"No, you dummy, it's five miles."

On and on we went, going over things I had not dealt with for many years. Finally, late afternoon arrived and Ron declared it was time to head for the airport. I was mentally exhausted and more than a little overwhelmed with everything I had forgotten about general aviation over the years. With some anxiety, I followed Ron out to the "airport vehicle."

I was dressed in my recently purchased Nomex flight suit. It had been red when I bought it. After the first wash, it turned pink. Ron was dressed in his usual casual attire: a pair of Speedo nylon shorts and no shirt, bald head glistening in the heat and humidity.

The airport vehicle we had available was a red Suzuki Samurai without a top. The Samurai was owned by Ron's 17-year-old daughter, Alex. She was away on an excursion so the vehicle was readily available for the two of us. The distinguishing factor of this Samurai would have to be the seat covers. They were made out of imitation black and white Holstein cowhide.

It wasn't until much later that we learned from Ron's daughter that everybody who is anybody knows that if you're male and drive around in a vehicle with cowhide seats, you're considered to be "gay." So there we were, totally naïve. Ron in his purple Speedos and me trying to look masculine in my pink flight suit, whipping through Orange County New York in a red Samurai with fake cowhide seat covers. I thought the funny looks from people were because they thought we were "stud muffins."

We arrived at the airport and began to preflight the Pitts S-2B. I quickly learned why you don't wear a flight suit to the airport in 90-degree temperatures. It was long, hard work in the New York heat. We went over every nut and bolt, every moving part, and then some.

I learned how to pull a Pitts out of the hangar correctly. I learned what to touch and what not to touch or pull on. I ran into the sight gauge once as I was walking and looking at something else. This brought up an abbreviated insult like, "You dumb @#$," or something to that effect.

I learned to watch where I walked and what I touched. I learned not to hold anything sharp over the aircraft. I learned how to put on a parachute outside the aircraft and how to get in the aircraft with it on and then back out again—over and over. I learned how to release the canopy. Ron took me through all the steps, repeating the instruction for even a minor error.

Ron Saglimbene showed up in anticipation of flying parts of his air show routine as the Split Image Aerobatic Team, with Spencer. I found out that my first flight in a Pitts would be in the front seat of Ron's Pitts S-2B in formation with "Sag."

I was just along for the ride on this one—how hard could that be? I will admit that while I struggled with my parachute, straps dangling here and there, trying to connect them up and look cool at the same time, I caught a look of pity from Sag. He could tell with one eye open that I had no idea what I was doing. My anxiety level rose. Here's a veteran aerobatic pilot watching me as I strap a parachute on my pink flight suit. I have had better days. Finally, after a small battle with all the straps, sweat pouring off my body (we had a heat wave at the time), I struggled into the front seat of Spencer's Pitts. We taxied out to the runway.

After the run-up, we taxied into position to hold behind Sag. I heard something like, "Ready? One, two, three, go!" And away we went. The immediate surge of power and acceleration was fantastic. I must admit that I was impressed. In a second or two, the tail was raised and there was Sag's red and white Pitts just ahead of us to the

left. I mean, it was "right there!"

Before I could collect my thoughts, we had lifted off. I glanced at the airspeed indicator, 90 mph. Whew, that happened fast! But we didn't just lift off—we were *climbing,* man!

Sag's Pitts was just ahead and a few feet away. The angle just didn't look right to me. It seemed impossible that a small aircraft such as this could climb at such a steep angle. I thought to myself that these guys are going to screw with me just a little bit and maybe do a stall or something. I looked down at the airspeed indicator and saw 120 mph. My hell, we had actually accelerated! I could not believe what I was seeing. I decided to sit back and watch. I was really impressed.

Ron had warned me that his front seat intercom was intermittent under *g*, and that he had been troubleshooting it. As advertised, the intercom promptly shut down between Ron and me, so I couldn't hear anything he was saying. We closed up to Sag until I was really uncomfortable. The air was bumpy. Every time Sag hit a bump, we hit the same bump an instant later. After a couple of minutes, I started to relax a little. It was obvious that these guys knew what they were doing.

We flew like that for a bit. I had a chance to see some close-formation aerobatics, which was stunning to a novice like me. I had a great time. At some point, after we had kissed off Sag, Spencer wiggled the stick in my hands and said, "You got it!"

I assumed control, kind of. Immediately, an aircraft that had been flying straight and level started wobbling left and right and up and down. I felt like I was suspended on the head of a pin. My first thought was that I would never be able to fly this thing. After a minute or two, I settled down, wiggled my butt down in the seat, and relaxed. Fingertip control was all that this airplane needed. I made turns to the left and to the right. Ron wanted me to do a roll, so I did. It was effortless. Descent, climbs, turns . . . it was like I was part of the airplane. We were getting low on gas so we had to turn back, but I didn't want to.

Ron took control of his airplane again as we entered the pattern at Orange County airport in New York. He showed me the "curved linear approach" to Runway 26. We were abeam the numbers at 1,000 feet AGL when the throttle came back and we started a descending right-hand turn. When I say "descending," I mean we were going down fast; way too fast for what I was comfortable with. One second we were a thousand feet above the runway, and less than 10 seconds later we were rolling out after a smooth landing. I was not sure about what I had just seen, but I started to breathe again.

We filled up with gas and up we went again. Ron taxied out and lined up on the runway. He then gave me the controls and said the aircraft was mine, adding, "And don't #$&* it up."

I sat there for a couple of seconds and thought about it. Then I applied throttle and off we went! The first approach ended in a go-around. We had briefed that if I felt uncomfortable at any time, go around! So I did. I was impressed with the power of this aircraft. When I wanted to go I added power and we would *go*!

The second approach was totally screwed up, too, but I somehow got it aligned with the runway and down in one piece; tail wheel bouncing and bouncing. Ron added power to save a crash and away we went again. My confidence was eroding quickly. Up and down, up and down we went. Sometimes Ron took the airplane to show me *again* how it was supposed to be done.

The language describing my aviator skills coming from the back seat was colorful and descriptive. When the intercom cut out at critical times and he knew I couldn't hear him, the swats to the back of my head commenced. *Whack! Whack!* "You almost…[scratchy garble screech]…killed us all! You [scratchy garble]!"

I might be the only Pitts pilot who is most comfortable landing a Pitts leaning as far forward as possible. The visibility is terrible in this position, but I quickly learned that he couldn't reach me. I finally accomplished a couple of approaches that were acceptable.

Thinking that I was in the groove, I started the next approach. I brought the throttle back to idle abeam the numbers and heard the crack and pop from the engine. Speed was 130 mph. I added a little left rudder to compensate for the lack of torque and then right aileron and rudder for the base turn. We were dropping rapidly, but I could clearly see the runway numbers.

I rolled to level quickly to look left for any traffic on final we might have missed and then rolled back into the right turn still descending rapidly. Speed was at 110 mph. I was loading the aircraft up in the turn, and I didn't want to. I saw that I was slower than I had been on the other approaches. I rolled out on final and kept the descent going. Speed was now at 90 mph on this hot summer day with me up front and "Mr. Slightly Overweight" in back.

I heard his mumbling but the static overrode his "comments." I crossed the runway threshold keeping a slight crab in to see the runway ahead. A little slow as I went into the flare—and there was no flare—the airplane just kept heading for the runway. I thought, "Power, power!" But the throttle was already forward as Ron, having waited until the last second, took over. As we went around there was no doubt in my mind that I would have busted the aircraft. With the flight time and experience that I had, I didn't see this situation coming until it was too late. One second too late, but certainly enough in this aircraft to have put both of us into a critical situation. I got too slow, and the airplane just quit flying.

I landed once more (confidence-builder attempt I think), and we returned to the hangar. I was a humbled man. I realized that this aircraft would do *exactly* what you told it to do. But it would eat your lunch if you told it to do something wrong. It was the most honest aircraft I had ever flown, but if your input was wrong, you would pay the penalty. Garbage in, garbage out.

I was soaked in sweat when I got out of that Pitts. Ron didn't say much as he


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started cleaning off the leading edges of the wings with Windex. I walked into the hangar in my soggy flight suit with my flight helmet hanging from my hand wondering if I was going to be able to make the grade. I didn't feel like a 12,000-hour airline pilot—I felt like a student pilot. I heard a voice and turned around. There was Ron Saglimbene. He looked at me as if he understood what I was going through.

He said, "Don't let it get you down… you're doing okay, and even though it's going to take some time, you're going to do it. Relax." I barely knew Sag, but I had heard all the stories. He's one of the best Pitts pilots around, in my opinion, and there he was taking the time to let me know that what I was going through was not unusual. I really appreciated that, and it boosted my spirits.

Spencer and I finally debriefed, and we retreated to Spencer's house. After a lot of *good* wine, cheese, and a great dinner from Karen, Ron's wife, I was ready to go to bed and go at it again the next day. My spirits were higher, but in the back of my head I was asking, "Can I do this?"

The next day was hot and humid again. We went through another extensive briefing and then it was more flying. We started by going out and doing some spins. Ron was thinking that *if* I ever did solo, he wanted me to have some idea as to the recovery techniques for flat spins and crossover spins, etc. Frankly, I had never seen anything like this before. The first crossover spin we did was totally confusing to me. The next one, I had to recover from myself as directed by Mr. Spencer. I did so, but again, I saw how fast a pilot could get himself in trouble with this airplane if they told it to do something wrong.

As always, right at the most critical time, Spencer's intercom would blank out. So there I was, hanging upside down with my eyeballs trying to bust out of my head, the terrain spinning in a blur, and no instruction from the back seat, just mumbles and a lot of static. I mean I could hear that he was yelling something back there, but I couldn't understand a word of it. Because we had extensively briefed every maneuver, I knew what to do and recovered before Spencer took over. I had a great time!

For once the *g*'s were powerful enough that he couldn't get his arm up to smack me in the back of the head, and I saw aerodynamic flight characteristics I had never seen before. I quickly learned that *g*-forces were my friend. Spencer couldn't get his arms up high enough to whack me, and although I could barely hear him screaming something in the background, the intercom always cut out under *g*'s and I could not understand the particulars.

We did touch-and-go after touch-and-go. Finally, on one approach, everything started to fall into place.

We eventually went back to the airfield to do touch-and-go landings again. The first couple were not good. We went back to the hangar to refuel, and I told Spencer I needed another seat cushion under my butt. The visibility out of the Pitts was "the pits," and I still had room over my head so I wanted another inch under my bottom. We found some more padding, and away we went again. The afternoon wore on and on.

We did touch-and-go after touch-and-go. Finally, on one approach, everything started to fall into place. The extra inch of height really helped. Spencer said he wanted to see 10 consistently good approaches and landings where I didn't try to kill him or beef the airplane. I had to do these in a row. If I screwed up one, he started the count over. Visions of Spencer tied down in the sand with army ants crawling over his bald head and me standing there with a margarita, laughing, were going through my head. Up and down. Up and down. Intercom crackling…smacks to the back of the head and finally four, then five, then six good approaches and landings. I was on a roll, and that's when the tail wheel disintegrated.

Now I have never seen a tailwheel aircraft taxied to the mechanic at 15 knots with the tail in the air but I did that day. Lots of power and lots of brakes and we were there. I crawled out of the Pitts, again, soaked in sweat.

Maybe it was the taxi experience, or maybe it was the flying—I don't know. But I was very disappointed. I only had four more landings to do, and I could have soloed my own Pitts. I had been feeling pretty good about the whole thing. Everything was coming together. I had 2.9 hours of flight instruction in the Pitts, and suddenly this aircraft was really feeling good to me. And now this; a tail wheel flies off the aircraft and into the weeds. Was it because of me, or was it just its time to go? I don't know, but I was really disappointed.

Ron got out and took off his parachute. I noted he was soaked in sweat, too. He went back and looked at his tail wheel. The smell of burned brake pads was in the air. He declared that his aircraft was not going to fly again that night, but, he thought I could fly again if I wanted to solo my Pitts.

Admittedly, I had to think about this for a bit. I wanted to solo my Pitts, but I didn't want to screw it up. I thought I could, but I had also been told that if I thought the S-2B was sensitive, wait until I got into my S-1T. I looked up at the light we had left as it was getting late and the sun was setting. I figured that we had enough daylight. I felt the wind on my cheek, and it was very slight with no gusts. I looked back at Spencer and said, "I want to do it." He looked back at me and said, "Okay."

Karen was suddenly there with a video camera, and I wondered how she knew to show up at that precise time. I looked at Ron and he said, "I knew yesterday that you were going to solo today, I just didn't want you to get your hopes up." He is a merciless fellow.

Pitts Solo

We went over to my hangar and pulled out my Pitts. Ron did a preflight on it, and I backed him up. He had a handheld radio he was going to use to communicate with me during the solo. He seemed as nervous as a mother hen. He kept saying, "Now, if you get into problems, power, power! And go around."

I would say, "I know." "Don't load up the damned airplane when you are on base turning to final," he would say. I would reply, "I know."

"Go out and do the falling leaf, a couple of stalls, get a feel for the aircraft, but for God's sake don't do anything weird or something I have not taught you."

"I know."

"Make the first landing a full stop and then come back in to talk to me if you're still alive. If everything is going okay I will clear you for another one."

"Okay."

He stomped around as I put on my parachute and flight helmet, "And another thing..."

"I know, I know."

So it was time. I stood there in my pink $228 Nomex flight suit with my parachute on my back and butt and Spencer stood there with his purple nylon Speedo shorts—the setting sun reflecting off our respective presentations. We shook hands, and I climbed in. It was impossible to strap myself in as Spencer's hands were everywhere, making sure everything was just so. I felt like a Blue Angel with a crew chief. Finally it was time to start the engine. The engine started, everything was in the green, and away I went.

Spencer was still clucking around checking in on the radio as I taxied out, "Keep turning right and left as you taxi out, you moron. Make sure you've secured the chin strap on your cloth helmet. If you screw this up, I will kill you."

I got to the end of the runway and did my run-up. Over the radio I kept hearing "[Scratch] [garble] and make sure you [garble]...[scratch]...[screech]." (The hand-held evidently had problems, too.) So I turned him down to tune him out for a minute or two so I could collect my thoughts and focus. And focus is the name of the game in a Pitts.

I finally lined up on the runway and suddenly there was silence. Spencer had quit talking. It was just the airplane and me and my good friends who were watching. I sat there for just a minute. I was totally confident that I was going to take this beast off and land it again without rolling it up in a ball, but I knew how easy it was to do just that if I relaxed or lost my concentration for even a split second. After the complete humiliation I had felt upon my first flight with this aircraft, I sensed a feeling of understanding between my airplane and myself. It would do what I told it to do. It would be more sensitive than the S-2B. It would therefore be even more fun to fly. I was trying not to be intimidated by this airplane. Either I was the boss or it was. I decided that I would be the boss, and taking one more look to the left of the runway and noting Karen

watching this scenario intently and the setting sun reflecting off Spencer's bald head, I applied power.

The acceleration was just as I expected—quick! Within a couple of seconds I had the tail up. A couple of seconds after that, I let my Pitts take itself off the runway. Just as we got airborne I felt how sensitive this bird really was. If I thought the S-2B was finger-sensitive, *my* Pitts was even more so. I did a couple of vertical warbles as I went down the runway and then up we went.

Everything fell into place. Passing through a thousand feet I turned right to exit the traffic pattern. I looked out at those little tiny wings, moved the ailerons a little, and thought, "Man, I'm flying this thing! What a thrill." I have to say that it is one of the top experiences of my aviation career. Gone were the DC-10s and B-757s—great airplanes but nothing like this. Gone were the whacks to my head and screw-ups and lack of confidence and that "static" coming from the back. Everything took one pace behind what I was doing right now in this instant. I was flying a Pitts by myself, and as the sun was slowly setting I exited the pattern and climbed to 3,500 feet staying in sight of Ron and Karen.

I went through the briefed maneuvers, and then Ron (who was watching) gave me a special treat, "Go ahead and roll it." I did, and it was great. A loop followed (Ron had opened the box before my flight). I was in seventh heaven. After about a half-hour of flying my airplane, I turned back to the airfield and under the supervision of the LSO (Ron), I did my first solo landing in the Pitts. What a pleasure it was to fly this airplane.

As I flared Ron was on the radio, "Three feet, hold it, hold it! Two feet. One foot." I did two more landings, and then we called it a night. My confidence was back, and I was proud of having done something I didn't think I was going to be able to do a few days before.

I write this to all of you because I want you to remember your first experiences in the first airplane you owned or the first aerobatic airplane you could call your own. Or your first solo in the Pitts or a similar aircraft. I was 43 years old back then, but when I taxied my Pitts up to my hangar that evening I was like a young kid. Karen was jumping up and down. Ron was standing there like the typical squinty-eyed military instructor watching my every move thinking, "Yeah, the kid did okay today, but he may screw it up somehow tomorrow."

However, I also saw the pride in his eyes because he had shown me a completely different world and the fact that I had not rolled myself in a ball gave tribute to the fact that the instruction he gave me was well done. I parked my Pitts, shut the engine down, and just sat there for a few moments. The hand shake I received when I got out was worth everything, and the hug I got from Karen was even better. That's what this sport is all about—a feeling of accomplishment.

Have any of you ever walked away from your airplane without taking a second look back at it? As I look back on this article I wrote years ago I realize that I have been flying airplanes for 43 years and I don't think there has ever been an airplane I have not walked away from without looking back at it and thinking, "I flew that." After my first Pitts solo, we put her in the hangar after cleaning her up. I put the canopy cover on, made sure the prop was vertical and everything was "just so." Just before I turned out the lights, making sure it was just the airplane and me, I took one last look at my airplane and well... you know what I thought. It was a great feeling—almost spiritual.

My thanks to Ron and Karen Spencer, who put up with me through this whole thing. I also want to thank Ron Saglimbene (Sag) for his advice and his consideration to a neophyte when he (I) needed it. I also want to thank Ron Chadwick who watched some of my touch-and-goes and then took the time to give me advice on what I could do better.

A Short Story on "The Fearless Leader"

by Mr. Chadwick

I had just come back from showing my "great prowess" in getting the Pitts on the ground after some touch-and-goes with Chadwick and Spencer watching me. If you know Chadwick's life and experiences (ex Eastern striker, Thud driver Nam), you know that I was under a little pressure to show that I have the "stuff." I had refueled and was standing there with my pink flight suit talking with Spencer and Ron. I was one of these guys now, right? I could fly a Pitts just like them. Out of the blue, Ron Chadwick turned to me and said, "Are you done refueling?"

I thought, *Huh? Even this old guy can see that I am done refueling. No fuel truck and here I stood making conversation with these veterans.* I said yes. He glanced over at my Pitts. I followed his look, and there in my guide wires was my fuel cap placed right where I had put it a half-hour before (as I had been taught to do for that precise reason). Blushing, I went over and put it back where it belonged; screwed into the top of the fuel tank. So much for showing I had the "stuff." Not the first mistake, and definitely not the last!

That adventure was a humbling experience for me, but one of the best times of my life. It doesn't matter if you have thousands of hours of flight time or just a few. Flying aerobatic aircraft opens a whole new dimension in the world of aviation.

But like Ron Chadwick told me in an e-mail, "We do it for the women!" For the guys, I bet there's some truth to that, but I think they are lying. It's truly for the amazing experience of flying a Pitts! IAC

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Clipped-Wing Cub

Getting out the saw

BY GILES HENDERSON, IAC 159

Author's note: This article was originally published more than 40 years ago in the March 1972 issue of Sport Aviation *magazine. Some revisions have been made to reflect changes that have occurred in the competition environment as well as new options currently available to experimental aircraft.*

Since the article "A Comparison of a Stock J-3 with a Clipped-Wing Cub" appeared in the December 1970 *Sport Aviation*, I have received numerous requests for specific information on modifications of the Cub. This article has been prepared in an attempt to answer the most frequently asked questions. In view of the gross sacrifice in performance (takeoff, ground roll, increased stall speed, rate of climb, glide ratio and, in particular, the loss in useful load) discussed in the previous article, shortening the wings of a stock Cub deserves considerable consideration. In all fairness to the ever-decreasing quantity of good Cubs, the would-be acro pilot should be absolutely certain that he/she knows what to expect from a clipped-wing before getting out the saw.

It has been my observation that it is almost always cheaper to buy an already modified Cub than it is to modify one yourself. Rebuilding a clipped-wing Cub would involve considerably less work than starting from scratch, and at the same time preserve the relatively scarce vintage stock J-3. Furthermore, in rebuilding, and possibly more extensively modifying, a clipped-wing (or any other aerobatic aircraft) you will have the opportunity to become thoroughly acquainted with the mechanical condition of the machine. The peace of mind that this knowledge provides is indeed a valuable security. Needless to say, exposing an aircraft of unknown structural integrity to the stresses of aerobatics has frequently proved fatal. Not only

is the quality of the aircraft's structure a cardinal safety factor but also an important element in the quality of the pilot's airmanship. It is essential to have complete confidence in the aircraft's structural integrity before the pilot can concentrate completely on the precision of his maneuvers. Somehow you just can't execute a quality nine-descending snap roll if you are haunted by the thought of a wing coming off.

Any modification or alteration that results in a departure from the original Piper type certificate will revoke the standard airworthiness certificate unless it conforms to an approved supplemental type certificate (STC). There are, indeed, several STCs available for major alterations of the J-3. The basic Reed-Lippert conversion of the J-3C-65 is authorized by item 621 of Piper Type Certificate A-691, which allows shortening the wings 7 feet. This authorization is applicable only to wood-spar wings and does not authorize larger engines or inverted systems. There are STCs available for similar metal spar modifications. Information concerning STCs and the name and address of the respective holders are available from the FAA. It is necessary to comply with and obtain the FAA approved data for a particular modification from the STC holder. Usually the holder will fix a user's price for the privilege of using the engineering data, drawings, etc. Of course, the actual alteration must be conducted by an A&P mechanic, and an IA or FAA approved repair station must complete the paperwork, including the 337 forms, to return the aircraft to service. In some instances, it is possible to incorporate modifications without STCs by placing the aircraft in the restricted classification and operating with a special airworthiness certificate and restricted operating limitations. This approach requires the production of complete engineering data describing the modification. A third alternative is to license the aircraft in the experimental exhibition classification in accordance with FAR 21.191. This type of certification offers the highest flexibility in the nature of the alteration, but is usually the most restrictive in operating privileges. The specific limitations are made at the discretion of your local FAA GADO. It should be noted that a modified production aircraft is ineligible for certification under the experimental amateur-built classification.

In some cases it is possible to obtain certification in multiple categories in accordance with FAR 21.187. For example, this alternative might allow a standard category Reed clipped-wing Cub to use a portable smoke system under restricted classification during air show performances and be returned to standard category after removal of the equipment, provided sufficient design and engineering data is available for the modification.

To the best of my knowledge, it is not possible to build up a fully aerobatic clipped-wing Cub with available STCs under standard airworthiness.

The extent of specific modifications is naturally contingent on the competition category the Cub will be used in. Hence, the modifications are discussed approximately as they apply to current competition levels.

Primary Category

The Primary category routine is composed of basic positive *g* maneuvers. Furthermore, the competition rules provide 2,000 feet of altitude to complete the six-figure sequence (3,500-foot maximum, 1,500-foot minimum). These two important factors make it possible to be competitive with a low-horsepower aircraft without inverted fuel/oil systems. By trading altitude for airspeed and using proper timing, it is possible for a low-performance aircraft to fly these maneuvers with quality scores. However, the current Primary sequence puts the high-drag low-horsepower non-inverted aircraft at some disadvantage in two places:

1) It is essential to have sufficient energy at the top of a loop to maintain a constant radius. This becomes a huge issue in a downwind loop in which the inverted aircraft is confronted with a significant headwind. The competitor flying a downwind loop with a low-powered aircraft is often faced with the choice of a downgrade for an "l-shaped" loop or "segmented across the top."

2) It is difficult to maintain sufficient energy through a properly executed 180-degree competition turn to execute a high-scoring aileron (slow) roll with a non-inverted aircraft.

One strategy is to build redline speed on the downline of the half-Cuban in order to carry maximum energy through the loop and then make some sacrifices on the low-K 180-degree turn in order to preserve as much energy as possible for the roll. If after completing the 180-degree turn the airspeed does not meet the predetermined minimum for a quality slow roll, the pilot may benefit by taking a 5-point penalty for a program interruption, reposition, and dive back into the box to whatever airspeed is desired to execute the 10K roll with sufficient energy.

The Primary sequence can be completed in a clipped Cub within +4.2 and -1.2*g*'s and 120 mph. Hence, a Cub, modified per Reed-Lippert type conversion, is well-suited for this type of performance envelope. A typical Primary category competition Cub might include the following modifications:

1. Balanced 65-90 hp engine, equipped with a balanced metal prop and standard float carburetor.

2. Fuel tank equipped with a pressure cap and a vent line running from the filler neck to the bottom of the engine cowl.

3. The crankcase breather line is rerouted and possibly a "separator-slobber tank" installed to minimize oil losses while inverted.

4. Wings shortened 7 feet from the root bay.

5. Wing strut spar fittings modified and reinforced to accommodate the new strut angle.

6. Aileron cables shortened.

7. The struts are replaced with custom-built struts, manufactured from streamlined tubing equivalent to (or preferably stronger) than the original front struts.

8. The angle of the fuselage strut fittings is increased to accommodate the shorter struts.

9. Lower door modified to clear struts.

10. Install a *g*-meter.

11. Since the weight of the pilot and parachute may frequently exceed 1,000 pounds during aerobatic routines, the original canvas-sling, rear seat is unsatisfactory. I have personally had the misfortune of discovering this many years ago, halfway through a competition flight. It should be emphasized, that this can potentially lead to very grave consequences since tearing the canvas seat could cause a seat-pack to jam the elevator bell-crank located directly behind the seat. Hence, I recommend that the canvas seat be replaced by a suitable metal seat, constructed to provide the proper elevation with a parachute. Smaller pilots may be able to use a thin backpack in the rear cockpit without major alterations of the seat position.

12. Install a shoulder harness and a ratchet-type dual seat belt.

In addition to these alterations, there are certain critical points that deserve close attention. The tail-wire fittings (Piper part nos. 40521-08, fin; 40521-07, top stabilator; 40521-09, bottom stabilator; and 40531-00, fuselage) may crack after prolonged use under high stress. They should be checked routinely in every preflight. I personally keep a spare set of the fittings on hand and exchange them every 100 hours and do a magnetic particle inspection of the set removed. Likewise, the strut forks should be periodically checked by magnetic particle inspection. All of the engine mount bolts can be replaced for a few dollars and a couple of hours' work. This is another high stress area in which failures on aerobatic aircraft have occurred. I'm sure most experienced aerobatic pilots are personally acquainted with fatal mishaps involving engine-mount structural problems.

The fuel system should be inspected very carefully. Aerobatics will cause the fuel to slosh around with a lot of momentum. This puts a great deal of stress on the seams of the tank. Furthermore, the support straps are subjected to frequent, high *g*-loads. If the tank moves or shifts slightly during aerobatics, the fuel line connecting the tank to the gascolator will eventually become brittle and possibly crack if it is made from copper tubing. A serious in-flight fuel problem can be avoided with proper maintenance.

Sportsman Category

Although the Sportsman category Known has no outside maneuvers it does require prolonged inverted flight, vertical lines, and higher positive-*g* maneuvers. Hence, a good inverted system becomes essential as well as higher overall performance capabilities. Fuel can be obtained while inverted by using a standpipe or flop-tube in the main fuel tank or by installing a small 1-gallon "header tank,"

usually located on the floor of the front cockpit between the rudders and just behind the firewall. Each of these methods has certain advantages and disadvantages. Throttle body injector/carburetors such as the Ellison or the Rotek offer the best inverted power performance. The Posa/AeroCarb type slide carburetors are inexpensive options that work with gravity fuel systems. However the fuel metering and subsequent fuel/air mixture and engine performance varies appreciably with *g*-loads. Cockpit mixture adjustments made during a competition sequence is a significant distraction to say the least.

Inverted oil pressure is a controversial point. Many pilots feel that as long as the aircraft is only flown a few moments inverted (such as in a square loop), a momentary drop in oil pressure is not critical. In fact, you can find many engines that have flown several hundred hours of aerobatics where prolonged inverted flight was avoided, with no apparent consequences upon teardown. On the other hand, factory representatives, and many engine mechanics, shudder and have fits at the mention of such abuse. I personally believe it is far more abusive to start an aircraft engine in cold weather without pre-heating than it is to fly slow rolls or Immelmann turns with momentary drops in oil pressure.

During the past 40 years since the original version of this article appeared in *Sport Aviation*, there has been a tremendous upgrade in competition aircraft. In addition to Pitts Specials, we are now seeing high-performance composite monoplanes competing in the Sportsman category. Unlike the self-taught pilots of the '70s, many competitors today are acquiring professional training and coaching. It is no longer possible to be competitive with a clipped Cub in the Sportsman category without at least 85 hp and a good inverted system (and a great deal of practice).

Many of the maneuvers in the Sportsman sequence will require substantially higher entry speeds than the Primary sequence. Experimental category Cubs are often operated 15-20 mph above the original Piper redline airspeed. Hence, not only will the ship need higher performance and inverted capabilities, but also it will need to be stronger. The following modifications will improve performance and strength of the Cub:

1. Replace the normal 1/8-inch (0.125) windshield with 3/16-inch (0.187) Plexiglas, if available. Also, brace the windshield near the top center from the cabane structure to prevent deformations at high airspeeds.

2. Use heavy gauge leading-edge material in the wings, such as that

manufactured for the Tri-Pacer.

3. Replace all of the false ribs with full ribs.

4. Use closer rib stitching.

5. Modify the compression members (such as using double tubes, one above the other with a common end plate) to prevent torsion of the spars. Abrupt, high-*g* maneuvers such as snaps or square loops can cause torsional stresses in the wing, which may result in multiple rib failures.

6. Rig the wings with no dihedral. This will lessen the upright lateral stability but improve inverted-flight characteristics.

7. Install internal strut tubes to increase their strength.

8. Install smaller wheels, tires, and wheelpants with disc brakes.

9. Remove the bungee shocks and replace the round shock tubes with a solid streamlined tube.

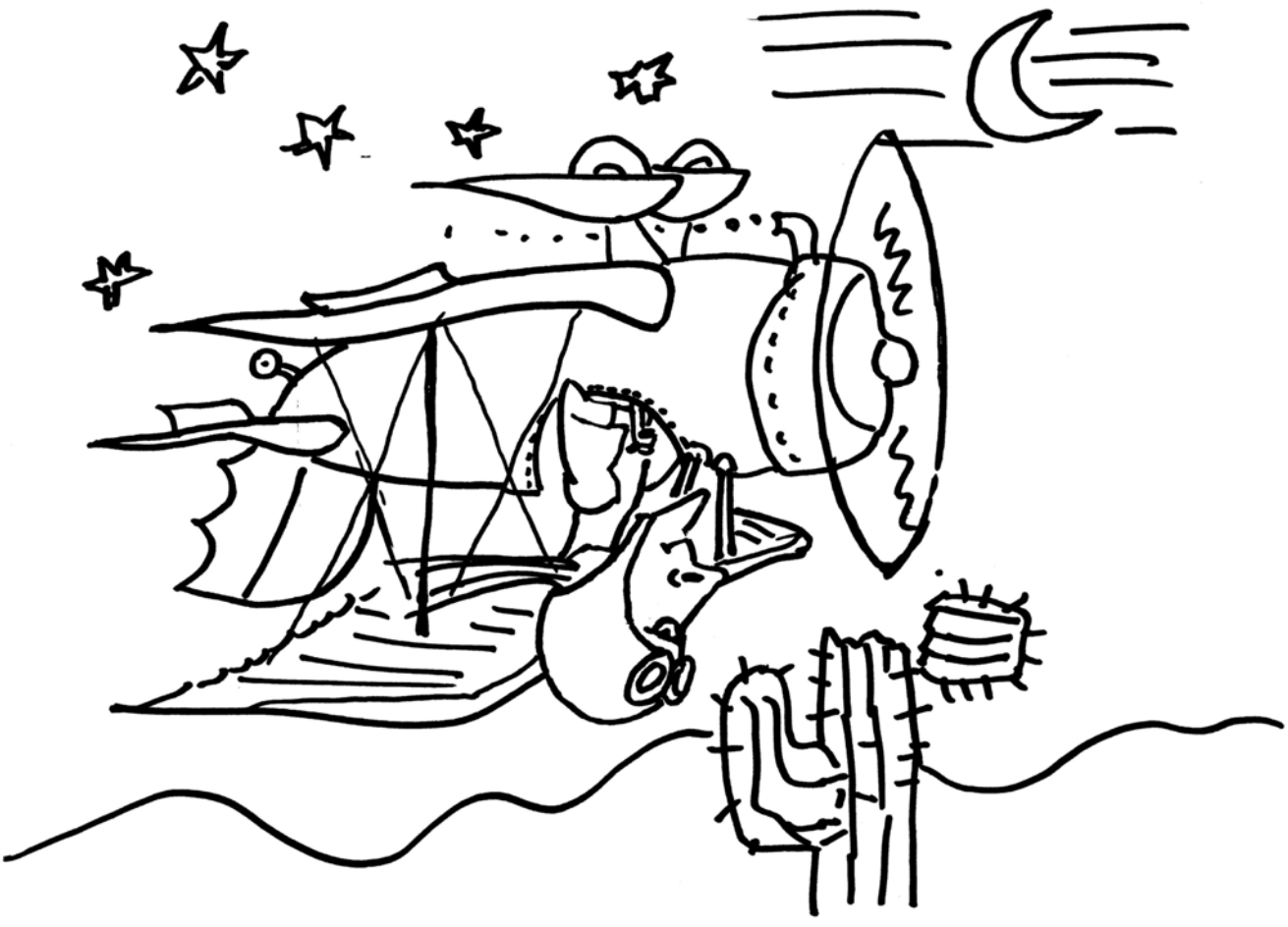
10. Although snap rolls have been deleted from Sportsman Known sequences, stall strips installed on the leading edge of the wing (typically 7 to 10 inches long, installed directly in line with the outboard strut fittings) will allow snap rolls to be executed with substantially lower wing loadings. The abrupt, high-speed stall characteristics may or may not be desirable.

11. The Christen type inverted oil system can be adapted to the Continental engine. However, if prolonged inverted oil pressure is deemed unnecessary for Sportsman level sequences, at least an inverted oil recovery system should be installed to eliminate oil losses through the crankcase breather.

Intermediate Category

A few years ago it was indeed possible to be competitive in Intermediate competition with high-performance clipped Cubs. Today, however, it has become unrealistic for a super-modified Cub to be competitive with the six-cylinder monoplanes. Over the years there have been a handful of ultra-modified Cubs that in the right hands were capable of Intermediate and even Advanced competition. These machines typically incorporate clipped semi-symmetrical T-craft wings, beefed-up shortened fuselage with extra brace wires, tubing and gusseted clusters, dorsal fin, balanced elevator, single-place cockpit, and 150-200 hp fully inverted engines with "Super Cub" pressure cowling. Modifications this extensive are clearly complex and require an experienced master craftsman.

The greatest variety of aircraft types are generally found in the Sportsman lineup. Unfortunately, newcomers often perceive the need for an expensive high-performance airplane to compete. Clipped Cubs, T-crafts, Decathlons, classic biplanes, and the like can mix it up with the exotic acro mounts on a level playing field providing the Sportsman sequence is designed to measure airmanship rather than aircraft performance. To get in there and have a go at it with any kind of machine is a challenge to say the least. It seems especially fun to do it in a Cub. *IAC*



Introduction to Competition Aerobatics

Getting the basics

BY DOUG LOVELL

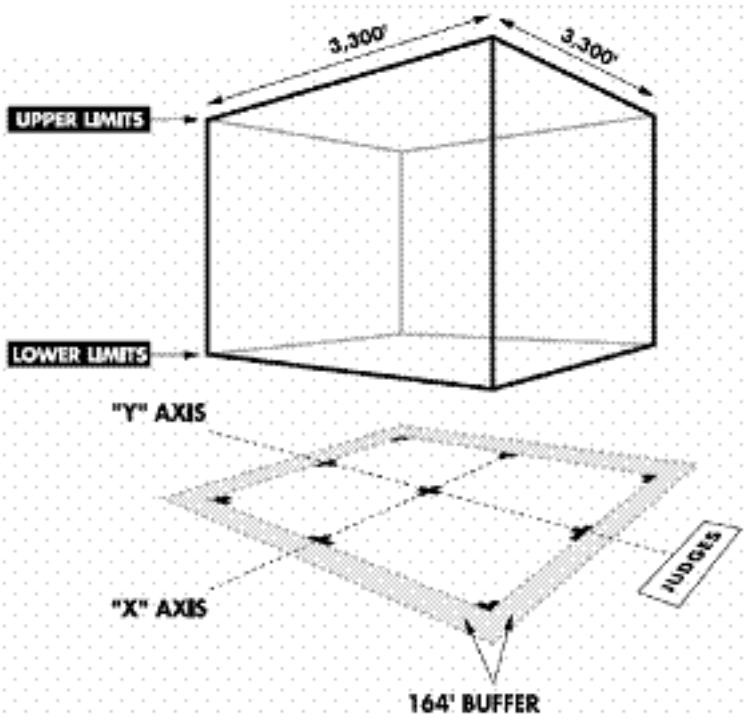
The popular characterization for aerobatic flying is "stunt flying." Pilots who engage in this activity are sometimes thought to be crazy daredevils. This romantic and somewhat sensational view is common in the media because it is exciting. It sells advertising and gets attention. The reality is very different.

Aerobatic competitors are pilots with some aerobatic training who want to do more than a Sunday loop. They are pilots looking for new challenges, working to improve their skills and perfect the accurate performance of aerobatics figures, routines, and their flying to exacting standards.

Competition aerobatics is a physically and mentally challenging sport that takes years to learn and a lifetime to master. Judges grade the contestants, much like the figure-skating contests popular in the Winter Olympic Games. World-class aerobatic competitors start with some natural talent, then dedicate thousands of hours in the air and more on the ground to train to be the very best. More commonly, 600 or 700 pilots in the United States participate, for fun and for challenge, in a few dozen regional contests around the country each year.

The Aerobatic Box

Aerobatic competitors perform their aerobatic figures in a safe zone called the "aerobatic box," or more simply, "the box." The box keeps



competitors in front of the judges. It lies over a 1-square-kilometer area on the ground delimited by white markers visible from the air. The markers show the corners, the center, and the center of each side. One kilometer is about 3,300 feet, a little more than six-tenths of a mile.

The altitude for the bottom of the box varies for different levels of competition. The most advanced pilots may descend as low as 300 feet above the ground. The beginning pilots must remain more than 1,500 feet above the ground.

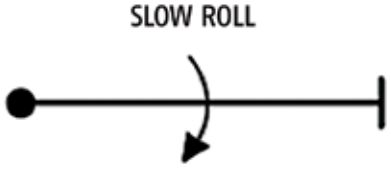
There is a maximum altitude for all pilots of 3,500 feet. This keeps the pilots low enough to be seen by the judges.

Six-tenths of a mile is a good distance to walk. You cover it on the highway, in your car, in about half a minute. A competition airplane will cross it in 15 seconds. Looking down from a cockpit at 3,500 feet, the box looks about the size of a postage stamp. Maintaining awareness of position in the box and performing figures in good sight of the judges is part of the challenge.

Aerobatic Sequences

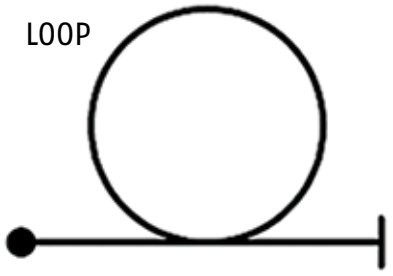
An aerobatic sequence is a series of clearly defined aerobatic figures. Aerobatic figures are individual maneuvers such as loops and rolls that begin and end with horizontal, level flight (upright or inverted). The system of diagramming aerobatic figures and sequences was developed by Jose L. Aresti in the early 1960s. It shows what a pilot is expected to fly in a manner similar to the way music shows what a musician is expected to play.

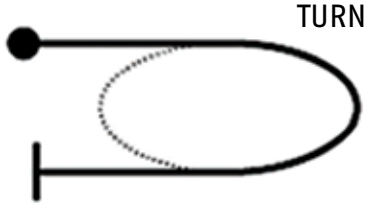
The paragraphs that follow describe some of the aerobatic figures that appear in an aerobatic sequence. They show the Aresti symbol, give the popular name, and provide a short description of the figure along with some of the things the judges look for.



The **slow roll** requires that the aircraft roll without changing its flight path. Judges will deduct points if the aircraft changes direction in the roll, pitches up or down, or changes the rate of roll.

A competition **loop** requires the competitor to fly a perfect circle in the sky regardless of wind conditions. Judges will deduct for variations in the radius of the loop and for changes in roll or in heading. Most Sunday loops are shaped like a script letter '*ℓ*'. They have a very pinched, narrow radius at the top with wide radius entries and exits. Competition loops are round.

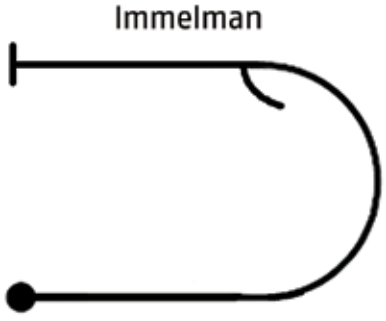




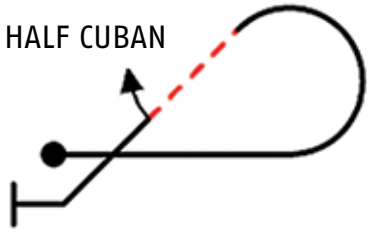
The competition **turn** requires the pilot to roll on heading to a bank of at least 60 degrees, immediately begin a constant rate change of heading without climbing or descending, stop after 90, 180, 270, or 360 degrees, then roll on heading to level flight. Judges deduct for inadequate bank, changes in rate of turn, climbing or descending, and finishing off-heading.

The **spin** is a controlled maneuver in which the airplane essentially falls downward while rolling and yawing at the same time. Judges look for the nose and a wing to drop together, at the same time, in the entry to the spin. They look for a clean vertical downline after finishing the spin. The wings should stop at the exact amount of rotation specified—anywhere from one to two turns in quarter-turn increments.

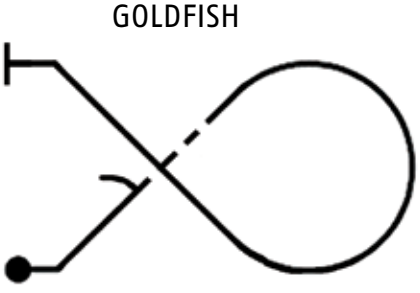
Aerobatic competitions of the International Aerobatic Club have five categories, or levels of competition, of increasing level of difficulty.



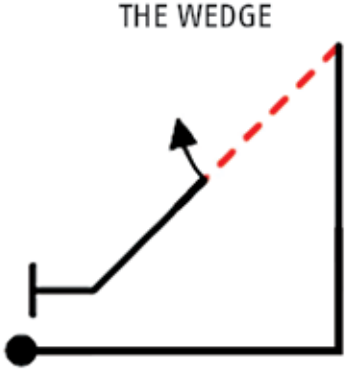
The **Immelmann** is a half-loop up followed immediately by a roll to upright. The half-loop up must have a constant radius. The roll must occur on a level line without delay after the half-loop up. The plane must fly off level from the half-loop while making the half-roll.



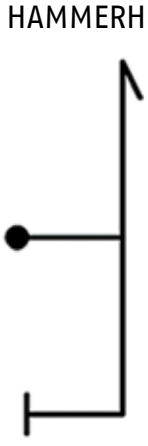
The **half-Cuban** requires a five-eighths loop of a constant radius. The pilot must draw a 45-degree line and center a roll to upright on that line. Judges deduct for changes in radius, steep or shallow lines, and rolls not centered on the line. On all 45 lines for powered airplanes, the pilot points the airplane halfway between the horizontal and vertical. Judges call an angle closer to vertical "steep." Closer to horizontal they call "shallow."



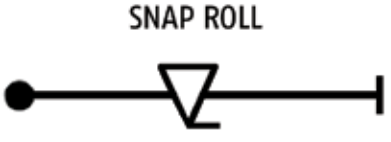
Flying the **goldfish** the competitor flies two 45-degree lines connected by a three-quarter loop. Any rolls must be centered on the lines. By now you know that all loops and loop portions must have a constant radius.



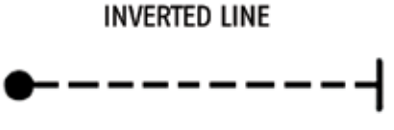
The **wedge** has a vertical line and a 45-degree line. Judges deduct if the pilot does not point the airplane vertical. If the airplane is slightly on its belly, they call it "positive." If it is slightly on its back, they call it "negative."



In the United States we call this a **hammerhead**. Elsewhere it's described as a stall turn. The competitor flies straight up until the plane slows nearly to a stop, then turns the plane on the yaw-axis, with the rudder, and flies straight down. Judges deduct points if the plane rolls or pitches during the turn, or if it flies any kind of an arc, rather than pivoting at the top of the vertical before starting back down. Rolls on the vertical lines must be centered on the lengths of the lines.

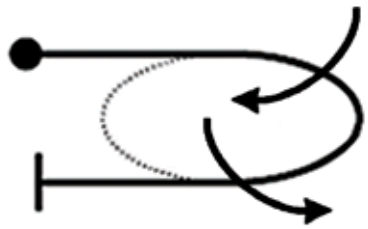


A **snap roll** is a very fast roll caused by rapid change in pitch and yaw, not by the ailerons as in a slow roll. The nose moves abruptly upward (toward the canopy) just before the rotation begins. The rotation stops precisely after a given number of quarter-roll increments.

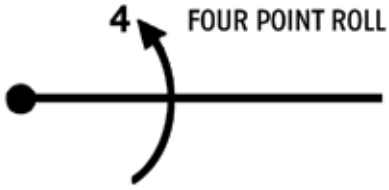


The Aresti symbol will show a dotted line whenever pilots must push the nose away from them to maintain the flight path.

ROLLING TURN

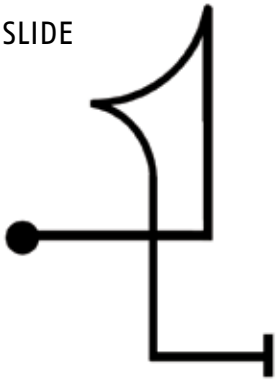


A **rolling turn** will have one or more rolls integrated with the turn. The rolls may be inside, in the same direction of the turn; outside, in the opposite direction of the turn; or alternating inside and outside. The rate of turn and the rate of roll must be constant. Both the turn and the rolls must end at the same time after 90, 180, 270, or 360 degrees of heading change.



Rolls may contain hesitations, or "points." A two indicates hesitations every half roll. A four every quarter roll, and an eight every eighth roll. The pilot must pause the same amount of time at each point and move between points with a constant roll rate. The points should look like the ticking of a clock. At the same time, the plane must roll without changing direction, climbing, or descending.

TAIL SLIDE



In a **tail slide** the airplane will briefly fly backward. The competitor flies a vertical line up until gravity begins to pull the airplane back down tail-first. The pilot must cause the plane to flip nose to tail wheels-down (positive) or wheels-up (negative) after sliding at least one-half the length of the fuselage. The pilot must fly a vertical line down before resuming level flight.

NEGATIVE SNAP

A **negative snap** roll is much like the positive snap roll described earlier, only watch for the nose to move downward (toward the wheels) rather than upward. The nose will move abruptly before the onset of very rapid rotation.

Competition Categories

Aerobatic competitions of the International Aerobatic Club have five categories, or levels of competition, of increasing level of difficulty. The five categories are Primary, Sportsman, Intermediate, Advanced, and Unlimited.

The Primary category is the most basic, entry level category of aerobatic competition. Pilots must demonstrate a spin, loop, roll, and competition turns.

The Sportsman category offers a greater challenge to the beginning competitor and a category for all competitors with recreational aerobatic aircraft. It includes a greater number and variety of figures, including the hammerhead. Sportsman competitors may design a "Free" sequence. A Free sequence is a sequence of the competitor's design that satisfies constraints on the type of figures flown, the number of figures, and the total amount of difficulty of the sequence.

The Intermediate category adds the snap roll, some inverted figures, and 90-degree rolling turns. Intermediate competitors must provide a Free program. If there is time at the contest, they may also be required to fly an "Unknown" compulsory sequence.

The contest director provides the Unknown sequence to the competitors the day before the competitors

must fly it. Competitors may have practiced many of the figures in the Unknown, but have no opportunity to practice the sequence before performing it for the judges at the contest. You might see competitors doing a strange dance next to their airplanes as they rehearse the sequence on the ground before their flight. Some of the challenge of the Unknown is remembering what to fly, and reading the sequence card in the airplane while flying.

The Advanced category includes more challenging figures with multiple rolls and snaps on each figure, more inverted figures, and 360-degree rolling turns. Advanced pilots fly a Known compulsory, Free, and Unknown compulsory sequence.

The Unlimited category is the most difficult of all. Only the most capable pilots flying the most capable airplanes can manage the figures required in the Unlimited category. Pilots flying Unlimited are flying at the level of air-show performers and world competitors. Unlimited sequences include snap and roll combinations on vertical lines, negative snap rolls, and tail slides.

The Airplanes

Biplanes are popular in all but the highest category of aerobatic competition. Most of the biplanes you will find at any of the dozens of regional contests held around the United States each year were designed by one man, Curtis Pitts, and are generically referred to as "Pitts Specials." The wing construction uses wooden spars and ribs with steel wire reinforcements all covered with fabric. The fuselage is welded steel tubing. The fuselage from the engine to the cockpit has sheet-metal covering. The remainder of the fuselage and tail has fabric covering.

While the Pitts dominated aerobatics in the 1960s, world class aerobatics is now dominated by high-performance monoplanes. There are many different monoplane models. Some of their names are Sukhoi, Yak, Zlin, Extra, CAP, Edge, MX, and Giles. Most have a welded steel tubing fuselage. Some use fabric covering; some use sheet steel. The latest models use lightweight carbon composite material.

The Decathlon and especially the higher horsepower Super Decathlon are popular for introductory aerobatics at flight schools and widely available for beginning competitors, including for rental at regional aerobatic contests. They are competitive in the Primary and Sportsman categories of aerobatic competition.

Getting Started

As a pilot, the best way to begin competition is to find a flight school near you that brings its plane to a competition near you. The IAC has flight school and competition listings online at *www.IAC.org*. Take a few lessons with the flight school, and they will send a safety pilot up with you to fly at the contest.

Your next step will be to get thorough spin training, solo sign-off, more practice, then solo competition. Pretty soon you'll want an aerobatic-capable airplane of your own, beware; but it is very practical to fly a flight school Super Decathlon in Sportsman for years of fun.

IAC chapters offer practice days and "patch" days around the country. Here, you fly for a judge, or with an instructor, and earn IAC patches signaling your aerobatic accomplishments. There are separate patches for competition accomplishments. You can show that you can fly a good loop. Then you can show that you can fly a good loop as part of an aerobatic sequence in front of an audience of judges at competition.

If you have an aerobatic plane and enjoy some recreational aerobatics, find a contest near you, contact the contest director (CD), schedule the weekend free, and get your game on. The CD will ensure that someone is assigned to you as a coach. If you would like a safety pilot, use some lead time to get help from the CD identifying a few people to ask; maybe try to fly with them before the contest. Going the school route isn't a bad idea, either. It's a sure way to have someone dedicated to your fun and safety.

Some are afraid of competition because they might not be good enough. The Primary category is the get-good-enough category. No one expects you to ace your first time in the box. They will expect you to look after your safety, seek guidance, and enjoy lots of talk about flying aerobatics. Every pilot at the contest is learning and improving.

One word of warning. IAC competition is fun. You are likely to get hooked. Beware. IAC

AIRCRAFT

Sukhoi SU-26, 1993, 560 TT, 196 SMOH on 400 hp M14PF, 225 hr on MT-29 prop, Cleveland wheels and brakes, Flush mounted Garmin 496, Excellent condition $180,000 561 339-2001

IAC

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ADVERTISING INDEX

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.*

Wildwoods AcroBlast
Thursday, June 13 - Sunday, June 16, 2013
Practice/Registration: Thursday, June 13 - Friday, June 14
Power: Primary through Unlimited
Location: Cape May County Airport (WWD): Cape May, NJ
Region: Northeast
Contest Director: Craig B. Wisman
Contact Information: Primary Phone: 717-756-6781
E-Mail: cwisman@comcast.net
Website: *www.iac58.org*

Ohio Open
Friday, June 14 - Saturday, June 15, 2013
Practice/Registration: Thursday, June 13
Rain/Weather: Sunday, June 16
Power: Primary through Unlimited
Location: Union County Airport (KMRT), Marysville, OH
Region: Mid-America
Contest Director: Sheri Davis
Contact Information: Primary Phone: 614-448-7392
E-Mail: *sdavis_1985@yahoo.com*
Website: *iac34.com*

U.S./Canada Aerobatic Challenge
Saturday, June 22 - Sunday, June 23, 2013
Practice/Registration: Thursday, June 20 - Friday, June 21
Power: Primary through Unlimited
Location: Olean Municipal Airport (KOLE): Olean, NY
Region: Northeast
Contest Director: Patrick Barrett
Contact Information: Primary Phone: 716-361-7888
E-Mail: *cbpbmb@aol.com*
Website: *IAC126.blogspot.com*

Apple Cup
Friday, June 21 - Saturday, June 22, 2013
Practice/Registration: Thursday, June 20
Rain/Weather: Sunday, June 23
Gliders Categories: Sportsman Unlimited
Power: Primary through Unlimited
Location: Ephrata Municipal Airport (KEPH): Ephrata, WA
Region: Northwest
Contest Director: Will Allen and Jerry Riedinger
Contact Information: Primary Phone: 425-985-9469
E-Mail: *JRiedinger@perkinscoie.com*
Website: *www.applecup.org*

Lone Star Regional Aerobatic Contest
Friday, June 21 - Sunday, June 23, 2013
Practice/Registration: Saturday, June 15 - Friday, June 21
Rain/Weather: Sunday, June 23
Power: Primary through Unlimited
Location: North Texas Regional (GYI): Sherman, TX
Region: South Central
Contest Director: Mike Gallaway
Contact Information: Primary Phone: 214-673-9935
E-Mail: *mike.gallaway@tx.rr.com*
Website: *iac24.org*

Bear Creek Bash
Friday, June 28 - Saturday, June 29, 2013
Practice/Registration: Thursday, June 27
Rain/Weather: Sunday, June 30
Power: Primary through Unlimited
Location: Clayton County Airport - Tara Field (4A7): Hampton,GA
Region: Southeast
Contest Director: Chris Rudd
Contact Information: Primary Phone: 850 766 3756
E-Mail: *invertedribboncut@gmail.com*

Midwest Aerobatic Championship
Friday, June 28 - Sunday, June 30, 2013
Practice/Registration: Friday, June 28
Power: Primary through Unlimited
Location: Seward (SWT), Seward, Nebraska
Region: Mid-America
Contest Director: David Moll
Contact Information: Primary Phone: 402-613-5422
E-Mail: *davidmoll66@gmail.com*
Website: *IAC80.org*

Michigan Aerobatic Open
Saturday, July 6 - Sunday, July 7, 2013
Practice/Registration: Thursday, July 4 - Friday, July 5
Power: Primary through Unlimited
Location: Jackson County Airport-Reynolds Field (JXN): Jackson, MI
Region: Mid-America
Contest Director: Brian Roodvoets
Contact Information: Alternate Phone: 8106670642
E-Mail: *redfoot@usol.com*
Website: *iac88.eaachapter.org*

Green Mountain Aerobatic Contest
Friday, July 12 - Sunday, July 14, 2013
Practice/Registration: Thursday, July 11 - Friday, July 12
Glider Categories: Sportsman through Unlimited
Power: Primary through Unlimited
Location: Hartness State Airport (VSF), Springfield, VT
Region: Northeast
Contest Director: Bill Gordon
Contact Information: Primary Phone: 803 585 0366
E-Mail: *wsgordon@earthlink.net*
Website: *http://iac35.aerobaticsweb.org*

Salem Regional Aerobatic Contest
Saturday, July 13 - Sunday, July 14, 2013
Practice/Registration: Friday, July 12
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*

High Planes HotPoxia Fest
Saturday, July 13 – Sunday, July 14, 2013
Practice/Registration: Friday, July 12
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: *DagmarAerobatics@me.com*
Website: *www.iac12.org*

Kathy Jaffe Challenge
Friday, August 9 – Sunday, August 11, 2013
Practice/Registration: Thursday, August 8 – Friday, August 9
Power: Primary through Unlimited
Location: South Jersey Regional Airport (VAY), Mt. Laurel, NJ
Region: Northeast
Contest Director: Mark Mattioli
Contact Information: Primary Phone: 609-634-0327
E-Mail: *ce2n6gk@gmail.com*
Website: *www.iac52.org*

Hoosier Hoedown
Saturday, August 10 – Sunday, August 11, 2013
Practice/Registration: Friday, August 9
Power: Primary through Unlimited
Location: Kokomo Municipal Airport (OKK), Kokomo, Indiana
Region: Mid-America
Contest Director: Mike Wild
Contact Information: Primary Phone: 765-860-3231
E-Mail: *mike.wild@hotmail.com*
Website: *www.hoosierhammerheads.com*

Doug Yost Challenge
Saturday, August 17 – Sunday, August 18, 2013
Practice/Registration: Thursday, August 15 – Friday, August 16
Power: Primary through Unlimited
Location: Spencer Municipal Airport (SPW), Spencer, IA
Region: Mid-America
Contest Director: Aaron McCartan
Contact Information: Primary Phone: 515-570-3537
E-Mail: *northernplanes@outlook.com*
Website: *www.iac78.org*

Beaver State Aerobatic Contest
Friday, August 23 – Saturday, August 24, 2013
Practice/Registration: Thursday, August 22
Rain/Weather: Sunday, August 25
Power: Primary through Unlimited
Location: Eastern Oregon Regional Airport (PDT), Pendleton, OR
Region: Northwest
Contest Director: John Smutny
Contact Information: Primary Phone: 206.399.7097
E-Mail: *johnsmutny@gmail.com*
Website: *http://www.iac77.eaachapter.org/*

2013 Upper Canada Open
Saturday, August 24 – Sunday, August 25, 2013
Practice/Registration: Friday, August 23
Power: Primary through Unlimited
Location: Chatham Kent Municipal Airport (CNZ3), Chatham ON, Canada
Region: Mid-America
Website: *http://aerobaticscanadachapter3.blogspot.com*

Oshkosh 2013
Saturday, August 24 – Sunday, August 25, 2013
Power: Primary through Unlimited
Location: Wittman Regional Airport (OSH), Oshkosh, WI
Region: Mid-America
Contest Director: Audra Hoy
Contact Information: Primary Phone: 920-203-9000
E-Mail: *audra_hoy@yahoo.com*

Happiness is Delano
Saturday, August 31 – Sunday, September 1, 2013
Practice/Registration: Friday, August 30
Power: Primary through Unlimited
Location: Delano Municipal Airport (DLO), Delano, CA
Region: Southwest
Contest Director: Stephen De La Cruz
Contact Information: Alternate Phone: 760-963-6426
E-Mail: *sec@iacchapter26.org*
Website: *www.iacchapter26.org*

Hammer Fest
Saturday, August 31 – Sunday, September 1, 2013
Practice/Registration: Friday, August 30
Rain/Weather: Monday, September 2
Power: Primary through Unlimited
Location: Llano Municipal Airport (AQO), Llano, Texas
Region: South Central
Contest Director: Mike Carver
Contact Information: Primary Phone: 360-888-7604
E-Mail: *mngcarver@comcast.net*
Website: *iac107.org*

Ace's High Aerobatic Contest
Saturday, September 7 – Sunday, September 8, 2013
Practice/Registration: Friday, September 6
Power: Primary through Unlimited
Location: Newton City Airport (EWK), Newton, Kansas
Region: South Central
Contest Director: Ross Schoneboom
Contact Information: Primary Phone: 316-648-5057
E-Mail: *schoneboomr@prodigy.net*
Website: *www.iac119.webs.com/*

East Coast Aerobatic Contest
Saturday, September 7 – Sunday, September 8, 2013
Practice/Registration: Friday, September 6
Power: Primary through Unlimited
Location: Warrenton-Fauquier Airport (HWY), Midland, VA
Region: Northeast
Contest Director: Scott Francis
Contact Information: Primary Phone: 703-618-4132
E-Mail: *s.francis@ieee.org*

NorAm Team Championship
Friday, September 13 – Saturday, September 14, 2013
Practice/Registration: Thursday, September 12
Rain/Weather: Sunday, September 15
Power: Primary through Unlimited
Location: Ephrata Municipal Airport (EPH), Ephrata, WA
Region: Northwest
Contest Director: Jerry Riedinger and Emma Stewart
Contact Information: Primary Phone: 425-985-9469
E-Mail: *JRiedinger@perkinscoie.com*
Website: *http://www.iac67.org/*

BY GARY DEBAUN, IAC #4145

Jim Nahom

GD: Jim, how did you get your start in aerobatics?

JN: I always wanted to get my pilot's license, and once I finally got it I found myself getting bored with going for the $100 hamburger. I did not feel the need to pursue more ratings than my private. The flight school that I took lessons at put a Citabria on line, so I figured I would get a tailwheel endorsement. Well, as it turned out the instructor taught me some basic aerobatic maneuvers up to his ability and then sent me on my way to find a new aerobatic instructor.

GD: I know you are not currently competition flying, but you are very active in Chapter 49 (Los Angeles Aerobatic Club). What volunteer roles do you play?

JN: Just about anything that needs to be done. There is nothing worse than sitting around with nothing to do. At a contest there is ALWAYS something to do.

GD: At the Apple Valley Duel in the Desert contest you and Judi open up your home to the contestants and volunteers to spend the nights (sleeping on your floor), so how does that work out?

JN: We have a modest three-bedroom two-bath house. Anybody is welcome to stay with us as long as they don't mind the couch, floor, or a tent in the backyard. Last year I think we had 11 people. Turned out to be a bunch of fun.

GD: What aircraft have you flown in competition and what category?

JN: I started out with the Citabria although never competed in it. Then I flew a 150-hp Decathlon with a constant-speed prop and also a Super Decathlon both in Sportsman and Intermediate. After that came the S-1S. The most bang for the buck in an aerobatic mount.

GD: Do you see yourself in the box again sometime in the future?

JN: Yes I do. I should be putting out box markers at the first few contests this year.

GD: If you could change one thing in the IAC, what would it be and why?

JN: One thing we always seem to be lacking is new and interesting Known and Unknown sequences. I think every chapter should be encouraged strongly to submit one or two of each. It can make for a fun and interesting club meeting.

GD: What is your favorite contest and why?

JN: That's an easy one, Paso Robles. Unfortunately we no longer have a waiver for that contest so I am looking forward to Coalinga in place of it.

GD: Who was or is your greatest influence in the aerobatic community?

JN: Marta Meyer.

GD: What are your other interests in life?

JN: My kids. Watching them grow up and become good, kind, and caring young adults makes me very proud.

GD: How did you luck out and find such a great wife who flies competition aerobatics also?

JN: Judi owned the first Pitts I ever flew. It was several years after that we met up at a contest and the rest is history. *IAC*

Occupation: Printing Business
Chapter Affiliation: Los Angeles Aerobatic Club Chapter 49
***Age: 50**
E-mail:** ***califprint@earthlink.net
***Phone: 626-893-3059**

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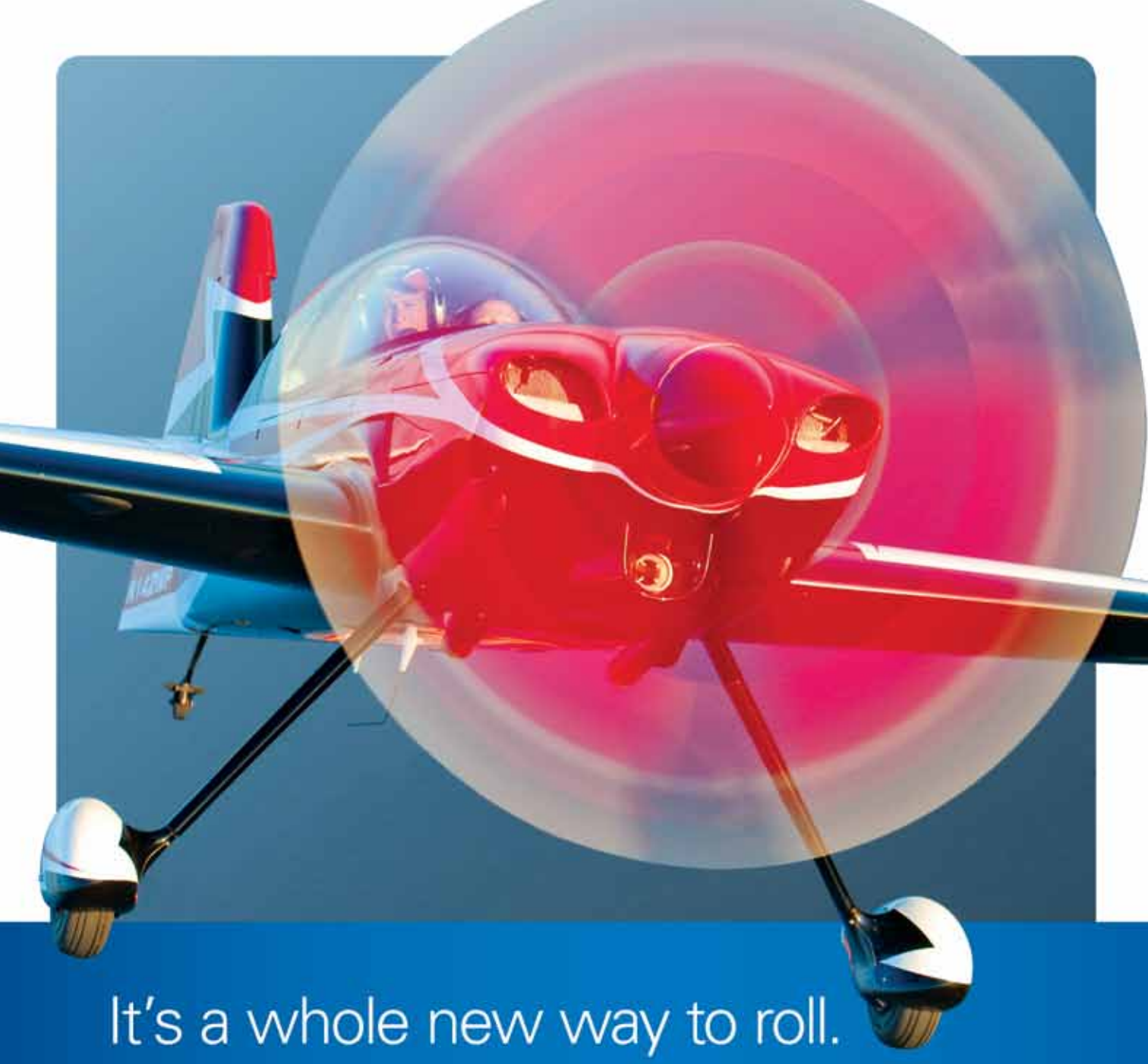

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