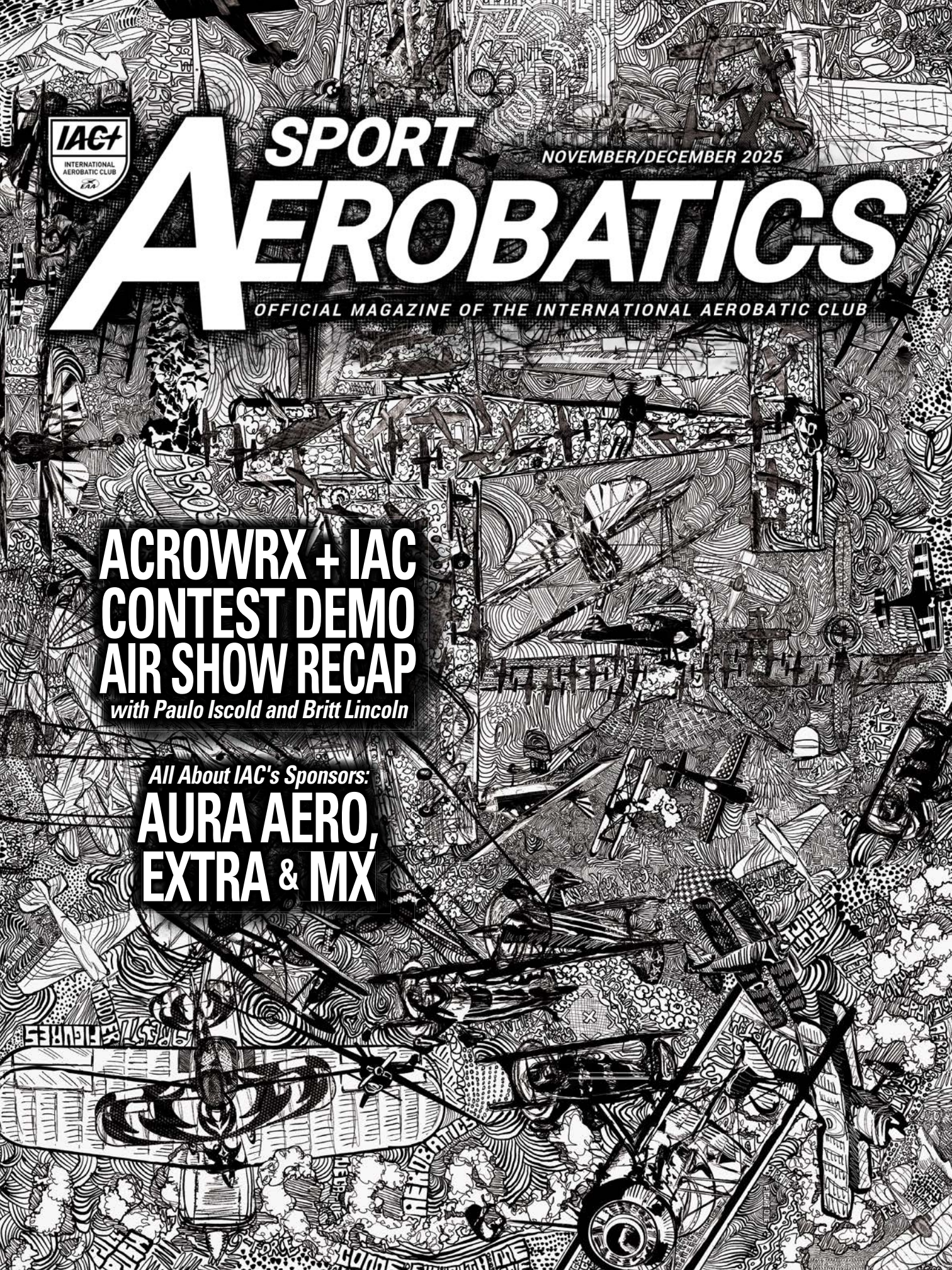
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ACROWRX + IAC CONTEST DEMO AIR SHOW RECAP
with Paulo Iscold and Britt Lincoln
All About IAC's Sponsors:
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ONE OF THE MOST exciting innovations to hit our sport in recent memory is the ACROWRX program, created by Paulo Iscold. At EAA AirVenture Oshkosh this year, ACROWRX showcased its many capabilities at the ACROWRX + IAC Competition Demo Air Show. In this event recap, we'll unpack the groundbreaking technology behind this unique air show and discuss how it has started to revolutionize both training and public engagement in our beloved sport.

Bringing Aerobatics to Life: Inside the ACROWRX Live-Scoring Experiment at Oshkosh IAC Demo

BY PAULO ISCOLD

It was February 2025 when I got a call from Jeff Boerboon inviting ACROWRX to help boost the IAC demo at this year's EAA AirVenture Oshkosh. The challenge was simple: Can we transmit the air show live and allow the public to interact with scoring? The goal was even simpler: to make a competition aerobatic demo understandable, engaging, and interesting for the public.

Let's be completely honest: competition aerobatics is typically only interesting to those who are actually involved with it. For someone who doesn't understand the rules or isn't engaged in the community, competition aerobatics can look, well ... a bit boring. But as those of us involved in competition aerobatics know, that's absolute nonsense! Aerobatic competitions are fascinating from every angle if you look closely enough (judge, competitor, volunteer, photographer — you name it!), and we could spend this whole article arguing about that, but instead, let me just tell you what we did — and how we tried to fulfill Jeff's vision to make competition aerobatics interesting and understandable for the general public!

At this point, you may have heard of the program I designed for aerobatic pilots called ACROWRX. The idea grew out of my activities with the Red Bull Air Race, when I decided to learn aerobatics myself. Basically, you can put a data acquisition unit inside your airplane that measures and records your airplane's every move, and then after the flight — on the ground — you can use this data to replay the performance from the perspective of a spectator or a judge and analyze the flight at your discretion. But for the IAC Competition Demo Air Show at AirVenture 2025, Jeff asked me to go a few steps further. He wanted to know: Can we broadcast the movements and/or summary data of a specific flight, live, to the whole world? And how could we engage users further by allowing them to submit feedback about the flight? Driven by challenges (especially unpaid challenges, it seems), I told Jeff, "I'll figure this out!"

My first step was to call Brian Taylor from Bolder Flight Systems (BFS). Brian is the mastermind behind the OnFlight Hub (OFH), the data acquisition unit that made ACROWRX accessible to the aerobatic community. I knew the OFH had a Wi-Fi data stream, so if we could capture that data, we could definitely do more with it. Brian jumped in right away, and within a few weeks, he sent me hardware to test telemetry (the use of radio waves, phone lines, etc. to transmit readings from instruments to a device that records them). At the same time, I tested another approach: using a cellphone to capture the OFH Wi-Fi data and send it over the cellular network to the ground.

"It was a unique experience because it was technically an air show, but it felt really like a competition." — Brittanee Lincoln

By April, I started testing the cellphone-based system, which was an attractive solution because it would allow us to transmit data easily without ground equipment, even making live online coaching possible. We got it working fairly well, but the instability of cell service at altitude and the risk of a congested network at Oshkosh, Wisconsin, during the enormous AirVenture event that attracts well over 500,000 annual attendees forced us to abandon that plan. Still, I don't think it will be long before phones are all satellite-based, which will make this solution possible. At the Cal Poly flight-test lab, we're already using Starlink for telemetry in flight tests — at least in airplanes big enough to carry the antenna.

So, for Oshkosh, we committed to the BFS radio. The only drawback? It requires a ground station and a computer with internet. For the onboard radio, we designed an enclosure with an internal battery that could be easily mounted to the sighting device of an Extra. That location gave us the best line of sight between the airborne antenna and the ground during aerobatic maneuvers. Initial testing made me confident we had a path forward.

The next step was modifying ACROWRX software to accept live data — rather than saved files. It wasn't an easy task, but it was mostly programming work. The real breakthrough came from using real-time database

PHOTO PROVIDED BY **BRITT LINCOLN** *AIRPLANE ILLUSTRATIONS BY* **TAYLOR MERSHON**

services offered by providers such as AWS and Google. These services allow very high-speed inbound and outbound data communication, meaning people anywhere in the world can access the data in real time with little latency. Initial testing was surreal. I'd move the OFH unit in my hand at the Cal Poly lab, and my friends in Brazil would see the data on their computers before our FaceTime video got there!

So, now we had a solution to transmit live aerobatic data from an airplane to the world. The last piece was to create a user interface to let the public interact with the flight in real time. And, well ... this is probably where we fell short. Not entirely our fault, but our sport is just too complicated. During the air show, there's no way to explain the basics of competition aerobatics to the average Oshkosh spectator who isn't already involved in aerobatics. Our rules are just too complex, too detailed, and based on an immense foundation of fundamental knowledge that takes years to fully grasp. So, to keep it simple, we gave people just one option: to give a single score to the whole flight, just based on the overall impression of the flight.

Did it work? I don't think so. That's on me — I need a better user interface. It also caused another problem. The people who did follow the demo on ACROWRX mostly had some knowledge of aerobatics, and they had expected figure-by-figure scoring, because that is how sequences are scored in competition aerobatics: each figure individually. So, some of the people who are familiar with aerobatics got lost, too, basically because our simplification of regular competition aerobatics scoring wasn't communicated well enough. We will need to rethink this approach and make future improvements.

Another idea we explored was having IAC judges score the flights live, figure by figure, with their data being collected separately from the votes on the overall flight from the general public. Then, while the air show was happening, commentators could compare impressions: The crowd usually thinks everything is awesome, while, for judges, you're a world champion if you average above 8.5. We implemented a system for this, but unfortunately, for a handful of reasons, it didn't get used. Maybe next year!

Britt Lincoln and Jeff Boerboon. PHOTO PROVIDED BY **BRITT LINCOLN**

But the basic system for the air show overall was up and running. Now we needed to test it rigorously and make it bulletproof. Most of my testing was in San Luis Obispo, but since I don't fly low and we don't have a box over the airport, there were limits. So, I reached out to A.J. Wilder — ACROWRX's first customer and a great supporter — and asked if he could help. Of course, the answer was yes! I flew the system to Santa Paula, where we ran a successful test with the help of the legendary Mark King.

The only thing I never tested was two airplanes flying at the same time. We had thought about it, but we missed some details. If you were at Oshkosh for AirVenture and looking to watch this show, you probably saw me on the flightline, disassembling electronics and reprogramming microcontrollers on the grass — under the 90-plus degrees Fahrenheit Wisconsin summer sun. Too many details to explain here, but with Brian's help, we fixed it just minutes before the show. Before the show, the last piece of the puzzle was spreading the word about the event. With the help of IAC and EAA, I published articles, posted on social media, and did other things to promote and advertise, but I don't think the marketing was as successful as it could have been. It is frustrating because I think we often fall short of success at promoting the sport of aerobatics, in general.

While I don't know the perfect solution, the frustration just fuels me to work harder to spread the word about this fantastic sport, with the goal of bringing more people into it. I'm still looking for ideas and input, and we will do better in the future, I am sure! After a quick test Monday during Jeff's solo air show, we ran the system for the IAC demo on Tuesday and Wednesday. The demo flights were flown by Britt Lincoln (Advanced category — IAC's second highest level of competition) and Jeff Boerboon (Unlimited category — IAC's highest level of competition), both flying modified IAC Known sequences.

On Tuesday, I messed things up a bit while switching antennas between Britt's and Jeff's flights, and we lost telemetry during four of Jeff's maneuvers. On Wednesday, the system worked for both flights. The only bug I found was an

PHOTOS PROVIDED BY **BRITT LINCOLN**

error in altitude units, which made the judge-perspective animation look awkward — an easy fix for next time. We had just over 200 people following the demo online and uploading scores. The quick turnaround between Britt's and Jeff's flights made the online scoring more challenging. Without narration, it was hard for those not physically in attendance of the air show to follow what was happening, although Britt's grandma in Montana got it just fine!

People watching both the live video feed and ACROWRX telemetry noticed that the live video had much less latency than the telemetry. That actually made it hard to follow. Maybe in the future we'll sync narrator audio with ACROWRX data. Overall, the demo itself was an absolute success. Britt and Jeff flew beautifully, and I'd classify the ACROWRX part of the demo as a success too. It certainly wasn't perfect, but the proof of concept opens a lot of doors for other ideas and developments in promoting competition aerobatics and air shows.

We now have a framework to integrate the judges' scoring into a live system. We've already had requests and offers to use telemetry for contests and events, and we'll use those opportunities to keep developing the system. In the end, we've added another tool to help promote our sport — which, I believe, should always be our ultimate goal with all of this.

First AirVenture Performance: Britt Lincoln's Experience

BY TAYLOR MERSHON

Britt Lincoln, the 2023 U.S. Advanced National Aerobatic Champion and the pilot who flew the Advanced sequence in the ACROWRX + IAC Competition Demo Air Show, talked to me after AirVenture and recounted her own experience of the event. Her insights into flying a competition sequence under the intense spotlight of AirVenture, broadcast live to thousands, were captivating.

When I asked Britt what first came to mind about her AirVenture experience, her answer immediately underscored the immense significance of the event. "Being invited to participate at AirVenture and fly as part of the air show as a pilot is a huge deal, and I realized that this wasn't a traditional air show. But as an air show pilot, it's one of the biggest honors." Britt said. "There were lots of emotions leading up to [the show], a mix of excitement and feeling so honored and blessed."

Beyond the personal accomplishment of flying at AirVenture, Britt emphasized the honor of representing the IAC for the first time in this capacity. "My first time representing the IAC was a huge honor. IAC is where everything started for me," she said. She highlighted her continued deep involvement with the IAC, including her participation on U.S. teams. For Britt, this combination of flying at her very first AirVenture and representing the IAC was "a huge accomplishment."

What made this particular demo so unique was its dual nature: an air show for the public but one specifically designed to simulate a competition environment. "It was a unique experience because it was technically an air show, but it felt like a competition," Britt explained. Normally, in a typical air show, a pilot has a bit more leeway. As Britt put it, "It doesn't matter if you overrotate something by five or 10 degrees or you need to wind correct. You just... fix it in the air show, because nobody knows. They don't have a sequence card."

However, the ACROWRX demo changed that dynamic entirely. The purpose was to showcase live competition aerobatics, complete with a line of judges and a commentator explaining the details, maneuvers, and scores to help viewers understand. ACROWRX was also streaming the flights live using telemetry data, displaying the individual Aresti code for each figure as it was performed, and even allowing the public to score the flights in real time. This meant that Britt, flying at the Advanced level, and Jeff Boerboon, at the Unlimited level, were performing modified IAC Known sequences under a microscope. "There was a little bit of an added challenge because I was flying a sequence and it was being broadcast," Britt noted. "So people who are familiar with aerobatics knew what they were watching... [I had to] fly to a competition standard."

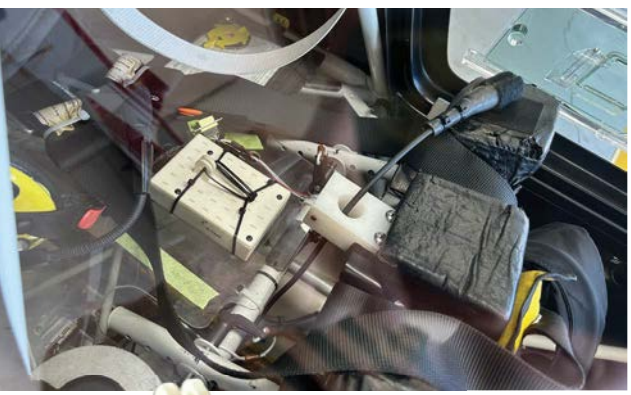
Britt's performance at AirVenture was the culmination of so many things: the nerves of an air show, the nerves of a competition, and the nerves of flying at Oshkosh for the very first time. Britt said it was like "[flying a] competition, except that there's 700,000 people on the ground watching you, and people are logged in online watching you on ACROWRX where they can see every little mistake." To add to the challenge, the weather conditions were far from ideal. Britt

PHOTOS PROVIDED BY **BRITT LINCOLN** *AIRPLANE ILLUSTRATIONS BY* **TAYLOR MERSHON**

specifically recalled "a 25-knot off-crowd wind" on the second day. Again, in a regular air show, you might adjust your lines, but in a competition, you can't. Despite the anxiety this might induce, Britt explained how her extensive training kicked in. "As soon as I got called into the box I was laser focused, and it was just an aerobatic box like any other aerobatic box."

One of the memorable moments from my perspective, watching the ACROWRX live stream, was seeing Britt circling in the holding pattern for an extended period before her flight. It turns out this long wait almost caught her off guard. She had enough fuel for a typical sequence, but had made a prudent decision to add "five or six gallons, just in case," which proved to be invaluable. "I'm so happy that we did because of how long we were up in the hold. It would have been terrible if I had to come in and land because I didn't put enough fuel in my airplane for my first flight at Oshkosh," she told me with a laugh.

From her vantage point behind the crowd during the hold, Britt had a unique perspective on the sheer scale of AirVenture. "It was incredible to look down from behind the crowd and see the enormity of the event," she said. The most heartwarming part of Britt's experience and a shining testament to ACROWRX's user-friendliness involve her grandmother. The ACROWRX demo was live-streamed on EAA's website and accessible through the ACROWRX program itself, allowing viewers to watch from anywhere in the world on various devices, including mobile phones. Britt's grandparents, who live in Montana and whom she affectionately calls "basically my parents," wanted to watch. So, Britt sent her grandmother the link to the EAA live stream of the event, and her grandmother even figured out how to "simulcast it from their computer to the TV."



The photo above shows the unit mounted inside of AJ Wilder's airplane during some of the testing that occurred before the event at Santa Paula airport, California, with Paulo, Jim B, and AJ.
PHOTOS BY **TAYLOR MERSHON**

What Britt hadn't anticipated was her grandma's initiative with ACROWRX. "I hadn't said anything to her about the ACROWRX program. She's 83 and pretty tech savvy for her age, but I wasn't sure if she'd figure that out," Britt said. But her grandma, who follows Britt on social media where ACROWRX was being promoted, took matters into her own hands. "I downloaded ACROWRX and I followed your flight on it," Britt's grandmother told her after her performance. She thought it was really neat that "there were even ways that you can change the viewpoint of the plane." So while Britt was flying, her grandma "'could look at different angles and different viewpoints."

Britt's amazement was palpable. "My 83-year-old grandma figured all that out without any assistance from me. That is pretty impressive!" she exclaimed. "If my 83-year-old grandma can figure out how to work ACROWRX, I think that most of us should be able to do it, too." From my own perspective watching the live feed, I was also impressed. With the two or three different views of the airplane and the Aresti figure and the other data on there, I would think it was interesting even if I didn't know anything about aerobatics. The demo, despite some minor bugs, was considered an absolute success as a proof of concept for promoting the sport.

Beyond the technology, Britt also gave immense credit to her fellow demo pilot, Jeff Boerboon, a celebrated aviator with over 20 years of air show flying experience and the 2010 U.S. National Unlimited Aerobatic Champion. His mentorship was pivotal in navigating the complexities of flying at AirVenture for the first time. "Jeff was so helpful to me, and it just made the whole experience amazing. His involvement peeled away a level of distress that would have been there otherwise if I had done all of this on my own," Britt emphasized. To prepare for the show, Britt recounted how she, Craig, and Jeff met up at another airport in Western Wisconsin before Oshkosh for a full simulation. They went over everything using Google Earth, discussing takeoff and landing runways, holding patterns, and entry and exit procedures for the box. "We walked through everything on the ground," she said. "And then we simulated it there at that airport. Craig played the air boss. And Jeff and I took off, and we simulated the entire thing before we even got to Oshkosh," she detailed.

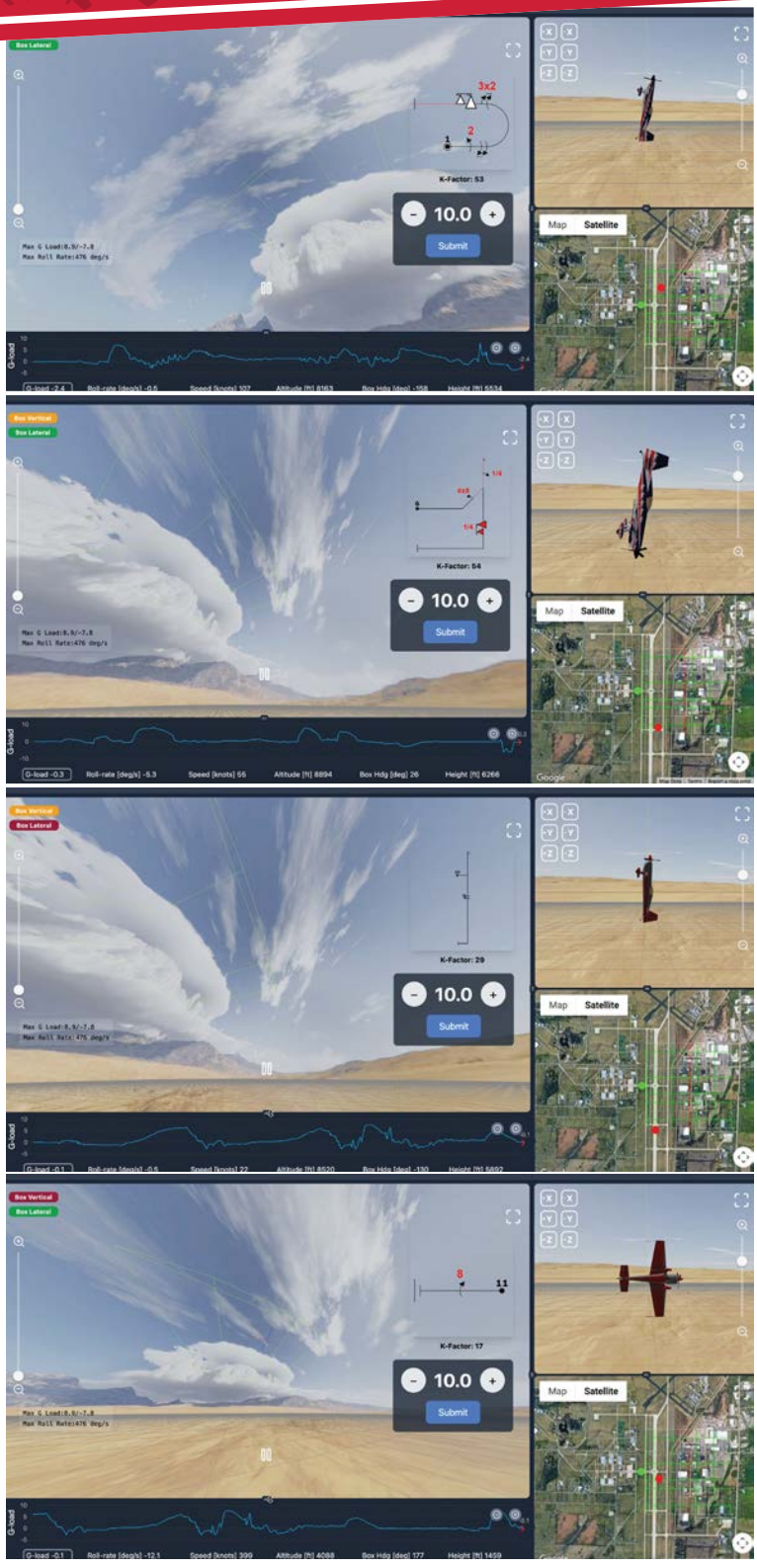
Jeff's guidance covered everything from how he would slowly bring her into her base leg when the previous performer was almost done, to the best way for her to exit the box so they wouldn't conflict during his immediate entry. She said, "There's been a push to emphasize and promote IAC's commitment to safety, and a professional image that we want to project. An image of competent people who are not messing around and they're not about ego. They're about commitment to safety and commitment to teaching people the right way. Jeff's guidance is a perfect example of that."

Britt wholeheartedly agreed, adding that much of the experience was about "the mentorship aspect of aerobatics." She shared an example of how Jeff provided constructive feedback during one of their practices: "When we landed, Jeff said, 'Okay, next time, let's just change this and do that a little bit differently. Everything went great." This attitude, rather than a critical one, fosters a positive learning environment. It's exactly the kind of "How can we be better? How can we be safer? How can we make sure that this sport is something that we feel good about encouraging kids to get into?" mindset that defines the best in our community. Sometimes, a gentle nudge and "Everything went great!" goes a lot further than a sharp critique.

Looking Ahead: The Sky's the Limit for ACROWRX

BY TAYLOR MERSHON

Britt Lincoln's experience at EAA AirVenture Oshkosh 2025 with the ACROWRX + IAC Competition Demo Air Show was, by all accounts, a resounding success. From the personal achievement of flying at AirVenture and representing the IAC, to the unique challenge of performing a competition



Screen recording from the first day of the air show being live streamed at AirVenture 2025. Top two images of Jeff Boerboon and the bottom two images of Britt Lincoln. PHOTOS BY **TAYLOR MERSHON**

sequence for a massive live and online audience, Britt navigated it all with grace and skill. The demo showcased ACROWRX's potential to not only refine pilot training through objective data but also to make the often complex world of competition aerobatics accessible and engaging for everyone, from seasoned fans to a curious 83-year-old grandmother.

While there were technical hurdles that pointed to improvements needed in the software, such as refining the public scoring interface and syncing narrator audio with ACROWRX data, the proof of concept opens a lot of doors for other ideas and developments in promoting competition aerobatics and air shows. We've seen how the program is an invaluable training partner for pilots such as Britt, providing objective data for continuous improvement. But its scope is much wider. ACROWRX is positioning itself as a "global data-sharing platform," enabling not just competition pilots but a broad spectrum of aviators — students, CFIs, backcountry pilots, ultralight enthusiasts, experimental aircraft builders, and anyone curious about flight performance — to review their flights and learn. As Paulo Iscold explained, before this, improvement in aerobatic flying was based on theoretical guesswork. With ACROWRX, it's quantifiable science.

ACROWRX is also being leveraged to foster community and increase participation in aviation. Paulo noted the success of similar flight-sharing platforms in soaring, which have significantly increased participation in in-person glider competitions. Many newer pilots gain the confidence to step further into aviation competition when they receive positive feedback and encouragement from their peers online. ACROWRX is already launching a series of online contests, like the 2025 Pre-Season Online Contest sponsored by LIFT Aviation. This bridges the gap between casual interest and active involvement, allowing anyone anywhere to participate.

Furthermore, the tool is equally useful for training aerobatic contest judges. By allowing judges to review flights from various perspectives and overlay data, it offers a path toward potentially making aerobatic competition more objective than subjective. It brings up an interesting, almost philosophical debate within the aerobatic community — much like the discussions around automated strike calling in Major League Baseball. Some believe automated scoring is the ideal future, while others resist, wishing to preserve the human element of subjective judging in the moment. Paulo, ever the diplomat, states that the "beauty of this is that I don't need to take a side ... the tool has the potential to help both sides of the coin." It's about providing data and perspective, allowing the community to evolve as it sees fit.

So, as we look to the future, it's clear that ACROWRX is more than just a piece of cutting-edge technology; it's a powerful bridge connecting the intricate beauty of competition aerobatics with a curious and engaged public. It refines pilot training, demystifies a complex sport, and fosters a vibrant, accessible community, all while pushing the boundaries of what's possible in aviation. ***IAC+***