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One Plus One Equals 110



MARCH 14, 2019



BY HAL BRYAN

IN [AEROBATICS](#), [AIR SHOW](#), [AIRVENTURE](#).



Previously printed in February 2019 [EAA Sport Aviation](#).

When Sergei Yakovlev, son of legendary Soviet aircraft designer Alexander Sergeyevich Yakovlev, was working on the aerobatic Yak-55 for the then-Soviet organization that bears the family name back in 1980, he probably never imagined anything like this. It would have surely been inconceivable to him that nearly 40 years later a group of

guys, in the decadent West no less, would take two of his airplanes and stick them together.

But that's exactly what happened.

Birth of a Bureau

The Yakovlev Design Bureau was officially formed in 1934. However, the company traces its real beginnings to 1927 when the elder Yakovlev designed his first aircraft, the VVA-3, later renamed AIR-1, to honor the then-current Soviet premier, Alexei Ivanovich Rykov. The AIR-1 was a two-seat, open-cockpit biplane originally powered by a 60-hp Cirrus engine. Yakovlev had worked for about three years as a mechanic at the Zhukovsky Air Force Engineering Academy starting in 1924. Then, after repeated denials because of his non-proletarian roots — his father held a high-level position at an oil company — he finally enrolled as a student in 1927. His AIR-1 design was met with disapproval by the faculty, perhaps in part because of its similarities to the British de Havilland DH.60, but he worked on the airplane on his own time. It first flew in May 1927 and shortly thereafter was flown nonstop from Sevastopol to Moscow, a grueling 15-1/2 hour flight.

Yakovlev went to work as an engineer at Moscow Aviation Plant No. 39 after he graduated in 1931 and established his own design bureau in 1932. Over the following decades, his bureau designed World War II-era fighters like the Yak-3 and Yak-9, early jet-powered Yak-15, and, after the war, the Yak-42 trijet airliner, which looks a lot like a slightly smaller Boeing 727. Yakovlev himself was thoroughly entrenched in the Soviet government and remained chief designer of the company that bore his name until he retired in 1984.

The bureau is probably best known for aerobatic trainers like the Yak-18, which first flew in 1946, and the four-seat Yak-18T, which, contrary to popular belief, was not truly a variant but a unique design that first flew more than 20 years later. In 1975, the Yak-50 came

along, built with aerobatic competition in mind. There were more than 300 built, but many of those that flew with the Soviet national team — the type won the world championships twice — were scrapped after short flying careers because of the stresses of aerobatics. Through the 1970s, the Soviets were impressed by the style of aerobatics flown by U.S. competitors with very familiar names like Gene Soucy, Charlie Hillard, Kermit Weeks, and Tom Poberezny in airplanes that were lighter, slower, and more maneuverable. That led to the design of the Yak-55, a mid-wing single-seat taildragger powered by a 360-hp nine-cylinder Vedeneyev M14P radial engine.

The prototype of the Yak-55 first flew in 1981 but was initially rejected by the Soviet national team members because, by that time, the tides had shifted, and they wanted speed and performance again. The Yak-55 was redesigned with shorter and thinner wings, which improved the speed and, in particular, the roll rate. The Soviet team flew the new version in the 1984 World Aerobatic Championships, which resulted in a victory for the women's team. The design was enhanced again, and the Yak-55M, with an even higher speed and faster roll rate, first flew in 1989.



Photo by Scott Slocum

Meanwhile, at Oshkosh

About the time that the Yak-50 first flew, a 7-year-old named Jeff Boerboon, EAA 363600, made his first trip to Oshkosh.

“It was there, really, that I got my first experience with this air show kind of flying,” he said. “Watching all the greats from way back in the '70s, for me, was something that obviously left a very lasting impression. ... The aerobatics type of stuff I saw at the air show ... was cemented that weekend. This is something I want to do for the rest of my life.”

Jeff started college at the University of North Dakota in 1988, began flight training right away, and graduated with all of his ratings up through his multiengine instructor. He also did an aerobatic course in a CAP 10, which reaffirmed his love for aerobatics. By coincidence,

he flew that same airplane again nearly 30 years later for a series of photo shoots. While at UND, Jeff also spent time instructing, giving tailwheel endorsements in a Super Cub and teaching some introductory aerobatics in the CAP 10. From there, he was off to the Grand Canyon to fly tours. After that, he spent a few years flying for a regional airline before starting with one of the majors.

The airline job gave him the time and resources to really get into aerobatics. In 1997, he started working on a Pitts S-1. After it was finished about four years later, Jeff started getting serious about competition. He went on to be a two-time U.S. Advanced national champion, a member of both the U.S. Advanced and Unlimited aerobatic teams, and a U.S. Unlimited national champion. Along the way, he started flying with John Klatt Airshows and was eventually selected to fly *Screamin' Sasquatch*, the jet Waco that's well-known on the air show circuit. He also sold his Pitts and bought an airplane he now refers to as the left half — a red Yak-55. Prior to that, he met a man in the medical devices business named Chad Bartee, EAA 603397, in Lubbock, Texas, who also owned a Yak-55 — now known as the right half.

“He’s the real deal as far as a stick guy,” Chad said about Jeff. “I had my Yak and he was going to fly a Yak at the world championships, and he needed something to practice in. And he called me out of the blue, and I’m like, ‘Sure, come fly it, I don’t care.’ That’s how we met.”

That meeting would turn out to be more auspicious than either of them realized.

Three Guys, Two Airplanes, One Idea

In the fall of 2012, Jeff pitched the idea of building one airplane out of two Yaks to a fellow air show performer. That person was intrigued but not quite convinced.

“[That was] the first time that I had actually tried to get the Yak-110 built,” Jeff said. “I had gone to another air show performer that was thinking of building an air show airplane, and I presented the idea. I said this is what we need to do; we need to combine two Yak-55s together, and then put a jet on it, and we call it a Yak-110. It’s too strange. It’s hard to explain. It doesn’t look right, and so I think the oddity of it led him to say, ‘Yes, it’s a good idea, but I’m gonna pass.’ So the idea was shelved.”

Jeff also met Dell Coller, EAA 683852, an avid builder and restorer who works as the crew chief for John Klatt Airshows. As it turned out, both of them had independently been thinking along the same lines and they’d both imagined building a new air show airplane like nothing anyone had ever seen.

“I met Dell, and interestingly enough, Dell had a very similar idea,” Jeff said. “Dell and I think alike. He had an idea of combining two Yaks together, too. His idea didn’t have a jet engine on it. And I’m not sure that they were even Yak-55s, they might have even been Yak-52s or something. ... And then when we started talking one day over a couple of beers, this idea came up, and it’s like, man, we gotta do this thing. It would be really cool.”

“It’s an idea that I’ve been kicking around for quite a few years, and ideas are great but to take them to reality is a whole other step,” Dell said. “This is certainly something different, taking two completely separate airplanes and making them one.”

That first discussion was in the fall of 2013. They reached out to Eddie Saurenman of Saurenman Aero Works, who had done design work for *Screamin’ Sasquatch*, Kyle Franklin’s *Dracula*, and several other notable air show airplanes.

“He said, ‘Yeah, that sounds like a great idea. Let me put some thought into it and get some designs and stuff to you guys,’” Jeff said. “And, in the meantime, we got an artist’s rendering of the

airplane and started really salivating over the possibility of putting this thing in the air.”

Salivation aside, not much happened beyond that for a couple of years. The idea was put on the back burner but never forgotten.

“[By] 2015, now this idea’s getting out there,” Jeff said. “There’s people that have heard us talking about it. I felt the idea was such a good idea that we needed to do it. I wanted to do it with Dell because we’d worked together. I just didn’t want to see the idea go away to somebody else.”

By December 2016, Jeff didn’t want to wait any longer, so he called Dell.

“[I] said, ‘Hey man, we need to start calling people and get this thing done,’” Jeff said. “He’s like, ‘I’m all in. Whatever you need to do.’”

Jeff knew exactly who he needed to call.

I’m Listening

“My first choice, of course, was to call Chad,” Jeff said. “Because if I were going to put two airplanes together, it’d be his old airplane and my airplane. ... I’m telling him this story about putting these airplanes together, and his line was, ‘Yep, okay, I’m listening.’ And I continued. And he said, ‘I’m still listening.’”

Chad asked Jeff for some time to think about it.

“So, he called me back, probably wasn’t even an hour later,”

Jeff said, “and he says, ‘Hell yeah, man. We gotta do this thing.’”

But he didn’t rush right in.

“I told the guys before I get behind it, it’s going to have to be ... safe, and it’s going to have to be engineered, and that type of thing,” Chad said.



Photo by Jim Raeder

By this time, though, there was a minor problem. Jeff had sold 75 percent of his Yak to partners, and Chad had sold 100 percent of his to another buyer. However, within about a month the team had bought out Jeff’s partners, bought back Chad’s airplane, and brought them together at Dell’s shop in Boise, Idaho, where work began in earnest.

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Mating Ritual

“The aeronautical engineering part of it took a lot of time to analyze,” Chad said. “The lift and the stress, and twisting movement and all that kind of thing because you’re taking two full-size airplanes and cutting the wings off ... and putting that center section in.”

As you’d expect, the bulk of the work needed to make one Yak-110 out of two Yak-55s revolved around that center wing section, which not only joins the two airframes together but also houses the fuel and smoke tanks. That had to be designed and fabricated from scratch. One wing was removed from each airplane, and after making detailed measurements, laser scanning the relevant attach points, and creating a series of detailed CAD drawings, they built a mock-up center section out of wood. The fit was close, but not perfect, so they made some adjustments and built a second mock-up, which did the trick. With the design finalized, the structural components were CNC milled out of solid aluminum. The horizontal stabilizers were trimmed

and beefed up but left intact, with a new center attach piece fabricated using a process similar to what they used with the wing.

Reworking the aircraft's systems was another complex piece of the puzzle.

"We completely gutted every wire and every bit of plumbing from the firewalls back," Dell said. "We have new instrument panels and a new electrical system. We converted the fuel system and air system components to be operated electrically, so we had just one big wire bundle from the right to the left side. Everything is controlled with switches on the panel."

Thanks to the rugged simplicity of the original Yakovlev design, connecting the flight controls proved to be pretty straightforward. At the time of the test flight, each cockpit had a full set of flight controls, but things like the starter and the show smoke controls are only found in the left cockpit. Now that the airplane is active on the air show circuit, all of the flight controls, including the rudder pedals, have been removed from the second cockpit, which is used mainly for baggage and planned passenger rides.

So how long did it take to go from two airplanes to one?

"From start to first flight was 14 months almost to the day," Chad said.

That's right, from the airplanes' first meeting to their first joint flight was just a little more than a year.

"[When] the DAR came out to first

view the airplane, his first comment after looking over the airplane for about 10 minutes was, 'Where is the complexity in this thing? It's so simple,'" Jeff said.

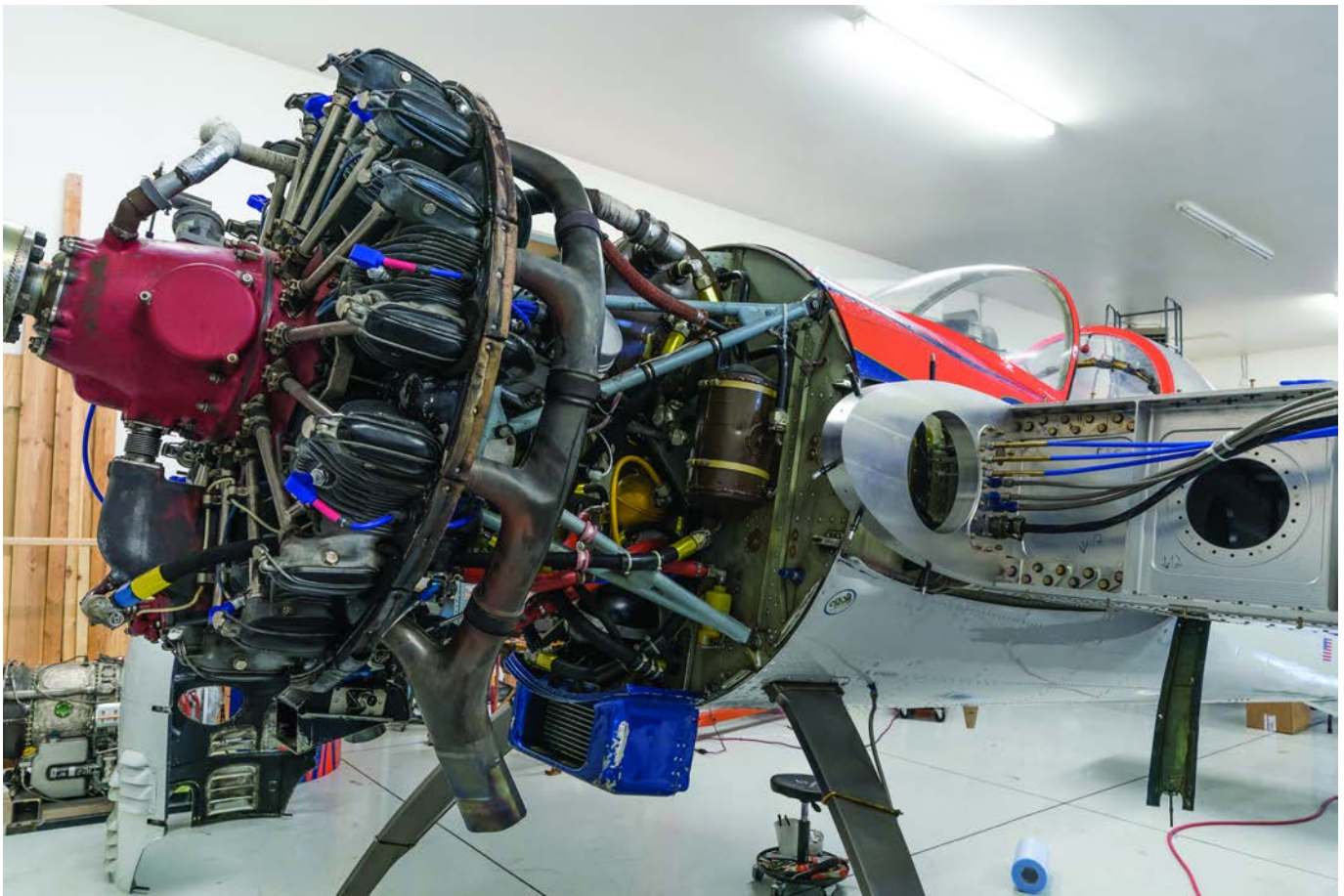


Photo by Jim Raeder

The first flight was flown by test pilot Len Fox who told

Chad, "Hey, you've really got something here. This is really cool."

For those initial flights, the airplane was powered by the original Vedeneyev M14P nine-cylinder radials. Once the concept was proven, the team added a General Electric CJ610-6, a turbojet derived from the J85 that produces around 3,000 pounds of thrust. Combined with the two radials, this gives the Yak-110 a thrust-to-weight ratio greater than 1-to-1, not to mention the cool sound and the fact that it's the only known tri-motor capable of Unlimited category aerobatics.



On With the Show

Jeff and the team set up a booth at the 2017 International Council of Air Shows (ICAS) convention, the place where performers and venues meet up to decide who performs where and when.

“I wanted to get it in the air before we went to ICAS, so at least we could show that the airplane does fly before we start advertising it to the air shows,” Jeff said. “When we got to ICAS, I think most people there really thought that it was ... fake. It’s just a model.”

But one person got it right away.

“The guy that saved us, really, was Dennis Dunbar [EAA’s director of flight operations],” Jeff said. “He had no doubt what it was. He knew the players ... and he knew that the airplane needed to be at Oshkosh.”

After a promising debut at the Gunfighter Skies Air and Space Celebration at Mountain Home Air Force Base in southwest Idaho, it was time to head to Oshkosh. Along the way, Jeff and the Yak-110 made several stops. They were met by scores of curious aviation enthusiasts at each one. During a stop at Anoka, Minnesota, he visited Pat Harker and his F-82 Twin Mustang project.

“Pat was excited,” Jeff said. “He was like, ‘Man, I’m just super excited to be talking to a guy that’s got twin fuselage time.’”

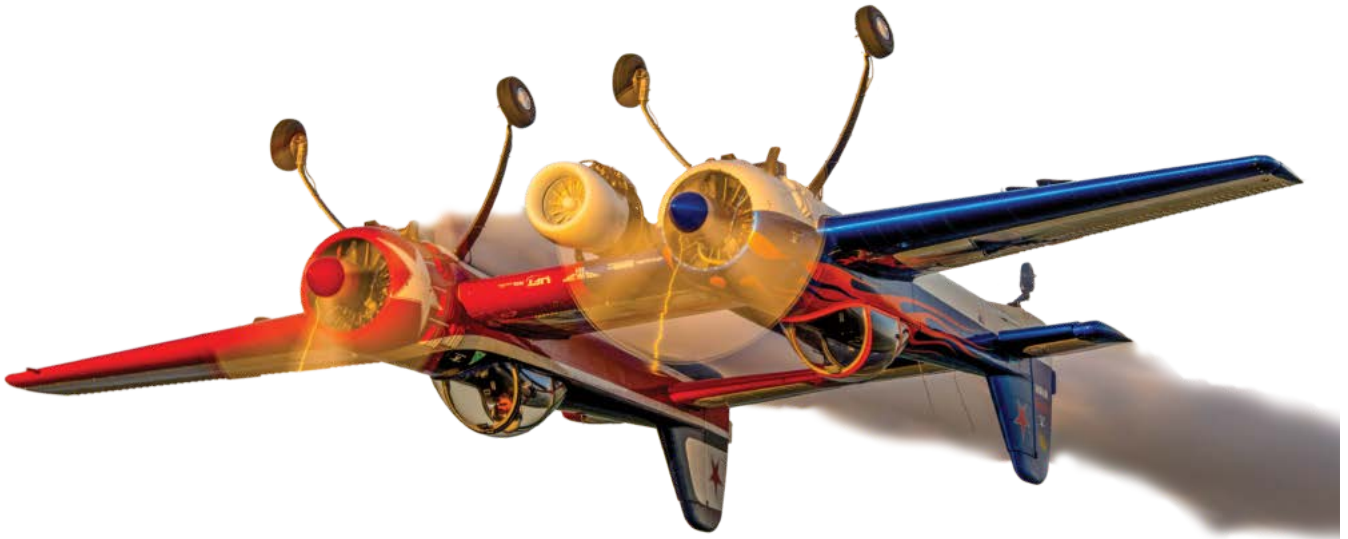


Photo by Scott Slocum

Jeff flew the Yak-110 three times at EAA AirVenture Oshkosh, including once in the Saturday air show, a personal first. His routine was designed to showcase the unique appearance and abilities of the airplane to full effect.

“Of course, you want to accentuate the airplane with the noise, for one, and with the size of the airplane,” he said. “What I wanted to do on the very first figure is absolutely convince the crowd that this isn’t just a novelty item.”

He took off from show left, and then rolled and climbed out inverted.

“Right away, I wanted to get everyone’s attention,” he said.

If you were there, you’d agree that it worked. After the attention-getting takeoff, Jeff followed with a series of loops, rolls, and passes that let the audience see — and hear — the Yak-110 from just about every angle.

“The airplane is massive — it’s a 39-foot wingspan, 4,800-pound airplane,” he said. “To just sit up there and hover ... I wanted to provide that for the crowd to get the sense that, wow, this is something really unique and very, very powerful at the same time. ... This airplane has so much power that I came down to about 1,200 feet, stopped the airplane at zero, and then climbed up from there doing rolls and then eventually ending in a double hammerhead. The differential power ... gives you that ability to pull the power back on one engine and full power on the other and really pinwheel the airplane around.”

Jeff said the satisfaction of debuting a first of its kind airplane at Oshkosh is “just thrilling.”

“It’s amazing,” he said. “It’s something that doesn’t happen to many people, and I’m really, really fortunate.”

And so is everyone who’s had the chance to see Jeff perform in the remarkable Yak-110.

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Tony Skilton

I was there! It was a very impressive performance. Well done to all those involved for taking the idea through to fruition.

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