



Charlie Precourt



Robert "Hoot" Gibson



Jim Voss



Joe Engle



Scott Horowitz

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—Scott Horowitz**

"For an aeronautical engineer it doesn't get any better [than building a plane]," said Scott Horowitz, EAA 138920, a veteran of four shuttle missions who built his Tri-Q200 while serving as an Air Force flight instructor. "I did a lot of redesigning on the airplane, I built the airplane, I flew the airplane. I learned more from actually building an airplane than you can learn in all the textbooks you could ever read. It was the ultimate experience."

Scott's project moved with him as he was transferred from base to base. He began construction while stationed at Williams Air Force Base in Phoenix, and made the first flight while attending Test Pilot School at Edwards Air Force Base in California.

Charlie Precourt, EAA 150237, also made the first flight of his experimental homebuilt at Edwards. He "started messing around with fiberglass" in the late 1970s and finally had time to build his VariEze after graduating from Test Pilot School in the mid-1980s.

Jim Voss, EAA 137893, got the bug for building an aircraft after his first visit to Oshkosh in 1980. "I found a spot in the camping area close to the display area as you could see out being inside it, pitched my tent, and spent three days experiencing Oshkosh," said Voss, who went on to fly four shuttle missions. "I went home and ordered my Long-EZ immediately. I remember getting the kit in December and starting to build in January." "I really understood aircraft because I built one," Jim said.

Joe Engle, EAA 390011, who earned his astronaut's wings piloting the X-15, joined the shuttle program, recalling his flight instructor build a Stits Flaperon. Joe was still in college and interned at Cessna at the time. "We built it in the house," Joe said. "The fuselage in the living room, wings in the living room, a garage, surfaces upstairs. We found an engine in the kitchen became the engine room."



Running a mechanic's magnetic pickup tool around in the drained oil is a good idea for any engine, but particularly for Continental engines where the suction screen cannot be inspected.

Making Metal?

How to ensure nothing is coming apart inside your crankcase

BY MIKE BUSCH

I'D BEEN WORKING WITH a Bonanza owner in Memphis for several weeks helping him chase down a problem with his Lycoming engine. Yes, Lycoming—the aircraft was an A36 with a Machen conversion to a fire-breathing 350-hp Lycoming TIO-540-J2BD engine. The owner of this hot-rod Bonanza initially reported that the engine had exhibited several episodes of rough running after start-up, but that the engine seemed to run smoothly once it warmed up.

The No. 1 cylinder oil spray nozzle and its Heli-Coil had come out, bounced around inside the engine, managed to hit all six pistons, and scored two connecting rod end caps.

The owner e-mailed me a data dump from his JPI engine monitor, which confirmed my suspicions that his “morning sickness” was caused by a couple of sticky exhaust valves in cylinders No. 4 and No. 5. Sticking exhaust valves is a fairly common malady in Lycomings, which is why Lycoming Service Bulletin 388C and Service Instruction 1481A call for doing a “valve wobble test” every 400 or 1,000 hours (depending on what kind of exhaust valve guides are installed).

The owner wound up taking his sick engine to an excellent engine shop near Memphis. The shop pulled the rocker covers and found the No. 4 exhaust valve springs black with carbon from a badly leaking exhaust valve guide. No. 5 had the same problem, but not quite as bad.

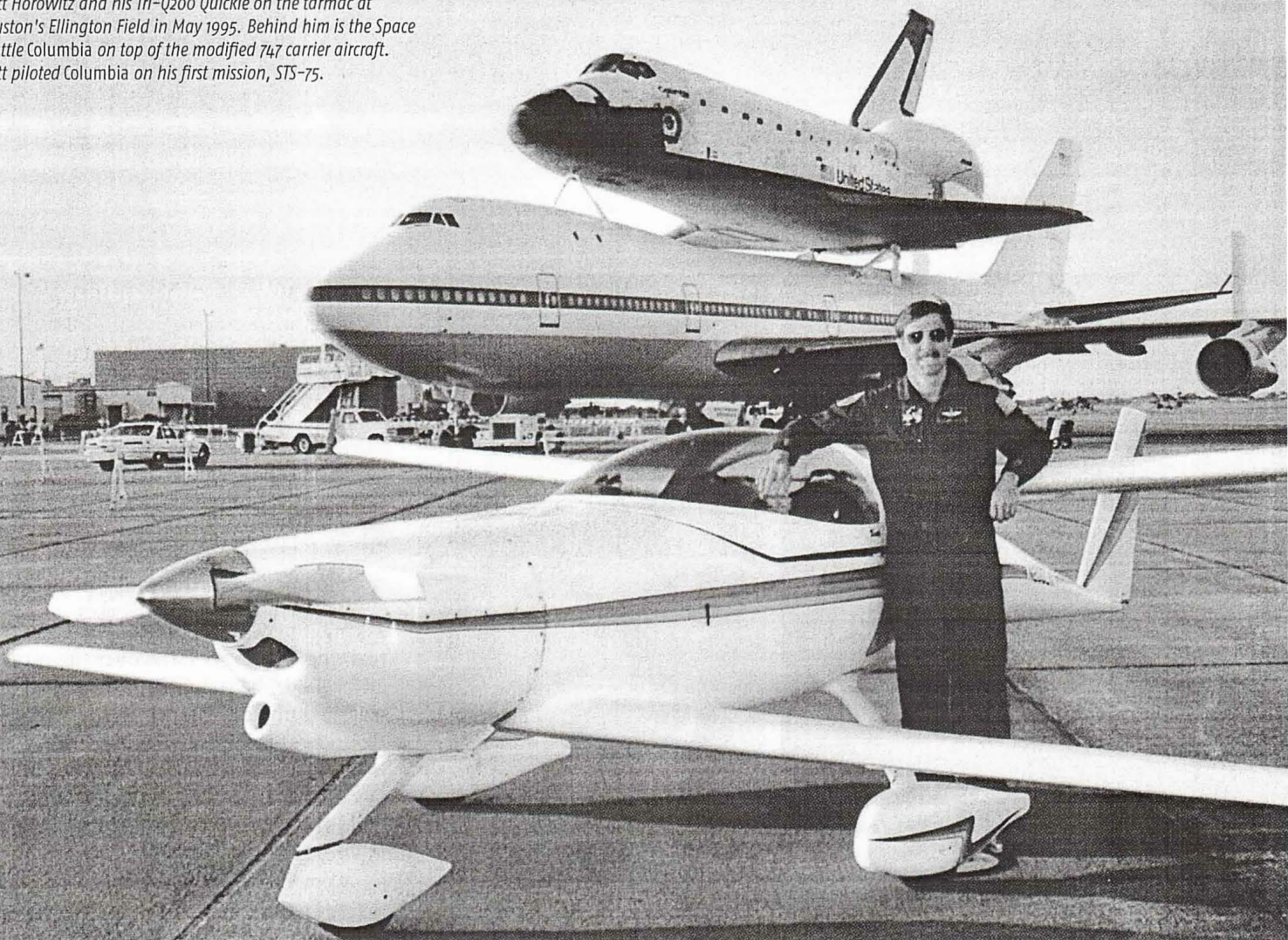
But this article isn't about sticky valves. It's about something much more serious.

FLYING NOZZLE

The engine shop decided to inspect the cam and make sure it was not damaged by the valve-sticking episodes. In most Lycomings (unlike most Continentals), you can't remove the lifters from the outside of the engine, so the only way to inspect the cam is to pull a jug. The shop proceeded to pull cylinder No. 4, and it turned out to be a lucky thing it did. The owner e-mailed me:

“They pulled the No. 4 cylinder and found evidence of damage from a screw hammering the bottom of the piston. They also found marks on the crankcase on one side of the cylinder base. The engine was removed and torn down. They found that

Scott Horowitz and his Tri-Q200 Quickie on the tarmac at Houston's Ellington Field in May 1995. Behind him is the Space Shuttle Columbia on top of the modified 747 carrier aircraft. Scott piloted Columbia on his first mission, STS-75.



The completed plane became a platform for Joe's education as a flight engineer.

"I knew I wanted to get into flight testing," Joe said. "I would take the Flut-R-Bug and calibrate the airspeed and the rate of climb using a stopwatch."

The homebuilt-to-spacecraft transition can work in reverse too, as Hoot Gibson, EAA 219551, an avid model aircraft builder in his youth, demonstrated.

"When I was at NASA it occurred to me: all the things I do to build radio-controlled [RC] model airplanes are similar to what is needed to build a homebuilt airplane," he said. "Sometimes it could take me a year [to build an RC model]. Well, I could be making a homebuilt."

Hoot bought a Cassutt one-place racer in 1983 and started rebuilding it, redesigning the wing in the process. "I finished it right before my first launch. I was in a bar with the director of flight operations, and somebody brought up that I had just finished building an airplane

and his ears picked up. 'Oh, is that right? And when were you planning to fly this thing?' I said that I probably wasn't going to even try until after the mission. He said, 'I think that would be a very good idea.'"

By the time Hoot had flown five shuttle missions and ascended to chief of the Astronaut Office, a lively community of Johnson Space Center homebuilders was settled at Houston's Ellington Field (KEFD).

"We had quite a club out there," said Charlie, a four-time shuttle crewmember and himself a chief of the Astronaut Corps. He kept his homebuilt VariEze in a hangar he shared with Jim Voss and Scott Horowitz. "There were a number of folks from Johnson [who were homebuilders], not just astronauts. We'd all go fly formation in our homebuilts. We'd go down to Galveston, have lunch, hang out, and tinker with each other's airplanes."

Among the other NASA hangar rats at Ellington were astronauts Marsha Ivins, EAA 203154, and Joe Turner, EAA 551097, who both

flew Stearmans; Dr. Edward Tsang Lu, EAA 574109, with his RV-4; and Frank Caldeiro, EAA 26726, another Long-EZ owner.

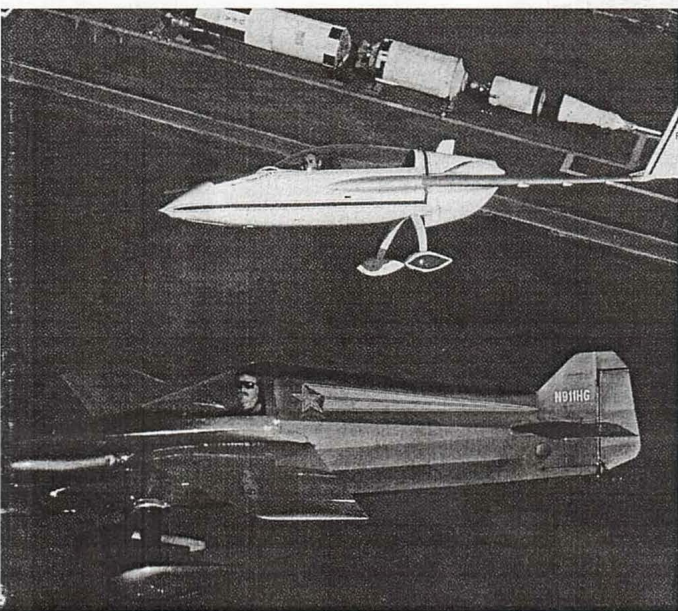
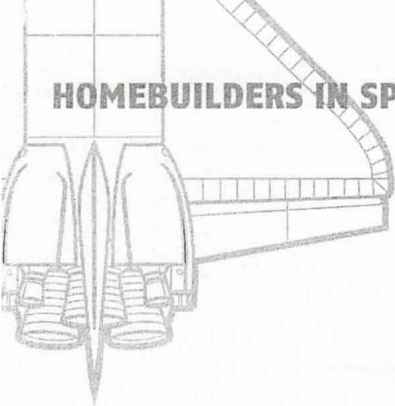
During AirVenture several from the group could be found at Camp Scholler. "[Astronaut] Steve Nagel's dad used to bring a camper, and a bunch of us would go and stay at the campground," Charlie said.

"Ten or 15 astronauts would get together and put up really big tents with eots," Jim said. Sometimes they'd arrive in T-38s that would be put on display and once Charlie flew a M21 to Oshkosh.

"It's a tradition that continues to this day," Jim said of the annual Oshkosh campouts.

MISSION FOCUS

Determination is a critical component of an astronaut's character, something to which every homebuilder can relate. In the late 1950s NASA began accepting engineers and scientists as well as test pilots into the astronaut corps. But the bar was set high. NASA favor-



Hoot Gibson in his Cassutt and Charlie Precourt in his VariEze fly over the Saturn V rocket on display at the Johnson Space Center in Houston, Texas. The rocket was later restored and a building was erected to protect it from the elements.



Jim Voss dons his spacesuit during a training session. He has logged 201 days in space, including four space walks totaling 22 hours and 35 minutes.

engineers with Ph.D.s, and applicants also had to be military pilots. If they had graduated from test pilot school, too, so much the better. Some astronaut candidates were accepted for evaluation on first application, but others applied and were passed over several times.

"Every time you were rejected there was a lot of discouragement," said Jim, who had "fallen in love with the flying part" of aviation while earning his certificate at an Army base flying club in Germany. "But I'm a fairly stubborn person. I don't give up easily, and I was determined to make myself a better candidate."

Crucial to his plan was an appointment as a flight test engineer at the U.S. Naval Test Pilot School at Patuxent River, Maryland.

"I got to do a lot of flying and associated with other people who shared my dream of being an astronaut one day, and that encouraged me to continue applying," he said. Ultimately, that led to a job at the Johnson Space Center, another steppingstone. Jim believes completing his Long-EZ after 14 years of construction also helped his

acceptance into the astronaut corps after submitting five applications over nine years.

"I think building a plane made me be seen as a real aviator, more than just learning to fly an airplane," he said. "It affects a person's opinion of you as an aviator."

Scott Horowitz joked that it took him 20 years to get accepted into the astronaut corps.

"Since sixth grade I had the goal of flying for NASA," Scott said. But when he applied with the first batch of non-test-pilot applicants and got his "nice rejection with 15,000 other people," he realized NASA was serious about wanting Ph.D.s with military flight experience. "And I said, 'I'll do it all and keep bugging them until they hire me.'"

Step 1: Scott got his Ph.D. from Georgia Tech, where he'd earned undergraduate and master's degrees. Next, "I went to the Air Force recruiter and said, 'I want to be a pilot.'" No slots were available. Scott went to work for Lockheed, and three months later the recruiter called back; a slot had opened, but Scott had to report the following day. "I called my fiancée and said, 'We have to delay our

wedding for a year.'" After flight training and a stint as an instructor flying T-38s, he sought a slot at the U.S. Air Force Test Pilot School at Edwards Air Force Base, a rite of passage for many candidates. But the Air Force rejected him for lack of operational experience, so he became an F-15 pilot and went to Germany to fly fighters.

"I kept applying to the astronaut program and kept getting turned down," Scott said. He was in Buffalo testing flight control simulations on T-33s when NASA called, asking if he was still interested in astronaut training. "I put my hand over the receiver and yelled," he remembered. "It was the classic dumb question."

HOMEBUILDERS IN SPACE

Once in space, lessons learned during homebuilding proved surprisingly applicable to mission objectives.

"Jim Voss and I flew two missions together: two homebuilders with a box of tools," recalled Scott. "So it really was a huge advantage when dealing with all the things that are a part of a space mission besides flying the shuttle."

"Often in orbit we had to work on repairs on systems," Charlie added, noting he often drew upon his homebuilding experience. During his first space flight in 1993 aboard *Columbia*, repairs involved a bunch of plumbing. "A wastewater pump got jammed up—the mechanical bellows stopped moving—so we had to fix it."

Joe's flight-testing knowledge, starting with the Flut-R-Bug in college, provided a foundation to draw upon while experimenting with the shuttle's supersonic gliding characteristics when commanding the second orbital mission in November 1981.

"The top of my list of important things we were planning to do was a series of flight test maneuvers from Mach 25 down to touch-down," Joe remembered. "To me as a test pilot, that's about as good as it gets."

And Hoot credited training for those power-off descents (a minimum of 1,000 practice approaches in the Gulfstream GII flying



Maj. Gen. Joe Engle earned his astronaut wings flying the X-15 above the 50-mile altitude required for astronaut rating. He went on to command the second shuttle mission, during which he became the only astronaut to manually fly Columbia from Mach 25 to landing to test the flight characteristics of the orbiter.

EAA IN SPACE

The crew of STS-71, the first shuttle mission to dock with the Russian space station Mir, presented EAA with this collage, including an "I Love EAA" bumper sticker that they took aboard Atlantis. During a Today Show interview, Katie Couric, seeing the sticker hanging behind the crew, asked what EAA was. Commander Hoot Gibson noted that all the crew members, including Charlie Precourt, were EAA members, prompting Couric to reply, "That's the kind of advertising money can't buy."



simulator are required to serve as mission commander; 500 to serve in the right seat as pilot) with helping him land safely in five engine-outs in GA aircraft. "Some of that is definitely a skill transfer," Hoot said. "If you ever wind up without an engine, and you've done a whole lot of simulations, you've learned how to manage energy, how to put it down on the runway. So in most all of my unintentional dead-stick landings I've put it on the runway."

Scott, who said his Q200 has "a zillion quirks, is nasty in the traffic pattern, and on the ground doesn't handle very good," found "it always seemed to me [that] after I flew the homebuilt I could fly the shuttle better."

THE SHUTTLE'S—AND THE ASTRONAUTS'—LEGACY

Another common denominator among the astronauts: strong feelings for the space shuttle, whose seven million pounds of thrust has been likened to "riding a man-made earthquake" at launch.

"The space shuttle is the most fantastic flying machine that ever existed," Jim said, noting its ability to operate in and out of the atmosphere.

"I think the space shuttle has certainly delivered everything that was expected," Joe said. "It has been a wonderful work-horse for us, going to and coming back from space with payloads."

"It put more people in space than any other vehicle ever built. The downside is we lost two crews," said Hoot, who served on

NASA committees addressing systems involved in the loss of the *Challenger*. "We finally faced up to the fact that this is not easy to operate, this is not easy to fly, and if you let your guard down, you pay for it. The sad thing is, it's retiring without a replacement system."

But while the shuttle is retiring, not so for these astronauts. Charlie is an executive with Alliant Technology Systems, and Jim is with Sierra Nevada Corp.'s Space Systems Group; both companies are developing next generation space launch systems for the private sector. Scott, Joe, and Hoot work as aerospace consultants. All remain active pilots and EAA members as well. Jim just finished repainting his Long-EZ, and Scott is

refurbishing his Tri-Q200. Ho still fly their Cassutt and VariE tively. All use single- or twin-e for business travel. And Joe is rebuilding a Piper L-4 he boug years ago.

Meanwhile, humans will co access space, though once the s flying, the visceral thrill of its a lost—except perhaps for homeb Horowitz is correct. "Flying yo for the first time," Scott said, re on his lifetime in aviation, "ran with the first shuttle flight." **EAA**

James Wynbrandt, EAA 568059, is and instrument-rated pilot who lives i



Charlie Precourt gives the "All systems go!" thumbs up from the cockpit of his VariEze before a flight from Houston's Ellington Field.



Jim Voss, preparing to paint his Long-EZ, building the plane and has logged 1,400 time in it.