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Eagles and Extras at AirVenture 2017

EVAN PEERS

Laser-Focused

Rally for restoration

by Dave Watson and Beth E. Stanton

This is a story about a Laser that was built by a friend and for the past 20 years has been owned and flown by friends. Friends contributed their time and talent to bring it back to life. It is an airplane so special to them that they did whatever it took to keep it flying, no matter the cost.

Hotel Bravo Is Born

In the mid-1990s Hans Bok saw an ad for a Laser project on a bulletin board at Oshkosh. At 6 feet 2 inches tall, he decided to build an airplane that he could fit into comfortably. The wing and frame were already completed. With the help of his father, Hans completed the control surfaces, avionics, fabric, and paint. He built a pumped 10-to-1 IO-360 engine from various parts and installed a new constant-speed two-bladed MT propeller. Laser serial number HB-1, N230HB, flew for the first time in New Bedford, Massachusetts, in April 1997.

Hans was one of Dave Watson's first aerobatic mentors, and they soon became best friends. Hans bought a Sukhoi, and eventually his wife, Peggy, decided for "some silly reason," Hans said with a laugh, that he didn't need both the Sukhoi and the Laser. With two seats and a radial engine, Hans decided to keep the Sukhoi and sold the Laser to Darren Pleasance in 2005. At the same time, Dave was moving back to California. A three-ship formation with Hans in the Laser, Dave in his Yak-55, and Sal Webber in Dave's Super Decathlon flew cross-country to the West Coast. Subsequently, Darren sold the Laser, and the airplane has since been owned by Dave and friends in a couple of different partnerships, currently with Dale Roberts, Beth Stanton, and John Haag.

Watching and Waiting

By 2016, the engine had about 1,500 hours on it and was being carefully monitored with compression tests and engine oil analysis. The hope was to make it through the contest season with a major engine overhaul planned for that winter. After almost two decades of flying hard aerobatics, the Laser's last flight was in September 2016 at the IAC 26

Delano, California, contest. Quite unexpectedly, it was the propeller, not the engine, that didn't make it to the end of the season. During takeoff, the hub of the MT prop failed catastrophically, gushing engine oil onto the canopy. Flying practically blind, Dave managed to touch back down and immediately realized there was limited runway left. After a go-around and a 180-degree turn to landing, he got the airplane back on the ground safely.

With its 1,500-hour homebuilt pumped engine, useless propeller, and numerous cracks in original paint patched with duct tape, the Laser had just gone financially into the scrap heap. It was left in a hangar at Delano. Dave, Dale, and Beth drove back the following weekend for *Operation Laser Rescue*. After installing the propeller borrowed off his Super Decathlon, Dave flew it back to Livermore. "It's convenient that you have a Super D that serves as spare parts for the Laser," IAC 38 President Josh Horwich pointed out to Dave. With the Laser back safely in its hangar, the restoration could begin.

Propeller

The propeller failure haunted Dave. "It had always been overhauled well within MT's recommendations, but on its last major overhaul just 18 months and 250 hours prior, we had to remove the prop after only two hours of use since one blade already had excessive rotational backlash," Dave said. "Despite that major mistake during the major overhaul, MT and the prop shop denied any culpability for this failure, yet offered no rationale why this prop was one of a very few that had failed in such a manner that one blade had over 10 degrees of rotational backlash and engine oil was capable of pouring out the blade seals." MT in Germany offered Dave a substantial discount on a new propeller since they were unable to assign the failure to lack of any prior maintenance. With a four-month delivery on the propeller, there was plenty of time to get the engine overhauled and take care of accumulated deferred maintenance.

Engine

The engine had far exceeded the normal life span of a pumped IO-360, even though it still had good compression tests and performance. It was sent to Ly-Con in Visalia, California, for a major overhaul. "This part of the project went as anticipated, although the crankcase was determined useless from fretting that once corrected left it at the minimum of tolerances," Dave said. Three cylinders were found to have minor cracks, and one main bearing was found to be almost ready to spin. "Scary stuff for an engine that had been meticulously maintained," he said. "Some things are just invisible."

Tail Feathers

The tail fabric had been in dire need of replacement but was being delayed until the engine overhaul would ground the airplane. Jeff Rose volunteered for the job. After a landing incident that wrecked his airplane, *Race 23, The Reno Rabbit*, after winning the Gold Biplane category at the 2016 Reno Air Races, Jeff needed a project to keep his mind busy. "Jeff begged me to 'allow' him to re-cover the tail fabric," Dave said. "I had no clue as to the art of fabric re-covering, so Jeff taught us his skills. He spent his evenings sniffing glue and freezing in his garage throughout November and December."

Jeff stripped the five tail pieces with medium blasting by American Strippers and had them epoxy-primed. "I prefer the Air-Tech Coatings system because of the incredible glue and catalyzed primer that eliminates the tag chasing on pinked tapes other brands offer," Jeff said. He also enlisted his good friend Eric

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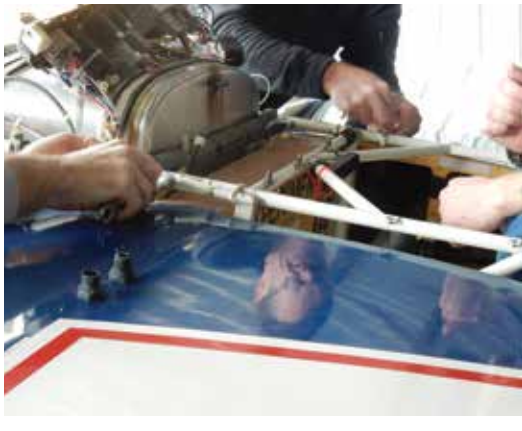

Scheppers, a talented builder who taught Jeff fabric work 15 years ago. "It's no fun working on a project without him. He is super particular, and we work perfectly together." Jeff and Eric pulled 16-hour days to finish the taping to meet the deadline.

Turtledeck

After 20 years of heat and sun, the fiberglass turtledeck had become warped and wavy. The affront to aesthetics prompted Jeff to insist that he and Eric fabricate a new one fashioned from carbon fiber.

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Normally, a mold would be made from the part to be duplicated, but the turtledeck was too warped to copy. Instead, Eric made a fixture with bulkheads to duplicate the dimensions and lay a piece of aluminum down to be the basis of the mold. "Eric always amazes me with his ability to solve challenges," Jeff said. "I learn a ton from him."

They next placed the original turtledeck inside the fixture. With the compound aspect of the turtledeck (the part that fits around the vertical stabilizer) poking out, they glassed it as an extension of the mold. After the fiberglass set, the original part was pulled from the fixture. They captured the entire piece. They waxed and gel-coated the mold and laid three layers of carbon with vinyl ester resin that weighs one-third less than the original part. When Eric brought the new turtledeck to Livermore for a fitting on the airplane, it fit perfectly. Without the airplane, Eric miraculously built a new turtledeck that defined the new presence of the airplane.

Fuselage

The fuselage and aileron fabric was in better shape than the tail. The original plan was to leave it intact and match the new tail feathers to the original blue paint. At this point, it was useless to cut any corners and save the old fabric and paint. It was decided that the Laser would be repainted in red, white, and black to match the rest of Dave's Evil Empire fleet of Super D N59AC and Pitts N77TW. Dave and A&P mechanic and Skybolt pilot Mike Flagella, KLVK hangar row mate and owner of Mike's AeroClassics, decided to re-cover the fuselage and ailerons. With the instructions and training in the Air-Tech system from Jeff, they took on the project since the fuselage and wing were in the hangar not going anywhere. Mike had done fabric repair jobs, but never such a large restoration job, nor had he used the Air-Tech system. "Mike did a fantastic job with the fuselage and aileron fabric, charging a fraction of his normal fees, since in his mind this was a learning experience for him," Dave said. After a few fits and starts trying to paint the fuselage, Mike arranged for T&P Aero Refinishers in Salinas to squeeze the project in so that the Laser would have a spectacular new paint job. "That decision reversed my ultimate desire to keep the wing on," Dave said. "Removing the wing for transport to a professional painter who repaints Sean Tucker's Oracle Challenger every year was small potatoes compared to the big picture of the project."

Sobering Surprises

Inspection of the fuselage revealed

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some surprises that will be shared in the hope that others may learn from them. One of the driving forces to finally pull the fuselage fabric was to reveal each weld from every angle. Despite having been flown hard its entire life, there were no structural cracks in the frame. It had been built from tubing thicker and stronger than the plans indicated, adding only about 1 pound of weight. Twenty years later, it proved to be great foresight.

Other discoveries were not so great. The bracket supporting the battery was secured to the fuselage behind the pilot's seat with four Adel clamps. Upon disassembly, it was discovered that just one clamp was intact. One had both arms broken off, and two had failed on a single arm. The 13-pound battery had been hanging on for +9*g* pulls and -6*g* pushes by the skin of its teeth. The Adel clamp breakages had been reported on previous annuals, yet repaired with the same design. It obviously wasn't working. Dave redesigned the attachment so that it now has eight Adel clamps such that none are subjected to cantilever-induced bending loads.

The new release mechanism Dave designed for the canopy was also hanging on by a thread. The canopy is attached to the upper longeron by four 0.050-thick steel tabs. They extend outward from the upper tangency point on the upper longeron, creating four simple cantilevers, and are covered by fuselage sheet metal so they are not visible. The two aft tabs were broken off clean at the longeron. This failure had happened before and had been repaired as designed. Dave had a welder add vertical gussets to the tabs to hopefully eliminate this failure again. Since the aft half of the canopy had been unsupported, excessive loads had been placed on the fiberglass canopy frame. After investigation and grinding into the numerous cracks and delaminations that were thought to be cosmetic, it became obvious it was more serious. The canopy frame had been previously been broken twice. The shortsighted repairs may have resulted in a catastrophic failure. The canopy was fully reconstructed.

Despite shortening the rudder pedal placement a couple of years ago, countless snap rolls had stretched the rudder cables. The pedal assemblies (cans holding the brake fluid) were making indentations in the back side of the firewall. New rudder cables and guide bushings had to be installed.

A single AN-3 bolt attached the Aviation Products tail wheel to

Leo Loudenslager completely modified the Stephens Akro monoplane into the Laser 200 in the mid-1970s. He went on to win an unprecedented seven U.S. National Aerobatic Championship titles between 1975 and 1982, and the World Aerobatic Championship title in 1980. "He took it out there and beat everybody badly," Budd Davisson said. "It was just slaughter. It wasn't even a competition." The Laser effectively ended the Pitts biplane domination of U.S. aerobatics. "Leo was on the world team," Budd said. "Everyone said, look at that, what a great idea. Everything went from there." Leo's Laser was the precursor and inspiration for all of today's modern aerobatic monoplanes.

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the round spring shaft. It had been replaced multiple times due to high bending loads. Widening the hole and going to an AN-4 bolt was considered, but the shaft diameter would be compromised. A second AN-3 bolt cross-drilled to the original was added, doubling the shear strength without compromising the integrity of the spring shaft.

"Aerobatics takes its toll on planes," Dave said. "Do not assume that since all is well, all will continue to go well. The broken Adel clamps that held the battery were within sight every time the pilot's seat was folded forward. Latching the canopy was getting more troublesome with every flight. Don't let creeping normalcy or complacency get you in trouble."

Friends Helping Friends

The total restoration was in no small part due to the remarkable generosity of many people. Pete Plum of Wood Wing Specialty cadmium-plated all the flying wire clevis ends free of charge. Jeff and Eric donated their time for the fabric work and turtledeck. "This selfless gift to us defined this project and the spirit of friendship and aviation," Dave said. Jake Carter, an aerobatic pilot who flies Dave's Super Decathlon, was the IA who oversaw the entire project. Every piece of the project was inspected three times: by Dave, Mike, and then Jake. The partners contributed as much sweat equity as possible with Dale and his life partner Kate Harps spending hours sanding and prepping aluminum body panels and fiberglass fairings.

A crew assembled at KLVK in Livermore, California, to remount the one-piece 25-foot wing when the airplane came back from the paint shop. The maiden voyage of the newly assembled Laser, now christened N230DW, happened on February 26, 2017, with Dave at the controls. "Seeing the plane painted and the pictures of your smiles after flying it made it all so worth it," Jeff said. "Pay it forward, and it always comes back at you more." IAC