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The legendary aircraft of World War I are inseparable from their pilots. The Golden Age Air Museum is determined to preserve the legacy of both.



The photo is one of the few of Biddle still in existence, and if the camera were moved a little more to one side we would have gotten a glimpse of another aircraft that was as much a part of Biddle as his own flesh and blood, the most advanced air fighter of the day and one he and many contemporary pilots preferred above all—the venerable SPAD XIII. Extremely rare today, the number of flying specimens in the United States can be counted on one hand, yet thanks to the Golden Age Air Museum in Bethel, Pennsylvania and its dedicated team of volunteers, this pilot and his airplane are making a comeback.

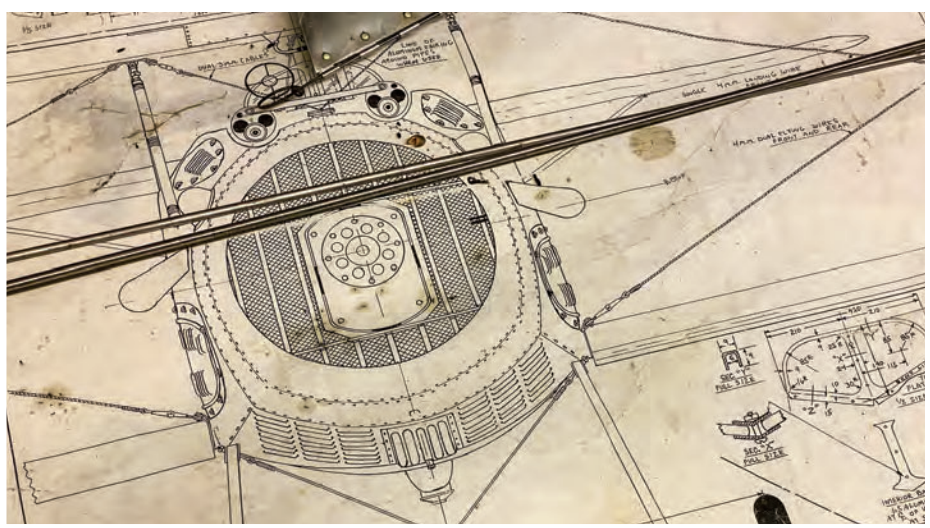
Time travel

Grimes Airport (8N1) in southern Pennsylvania is not a far cry from the aerodromes of World War I and aviation's golden age it harkens to. The perfectly trimmed grass runway, farmhouse-turned-museum, and cluster of hangars nestled among the picturesque

landscape feel homelike. A sign on the road pronounces this the Golden Age Air Museum, and rolling up the hangar doors will astound even the most seasoned enthusiast. A collection of vintage aircraft—most being airworthy—are built, flown, and maintained here by a dedicated family of staff and volunteers.

The museum's founder Paul Dougherty, A&P and American Airlines pilot, has been Grimes' visionary for more than 25 years. From small beginnings as a few restoration projects he and his father did together, the collection grew until they started flying a few aircraft for demonstrations on the weekends. Word spread, and now the museum hosts more than 30 aircraft and a schedule of exciting events throughout the year. The heart of the airfield is the shop packed with aircraft parts and machinery, where the staff and volunteers are hard at work on their challenging but rewarding quest to recreate the SPAD XIII belonging to Charles Biddle, with special ties to Pennsylvania.

The workshop at Golden Age Air Museum is a builder's dream, filled with supplies and machinery needed to fabricate many parts from scratch. Original SPAD XIII blueprints vary between manufacturers and can be difficult to work with, requiring experimentation and reverse-engineering from the museum crew. Pilot and IA Mike Damiani points out the pilot-controlled shutters originally used to limit temperature changes in the water-cooled Hispano-Suiza engine. This replica sports a Continental O-470, so the shutters are only for accuracy of appearance.



'Ship of dreams'

The French aircraft manufacturer *Société Pour L'Aviation et ses Dérivés* first flew the SPAD XIII on April 4, 1917. Its design and performance were remarkable for the time—at 220 horsepower, you'd need a high performance rating to fly one today—and it quickly built a reputation as a tough gunship that could take a bigger beating than the previous fighters and still bring its pilot home. Its geared, water-cooled, V8 Hispano-Suiza engine gave the SPAD a sleek-yet-beefy appearance, and its improvements in speed, durability, and firepower gave it an edge over the Central Powers' aircraft, making it the "ship of dreams" for many of the great French and American aces such as Georges Guynemer, Eddie Rickenbacker, René Fonck, and Frank Luke Jr.

Fast-forward a hundred years or so and SPADs are hard to come by. With no kit or detailed plans, the team set out from scratch with a combination of varied original plans, a modern set from Replicraft,

and as many original photos as they could find, determined to build an aircraft with an authentic outward appearance, yet safer and more reliable internally. Dougherty and team had visions of creating a SPAD that could not only be the star of their museum, but also travel to events and airshows around the country.

Michael O'Neal, one of the museum's board of directors and the managing editor of *Over the Front*, the journal of the League of World War I Aviation Historians, has been involved in this era's history since his teenage years and has been one of the crucial leaders of the SPAD project, which has been a painstaking labor of love for more than a decade.

The museum team started with adding steel tubing into the originally wood- and wire-braced fuselage and replacing the aluminum tubing reinforcement enclosed in the wooden struts with steel. This strut tubing was something other contemporary fighters did not have, and was a contributing factor to the SPAD's durability.



“The SPAD is a whole other animal. That thing is built super sturdy,” O’Neal said, explaining that even though the SPADs offered safety improvements in 1917, more changes were necessary to make this replica a robust airshow star and traveler, the most important being the matter of a fickle engine. Since an original Hispano-Suiza would be difficult and expensive to obtain, a more modern and reliable 230-horsepower Continental O-470 was chosen, but this created another set of problems.

“Because of the new engine the change in length of the airplane is about four inches longer than original; Paul [Dougherty] had thought early on that it would look different,” O’Neal said. “He said we could kinda kid that by changing the access panels on the front of the side cowlings—that’s one of the identifying marks of the SPAD—which were lengthened to make it more proportionally correct. This is a part of the illusion of making it look like a SPAD without having a ‘Hisso.’”

More brainstorming was needed to customize the exhaust, which originally exited the cowling in a row of four pipes that joined with a single runner down the sides of the fuselage.

“The original was V8, but this is a flat Continental six,” O’Neal said. Paul put together a custom stainless steel exhaust that collects into each side in a single outlet. That single exhaust comes out of the aircraft at a 90-degree angle and intersects with the

In search of instruments as close in appearance to the originals as possible, the team found this compass listed on eBay as for a boat. When it arrived, its details and inscription revealed it to be an original SPAD compass. Aviation historian and museum board member Mike O’Neal offers invaluable knowledge to the SPAD project. Director and founder Paul Dougherty (bottom, center) leads the volunteer crew in curating this extraordinary collection of vintage aircraft.



middle of the original exhaust pipes.” It’s perfectly functioning, and a casual viewer would be none the wiser. A dummy radiator, complete with replicated pilot-controlled cooling shutters, completes the look.

A complicated pressurized fuel system in the belly also needed reimagining, so the team replaced the original ammunition box (in front of the pilot under the guns) with a fuel tank for a gravity-fed system. What was originally an auxiliary fuel tank and water header tank for the radiator in the upper wing is now a single auxiliary fuel tank with a pass-through down to the main. Although, like the original, the aircraft has no brakes, a steerable tailskid was installed for operating on single direction runways, and an electrical system was added for ease of travel.

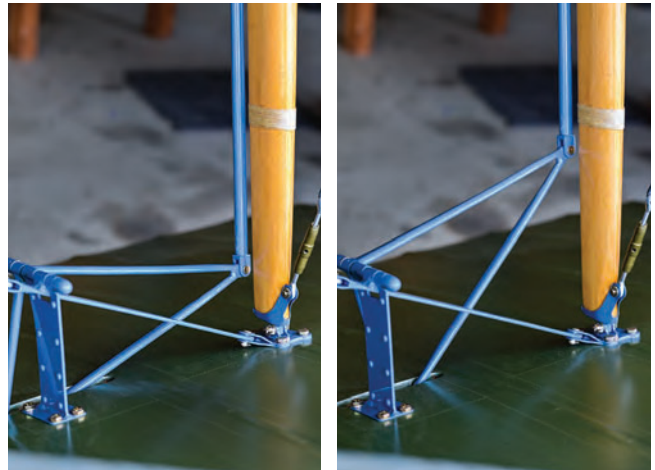
The goal of accuracy whenever possible finally led the team to search out the original SPAD paint formula. Mysteriously, it contained a large amount of aluminum flake, which gives the paint a rich metallic look when applied, yet no source confirms why this was done. Modern airplanes use aluminum layers for ultraviolet protection, and although this might have been a factor, the formula for the SPAD’s black patches had no aluminum powder, even though it would attract the most UV.

The team was puzzled until the first time they took the airplane outdoors, when it was discovered the aluminum flake refracts the light in such a way as to cause the aircraft to take on some color from its surroundings, and its edges blend in when viewed from different angles—a masterful trick that adds to the already effective camouflage pattern—and using this formula gives the aircraft the most accurate appearance to the original.

As the SPAD nears completion, it’s easy to see the attention put into every detail of this masterpiece, and throughout the process it remains connected with its origins and mission. To help finance the construction, a program was set up in which donors could “sponsor a rib” to have their name inscribed on one of the 88 wing ribs; and to tie together the “modern and legacy” theme, the names of original pilots were also inscribed. One name especially is featured not only on the inside but on the outside, and in the spirit of every fiber: Deep-rooted Pennsylvania native Charles J. Biddle.

Destiny

The prominent Biddle family has lived just outside of Philadelphia since the late 1700s (their estate is open for public tours), and Charles graduated from both Princeton and Harvard law before World War I. In combat he became a seven-victory ace and commander of the 13th Aero Squadron “The Grim Reapers,” and in addition to receiving the Distinguished Service Cross for coming to an outnumbered comrade’s aid in a dogfight, he was one of the few to test a late SPAD model equipped with 37-mm cannon. After the war he was discharged with the rank of captain, compiled his wartime letters into a book, *The Way of the Eagle*, and returned home to his law practice. The team chose Biddle’s livery because of his Pennsylvania roots, and the SPAD now boasts the 13th Squadron insignia—a skeleton dubbed “Oscar” swinging a scythe—Biddle’s number “0,” and red, white, and blue stripes that identified him as the commanding officer.



A unique system operates the pushrod aileron controls, shown here in the up (left) and down (right) positions.



A customized exhaust system allows for the modern engine to maintain the signature look of the external exhaust pipe. A&P Mike Cilurso (the amount of Mikes at the museum is a running joke) displays the 13th Aero Squadron’s insignia used during World War I.



Obi-Wan the golden retriever is the airport greeting committee and a local celebrity. The SPAD XIII gets its metallic sheen from paint that contains aluminum flake. A painted cowling with Lieutenant Biddle's red-white-and-blue stripes and a Culver prop will complete the look.

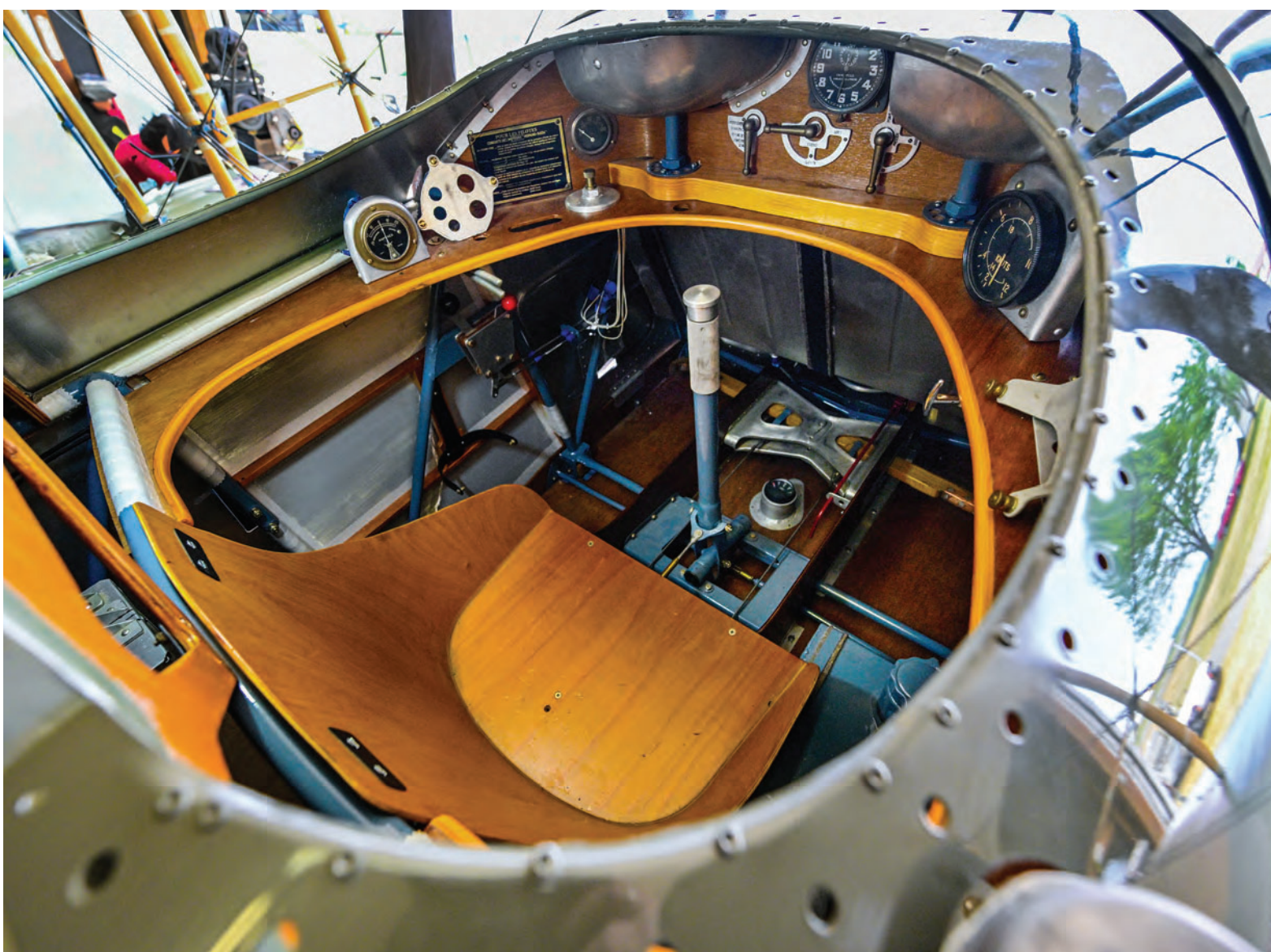
As the team spent long hours pursuing the descendants of Biddle and fellow squadron members, they found one man whose grandfather was not only in the 13th, but the designer of the original Oscar insignia. The grandson still has an original side panel and painting template, agreeing to bring it to Pennsylvania for the aircraft's debut event. The team was thrilled.

"This stencil hasn't touched another aircraft since World War I, and to put it up against this airplane, have the Biddle family help paint it, it's going to be a great thing," said O'Neal.

The Biddle family is understandably enthusiastic, and eager to attend the aircraft's debut also, and as the team continues to contact more descendants of the original 13th members—five so far—the aircraft keeps bringing people together. Nearby Horsham Air National Guard Base was recently renamed for Biddle, and the modern descendant of the squadron, now the 13th Bomb Squadron in Missouri, are interested in getting involved as well.

O'Neal doesn't believe in chance. "When you're doing the thing you're supposed to do, it seems like the right people and opportunities show up," he said. "I just know that when I'm focused on the things I think are important, love to do, passionate about, these things happen."





His sentiment is shared by the rest of the crew. All the volunteers are eager to show visitors around and talk about their experiences over the years of this project, giving of their time and talents to bring Charles Biddle and his piece of history to life for us and the generations to come. It's hard work, but every bolt and patch of fabric here tells an invaluable story, of an aircraft of legend and the ones who give it meaning. ■
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A mixture of old and new in the SPAD's cockpit: An original clock and brass fuel selectors (now just for appearance) are front and center, with brackets ready for original tachometer and altimeter. Every bit of space is utilized—note the fuel gauge between the pilot's feet and compass mount under the left arm. Volunteer Rob Waring enjoys giving tours of the museum and workshop.

Golden Age Air Museum is located at public-use Grimes Airport (8N1), with a 2,720-foot grass runway 11/29. No fuel is available. Museum hours are Saturdays 10 a.m. to 4 p.m. and Sundays 11 a.m. to 4 p.m., May through October. Adult admission with a guided tour is \$15. Biplane rides are available during regular business hours; reservations encouraged. Check the website for fly-ins and other special events.

The museum's flying collection includes such legends as a 1918 Curtiss Jenny; a Fokker Triplane with an original rotary engine; 1926 Winstead Special; Sopwith Pup replica; and a Rumpler C.V replica used in the 1962 film *Lawrence of Arabia*.

► GoldenAgeAir.org