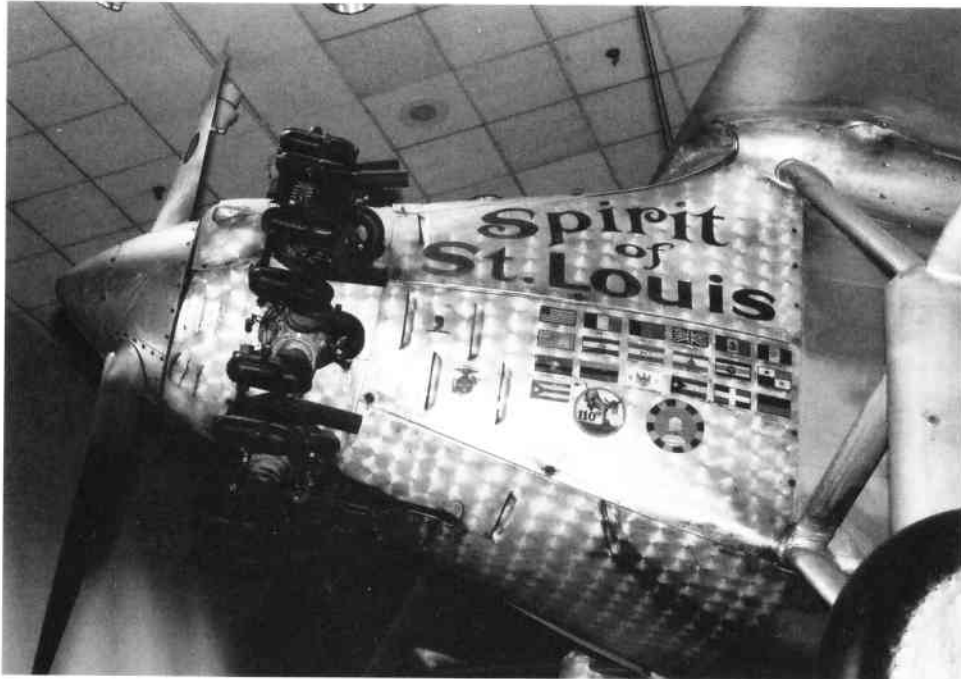


# *Spirit of St. Louis*

by Tom Polapink  
42 Eastwood Blvd.  
Centereach, NY 11720



*Spirit of St. Louis*, National Air and Space Museum, circa 2002.

Photo: Tom Polapink

*(Reprinted from Chronos magazine with updated information)*

Less than a lifetime ago it was widely believed that non-stop transatlantic flight was impossible. In 1927, Charles Lindbergh's historic flight in his *Spirit of St. Louis* changed the mindset of the world. His courage, careful planning and devotion to his mission ultimately led him to success. Lindbergh passed away in 1974, but the impact of his flight will be long remembered as one of the greatest achievements of mankind. The *Spirit of St. Louis* now hangs in the "Milestones of Flight" hall in the Smithsonian Institution's National Air and Space Museum, where it has been on exhibit since 1976.

The *Spirit* was based on a successful mail-carrying monoplane that the company had in production at the time called the Ryan M-1. Lindbergh worked with Ryan's design engineer Donald Hall to redesign the M-1 to make it capable of the long flight. 850 hours were spent reengineering the M-1. The original *Spirit* was built in just 60 days with the staff of the Ryan Airlines company working around the clock for a total of 3000 man-hours. The company saved a considerable amount of time by utilizing many components from the M-1

including the tail surfaces, wing ribs and many other parts and sub-assemblies. Three fuel tanks were installed in the wings and because of the extra weight of fuel required to complete the flight, the wingspan was extended to 46' from 36' for additional lift. The *Spirit* weighed 2150 lbs. empty. Fully loaded with 450 gallons of gasoline, 25 gallons of oil, minimal supplies and Lindbergh himself, the gross weight totaled 5250 lbs. The gasoline itself weighed 2750 lbs., 600 lbs. more than the aircraft itself! After completing the 3,600-mile flight, Lindbergh had 85 gallons of gas remaining in his tanks.

The M-1 fuselage design was lengthened and its shape was modified to provide Lindbergh with an enclosed cabin as opposed to an open cockpit. Lindbergh did not want to sit between the engine and the tanks, so two additional tanks were placed in front of him between the engine and the cabin. The tanks blocked Lindbergh's forward view, so his instrument panel (located just behind the main tank) was equipped with a small periscope. The periscope projected out of the left side of the fuselage and provided him with slightly improved visibility. He used the device when flying near the coast to avoid hitting tall masts of sailing vessels. Other times he would peer out of the cockpit window cutouts in the

side of the fuselage to see the outside world. These cutouts had removable windows that could easily be installed to keep the cold wind out of the cabin.

The late Frank Tallman (famed motion-picture stunt pilot and early aircraft collector) built a copy of the *Spirit of St. Louis* for the 1957 movie of the same name starring Jimmy Stewart. Tallman later recorded many of his flying experiences in his popular book, *Flying the Old Planes*. In reference to flying the *Spirit* without being able to see forward he wrote, "Strangely enough, the lack of adequate forward visibility doesn't bother me too much." It is not readily apparent unless you are in the pilot's seat, but most vintage biplanes have very poor forward visibility, especially while on the ground with the tail down while taxiing, taking-off or landing. In comparison with a biplane the *Spirit* actually has better downward and outward visibility as there are no lower wings to block the pilot's view.

Lindbergh amassed a total of just under 490 hours on the airplane, completing 174 flights before donating it to the National Air Museum in Washington, DC in April of 1928. He carried only a handful of passengers aloft in the *Spirit* including his mother, Donald Hall, Edsel Ford and Henry Ford. The *Spirit* landed in each of the 48 states (at the time there were only 48 states), stopped at the islands of the West Indies, and flew all through Central and South America. Lindbergh flew in and out of airfields of all shapes and sizes, attesting to the design of the aircraft. It is said by some to have been a "dog" to fly, but Lindbergh flew an additional 400+ hours after his Atlantic crossing without making any modifications to alter its performance.

### Aerodrome Project Background

The Rhinebeck Aerodrome Museum's *Spirit of St. Louis* project "took off" when Aerodrome founder Cole Palen acquired an original complete Wright J-5 "Whirlwind" engine through the purchase of six New Standard Biplane projects (all in pieces) many years ago. Cole recognized the J-5 as the same type of engine that took Lindbergh across the Atlantic. Lindbergh was one of Cole's great heroes, and that set the wheels in motion to start work on the project.

The acquisition of an earth inductor compass was another great and rare find that led to the commencement of the project, and a fuselage was tack-welded together for the *Spirit*. Final welding was done by a volunteer with good intentions while Cole was out of town, but unfortunately the work was found to be unsuitable for an aircraft that was to fly, and the fuselage could not be used. This set the project back.

The *Spirit* was put on the back-burner for a few years as other Aerodrome projects were worked on and completed. In 1993 Cole passed away unexpectedly in his winter retreat in Florida while in his sleep.

On February 6, 1996 the project was resumed by the staff at the Rhinebeck Aerodrome Museum in tribute to both Charles Lindbergh and Cole Palen. What better



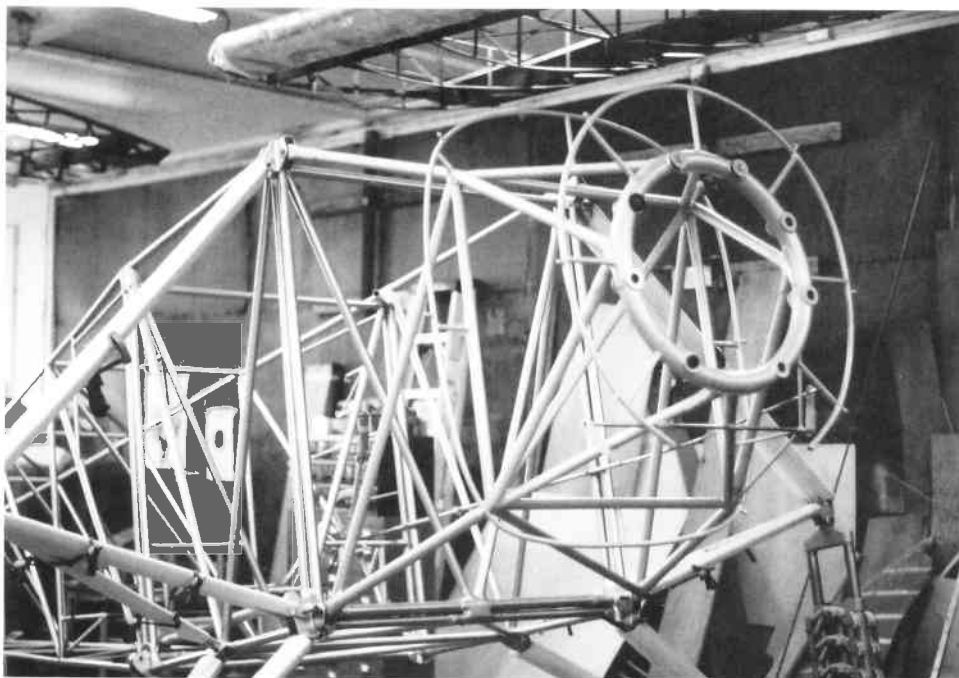
Ken with Rita Palen, 1997?

Photo: Brian Coughlin

subject could be chosen to fit into the Aerodrome's Saturday "History of Flight" shows than the most historic aircraft ever built? Ken Cassens headed up the project and became intimately familiar with the original aircraft and Lindbergh's history. Ken's lifetime of experience in the aviation field made him the perfect candidate for the job. In addition to his wealth of knowledge on the *Spirit's* history and construction, his middle name is Charles, he was born on the same month and day as Lindbergh (February 4) and his son's name is Ryan (same name as the company that originally produced the *Spirit*). Prior to this, before his work at the Aerodrome, Ken built a Starduster II biplane, which won a top award at Oshkosh. This is a testament to his level of craftsmanship and an indication of the level of perfection one could expect to find in his work on the *Spirit*.

Master woodworker Scott Mackenzie worked on strut fairings, wingtips and other wooden elements of the *Spirit*, serving as Ken's right-hand man with the project.

The late Rita Palen (Cole's widow) was quoted as saying, "Lindbergh was one of Cole's heroes and Cole said that someday we'll have the *Spirit of St. Louis* fly here." The staff at Old Rhinebeck worked to make Cole's vision a reality, and the goal was set to have the *Spirit* completed in time for the 75th anniversary of Lindbergh's flight in May of 2002.



Forward fuselage, circa 2000.

Photo: Tom Polapinski

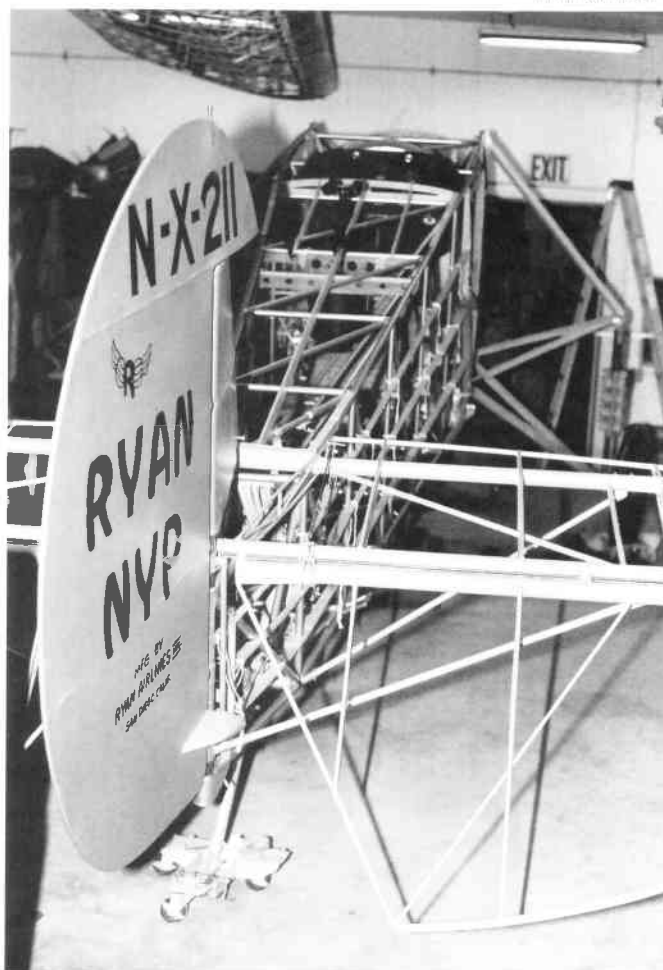
The most successful fundraising campaign ever by the museum brought in \$100K worth of funds and material donations, including donations from generous museum member visitors, the museum's own volunteers and staff members, a \$25K grant for NYS thanks to the assistance of NYS Assemblyman Marc Molinaro and Senator Steven Saland, a challenge grant from the Thomas Thompson Trust, and generous donations by Charles Lindbergh's daughter, Reeve, and NY businessman John Sikorski. The National Air and Space Museum, Cradle of Aviation Museum on Long Island and Niagara Aerospace Museum were also very supportive of the project and their contributions and assistance were very much appreciated.

### Fuselage

Ken welded up a new fuselage for the *Spirit* based on structural drawings made by Ed Morrow for the Ryan Aeronautical Library. The drawings were drawn long after Lindbergh's flight without the benefit of having the aircraft on hand to generate them. The original aircraft was built without the use of formal drawings as time did not allow for this "luxury." Soon after the fuselage took its basic form, Ken visited the National Air and Space Museum, and with the kind assistance of Peter Jakab (NASM's early Flight Curator), Ken gained access to the cockpit of the *Spirit* to photograph details not shown on the drawings. He was lifted up to the suspended aircraft in a cherry-picker early one morning before the museum was opened to the public, and much to his surprise found that the inside of the original *Spirit* did *not* look like the fuselage he had just built! Photographs and measurements were taken and Ken returned to the Aerodrome to compare his new findings to the Ryan drawings and the work he had already done. This confirmed that the drawings were incorrect and Ken rearranged parts of the fuselage structure to better match the original *Spirit*. As it

Completed fuselage and stabilizer; covered fin and rudder.

Photo: Tom Polapinski



turns out, the drawings from the Ryan Library had been used in other reproductions of the *Spirit* around the world that had been built up to this time, and these aircraft incorporated the very same mistakes.

The project was again put on hold in 1997 when the museum decided to restore the Aerodrome's original 1918 Curtiss JN-4H Jenny, which consumed most of Ken's time. Three airshow season's worth of maintenance and general repairs to the dozen or so airshow aircraft also helped to delay the "Jenny" and *Spirit* projects, but work was resumed on the *Spirit* in full-force during the winter of 2000-2001. Other necessary projects took priority over the *Spirit*, such as recovering the Aerodrome's New Standard's wings. This kind of work prevented the completion of the *Spirit* by its originally scheduled date of May 2002.

## Wing

Cole's wood-working friend, the late Andy Keefe built two wing halves for the *Spirit* in Florida many years ago, which were eventually transported to NY to be spliced together. They sat in storage at Rhinebeck in a barn for several more years while waiting for the project to be revived. The barn provided only limited shelter from the harsh upstate NY environment and pests. The wing panels were removed from the barn during the winter of 2001 and upon initial inspection appeared to be salvageable. Work commenced on the wings to repair nose ribs and replace several other ribs that had been broken and chewed on over the course of its extended storage time. Not long afterward it became apparent that the wing needed to be completely disassembled. It was decided that it would be easier to remove the old varnish from the spars by disassembling them and using a surface planer rather than scraping them manually with all of the ribs still in place. It was also found that the main strut mounts were in the incorrect locations on the spars and that the cap strips along the tops and bottoms of the spars were made from varying sizes of wood on the two wing halves to further complicate matters.

Twenty or so new ribs were fabricated to replace the broken ribs and the spars were taken apart, surface planed and then reassembled. There was extra wood left over to make additional ribs, so another ten or so were fabricated while the jig was out and volunteers had the production line rolling along in full-force. By this time over thirty of the fifty-one ribs were made, so it was decided to build the rest of them to have what would essentially be a brand-new wing. Scott Mackenzie, Bob Mackenzie, Bob Johnston and the late Larry Potter were able to knock them out in short order. Local Rhinebeck resident Lauren Decker generously provided all of the wood for the new ribs. Martin Mueller of MSM design in Haydenlake, Idaho provided all of the necessary custom made steel wing fittings, the engine mount ring was formed and donated by Kottler Metal Products of Willoughby, OH. Duraline

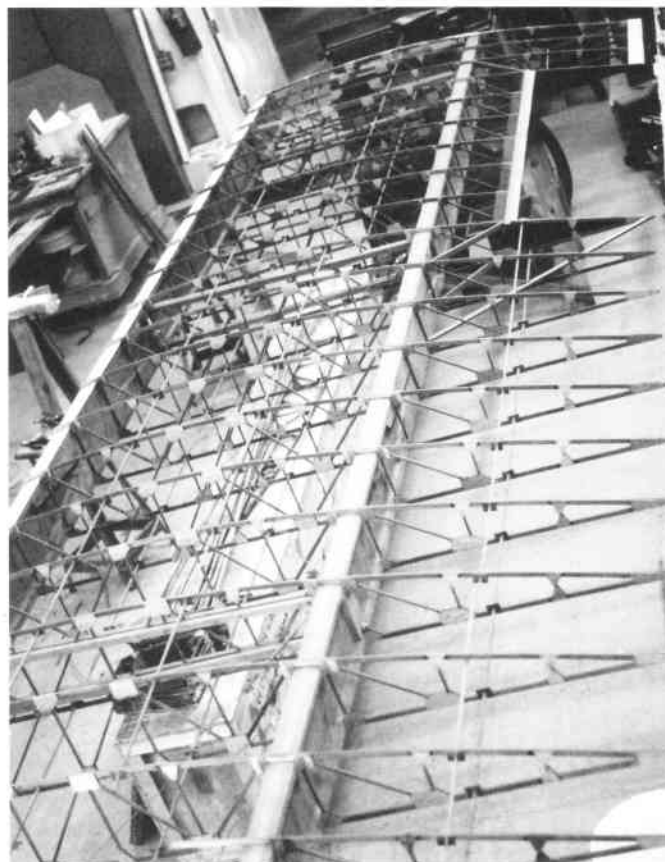


Ken, Scott Mackenzie and Bob Mackenzie building ribs, circa 2000.

Photo: Robert Johnston

Old wing that was not used.

Photo: Robert Johnston





Ken with Don Hall's grandson.

Photo: Robert Johnston

Completed instrument panel.

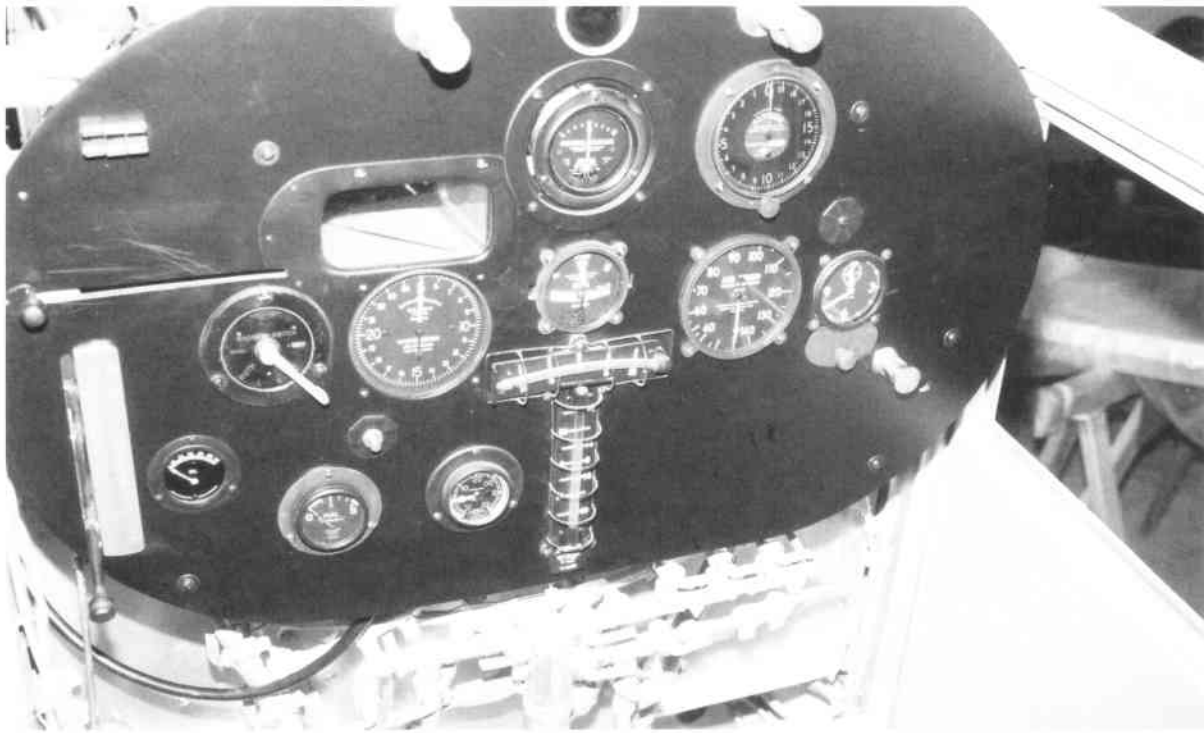
Photo: Tom Polapink



*Spirit* with fuselage covered and Wright J-5 installed and sitting on gear.

Photo: Robert Johnston



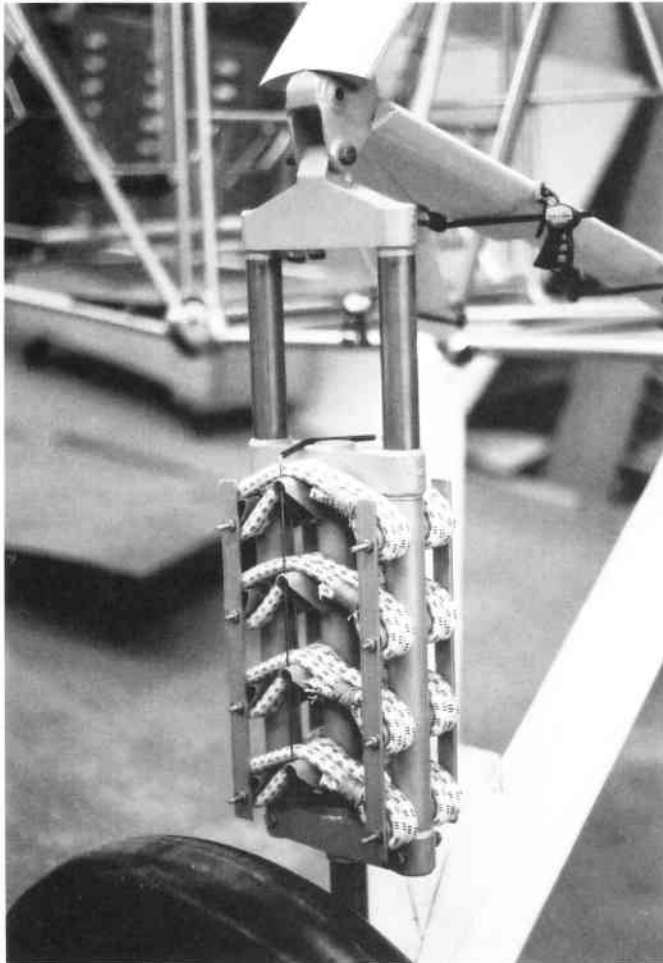


Instrument panel with fuel plumbing below.

Photo: Robert Johnston

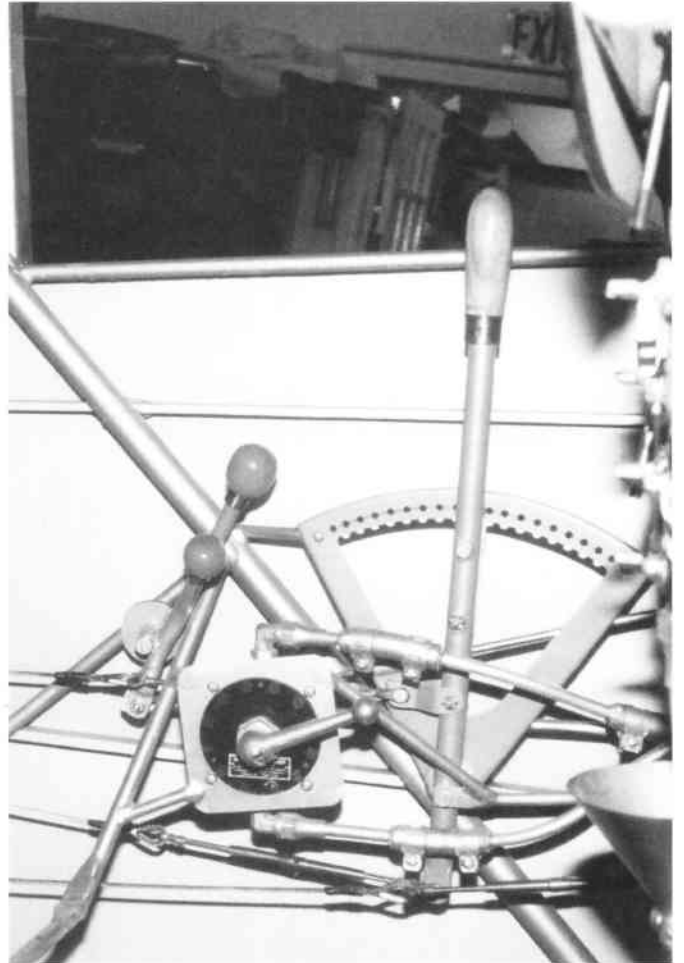
*Spirit* landing gear. Eight bungee cords on each gear leg.

Photo: Tom Polapink



Trim levers.

Photo: Robert Johnston





Reeve Lindbergh in cockpit of *Spirit* replica, circa 1997.

Photo: Tom Polapink

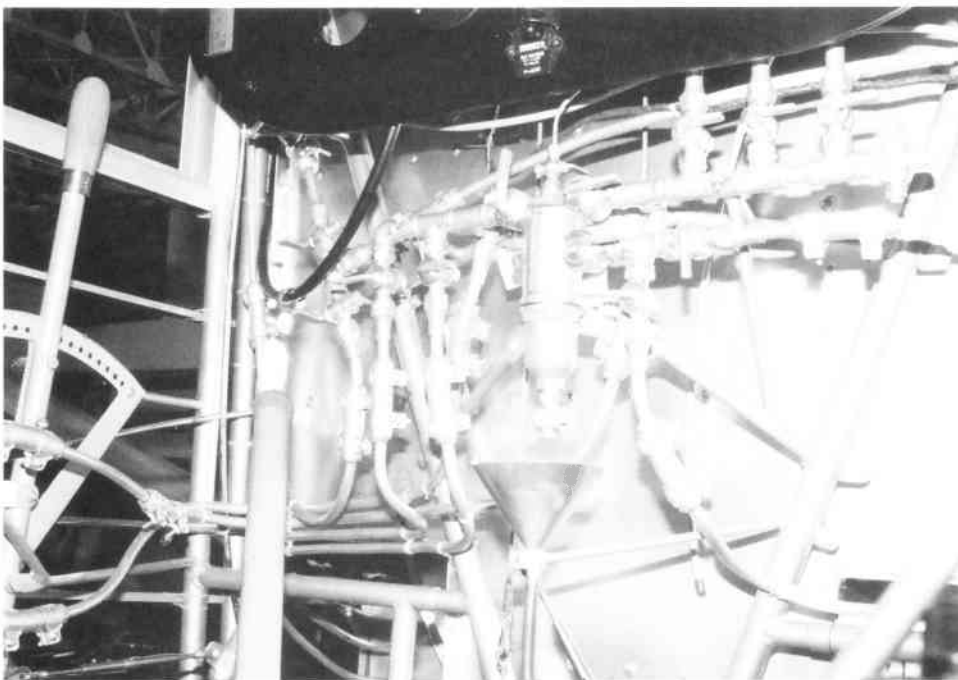
of Islandia, NY provided custom-molded rubber shock mounts for the engine (not on the original aircraft, but it was an upgrade that was felt to be worth making). Rolo Advanced Design of Poughkeepsie provided complimentary powder coating services, and Loos and Company of Pomfret, CT donated all of the necessary turnbuckles. Generous volunteers and businesses such as these helped immeasurably to move the *Spirit* project along.

### Engine and Prop

The J-5 was overhauled by Mike Connor of Preston, Georgia. The prop was acquired in a trade with the Niagara Air and Space Museum when Ken spotted a prop hanging on a wall in their museum in the background of a photo of one of their aircraft. It appeared to be exactly what the Aerodrome needed for the *Spirit*. At the time we had a prop for the project that appeared perfectly fine to the naked eye, but could not be made airworthy. After Ken inquired about a possible trade, the Niagara Museum generously came through and provided the prop. It was sent to Maxwell Aircraft in Minneapolis, MN for overhaul and was returned shiny and new. Ken and Scott installed the engine and prop on the *Spirit* and fired it up in 2003.

### Status

In the fall of 2002, the focus of the *Spirit* project was shifted to rebuild and refinish the Aerodrome's Fokker Triplane for use in the weekend airshows, which took the better part of that fall and winter. Early in the spring of 2003 other airshow aircraft needed attention and only minimal time could be given to the *Spirit*. By this time the fuselage and tail surfaces had been covered and completed, control cables were installed and functioning



Incredibly complicated fuel plumbing.  
No less than 12 cocks.

Photo: Robert Johnston



Ken with Peter Jakab, curator NASM, 2002.

Photo: Tom Polapink

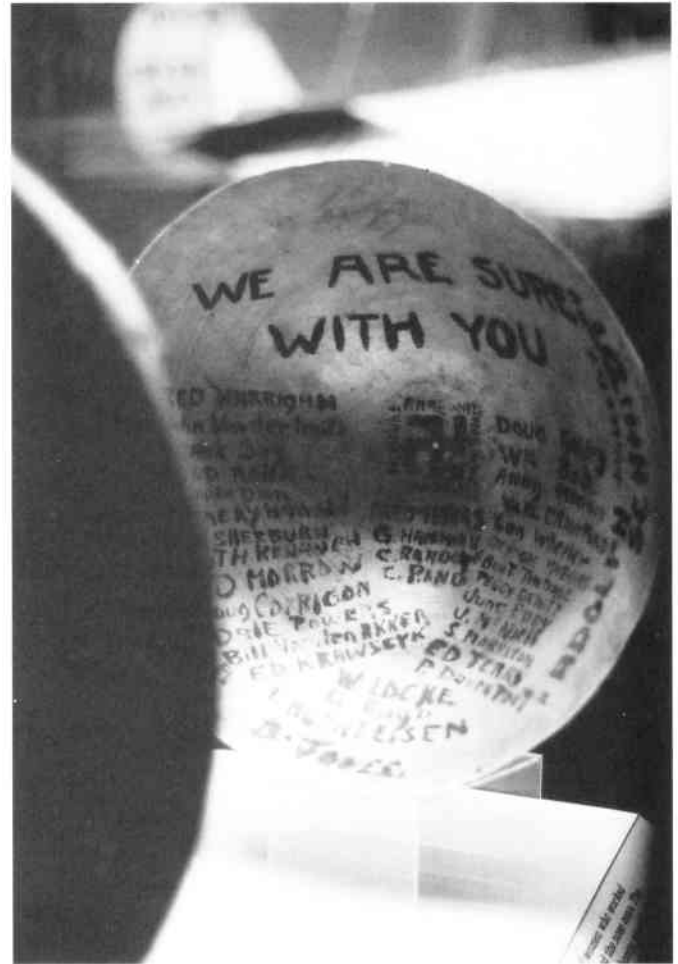
Original completed *Spirit* spinner.

Photo: Tom Polapink



Original *Spirit* spinner. Signatures are of all the Ryan employees who worked on aircraft.

Photo: Tom Polapink







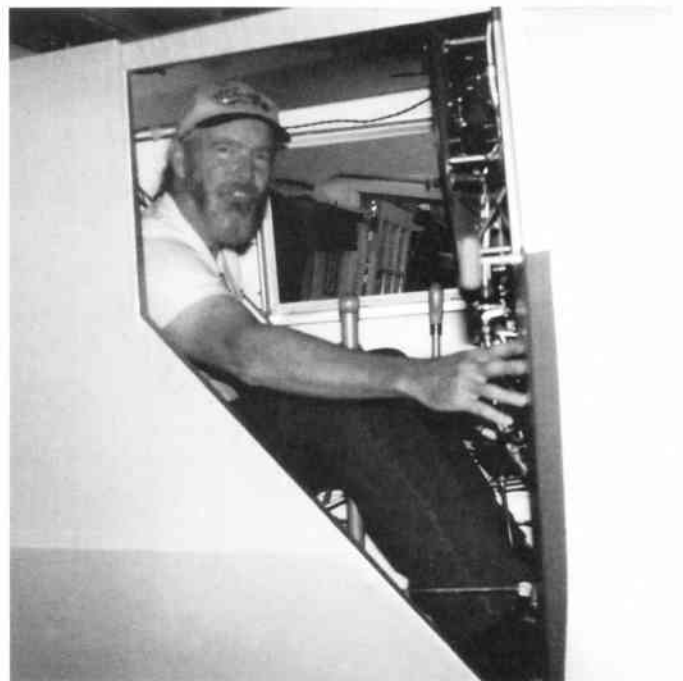
**Spirit assembled, J-5 running at Old Rhinebeck.**  
 Photo: Steve Sweeney

and Ken was starting work on the sheet metal cowlings and landing gear fairings. The wing was completed except for the leading edge plywood, final installation of the trailing edge and covering and was test fitted to the fuselage along with the struts.

Right around this time Ken had an unfortunate pre-airshow season accident in the Aerodrome's Avro 504 during the filming of a television show for the History Channel when its 110 LeRhone decided to stop running at a most inopportune time. Thankfully he had only minor injuries, but he didn't fly for the remainder of that season. Sadly, the project came to a halt when Ken and Scott were let go from the Aerodrome in the fall of that year and it has basically remained untouched since then. It is in the "Ryan Airline's Hangar" at Rhinebeck, and perhaps will be finished at some point in the future.

Ken has since started his own business doing repairs on fabric aircraft and in addition to other projects, has built a Curtiss Fledgling fuselage from scratch for a well known collector of Golden Age aircraft. He also flies rides in a Waco UPF-7 at Wurtsboro airport in NY on warm sunny weekends and tows gliders in a Cessna "Bird Dog."

Will he ever return to Rhinebeck to complete the *Spirit*? One thing is for certain... it would be great to see the project finished, and Ken has the knowledge, skills and interest in the aircraft required to make it happen. Who knows? In 1927 Lindbergh proved that anything is possible! ■



**Ken Cassens in cockpit, circa 2001.**

Photo: Robert Johnston