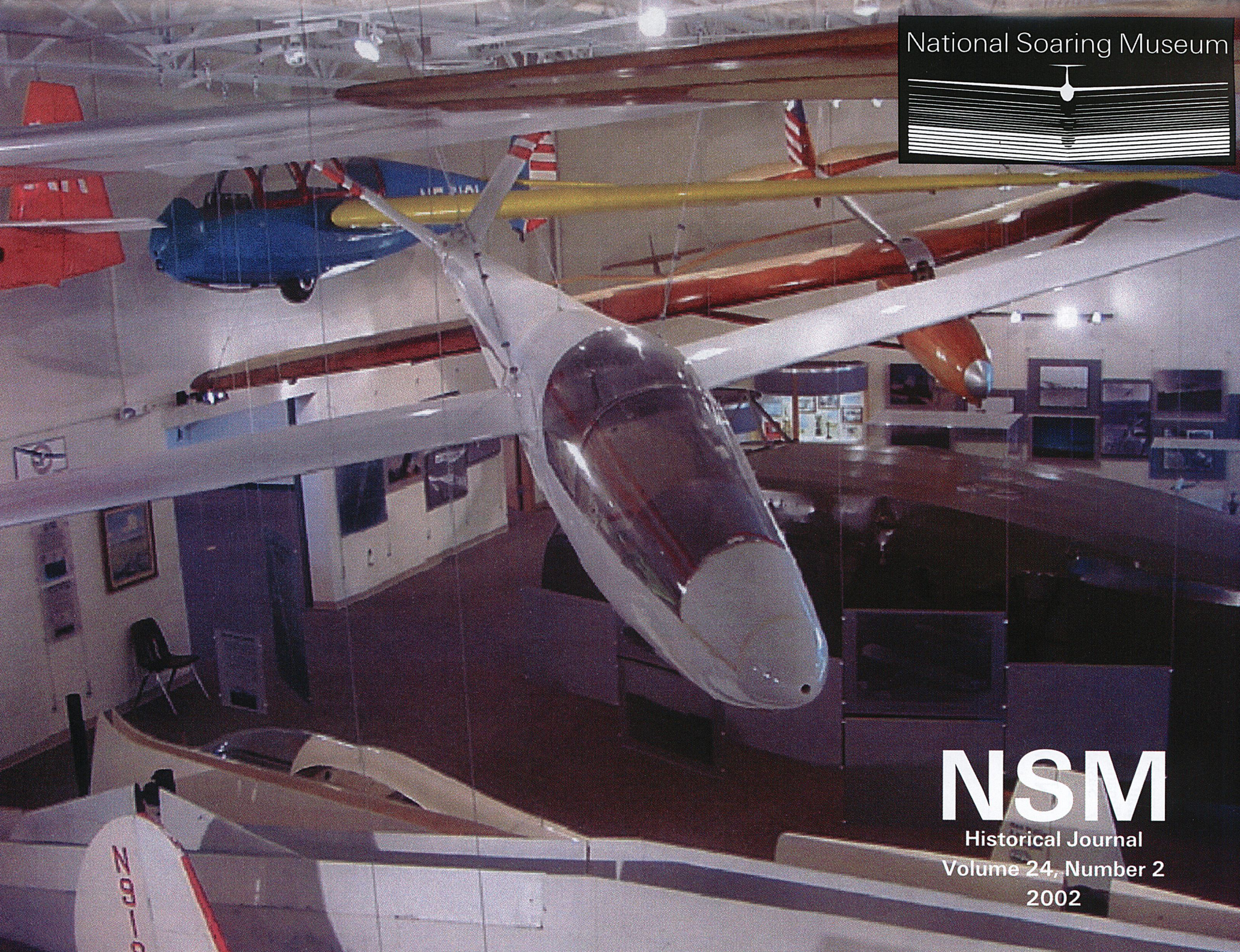
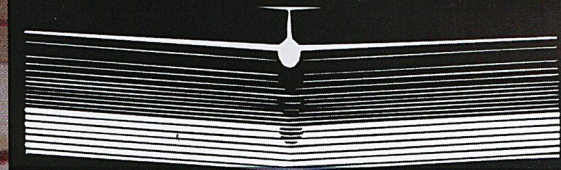




National Soaring Museum



NSM

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On the Cover:

A view of the northeast section of the National Soaring Museum's main gallery. Left, against the wall, Briegleb BG-12BD tail section, and Laister-Kauffmann TG-4A (LK-10A factory designation). Suspended overhead foreground, are the Schreder HP-11 Airmate, followed by the

Bowlus Baby Albatross BA-100, at floor level: trailered Schweizer 1-23D, Schleicher Ka 6E, along with WW II Waco CG-4A fuselage section in the background.

Back page: a view of the expanded National Soaring Museum from the Harris Hill main runway, with first and second level floor plans.

New Exhibits Showcase U.S. Soaring History

By Brian Howard, Former Director of Development and Collections*



The ribbon cutting ceremony marking The National Soaring Museum's Grand Opening Reception: Left to right, Bernald S. Smith, Paul A. Schweizer, Paul H. Schweizer, Thomas Santulli, Jeff Byard, NY State Assemblyman James Bacalles, William Schweizer, NY State Senator Randy Kuhl, Robert Ball, Michael Belosky, Jan van den Blink, and Brian Little

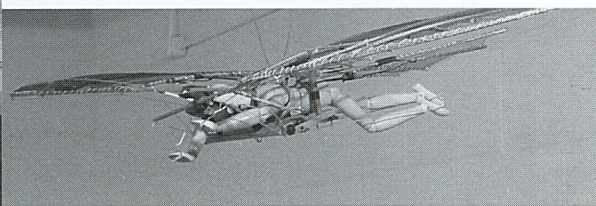
Opened on May 17, 2002, the National Soaring Museum's new exhibits relate the history of U.S. motorless flight from the 1800's to the 21st century. Visitors to the new facility will be presented with an impressive display of almost thirty classic aircraft that contributed to this exciting story. The grand opening and dedication was attended by over 200 supporters, and represented the culmination of the Soaring Heritage Campaign, started in 1998 to expand and reinvent the facility.

Other 'can't miss' areas include the Schweizer Gallery, the updated Evolution of Gliders and Sailplanes Exhibit (EOGASE), the new NSM Orientation Theater, and the revamped Windrider Gift Shop.

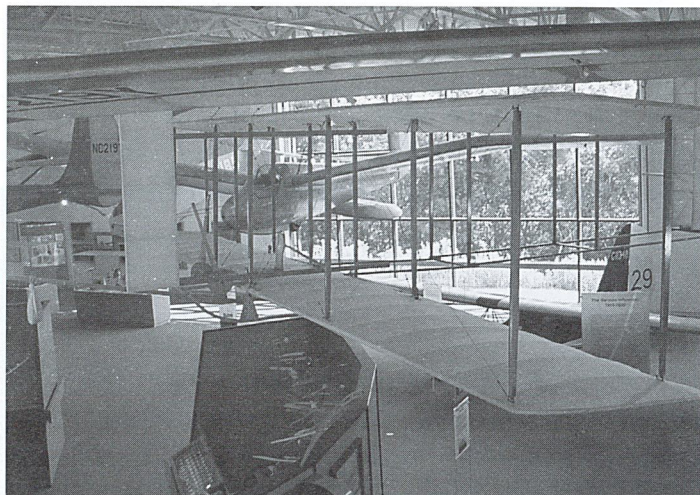
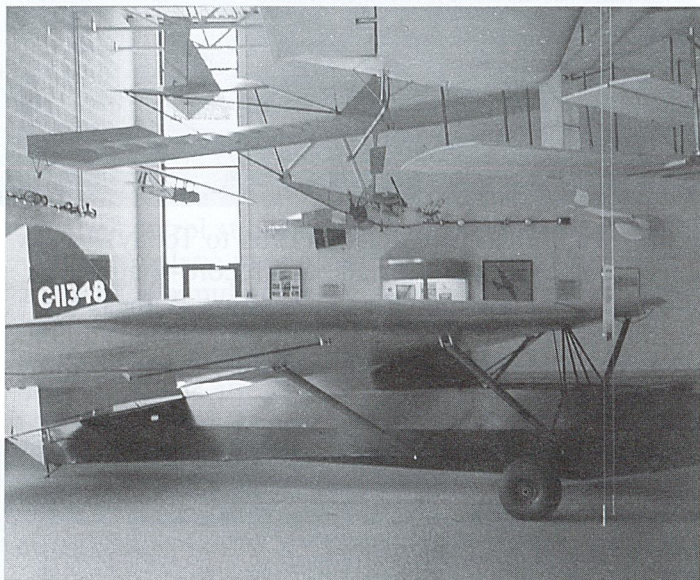
Schweizer Gallery tells the story of soaring pioneers Ernest, Paul A., and Bill Schweizer. These brothers became involved in the soaring movement in the late 1920s. Between 1939 and the late 1980s, their Elmira-based company built over half of all U.S.-made sailplanes. Their gallery displays four full-sized aircraft and models of every sailplane and motorglider type that the Schweizers made over their first six decades.

The new exhibits are arranged chronologically in sections that highlight distinct periods of our shared soaring heritage. They are:

FASCINATION OF FLIGHT (Ancient Times to 1890)—Graphic images show man's early attempts to fly. Images from the ancient myth of Icarus and a model of DaVinci's Flying Machine, through the middle 19th century are shown here. Gliders built by pioneers like Jean-Marie LeBris and American John Montgomery are highlighted.

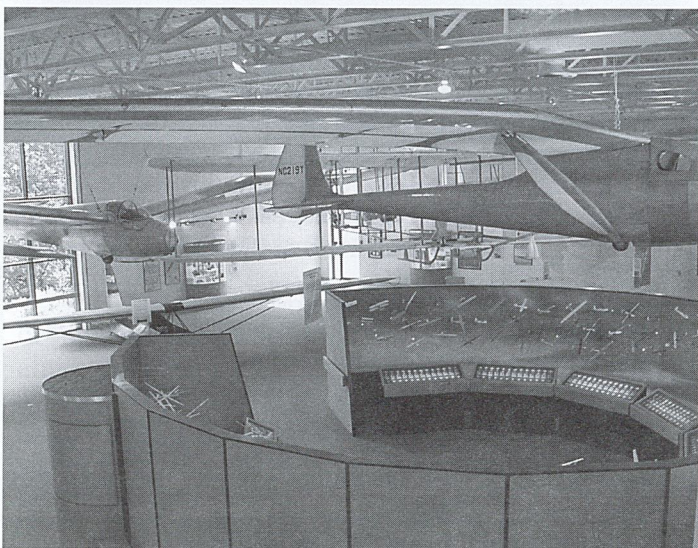


Right - **BREAKTHROUGH (1890-1911)**—Soaring flight takes off between 1890 and 1911 as experimenters like Otto Lilienthal, Octave Chanute, and the Wright Brothers make thousands of successful flights in gliders of their own design.

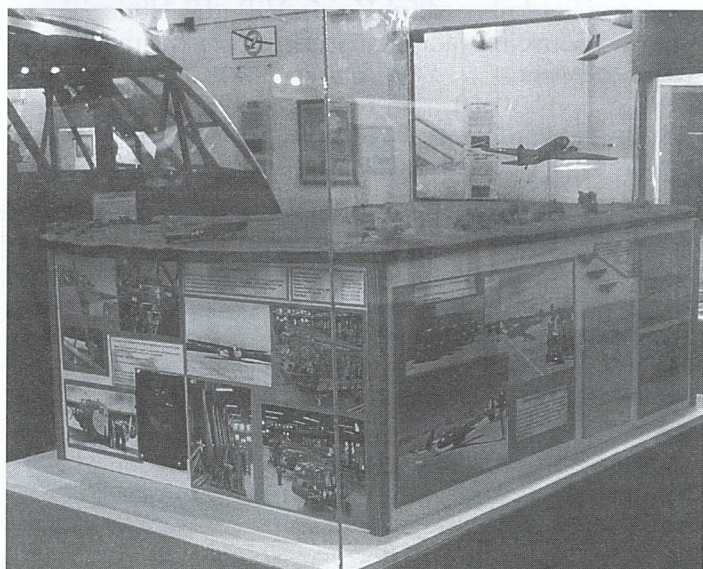


Left - **THE GERMAN INFLUENCE (1919-1930)**—Powered airplane development was restricted in Germany after World War I. Aviation enthusiasts there picked up motorless flight and made great advances in soaring throughout the 1920s. Their work sparked the U.S. soaring movement.

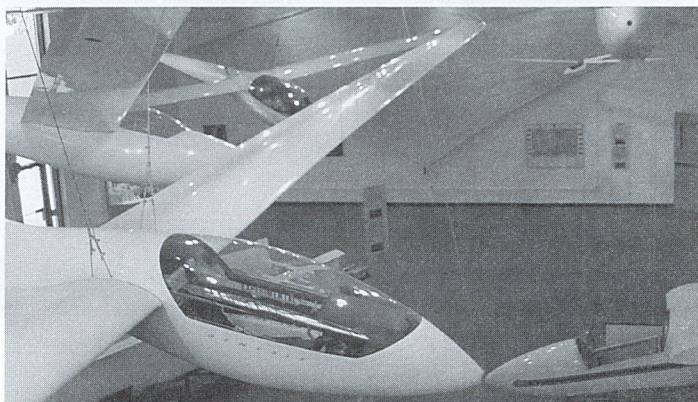
Right and Below - **ELMIRA AND BEYOND (1930-1940)**—See why the Elmira area was chosen as the site for the first National Soaring Contest in 1930. Trace the soaring movement's rapid growth throughout the decade prior to World War II.



Right - **GLIDING TO WAR (1939-1945)**—Gliding and soaring is adapted from the world of sports and recreation and utilized to train pilots and deliver gliderborne troops. Learn about the U.S. Army Glider Training Program, which started on Harris Hill in 1941. Walk through the interior of the widely produced Waco CG-4A assault glider.



Right - **STRIDES IN SOARING (1945-1965)**—Soaring experiences a revival in the late 1940s as new pilots and space-age technologies are applied to motorless flight. Witness the use of sailplanes for recreation, competition, and aeronautical research.



Right - **VIRTUAL FLIGHT LAB** —Three computer-run soaring flight simulation stations. Pilot your own sailplane. Take off, land, soar, in the full size cockpit simulator. You are the pilot-in-command.

The expanded Evolution of Gliders and Sailplanes Exhibit (EOGASE) features 129 models of historically and technologically significant sailplanes. EOGASE has been thoroughly upgraded with new graphic panels, several new models, and a 'dawn sky' scenic background that highlights each model in the display.

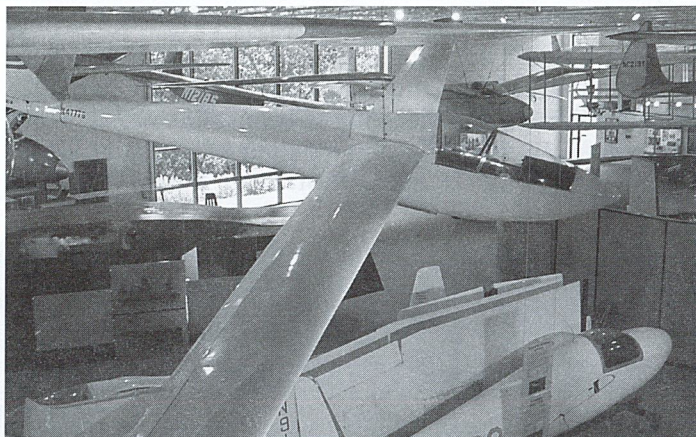
The new NSM Orientation Theater gives visitors an introductory glimpse into the world of soaring through videos that highlight the movement's history and growth. Visitors can finish their tour in the Windrider Gift Shop, which features hundreds of soaring-related items, perfect for souvenirs and gifts.

The National Soaring Museum has a long history of producing excellent exhibits and programs. This latest walk through U.S. soaring history is sure to please visitors of all ages, and should encourage repeat visits to beautiful Harris Hill, the National Soaring Museum, and Harris Hill Park for many years to come.

*Brian Howard recently left the NSM Staff to join his family's business enterprises.



WINDRIDER GIFT SHOP



Left - **MODERN SOARING (1966 to Today)**—New technologies, new materials, and record-shattering flights define the modern soaring era. Witness the introduction of fiberglass in sailplane designs and the growth of competition classes from 1966 through the present day.



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Anyone is invited to contribute material and pictures with identification, about historical soaring activities, renovation of old sailplanes, soaring pioneers, unusual uses of sailplanes, etc. Manuscripts are subject to whatever revisions, additions or deletions are necessary to make the material conform to the space limitations and standards of the NSM. Material that is to be returned must be accompanied by a stamped self-addressed envelope. No compensation other than credit will be given.

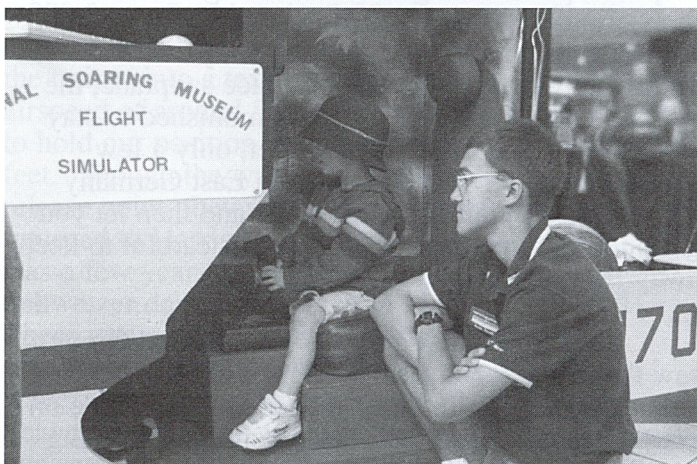
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The National Soaring Museum is an affiliate of the Soaring Society of America and, as such, is the official repository for all its documents and artifacts.

Cyber Sailplanes - The National Soaring Museum Simulator Project

By Ryan J. Smith

In an effort to provide more interactive exhibits at the National Soaring Museum, my dad (Norm Smith, Interim Director of NSM) and I have begun an ambitious project to build or obtain as many flight simulators as we can. We recently completed our first simulator, the "NR-1" (Norm and Ryan, number one). It was built to look roughly like a training glider, at a minimal cost. A computer screen in the cockpit displays a simulated flight environment. "Student Pilots" sit in the cockpit and use the control stick and rudder pedals to fly a virtual sailplane over a simulated central New York State. The simulator has castor wheels underneath its floor, allowing it to be easily transported. (Well, I don't know about easy, the thing is awfully darn heavy!) It has already been to several local events, helping to promote soaring and NSM. Kids love it, but the cockpit is very small and cramped, and is very difficult to get in and out of if you are taller than four-foot six!



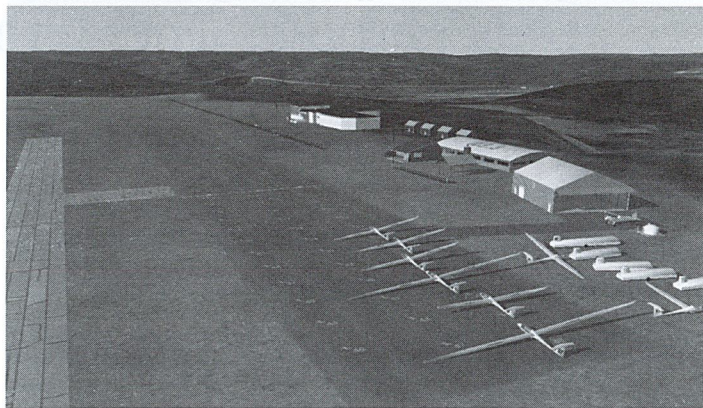
Here's a future airline captain or fighter ace getting his first flight! This photo was taken at this year's Think! Science Day at the Arnot Mall in Big Flats, NY.

Due to the comfort problem of our current design, we are working on plans for new simulators already. Several designs are in the works, including a 1902 Wright Brothers glider, a CG-4A military assault glider, a modern sailplane, and a hang glider. The goal is to have a simulator for every type of soaring and gliding.



About The Author

Ryan lives near Monterey, NY. He is 16 years old and has been home educated since the fifth grade. He is a very active member of the Harris Hill Soaring Corporation Junior Program. Ryan soloed a Schweizer 2-33A trainer this August, and is looking forward to earning his Private Glider License next summer.



An example of the virtual flight environment produced by the Microsoft Flight Simulator Software, showing the Harris Hill Gliderport.

The software that we are currently using to generate the visual display for our simulators is the 1998 version of Microsoft Flight Simulator. Hopefully, we will soon be able to acquire a new computer system that will be powerful enough to run Flight Simulator 2002. The new version has much more realistic visuals, and more realistic aircraft handling. However, the newer version still isn't perfect. None of the local landmarks are visible, and there are no thermals or ridge lift for soaring. All summer I have been using computer-aided design (CAD) to put some of the more important local structures into MSFS. I have also added thermals and ridge lift to permit soaring flights. The result is quite spectacular, although I am only about halfway finished. Soaring flights can now be made over Elmira, New York, the Soaring Capital of America, with familiar landmarks such as the Elmira-Corning Regional Airport and the Harris Hill Gliderport. The Harris Hill Gliderport is the most detailed area, with every building and hangar visible. The clubhouse even has the Pepsi machine on the porch! The enhanced scenery makes a virtual version of the famous Harris Hill "Snowbird" spot landing contest possible. The goal is to land on a 10x30 foot rectangle spray-painted on the runway, and then come to a complete stop as close as possible to an orange traffic cone about 200 feet down the runway. (For a more detailed description of the Snowbird contest, see the February 2001 and March 1997 issues of *Soaring*.)

I have had a great time working on the "NR-1" simulator, and I've learned a great deal about computer-aided design from programming the new scenery. Hopefully our simulators will help introduce a new generation to the wonderful sport of soaring!

Paul A. Schweizer Delivers the 31st Annual Ralph S. Barnaby Lecture, "Soaring Through The 20th Century"

At the 31st Annual Ralph S. Barnaby lecture on Oct. 26, Paul A. Schweizer piloted his audience back to the beginnings of the post World War I, the 1920s soaring movement on the Wasserkuppe in Germany's Rhoen mountains through the 20th century, to an imaginative glimpse of what soaring might be like in 2050. Schweizer is a pioneering sailplane designer and builder, co-founder of the Schweizer Aircraft Corporation, a recognized motorless-flight historian, and author of several books and articles on soaring.

Speaking at the National Soaring Museum's new "C" Hall at the Harris Hill facility, Schweizer said that he was pleased to be asked to give the Barnaby Lecture. He based his talk on a few shortened chapters from the book that he is currently writing entitled, "Soaring Through The 20th Century."

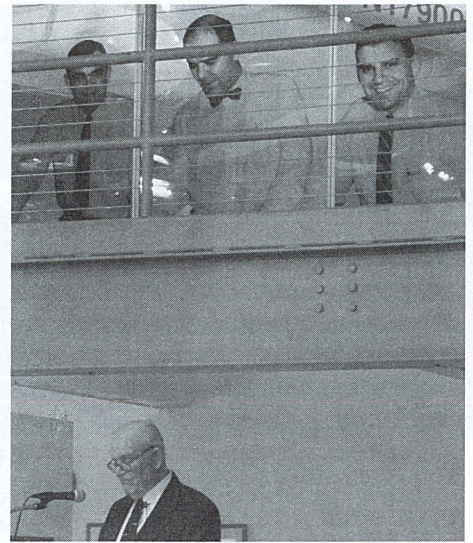
In "Wasserkuppe Pilgrimages," he said that most soaring enthusiasts hope at some time to be able to visit the Wasserkuppe, where the world soaring movement started in the 1920s. It is located in Germany's Rhoen Mountains northeast of Frankfurt, near the Fulda Gap, the place where during the Cold War, invaders from the East would pass if another European conflict was to start.

The mountain site was first used back in 1911. Hans Guttermuth and Berthold Fischer launched their first, primitive gliders there. Gliding activity ended with World War I, and was not revived until Oskar Ursinius started his glider meetings there, in the early 1920s. The combination of the Wasserkuppe's height and its proximity to the Fulda Gap and East Germany, made it an ideal location for a U.S. Radar station at the end of World War II.

He first visited there in 1960, during the World Soaring Championships at Cologne. He described the "Eagle of The Rhoen" a bronze casting of an eagle, mounted on rocks that memorialize the fallen flyers of the past. Previously, Schweizer heard from Wally Setz that there was a special room in one of the buildings atop "Eagle of Rhoen" bronze cast mounted on rocks atop the Wasserkuppe.



Paul A. Schweizer delivering the Barnaby Lecture with the Schweizer Hall plexiglass entrance mural of Paul, Ernie & Bill overhead.



the Wasserkuppe, called "The Lilienthal House." A more somber memorial, it is open only to selected visitors. A life-sized sculpture of a fallen glider pilot is at the room's center, with olive-colored wreaths on surrounding walls. "Lilienthal House" is dedicated to all pilots, power and glider, who had given their lives to aviation. On his second Wasserkuppe visit before the Berlin Wall fell, he and wife Ginny, were checked out in Rudy Kaiser's latest two-place sailplane, the ASK-13. The Schweizers were admonished to stay away from the East German border, only a few kilometers away. "If you landed in East Germany they put you in jail for a few days, and then let you go; but they keep the glider. So I was careful to keep away from the border."

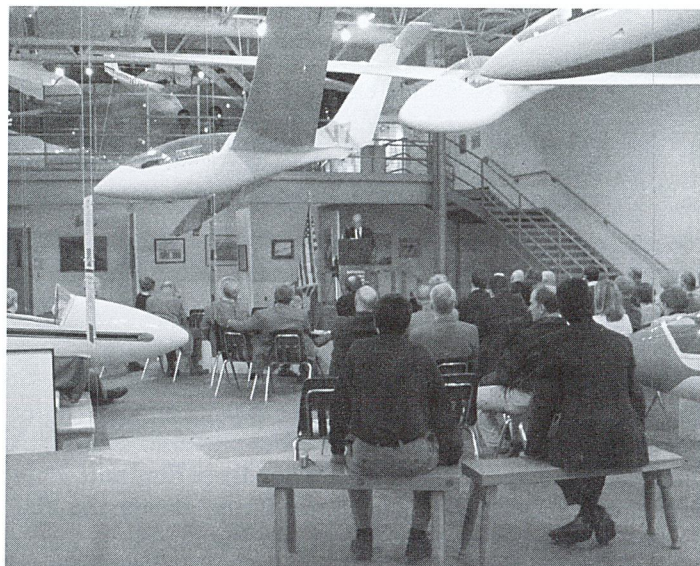
In a 1969 Wasserkuppe visit, he and Ginny saw that a small hangar museum had been started. At about the same time, a start was also being made on converting the Harris Hill Administration Building into a soaring museum. "Both these efforts have resulted in the creation of two modern soaring museums, the National Soaring Museum on Harris Hill and the Deutsches Segelflugmuseum on the Wasserkuppe," Paul said. Both facilities are planning to work together by exchanging books, posters and other artifacts.

At the International Vintage Soaring Meet 2000 held on Harris Hill, there were representatives from the Wasserkuppe Museum, the National Soaring Museum, the Swedish Soaring Museum, as well as representatives from Australia, and England who hoped to have such museums in the future. "We discussed the possibility of all the soaring museums joining together in an association to be named the World Soaring Alliance, and Jan Scott was chosen to lead this effort," Schweizer said. He added that provisions would be made for other types of museums with gliders on exhibit to join as association members.

On Paul and Ginny's last trip to the "Kuppe," as it is referred to locally, they were picked up by Rudy Kaiser who acted as their guide, and who talked about the Wasserkuppe's history and the Schleicher Company. It was the last time they saw Rudy, who passed away shortly thereafter. "The number of old-time soaring pioneers like him keep decreasing, and we have to look to the soaring museums to keep alive the history of the pioneers and their contributions to soaring," Schweizer reflected.

He then mentioned two memorable flights with Ginny. The first was in the 70s, on a beautiful Sunday in May; perfect for soaring. Right after church Paul and Ginny arrived at the Schweizer Soaring School only to find that the high performance 2-32 was in use. However a 2-33 trainer was available. Towing to 2,000 feet, they became aware of a 90-degree wind shift. Paul noticed a beautiful lenticular wave cloud forming downwind of the ridge that runs northeast from Corning to Watkins Glen. "Let's try for it," Ginny said. Lift was strong, and cloud base was about 8,000 feet. Pushing the 2-33, through a 10-mile upwind stretch of intermittent thermals, Paul nudged the trainer into a textbook standing wave. "With an airspeed of around 50 miles per hour, we were able to hold our position as we climbed steadily to 12,000 feet. Though the wave was 15 miles away from their release point, they still had 8,000 feet when they returned to Harris Hill. Another outstanding flight was a few years later, also in a 2-33 at one of the Schweizer dealers, Jon Putnam, in Franconia, NH. There was no wave cloud, but they thermaled to smooth lift that was immediately recognized as wave. They rode it up to around 12,000 feet. Schweizer said, "It was a tremendous sight . . . From our perch over Franconia, we thought that we could see seven states and a good part of Eastern Canada."

From his "Business Trips By Sailplane" chapter, the lecturer related several incidents where sailplanes were used for commercial travel. In one, a free distance day was declared during the 1953 Elmira Nationals. Pilots received extra points for making a goal. With a northwest wind aloft, Paul decided to make a downwind dash to New York City in a 1-23D. Brother Bill suggested that, as long as he was headed that way, why not see if he could reach Bethpage Airport on Long Island. That was where Grumman Aircraft was located. He could make a business trip of it. "We were making MAD Booms for Grumman's S2F Tracker, so I chose Bethpage as my goal," Schweizer said. Bill said that if Paul had not reported a landing to the contest headquarters by 2 PM, he would call Hank Kurt, the Grumman subcontract manager to let him know that I would be soaring down to see him on business.

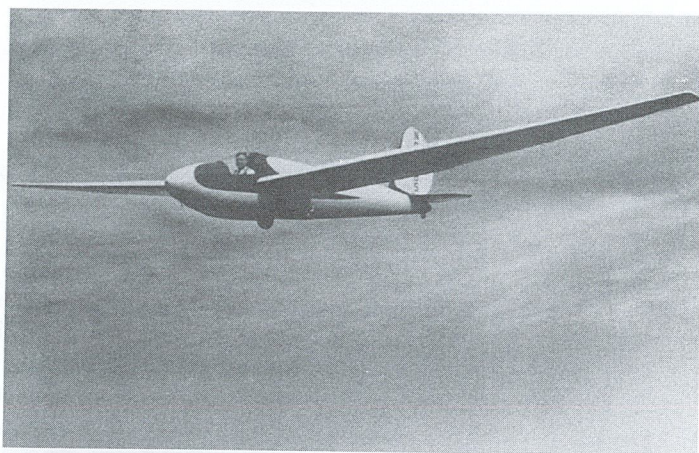


Paul A. Schweizer speaking at "The Modern Soaring 1966 to Today" exhibit in the Museum's new C Hall. Shown left to right: Schweizer 1-34 Simulator, Group Genesis, Inc. Genesis I, Glasflugel Libelle, Shreder H P-18. Not visible above the simulator, Laister L P-15 Nugget.

He soared over the Poconos, spanned New Jersey, passed Teterboro Airport, crossed the Hudson, and arrived at 6,000 feet over the New York side of the George Washington Bridge. He was looking down at the spot where, in 1930 Wolf Hirth in "Musterle" soared along New York City's Riverside Drive. "There was general lift over the city so I glided ahead without spiraling," he said. Passing the East River, he had Roosevelt Field in sight, and needed only one more good thermal to reach Grumman. He caught one over Queens, and arrived with so much altitude over Bethpage that he did a few loops and wingovers to get their attention. Unfortunately, Kurt went home thinking that because the sky was clear, Schweizer would never make it.

The 1953 soaring flights from the '53 Nationals to the metropolitan area caused quite a stir. Aside from Paul's flight, three others landed at Idlewild Airport. The New York Herald editorialized, "Idlewild authorities had good reason to be displeased at the landing there Tuesday of three gliders from upstate. This airport has no time for visiting firemen from Elmira who drop in on powerless wings." The next day, the New York Port Authority amended its rules by adding, "No motorless aircraft may land or take off at an air terminal without permission." (Dr. Paul MacCready in a 1-23D, won the day with a 212-mile flight to New Haven, CT. Paul Schweizer was second, with 201 miles. The Idlewild visiting firemen, Stan Smith in his 1-21, Nick Goodhart flying an L-K, and Steve Bennis in a 1-23D, tied for third with 191 miles.)

In the last segment of his lecture, "Soaring Capital in 2050," he reviewed how Harris Hill



Paul A. Schweizer in his 1-23D soaring from Elmira to Grumman Aviation, Bethpage, Long Island, during the 1953 National Sailplane Meet.

became the "Soaring Capital of America," and was the top American contest site in the 1934-59 period. He mentioned civic and business leaders like Bud Iszard, Bill McGrath, three-term mayor of Elmira, Eddie Mooers, Maurice Whitney, and the Association of Commerce, along with the community as a whole, who got together with the County, and created the present facility.

"So today we are again at a point where another major project will have to be carried out as was done in 1933, and 1967," Schweizer said. But before doing that, he stated the present situation where the limited size of the Harris Hill flying field has restricted its future. The big need is to expand the flying field so that it can handle all types of contests such as the Open Nationals, a 100-plane International Vintage Soaring Meet, or even a World Championship.

"This would again make Harris Hill the top soaring contest site in the USA, and assure our title of "Soaring Capital of America," during the 21st Century."

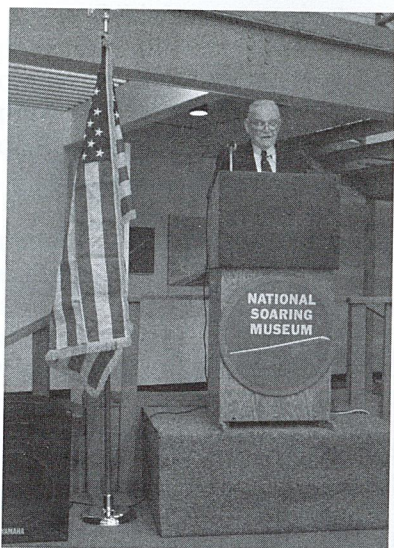
He said that everyone realizes that such an expansion would be an expensive project, "and many might say that it is impossible to achieve. But looking back, we are in about the same place as we were in 1933, when we had to conduct Nationals from hayfields on the Rhodes farm, using shock cords for launching, greatly limiting performances at the contest site. "There was an urgent need for a new location that could accommodate auto, winch, and airplane tows. This became a major project. Local soaring interests led by community leaders Bud Iszard, one of the founders of the Soaring Society of America, and Bill McGrath, CEO of Eclipse/Bendix Corp., working with the Association of Commerce and County created a new site from three adjacent hayfields, east of the Rhodes farm. It became known as Harris Hill and was first used for

the 1934 National Soaring Contest. It became the top American soaring site during the 1934-1959 period. "But in 1963," Schweizer said, "with the steadily growing size of the National Soaring contests, we had to split the '63 Nationals between Harris Hill and the Airport. This was not popular with the pilots or the SSA, and we realized that we needed to improve Harris Hill if we expected to get future national contests."

It took the Elmira Area Soaring Corporation (EASC) and other local soaring interests three years to convince the County of the need. Schweizer said that it was only possible again with the help of community leaders like Eddie Mooers, past three-term Mayor of Elmira, Maurice Whitney, CEO of Eclipse/Bendix Corp., the Elmira Association of Commerce, and the community as a whole, persuaded the County in 1967, to budget \$250,000 for leveling the field and adding two paved runways. The job was completed in 1968, in time for that summer's very successful National Meet.

Thereafter Open Class sailplanes became much larger and carried heavier loads of water ballast. Harris Hill could not handle an "Open" contest, and as the other contests increased, Harris Hill became limited in how large a contest it could hold. In the 1980s, the Harris Hill Soaring Corporation, with the help of the Army and the National Guard attempted to widen the field and add a third strip. But complications arose, and the strip was never completed.

The Barnaby Lecturer asked attendees to take a flight of fancy over Harris Hill in the year 2050 with him, "in one of those new special five-passenger sailplanes that take four passengers at a time for introductory rides. We see a greatly expanded Harris Hill airport that is the top soaring site in the USA. The increased size allows room for all types of contests, and room for a large operational hangar to accommodate all types of sailplanes, and a Vintage Sailplane hangar, plus an enlarged Flight Center. There is a visitor pavilion, halfway between the National Soaring Museum and the Flight Center with rest rooms, concessions, and a food center. It is a place where visitors can relax, wait for their sailplane rides, and view the flying activity. On the brow of Harris Hill, east of the field, sits an IMAX theater, visible from Interstate 86. The IMAX would be sponsored by eight area tourist attractions: Harris Hill Soaring Corporation (HHSC), National Soaring Museum, The National Warplane Museum, The Glenn H. Curtiss Museum, Corning Museum of Glass, Mark Twain Society, Watkins Glen Motor Racing and Rockwell Museum of Western Art. The IMAX shows films from all these groups."



Paul A. Schweizer describing his "Flight of Fancy" into the future of soaring and Harris Hill.

Such a theater would be a major project, and by sharing the cost among the above groups and the New York State tourist development agencies such as the "I Love New York" program, and the Finger Lakes Association, this might be possible.

Schweizer said that this theater could be used for other community events, and the sensational view from the theater would add to its appeal.

Other attractions envisioned, are a restaurant located on a high point on the west end of Harris Hill with a balcony jutting out from the ridge, a hotel and Convention Center where the NSM and HHSC would alternate in sponsoring the National Soaring Convention.

Looking down we see many new homes around the Harris Hill Park where soaring pilots have retired so that they can continue to be active in many phases of soaring and add their support to the overall Harris Hill soaring activity. Many homes have small hangars, some with taxiways to the Harris Hill flying field. The Youth Camp has expanded to include cabins for the contestants and Youth

programs like the Eileen Collins Aviation Encampments. An area for motor home pads, trailers, and tents are provided so that the Hill can again handle large visiting groups to activities.

The National Soaring Museum is the major structure on Harris Hill having steadily grown in all directions, along with the enlarged Heritage Hangar, and the new Vintage Hangar.

As we approach the Harris Hill complex for a landing, we see a natural amphitheater in the woods where outdoor lectures on soaring meteorology, birds, and nature can be held. Our pilot has shown us what Harris Hill might look like in the year 2050.

"This flight has involved a lot of dreaming," the speaker said. He moved the audience back to reality, by considering what can be done to get things started to realize these dreams. "It is unreasonable," he said, "to expect the HHSC, which is basically a club, to take on additional responsibilities that such activity would need. It will require an Administrator to take care of the overall interests of the County, the HHSC, and the NSM, plus other new activities of the Harris Hill Complex. We need to again get the support of the community's leaders, the Chamber of Commerce, and the community as a whole so it can sell the county on this proposal as was done in 1933-1967."

The pioneering sailplane builder, pilot, historian, and author, closed by saying, "We live in a fast changing world, and maybe those dreams can come to be."

Continued From Page 12

"Over Eight Miles High in a Sailplane"

Paul Bikle was selected as the 1962 recipient of the coveted Lilienthal Medal, the soaring world's highest honor. He was an outstanding individual and a very practical engineer. Soaring was Bikle's sport, but military aircraft flight test engineering was his business. Bikle went to work for the Army Air Corps on January 1, 1940 and participated in the flight testing of most of the new aircraft produced in the 1940's and 50's. After serving as Chief Flight Test Engineer at Wright Field, then the Technical Director at Edwards AFB when the Air Force moved the Flight Test Center to Muroc in 1951, he became the Director of NASA's Flight Test and Research Center at Edwards AFB in 1958. Under his management, the X15 rocket-powered airplane took NASA and Air Force test pilots to the edge of space. Concurrently, he oversaw the creation, building and flight testing of the lifting body design concept, a wingless type of aircraft, which developed into the vehicle that now takes our astronauts to and from

space. Chuck Yeager, Neil Armstrong, Scott Crossfield and many other famous pilots worked with Bikle during the Golden Age of flight testing.

His Air Force friends tell the following story about Bikle: During the Korean War, a Russian MIG jet aircraft was delivered to the Americans by a North Korean defector. Col. Al Boyd from the Wright Field Development Center ordered a small team of engineers and pilots from Edwards, including Bikle and pilots Tom Collins and Chuck Yeager to evaluate the MIG in Okinawa. They flew and studied the aircraft from all angles and they wanted to know the jet engine's thrust power. The power plant engineer of the team came up with an expensive and complicated way to determine the thrust of the MIG's jet. Bikle said, "Why don't we just hook a chain between the MIG and one of our jet airplanes that we know the thrust of and have a tug of war." They did it and it answered their questions quickly and inexpensively!

Over Eight Miles High in a Sailplane

By William Schweizer

On February 25, 1961, Paul F. Bikle set two world altitude records in one flight. He reached an absolute altitude of 46,267 feet and gained 42,303 feet after releasing from the tow plane. Bikle utilized mountain wave up-currents produced by the California Sierra Nevada Mountain Range. The flight was made in a Schweizer SGS 1-23E sailplane equipped with a pressure-demand oxygen system.

During the 1950's, Paul Bikle made several high altitude mountain wave flights on the Sierra Nevada Range in Bishop, California area and on one flight he reached the 36,000 feet. He was fascinated by being able to soar "without power" to great heights in this phenomenal atmospheric condition.

Basically, high altitude waves are formed by a strong wind sweeping up over a steep ridge and then forming a series of waves downwind of the ridge (see Fig. 1). This is like the series of downstream waves you can see when you look down at a submerged rock in a fast moving brook.

Mountain waves create a series of up and down currents well above the ridge, on the lee side.

This is the back side of the mountain or hill, away from the wind. At the Sierra Nevada Range, the average mountain height ranges between 8,000 and 14,000 feet. When the waves are being generated, it produces a continual series of waves, which might rise to 80,000 feet or more. They often extend for a hundred miles along the range and hundreds of miles downwind.

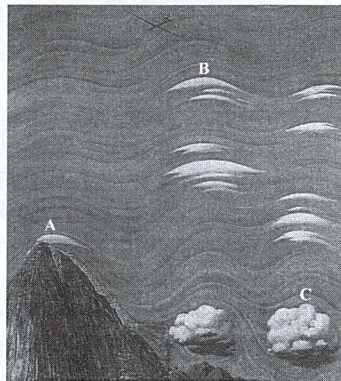


Figure 1

A. Cap Cloud – No value to Soaring Pilot
B. Lenticular Cloud – Indication of Wave in Action
C. Rotor Cloud – Turbulent Area to be Avoided

Among the soaring enthusiasts, the Sierra Wave phenomena is world famous. However, there are waves wherever there are ridges or steep hills. Even in Elmira, New York, with our 800-foot hills, soaring pilots have found waves that rise to 10,000 feet or more.

When Bikle made the record altitude flight, he was the Director of NASA Flight Research Center at Edwards AFB, California and was also the President of the Soaring Society of America. He passed away at the age of 75 in 1991, but will be long remembered as an outstanding engineer,

sailplane pilot, and a real gentleman. He loved a challenge and was a very competitive guy. That is why, in 1960, he decided he wanted to break Bill Ivan's single place world altitude record of 42,100 feet, which was set in 1950, and possibly the absolute altitude record of 44,255 feet set in 1952 by Lawrence Edgar and Harold Klieforth.

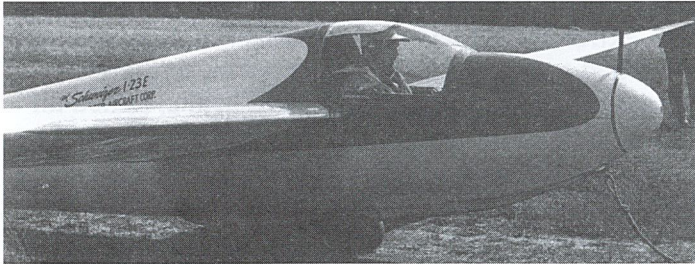
Bikle gave a great deal of thought in planning and organizing the proposed record flight. He understood the record must be broken by 3% to be official. This would require an altitude of at least 43,260 feet for the single place record and 45,583 feet for the absolute altitude record. He set a 46,000-foot goal for his proposed flight. In addition, he planned to restrict his time above 40,000 feet to no more than ten minutes because he would be near the upper altitude limit an individual can tolerate without pressurization. At that time, there were no sailplanes available with a pressurized cockpit or with a power pack to support a pressure suit. So, to be prepared for the flight, Bikle knew he must prepare himself physically, which included experiencing a simulated altitude of at least 2,000 feet above his goal in a pressure chamber. Individuals may vary from time to time in their altitude tolerances and he wanted to make sure he could handle the height. This was not a new experience for Bikle because he had considerable time in military aircraft at high altitudes and had ample opportunities over the years to test himself in altitude chambers at Edwards AFB. After retesting himself, he felt confident he could handle the altitude, so the preparation for the altitude record began.

On frequent occasions he could see beautiful lenticular clouds when looking north from his home at Lancaster, California, which was at the southern end of the Sierras. After thinking about various complications of making the record attempt from Bishop, which is 150 miles to the north and where all previous altitude records had been set, he decided instead to give it a try with a take off from an airport near his home base. Therefore, in early 1961, he moved his sailplane and support equipment from Bishop to Fox Field. This airport was near his home at Lancaster and also close to his work at Edwards AFB. Another factor was that the son of the famous woman bartender, Pancho Barnes, who Tom Wolfe wrote about in his book, "The Right Stuff," ran an F.B.O. at Fox Field. He was capable and available to assist Bikle as needed, which was a plus for Fox Field location.

Bikle's next project was to line up a tow plane and pilot on a standby basis and as an official observer. By chance, he found James Moeller, a pilot with a tow plane who just happened to be an official observer for the Soaring Society of America.

Bikle also sought the help of an experienced meteorologist because mountain waves can be quite elusive. It is often difficult to predict their presence and strength. For example, a wind blowing over a ridge one day can produce little or no waves, while the same wind the next day can produce very powerful up currents. This is the result of different atmospheric conditions, other than wind, such as temperature of air layers, air stability, etc. Therefore, Bikle discussed his proposed flight with Harold Klieforth. He had been chief meteorologist for the Sierra Nevada Wave Research project conducted by UCLA in the early 1950's and was the passenger in the absolute altitude record flight to 44,255 feet in 1952. Klieforth gladly volunteered to help and agreed to call when weather conditions looked favorable.

Just one day later on February 24, 1961, Klieforth called Bikle to alert him that conditions were developing which might produce a strong wave the following day. By 2:00 p.m. the next day, Bikle could see the lenticulars developing 25 miles to the northeast. He decided to prepare for a flight and drove to Fox Field with his son, John, for a 3:00 p.m. takeoff. According to John, "it was a clear desert winter day, windier than hell and cold." There were many details to be taken care of in the next half hour.



Paul F. Bikle in 1961 with his Schweizer 1-23E. The year he made his record flight, he was President of the Soaring Society of America & Director of the NASA Flight Research Center at Edwards AFB, California

In order to officially record the altitude of the flight, sealed barographs had to be installed in the towplane and the sailplane. The communication and navigation radios and the blind flying instruments were checked to make sure they were operating properly because above 25,000 feet there was a reasonable chance that frost would form on the inside of the plexiglass canopy. With this condition, it would be necessary for Bikle to fly the sailplane by its instruments. Extra plexiglass panels were taped on the inside of the canopy in an attempt to keep the frost from forming, but unfortunately, this

did not always work. It is cold at high altitudes and the temperature at 45,000 feet was estimated to be -65 degrees centigrade. Bikle did not believe that this wave attempt would produce a record because there was only two and a half hours of daylight left, which seemed like insufficient time after a 25 mile tow to the wave and for the altitude climb part of the flight. As a result of the hasty decision to make the flight, Bikle's dress was not properly planned. He did not have thermal underwear but wore two flannel shirts, two pants, two pairs of socks (unheated), and gloves. He also wore an Air Corps unlined leather jacket, helmet, sunglasses, and had an oxygen mask fit snugly to his face.

The 1-23E sailplane was equipped with a low pressure oxygen system which had a pressure demand mask and regulator to control the flow. With this system, above 35,000 feet, oxygen flowed under pressure into the lungs because the bloodstream cannot absorb oxygen at the low atmospheric pressures. The pilot then has to exhale by blowing out against the pressure. The flight plan called for a climb to 46,000 feet and then descend immediately. This is because the human body cannot stand the low air pressure for a prolonged period and still keep oxygen in its circulatory system.

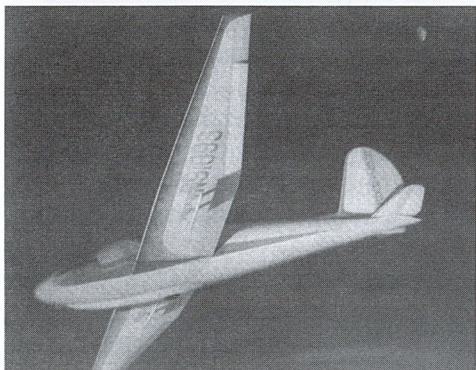
At sea level, air pressure is 14.7 lbs. per square inch, and at 45,000 feet, it is only 2.2 lbs. per square inch. As a pilot goes higher, in the range of 50,000 to 60,000 feet, gases in the blood, which include oxygen and nitrogen, come to the surface and start to boil. This will result in certain death by anoxia. (Anoxia is a Greek word meaning without oxygen). The problem is created by gases coming out of solution and forming bubbles in the bloodstream which block the blood supply to the brain, causing a series of strokes. The boiling of blood is similar to what happens when the cap is removed from a carbonated drink: gas bubbles rush to the surface due to the reduced air pressure.

It is also critical that the pilot has an adequate, continuous supply of oxygen at altitudes above 12,000 feet, or hypoxia (deficiency of oxygen) will also start. Therefore, before take off, the oxygen system was checked very carefully. Also during the flight, Bikle was well advised to check the seal between his face and the mask every few minutes when he was above 20,000 feet. Above 35,000 feet he was instructed to turn the oxygen pressure all the way up and press the mask against his face with his left hand to maintain the seal.

He also carried a small "bail out" reservoir of oxygen to be used in the event of a parachute jump that was necessary at high altitude. Bikle wore a parachute that had a control that would automatically

open at a pre-set altitude. For example, if he had to jump at 40,000 feet, it would probably be set to open at 15,000 feet. Without oxygen, even at 30,000 feet, consciousness will only last about one minute; so the bail out oxygen was necessary.

In preparation for the flight, Bikle had not had anything to eat that day and was restricted to a liquid diet. Food could easily cause gas bubbles in the intestinal tract that would double in volume at 18,000-feet and would increase eight times at 45,000 feet. After years of experience in military flight testing, often at high altitudes, Bikle was taking every precaution and was well aware that to make the 46,000-foot altitude flight in a sailplane could be a very dangerous undertaking, even if he were well trained and properly equipped. He also knew that he needed to be very cautious not to be carried up beyond 50,000-feet for it could mean serious injury or death.



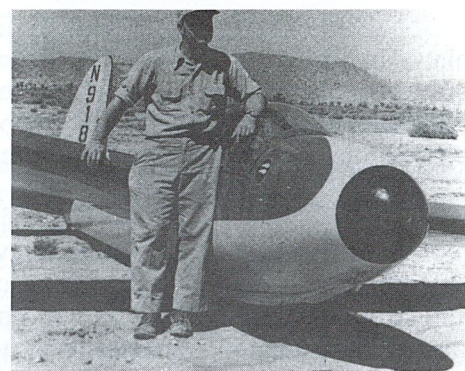
N91893 Schweizer SGS 1-23E in which Paul F. Bikle established two world altitude records in one flight on February 25, 1961. Maximum altitude of 46,267 feet and gained altitude of 42,303 feet.

Finally, at 2:55 p.m., with his double layer of clothing, chute and equipment, Bikle was helped into the cockpit and was ready to go. He was towed north behind an 85 hp Luscombe to 10,000 feet and released under a

large lenticular cloud where there was a steady 500 to 600 foot per minute lift. The flight plan called for a descent to 6,000 feet to establish the low point of the flight before he started his climb. Before he had started his descent, he had already climbed to 12,000 feet and then encountered an area of rapid sink where altitude fell away at an alarming rate. Fortunately, at 4,500 feet above sea level and 2,500 feet above the ground, he saw blowing dust which rose abruptly a few miles away. Bikle flew over to it but continued to experience rapid sink and severe turbulence. He pulled up vertically to reduce the stress on the aircraft and suddenly found himself in a narrow band of lift rising at 1,000 feet per minute. Bikle told his son John later he was glad he was in an all-metal Schweizer because many other sailplanes would not have survived the turbulence.

He carefully worked his way up to 25,000 feet where frost began to form on the inside of the plexiglass canopy. Soon the double layer of plexiglass was also frost covered and he was flying

on instruments. The rate of climb continued to be 1,000 to 2,000 feet per minute until 40,000 feet was reached, then it declined to 500 feet per minute and at 43,000 feet it increased again. Bikle then let the airspeed build to 80 mph and at 44,000 feet pulled back on the stick to climb rapidly to 45,000 feet according to his altimeter. He had been in the air 1 hour and 45 minutes and had reached 45,000 feet. He was elated and decided that was enough. He was suffering from the extreme cold and did not want to exceed the 10 minutes he had allowed himself over 40,000 feet. He immediately opened his dive breaks all the way, turned downwind toward the sink and pointed the nose down.



Paul F. Bikle ready to go with a releasable dolly used for ground handling and dropped after take off.

At 35,000-feet, he noted that it had been just ten minutes since he had climbed past 40,000 feet and he leveled off. He started to scrape the frost off the inside of the canopy and could see the surroundings. At 20,000 feet, he saw Fox Field was 40 miles southwest into the setting sun. (The 1-23E sailplane has a glide ratio of 30-to-1 so it had no problem getting home). Bikle landed at 5:05 p.m. and had been in the air for 2 hours and 10 minutes. The extreme cold had such an affect on him that John had to help him from the cockpit to the car where Bikle remained with the car heater turned all the way up. John tied down the glider in the cold windy darkness and then drove his father home without even taking a picture. He slowly recovered from the flight and was back to normal the next day.

The calibration of the barograph showed that Bikle was higher than he thought, 46,267 feet, a new world absolute altitude record. His low point was 3,964 feet, so the climb, or altitude gain, was also a new world record of 42,303 feet. The absolute altitude record was exceeded 25 years later, in 1986, by Robert Harris when he flew to 49,009 feet. Harris suffered for a year afterwards from the effects of this flight. Bikle's altitude gained record still stands today, 40 years after the flight. This will be hard to beat because of the low starting point. I believe a pilot in a pressure suit or a pressurized cockpit will be required in the future to break either record in a sailplane.

Continued on Page 9

National Landmark of Soaring No. 12 — Bishop, CA

By Simine Short

On 15 June 2002, almost 300 people came to honor the participants of the "Sierra Wave Project (1950-1952)," when the latest Landmark plaque was dedicated at the Bishop Airport in a small town in the Owens Valley in Eastern California.

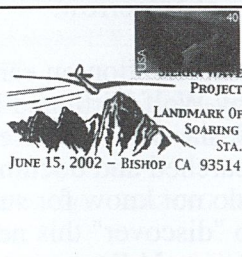
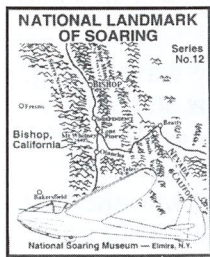
Fifty years ago the eastern edge of the Sierra Nevada was the site of intense atmospheric research to explore the cause and dynamics of the newly appreciated and powerful mountain wave phenomenon known locally as the Sierra Wave. This Landmark honors the pioneering spirit of the members of the two-year Sierra Wave Project: civilian glider pilots, volunteers, Army, Air Force, Navy Personnel and UCLA Staff. Their stratospheric flights were conducted under the inspiration and guidance of the Southern California Soaring Association.

Quite a few out-of-towners arrived the day before and the first exchange of memories and stories, almost forgotten in the past fifty years, took place.

It was nice to see that many airplanes, powered and motorless, vintage, classic and current, were either flown to or trailered into the Bishop Airport, site of the old Symons Ranch.

Saturday morning was filled with flying activities at the airport. The sky was blue, and no wave cloud.

As is customary, the dedication ceremony began with a soaring flight. David Grah, a local pilot from Bishop, got an early start in his Libelle 301, carrying 175 souvenir glider mail envelopes. He landed after a one-hour thermal flight in front of the new Bishop airport building, with Ron Coombes, the Bishop Postmaster, accepting the mail.



Twelfth National Landmark of Soaring Glider Mail cached envelope. Postmark shows a stylized Orlik over the Owens Valley.

Several old oak trees behind the airport building gave shade in the strong sun light, just as they did fifty years ago. Here, chairs were setup for the ceremony. Sylvia Colton, the organizer for the Bishop Landmark Dedication, introduced the Airport Manager, Mike Barnes, and Jack Cruikshank of the



The glider mail is being accepted by Ron Coombes, Postmaster, Bishop, CA. Onlookers are (from left to right): Ed Slater, glider mail pilot of NLS#5, Ron Coombes, Simine Short, David Grah, the glider mail pilot of this Landmark (with the Libelle 301 in the background) and Bob Ball, President NSM.

Bishop Chapter of the E Clampus Vitus. The "Clampers" are a national service club and fraternal organization. They were very supportive in all phases of this Landmark project and sponsored the bronze plaque. Members of the Clampers presented the United States Flag and everyone rose for the Pledge of Allegiance, followed by Tammy Kilpatrick singing the National Anthem.

Bob Ball, President of our National Soaring Museum, introduced past and present NSM Trustees and Simine Short, Chair of the Landmark Program. She introduced the members of her Committee: Janice Armstrong and Bob Gaines who were present, while Bob Davis from Tennessee could not make it.

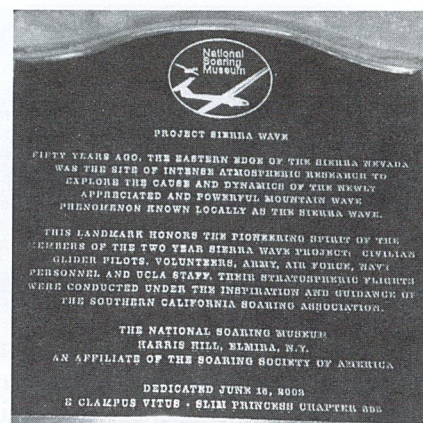
And, as a brief introduction to the Bishop Landmark festivity, Ms. Short read a paragraph from a report on the mountain wave project in a 1952 *Thermal*: (Publication of the Southern California Soaring Association) ".... This wave soaring is no child's play -- all the facts about it are by no means known. It's dangerous and it occurs over one of the most inhospitable terrains possible for any aircraft operation. . . But the pilots all agree that what little they do know is by no means the whole story about the wave." The map shows a tentative model for the cross-section of a typical wave flow, copied from Report No. 3.

It may be of interest to see the reflective markings or tape which were applied to the nose of the Pratt-Read sailplanes so that the ground radar stations could track or "see" them when flying at altitude.

Pilots in flight gear:
(L>R): Larry Edgar,
Ray Parker, John
Robinson, Dr. Joachim
Kuettner.



National Landmark of
Soaring No. 12 plaque
instruments, tow
planes, gliders, etc)
going.” In 1952 he
had set a world
two-seat glider
altitude gain record
in a Pratt-Read with
Harold Klieforth as
meteorological
observer. This
record still stands.



It was fascinating to hear him talk and see the slides
and a movie of his flying in the early and mid 1950s.

Speaking in another hut was Dr. Paul
MacCready, who is better known to us as a World
Soaring Champion, who flew the Bishop Wave in the
late 1940s in his Orlik sailplane. He discussed his
current research with Helios, the solar-powered,
unmanned aircraft which recently reached a record
altitude of about 96,000 ft.



Left: The “Monster” wave cloud
which helped Larry Edgar and
Harold Klieforth get to 44,000 ft
on 19 March 1952.

Right: Larry Edgar is capti-
vating the audience recalling
his experiences of the
early/mid 1950s.



In the evening,
almost 200 people attended a buffet dinner, with
Einar Enevoldson being the chief speaker, discussing
the Perlan Project which is often considered a
continuation of the Mountain Wave project. As the
closing part, Hannes Linke, SSA Region 12 Director,
led an open discussion with those who participated in
the early 1950s and those of us who wanted to know
more about the events from yesterday, leading
towards the events of tomorrow.

Historical information on early wave flying,
first in Germany by Wolf Hirth and his students
above Grunau, Silesia, then in the rest of the world,
remains to be researched and documented. For
instance, we still do not know for sure who the first
glider pilot was to "discover" this new source of
energy over the Owens Valley.

Most of the photos and technical information
on the Sierra Wave or Mountain Wave Project of the
early 1950s, followed by the Jet Stream Project of
the mid 1950s, was supplied by Larry Edgar from
the Los Angeles area. Much material was donated to

Carl Herold, who has been running Wave
Camps in the Minden, NV, area since the 1960s, then
introduced the Sierra Wave Project (1950-1952)
participants. Those present, received strong and
enthusiastic applause. He reflected on the research
done in the early 1950s and how the scientific and
meteorological research continues today.



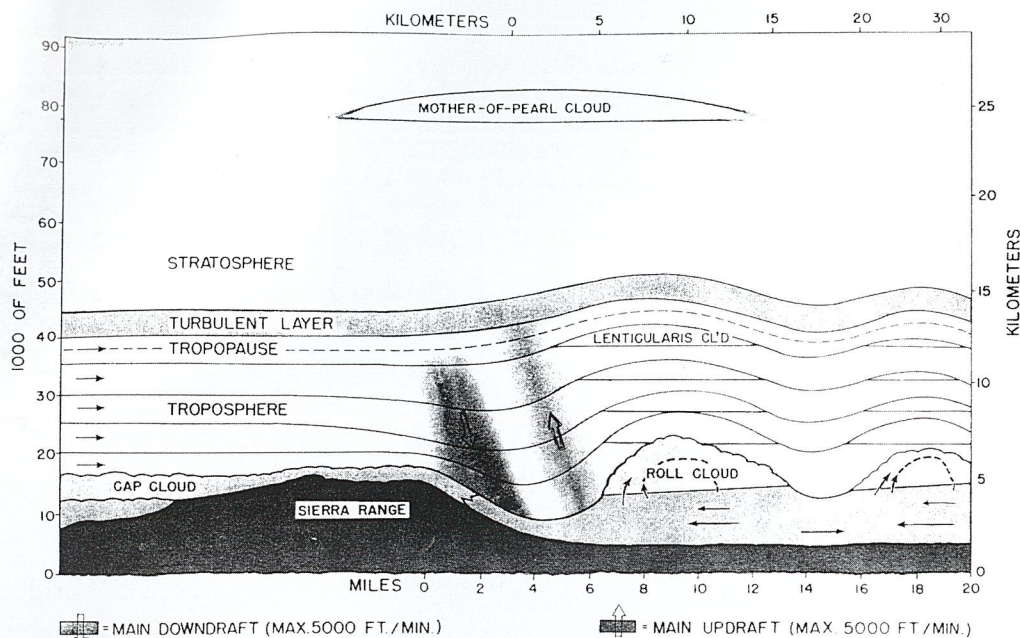
Participants of the Project: Betsy Woodward, Oats
Schwarzenberger, Dr. Joachim Kuettner, Larry Edgar,
Harold Klieforth, Al Langenheim, Bishop Airport Manager.

Rolf Algotson, came from Sweden, to
represent the Swedish Vintage Glider Club. He
reminded us that his early flight instructor Karl-Erik
Övgard, an “unofficial” participant of the Project,
died in December 1951, most likely falling asleep
due to lack of oxygen when he reached an altitude of
about 37,000 feet.

The official ceremony ended with the
dedication of the plaque: Mr. Cruikshank read the
wording and Betsy Woodward, a member of the
Project “blessed it” by breaking a bottle of the
locally brewed Mojave Red beer on the rock.

In the afternoon, there was “hangar flying.”
One could listen to either of the two speakers in the
surrounding huts, or sit in the shade of the oak trees,
meeting old and new friends.

Larry Edgar who considers himself a very
lucky person throughout his whole life, had many
stories to tell about his involvement and flying the
mountain wave. Victor Mead Saudek, the Project
supervisor, wrote that Larry with his many skills,
was the man who “kept the machinery (cameras,



Larry Edgar, Pilot, and Harold Klieforth, meteorological observer, with their Pratt-Read upon landing after reaching 44,000 ft, a world altitude record which is still standing. In the background, one can see Allen Langenheim, tow plane pilot.

Cross-Section of typical wave flow (Tentative Model)

the NSM archive in the late 1970s, when Vic Saudek, the Project Leader of the Sierra Wave Project, organized a Symposium at the NSM. The author was allowed to copy some of the remaining material from Mr. Edgar which was used for this article.

For the record, Landmark of Soaring No. 12 was first suggested in the early 1990s by Vic Saudek, at the time a member of the Landmark Committee. Sylvia Colton became the local Implementation Chair in March 2001. The local Implementation Committee was rounded out by Carl Herold, Hannes Linke and Bertha Ryan, as well as several volunteers from Bishop and Southern California. This helped make for another successful event in the NSM's Landmark Outreach Program. Fun was had by all.

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15 June 2002: Members of the 1952 Project: Anna Saudek Hutchinson, Ed Minghelli, Dick Lyon, Harold Klieforth, Dr. Joachim Kuettner, Dr. Paul MacCready, Einar Hovind, Mildred Symons (Bob Symons' wife) and Larry Edgar.

