

# Steve Hill's Twisted Composites

Photo by Birgitta Nurmi



Steve Hill at Reno, September 2009

*...all but two of the 21 IF1 competitors at the Reno Air Races in 2009 ran Steve Hill propellers.*

*Steve lands his DG-600 sailplane, built in Germany in 1988. He continues to fly sailplanes and participate in competitions.*



Photo by Mike Abernathy

Everyone in the Formula One Class knows Steve Hill. Those of us who are not familiar with him “up close and personal” have certainly heard of him in connection with *Owens Composites*, *Twisted Composites*, or carbon fiber propellers. Jon Sharp, among others, feels that the composite prop is one of the most important single innovations in the history of IF1 air racing. It is no surprise that all but two of the 21 IF1 competitors at the Reno Air Races in 2009 ran Steve Hill propellers.

Steve used to hang his hat in the IF1 hangar at Reno as he was associated with Jon Sharp's Nemesis project from the start. In 2004 Steve moved to “the hangar next door” as crew chief for the Nemesis NXT team. He is attentive and thoughtfully focused as he works. He exudes calmness and competence, yet there is an edge; an undercurrent of intensity. There is no question as to who is in charge in this pit. He is clearly respected by his crew members.

As one contemplates the details of his career and hears what others say about him, the profile of a most remarkable man, who has established a most remarkable business, emerges.

This tall, blond-haired man, now age 51, was born and raised in

Albuquerque, New Mexico. Despite the fact that there was no one in his family active in aviation, Steve did get an early start in the field. When he was 13 years old, Steve, together with a friend, started a two year project building a hang glider. During this time a mutual friend introduced him to another schoolmate, Brent Applebay, who was also building a hang glider. It did not seem a big deal at the time, but it turned out to be an event that would determine Steve's career direction.

Brent and Steve became close friends and learned how to fly hang gliders together. Before long Brent's father, the famous sailplane designer George Applebay, offered Steve a part-time job in his shop. Steve accepted without hesitation. He worked for George all through high school and college. At the shop he became involved with the Zuni project—the development and building of a racing sailplane with a 49 foot wingspan. Thus it was that Steve entered the world of aviation and the community of racers.

Steve flew hang gliders all over the country between 1974 and 1994. He first flew a sailplane in 1978. For the last few years, he has been exclusively flying sailplanes and loves it.

What drew him in, however, was not just his love for all things mechanical that fly. As it turned out, George Applebay's shop was a very special place to be in the seventies. Applebay's specialty was working with composite materials. This technology was so new that Albuquerque and Germany were the only two places in the world where a person could learn about composites. The first American

composite sailplane was built at Applebay's shop in 1976 when this technology was considered absolutely cutting edge. What a thrill it was to learn to work with these innovative materials and to be involved in the initial stages of development.

In this charged atmosphere of excitement, something clicked into place for Steve. He knew that he has been incredibly lucky to be in the right place at the right time. "I didn't have to waste any time figuring out what I wanted to study in college. I knew I would go into Mechanical Engineering, and work with composites and aircraft".

Steve understood the potential and the many advantages of using composites. By the time he completed his Mech. E. degree at the University of New Mexico and started to create his own designs, the use of composites had become integral to his thinking and his work. But it did not end with the design process. "The use of composite materials was so new and unique that few others had experience working with this; so I also had to build what I designed."

At Applebay's, Steve worked with another young enthusiast who was learning about the use of composite materials in aviation, Jon Sharp. Steve was 16 when they first met in 1975. Soon Jon would become the next determining factor in Steve's career. As Steve put it "It all ties into Jon".

In 1978, when Jon Sharp raced for the first time in Mexicali, Mexico, Steve was with him. Jon had been racing go carts for some time but felt ready for a change. He bought a Cassutt from

David Bice and air racing seemed like the logical next step. After Jon and Steve built a race trailer they considered themselves ready. Together with two other friends they left for Mexicali, hopeful and very excited!

In Mexicali Sharp learned his first air race lesson: the plane "ran dead last." One explanation was that Sharp had a wooden prop while all other contestants were running metal props. In those days that was "the thing to have." Without hesitation an optimistic Jon Sharp installed a metal prop and performance improved. While Jon pursued his air racing career, Steve went to school. The demands of the engineering program precluded Steve's further participation in the air race scene.

By the time Steve finished his engineering degree, Applebay's sailplane factory had gone out of business and there was no compelling reason to remain in Albuquerque. He was pleased to accept a contract position at Boeing and move to Seattle. He worked for Boeing for one year until Northrop hired him to work on the design and structural testing phases of the B-2 Bomber program in their Los Angeles office. Steve then moved to L.A. where he lived for 2 1/2 years.

Then he decided it was time to return to New Mexico. He quit work, got married, and built a house (in six months!) Then, together with a few friends, Steve started a composites business. A government project requiring composite

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*Steve and his wife Lilly at the air races in Reno in 1998.*

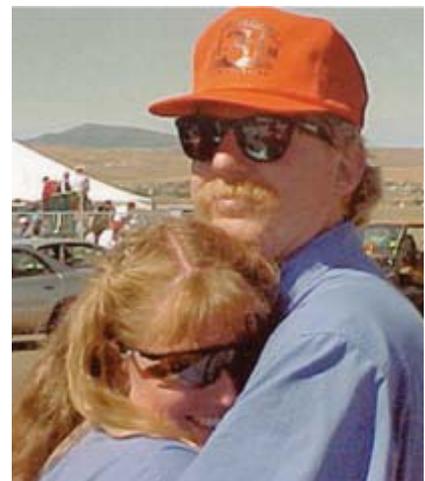


Photo by Patricia Sharp



Photos by Steve Hill

*These photos show the steps in making a Formula One propeller. Top Right: the carbon fiber skin plies, cut from templates. These are laid in molds, and wet out with epoxy. Top Left: the mold that forms the front side of the blade. Bottom: the mold that forms the back side of the blade.*

propeller blades got the business off to a promising start.

Steve wasn't thinking about air racing anymore. He had also lost touch with Jon. But in 1988, when George Applebay organized the Albuquerque Air Races, Steve went out to the field for a look around.

Jon Sharp was there a participant, but he had not anticipated meeting up with Steve. In fact, he had heard via the grapevine that Steve had been killed in an ultralight accident. Steve grins when he thinks back to Jon's reaction at the moment they met: "He was amazed that I was there and that I was alive! But I was amazed that he was running a wooden prop!"

It did not take long for the two to start "talking props" again. Jon had realized that metal props break easily and wooden props do not. He was racing *Aeromagic* with the now-famous *Nemesis* engine in it. That meant that Jon had a good plane with a really good engine. But one problem dominated everything: his propellers were breaking.

Steve had an idea. As Jon was pushing out, he walked along and showed Jon the composite blades that he

was making in his business for the government project. Jon instantly understood the possibilities. He commented, "I felt no question how it would work. When Steve showed me what he was making in his shop, I told him: 'We've got to make this bigger.' After the race was over, I showed Steve a metal race prop. 'Can you make one like this?'"

That is when Steve realized "This man was willing to risk his life testing these things." Despite the fact that this responsibility weighed heavily on him, he felt he had to proceed. He knew he could help Jon, solve his problem, and above everything else, give Jon a safer plane to race. The work began. This was the start of something new that has had, and continues to have, an enormous impact on IF1 air racing.

In 1989, with Kent Owens and one other partner, Steve started a business called Owens Composites to manufacture hang gliders. Steve was already making props for Jon on the side and continued to do so. Owens Composites ended thirteen years later, in 2002, when Kent Owens and partner decided that they did not want to make propellers any more. Steve explains that making propellers is not the most desirable business venture because of the serious risks involved.

"Props are dangerous," he says, "But at this time my props have been proven for twenty years. They don't break. So I feel like I should do this for safety's sake. And designing and building safe propellers is my passion. It was a part time business on weekends until 2000 when I started work full time for *Owens Composites*."

So when *Owens Composites* dissolved, I set up my own business, *Twisted Composites*, and carried on.”



Steve explains some of the challenges: “Building props is a process of continual and sophisticated inspection and testing that has to be done during the making of the prop. The needs of every engine are different. It is hard work—the sanding, the laying up of the materials. I don’t want to find out that a prop does not work after it is made. So I check it every step of the way. It is all a manual process.”

“In 1993 I did develop some simple automation but I cannot be fully automated because that would be very expensive and there simply isn’t enough of a market for the product. Plus they don’t break. The only times that replacement is necessary is when a prop is injured or the pilot gets a faster engine. Financially it is not a lucrative business. Not only is the product geared towards a distinctly limited market, but then one has to also consider all the work that goes into it. All the money I earn goes back into the business. I don’t pay myself and I don’t have kids so that makes it easier to justify doing this.” He adds with a smile: “My wife has a good job...”

A highly specialized market for Steve’s product is definitely an issue, even though the IF1s are not the only planes running Steve Hill props. Steve also makes aerobatic propellers which are raced on occasion. Steve may well be

the only propeller maker who has had props racing in three different classes at the same time: the IF1, Biplane, and Sport classes at Reno in 2002.

Jon Sharp has gotten to know Steve very well over the many years that they have been associated, and his words echo the thoughts of many others, “He is an incredible engineer who is not afraid to be innovative. His documentation is extraordinary. He can tell you the history of each prop. He has all the data. That has served the IF1 class very well. He is very meticulous and totally safety oriented. He is competent and totally responsible. I am convinced that he has saved lives in the IF1 class.”

In 2008 Steve built a new prop—the first new fixed pitch prop design in 50 years. The story of that development will be the subject of our next article.

Meanwhile Steve continues to love his work while enjoying life in the home that he designed and built with his wife, Lilly, years ago. The house, at 7500’ in the mountains east of Albuquerque, is solar powered, and costs only \$200 per year to heat and cool. Rain is their only source of water. A most remarkable man indeed!

*Building props is a process of continual and sophisticated inspection and testing.*



Steve Hill (right) stopped by to congratulate a very happy Ray Cote after Ray’s Gold race win in Alleycat at Reno, 2000.

Photo by Neal Nurmi