

Warnke's WOODEN WONDER

Warnke works wonders with his wooden almost-constant-speed propeller.

BY DON DOWNIE

In a high-tech era when the personal touch has been replaced by computers, electronic fabrication and robotics, it's quite refreshing to find a craftsman like Bernie Warnke who still keeps the data bank in his head and the finishing tolerances under his finger tips.

Bernie Warnke, designer of the "almost-constant-speed" propeller, has been designing wooden propellers for more than 20 years. When we landed at the Avra Valley Airport, just northwest of the Tucson, Arizona, to meet Warnke, he was out test flying a new RV-6A for Canadian builders Sherrie

and Robert Shields. Warnke, a very spry 67, test-flies each of his new propeller designs because he feels that the proof of the proper pitch can only be ascertained in flight.

"You must test-fly each new design to find out the static rpm and the rpm in cruise," explained Bernie. "You can't get the proper information about the prop without flying it to find out just how much the rpm will drop in cruise over takeoff."

For his wooden propellers, Warnke uses laminated, rock-hard maple, the kind used for golf club drivers, from Rice Lake, Wisconsin. He receives his

wood already laminated, 16 layers to the inch. The blocks are 7 inches wide, 4.5 inches thick, 6-7 feet long and 74 pounds heavy; yet Bernie handles them with ease and usually orders 30-40 blocks at a time.

"Wood is consistent, and I know what it will do. Wood is still best," said Warnke. "A prop strike with wood won't damage a crankshaft except in the worst conditions." Another good characteristic of Warnke's propellers, unlike the limiting metal props, is their lack of a critical vibration rpm. Several years ago, Warnke began putting carbon fiber covering on both sides of his blades to protect the prop and damp vibration. He uses a variety of epoxies to bond the carbon fiber to the wooden blade and to provide greater or lesser stiffness. He reports no problem filing and sanding the cured carbon fiber. "These new blades with carbon fiber are stronger than metal," says Warnke.

When Warnke showed us around his shop, built into two adjoining T hangars at the Avra Valley Airport, his only request was to not photograph his home-made contour mill. This innocent looking machine takes about an hour to rough cut a pair of blades. Finishing takes much longer, depending on the number of blades and the length. Warnke makes three and four-blade props on order and he says he has worked out the design for a five-blade unit for the RV-3, which he hopes to have in the air by Christmas. In the meantime, he has access to an RV-3, owned by Dave Sawyer, located at Avra Valley Airport, for flight-testing purposes.

"There is nothing I like more than having the opportunity to step outside my shop, climb into a little airplane and go flying," he said. "Here I don't have to ask permission, be directed by a control tower or file a flight plan just as long as I remain clear of the Tucson approach areas. We still have plenty of uncontrolled airspace out here in the Southwest desert." Warnke had nearly 6000 hours when he stopped logging his flight time.

Bernie Warnke uses this RV-3 to flight-test his props.





Warnke's almost-constant-speed props awaiting delivery. Warnke claims that these carbon fiber blades are stronger than metal.

"The two most important things in flying are the pilot and the prop," said Warnke. "If the pilot fails, the airplane goes down. And if the prop fails, the airplane also goes down."

How It All Began

Warnke began working with wood as a youngster. He made a rabbit hutch at age 12 and then began raising rabbits. "I enjoyed working with wood even then and found that I could create things with my hands," he said.

At age 15, Warnke began flying gliders launched by bungee cords in Hitler's youth program. He checked out in several of the advanced trainers before the war came to a close, and he spent a year in a POW camp before being released.

His first U.S. job was teaching woodworking and cabinet-making in a trade school in Atlanta, Georgia, where he made his first propeller just to see if he could do it. Subsequently, he moved to Arizona where he set up a shop to teach people how to make tables. Soon after, he read a magazine article about propeller craftsman Ray Hegge and wrote him for more information. He built his first ground-adjustable wooden prop for engines up to 150 hp in 1972.

One of his earliest three-blade props went on his own Sonerai II that clocked 170 mph with a 70-hp, 2180-cc VW engine. He explained that three-blade props cost twice as much to build as the two-blade units. Four-blade units are twice as expensive as the three-blade models.

Seven years ago, Warnke built a two-blade prop for John MacGuire's 230 Pitts Special in Burleson, Texas. "That prop is still doing fine after seven seasons of aerobatic competition," said Warnke with some satisfaction. The wide blades for the Pitts were 76 inches in diameter with a 65-inch pitch for aerobatics while the blades for an RV-6 would be 72 inches in diameter with a 74-inch pitch for better cruise.

Warnke suggests that all two-blade wooden props be installed on the crankshaft so that the blades are horizontal when the engine is shut down. This has the advantage of keeping the prop away from the ground in case of a forced landing. It also prevents moisture from collecting unevenly on the blades in damp conditions.

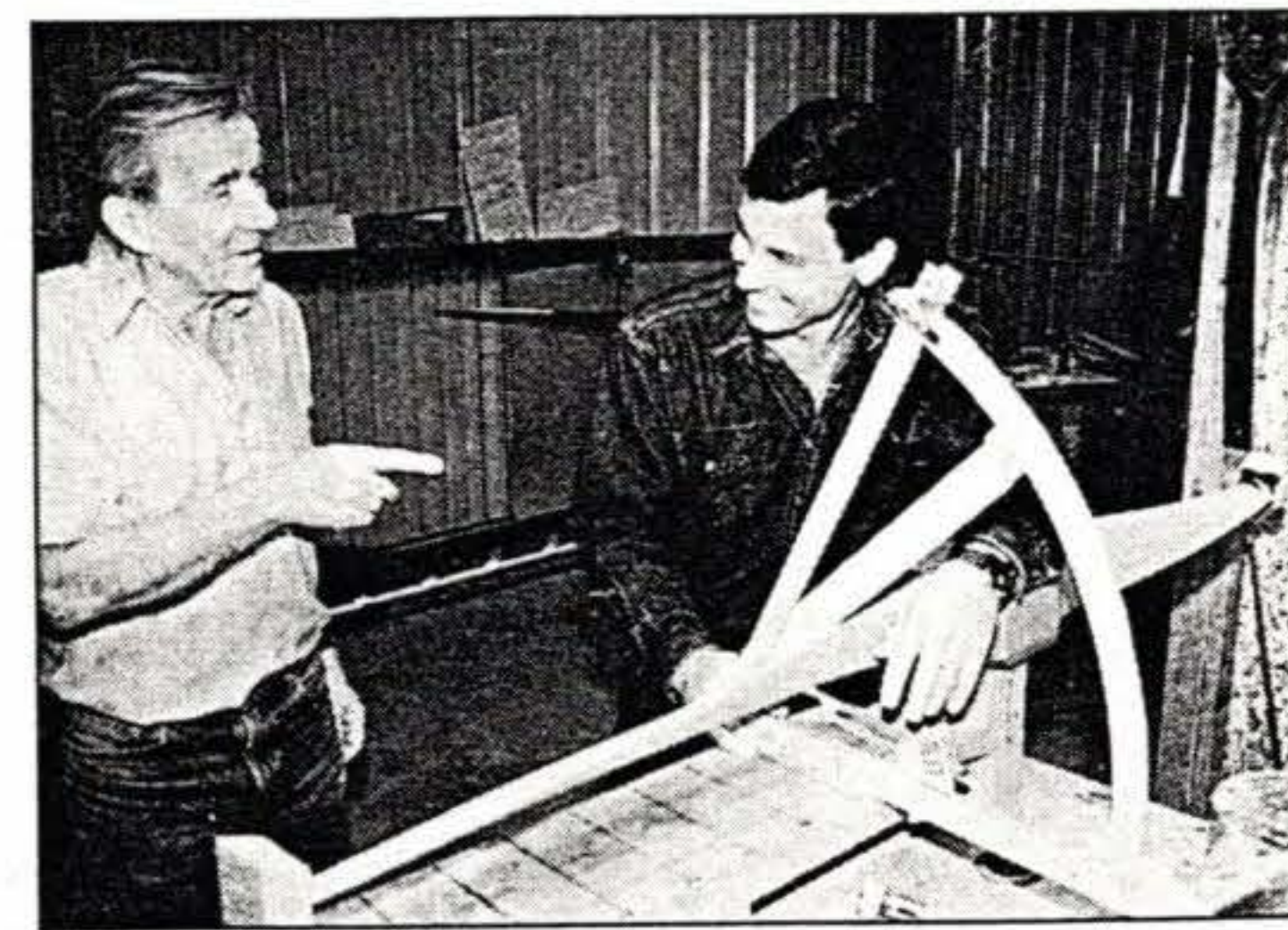
Not all of Warnke's props are ordered by homebuilders. He made a set of blades for a NASA lifting body that developed 2.5 times as much thrust as was expected by the computer. "Originally the NASA blades had too much pitch and I was able to modify them," said Warnke.

"The best, most efficient propeller has not been designed yet," said Warnke. "Minute changes in pitch



Bernie Warnke buffs his hand-sculpted prop. All the precision finishing is done by hand. A variety of prop patterns are shown hanging in the background.

Warnke gives his apprentice, Dave Toci, some well-humored advice.



inboard or at the tip can make an enormous changes in performance."

When it comes to making propellers, Warnke is somewhat like a concert violinist. He says that his left hand has the feel for the curvature of the blade. "I work with my head and my hands," he said. "Sanding is all by hand—no machines except an electric buffer wheel."

He sculpts a relatively long, narrow, high-aspect-ratio blade to permit



Warnke

continued

controlled flexing. Ideally, his fixed-pitch propellers will show 2400 rpm at full throttle while static on the ground and increase to 2700 rpm at top speed in the air. This additional rpm in cruise increases the pitch at the prop tips by 5-6 inches (a measurement of the amount of air displaced by a single revolution) and 2° twist in. The higher the rpm and/or the higher the airspeed, the greater the pitch change. The higher the airspeed, the greater the pitch change at the same rpm. "With my almost-constant-speed props, the design and layout makes the pitch change automatically. The only thing the pilot needs to know about props is that he pushes the throttle and it turns," said Warnke.

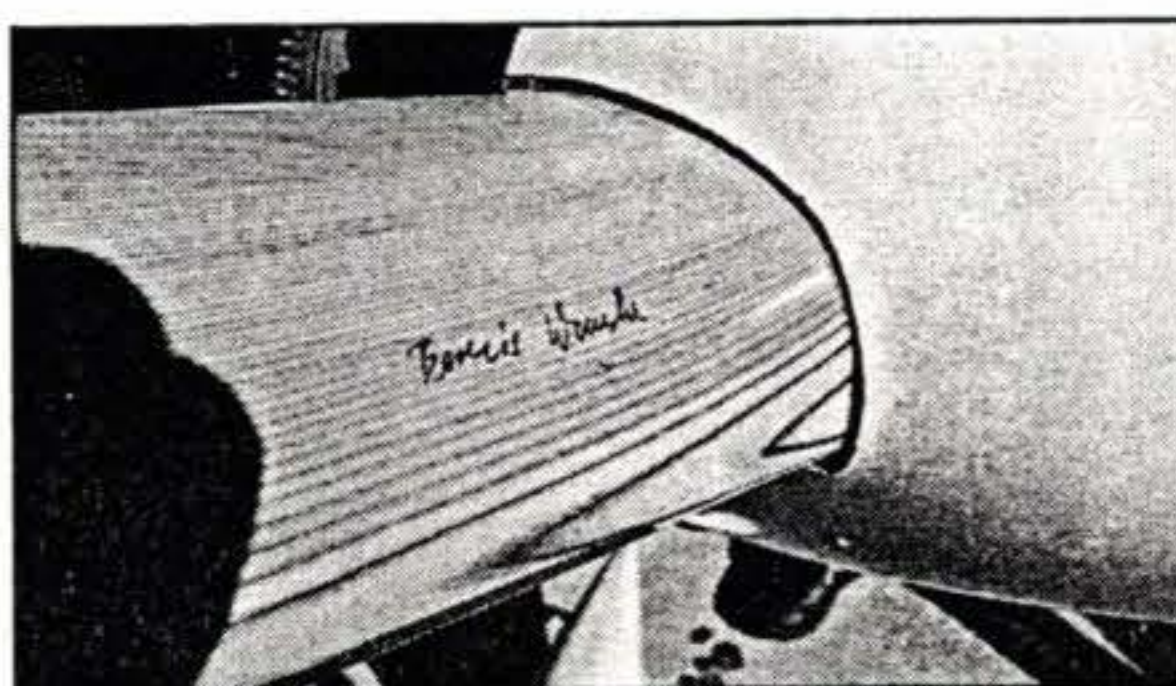
The Finishing Touch

Warnke began autographing his props about three years ago after his wife, Lina Lee, suggested the idea. The signature is not from a rubber stamp, but Bernie's own writing each time. Lina Lee handles the books for the company and also makes fabric dolls as a sideline. Warnke sells his props direct and on order with no dealers involved. He uses a computer for orders and bookkeeping as well as for programming the original rough outline of the blades; but, all the precision finishing is done by hand.

After a succession of part-time workers who didn't really have a feel for woodworking, Warnke has found Dave Toci, a former commuter pilot, who truly enjoys working with wood. Toci is learning the fine points of the

Warnke uses rock-hard maple for his propellers. They come in 74-pound blocks.

Bernie Warnke, who got the idea from his wife, now signs his almost-constant-speed props, giving them the final personal touch.



trade from Warnke, who hopes to increase his volume of work above the 200 props he now builds each year. The veteran prop designer urges builders to order their props well before completion of their project. He says that some builders order their props a year in advance and others wait until the last minute. He does have some popular prop sizes in stock.

At an age when many have retired, Warnke says, "I can't just sit down and do nothing." He has 2.5 acres of cactus-covered desert land near Tucson where he is building a house of his own design. Between the house, working full time producing his almost-constant-speed props and putting an RV-3 together, he has no plans to retire. "I don't even know how to spell the word," he said with a grin. □

FOR MORE INFORMATION, contact Bernie Warnke Props, 11700 W. Avra Valley Road, Marana, AZ 85653; call 682-2550 or fax 602/682-2520.