

Flying the Defiant

Will performance and features make this *the* future twin?

BY DON DOWNIE

Little did I realize what would happen after I first met Burt Rutan and his new twin-engine Defiant at Brackett Field just east of Los Angeles, back in mid-1978. Rutan's "tail-first" Vari-Ezes had been made available via plans just two years earlier and the first few were just beginning to appear at air shows. The Defiant was built as a proof-of concept aircraft and Rutan's first flights away from Mojave were to show the new craft to aviation reporters. I was one of that early group.

There were more than the usual "What is it? Which end flies first? Will it fly single-engine?" questions as Rutan taxied up to the terminal area, front propeller feathered.

What followed for us was the writing of *The Complete Guide to Rutan Aircraft*—now in its updated version—which required flights with Burt and his brother, Dick, in all of the new canard designs. There were even hops in the single-place Solitaire and the AMS/OIL Racer.

However, during that initial 1978 meet-

The Defiant is taxied with the aft-engine only; the front engine is shut down to prevent its prop from throwing dust and dirt into the aft intake.

ing with the Defiant, I learned a number of things. First off, Burt is a quiet but enthusiastic salesman and, unlike many design engineers, an excellent pilot. He walked us around the prototype like the Pied Piper as a queue of airport habitués followed with skepticism. We went through the "doctor-saver" advantages—as Burt likes to call them—of centerline thrust with twin-engine aircraft. He explained that the airframe packaging was more efficient with a wetted area only 60% that of a conventional twin.

"Everything about this design is compact," he explained. "There is no tail cone whose only purpose is to separate the control surfaces from the main wing. Our fuselage is all engines, people and baggage."

Rutan invited us aboard, which meant a climb-up-and-over procedure that was improved on the second airplane. The Defiant is big inside—2 inches more elbow room, 8 inches more cabin length, 6 inches more knee room in the back seat and 3 feet, 3 inches more baggage area than the Beech Duchess.

Small side sticks were fitted to the skin on each side of the cockpit and the throttle quadrant was mounted within easy reach between the seats. Without a control

wheel or center stick, the cockpit looked naked at first glance.

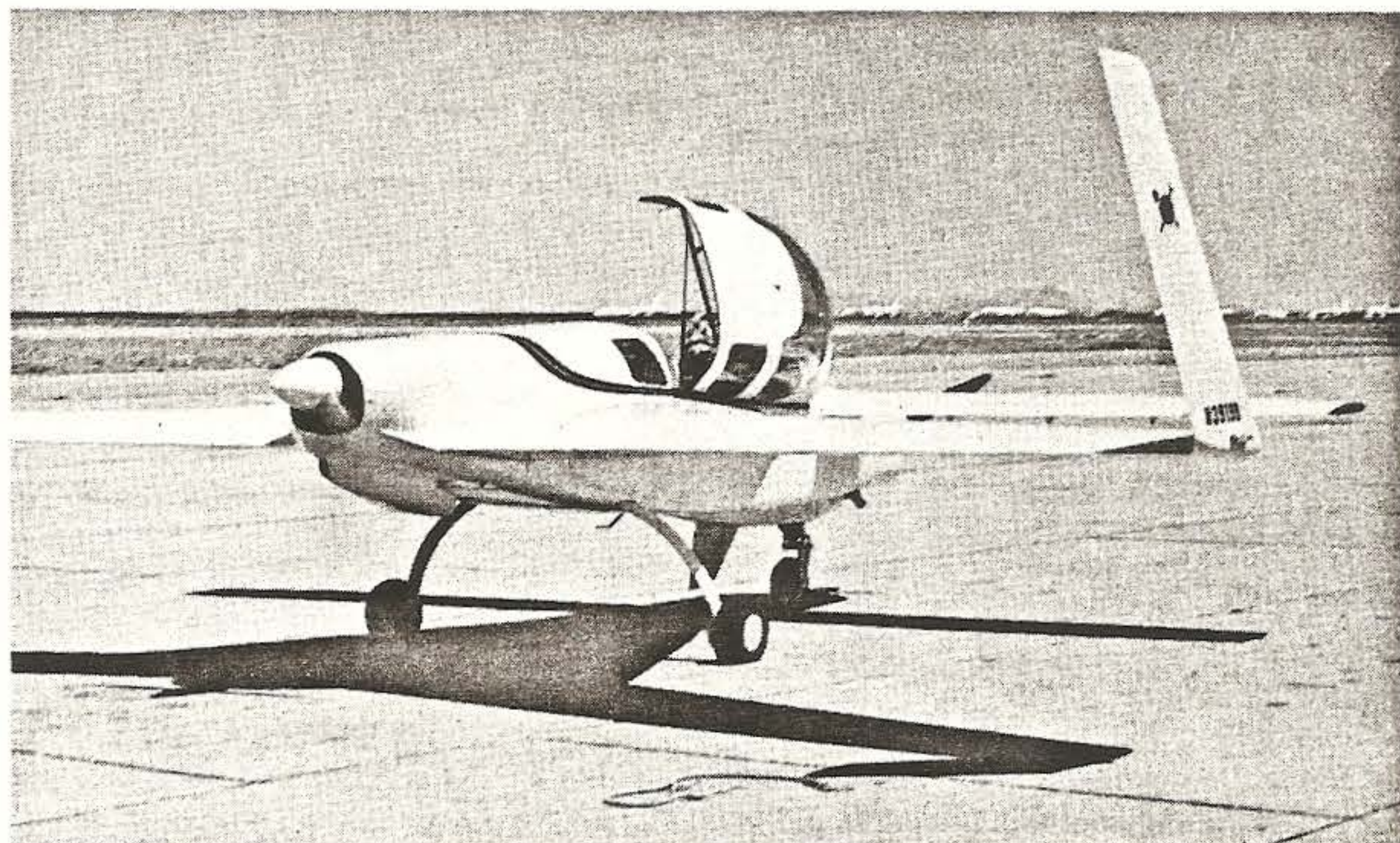
The semi-supine seats were a bit of a shock on a first trial, but they soon began to fit. Rutan explained that all the Defiant's seats are reclined 7° more than conventional seating to have the body weight distributed over the lumbar, forearms, thighs and head, rather than the tailbone. The back of the front seat is part of the airframe structure and is not movable.

The Defiant has two separate electrical systems, each with its own battery and alternator. Avionics are powered by both systems so that no single failure can affect the navcom equipment and lighting; the two systems can be tied together to run all equipment from one alternator in the event of the other's failure. Also, both engines can be started simultaneously if required.

Rutan partially closed the bubble canopy, leaving an inch for summer ventilation while on the ground, and fired-up the rear engine. We taxied out slowly with the front engine dead—normal procedure to keep it from blowing sand and gravel into the rear propeller. Fuel comes from each of two wing tanks—one tank feeding each engine—and a 45-minute sump tank; a crossfeed system is available in case of an engine-out situation, but the fuel systems are otherwise completely independent. All but one gallon of the 58 in each wing is usable.

As the tower cleared us, Rutan completed his checklist and carefully safetied the canopy closed. With two aboard and half fuel, takeoff was rapid. On later demonstrations, Rutan would chop an engine on takeoff to show the ease of handling, but on this flight he had only 30 hours on the new ship.

The nosegear was retracted and we climbed up and away from the airport to look for a small piece of uncluttered airspace north of Ontario International Airport. During climbout I was impressed with the size of the canard breaking the air ahead of us; even without the two feet of span added to the second airplane, that



Photos: Don Downie

canard was big. This was my first introduction to the canard and it wasn't like anything I'd ever flown before: the older biplanes had the wings well in front of the pilot who was normally flying in an open rear cockpit, but having that broad canard just forward of your knees was something else again.

Visibility was excellent because the canard covers only a small flat-plate area just below the horizon and the mainwing and winglets are so far aft as to be no obstruction.

We tried climbs and glides, turns and stalls. The Defiant would not really stall and it wouldn't spin: you could sit there as long as you wanted to with the stick all the way back and full rudder applied, waiting for a breaking stall and spin entry (with a canard it is called divergence). Frankly, there was at least one set of very sweaty palms aboard during this introduction to the basic aerodynamics of the canard.

We shut down the front engine and motored around at partial power on the aft, 160-hp engine with no trim change and both feet on the floor. It was most impressive.

One of the pleasant features of the twin, Kevlar-edged wooden props is the absence of the out-of-sync beat produced at split throttle settings on most twins.

Just about the only feature that isn't goof-proof is the nosegear extension. In a nosegear-up landing (mains do not retract) on a Long-EZ or Vari-Eze, damage is limited to pride and a few coats of paint as the nose slides along on the runway. With the Defiant, the same stunt would probably prang the front prop and scrape the tip of the rhino rudder protruding just below the pilot's rudder pedals. Rutan worked methodically with his checklist, even though there was a warning horn or light somewhere in the system.

The Defiant is a clean machine, even with all three wheels hanging down. No flaps are provided in the interests of simplicity and weight. Thus, the pilot must learn to slow the ship in the pattern so that

it won't float forever on landing. There really isn't a true stall speed but an area between 58 and 64 knots is considered to be the difference between flying and falling (mushing); any approach speed of 70 knots or above is comfortable.

As with any wide-tread trigear, landing is a piece of cake. On this first introduction, we shot landings at both Chino and Brackett, much to the delight of the tower operators and hangers-on. At slow speeds during flare, the canard's elevator is not particularly effective so the nosegear will drop to the runway shortly after the mains touch despite full-aft stick. Braking was good.

After exploring this totally new flight regime with Rutan, I had the personal feeling that I'd just jumped ahead into a whole new dimension of simplified and efficient flight; I felt that the Defiant or its ilk was sure to become the format for tomorrow's twin. And, the following years seem to bear out this feeling. True, the Defiant is not rolling out of a mass-production line—in today's marketplace, not much else is either—but it certainly is catching hold in the homebuilt market and should continue to grow in numbers as the first plans-built models begin to scamper

down the airways.

Rutan built the prototype at Mojave, California, in 1977 and logged over 300 hours in 14 months. Between its initial introduction and the announcement of plans availability, the future of the Defiant was often in doubt. There were a number of "almost starts" for production. Initially "Pug" Piper wanted to finance the development, but Rutan was reluctant to have others "improve" his design. Later, a multi-millionaire offered a partnership deal but he too wanted to influence the design.

An established southern California composite company with adequate financing and proper facilities wanted to go into a joint venture, but that was dropped because, as Rutan explained it, "We worked at 180°-opposed positions. We work in a direct way with not many people and a few sheets of paper; they wanted many people to produce fewer sheets of paper." Rutan continues to use

Fred Keller's No. 2 prototype Defiant drinks 80-octane fuel, stored in two 58-gallon wing tanks; each is independently paired to an engine.



FUTURE

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Fred Keller designed the Defiant's steps to accommodate a lady wearing a skirt; the correct sequence and placement of feet when entering is an acquired skill, though.

the prototype as a workhorse (pick-up truck, if you will) to carry people and materials to airshows. The ship is so docile that almost everyone around Mojave has flown it.

When I sat in a packed forum tent at Oshkosh in 1983 and listened to Rutan announce the Defiant plans project, I knew that something exciting was well on its way. Fred Keller followed with a detailed briefing of how he built the No. 2 airplane that was then sitting on the flight line and the question-and-answer session went on far into the night. Keller included an account of his first flight with Burt in the No. 2 airplane: "We were climbing out of Anchorage and Burt said quietly, 'There's something wrong; we should be climbing faster.' It took us both a while to figure out that we'd lost the front engine. We circled back and landed easily. The problem proved to be a stuck carburetor float."

The next day at Oshkosh, I talked with Keller and arranged to fly with him at Mojave on his way back to Alaska. There's just too much going on at Oshkosh, both in air traffic and hangar flying, to concentrate on a good, meaty report that would later be carried with a color cover in *Private Pilot* magazine.

When we met Keller in the bright sum-

mer sun at Mojave, the builder stressed that the airplane needed a lot of cleaning up, but it looked mighty good to me. He showed how the weave of the glass cloth could be seen under the resin, but only from certain angles and then when the sunlight was just right.

During a walkaround inspection, he meticulously wiped a tiny stream of oil away from the aft engine's cowling. He pointed out that the intake scoop for the rear engine is offset to the left so that it will not pick up what little smoke and oil is thrown out of the front engine.

Once seated inside, both cockpits appear remarkably spacious. However, there is no wasted space inside or out; the cockpit arrangement is functional with a sub-panel canted at the left of the left front seat. Both front seats have a cockpit-side-mounted control stick. The center console houses the throttles and mixture controls, for which Keller developed a handy-dandy throttle identification system: each throttle has a pointed flange headed in the direction of the engine it activates. Dual mixture controls with verniers were mounted just in front of the throttle.

We settled comfortably into the supine seats and Keller fired up the rear engine for taxi. Mojave Unicom gave us Runway 22, a distant taxi run out past the long line of mothballed, older jet transports. Sitting up front during taxiing, you begin to get a feeling for just how big this centerline twin really is.

At the time I flew with Keller at Mojave, there was just one basic change yet to be made. It has been decided to shorten the maingear by at least two inches to produce a more positive angle of attack during takeoff. With three of us aboard and low fuel, we used up almost two-thirds of Mojave's Runway 22 before liftoff. However, once climb was established, the Defiant averaged nearly 1000 fpm in the usual moderate turbulence of a desert midday.

Normal takeoff roll is 1480 feet, full gross, at sea level and at a density altitude of 5000 feet the figure is 2500 feet. The takeoff roll of any canard tends to be somewhat longer than with an aircraft that can be stalled into the air to stagger along in ground effect.

"We're so satisfied with the total harmony of the design that it would be foolish to do anything more than shorten

the gear," said Keller with a barely restrained smile.

We cruised over the Mojave Desert, climbing to 7500 feet where it was calm. A few miles away, secure in its own restricted area, was Edwards AFB, where so much of U.S. aviation development has taken place in the past 40 years. Right next door, Mojave is today providing a civilian parallel with innovative canards, new composite structures and finished products like the Defiant, Voyager and Starship. This is still where the action is!

Keller's airplane was shipshape, functional and designed to travel long distances in comfort and safety. Even though the nosegear was yet to be sealed and soundproofed, the cabin noise level was surprisingly low.

Full stick deflection for rolling into turns was brisk and smooth for an airplane of this size and only about one-half ball-width movement was noted from adverse yaw—a condition that was corrected almost automatically with a little "bottom rudder."

We found no pitch change with any change in throttle setting and there was no noticeable change when the nosegear was cranked down.

Our letdown into Mojave was strictly routine. Drop the nosegear and check both visually and with a warning light that it's down and locked. With no flaps and a very clean airframe, final approach is long and low. There is sufficient mass to make flare and landing greasy-smooth.

After comparing notes and taking a few ground photos, we decided to fly our Cardinal over to California City where 80 octane was available for Keller's engines. We sampled the excellent local hamburgers after fueling his plane and then took off in a loose formation to take air-to-air photos. We climbed through the turbulence and formed up north of Palmdale, a mile above the desert floor. For a pilot who spends much more time building than flying, Keller did a fine job of positioning his big Defiant off the right wing of our photoship.

Then it was time for Keller to peel off and head back. The glistening-white Defiant with its bronzed windows looked completely at home in the same desert airspace where the sound barrier had been broken and many of today's significant aviation breakthroughs first flew □

Creator of the Cozy

From watching airplanes to designing them, here's how Nat Puffer became a plans-maker.

BY DON DOWNIE

Cozy developer Nat Puffer has an almost-storybook aviation background. He grew up in Fond du Lac, Wisconsin, just down the road from Oshkosh, made model airplanes and rode his bike across town to the airport where he watched airplanes and was able to procure an occasional ride. These included flying with the local sheriff in a Stinson and riding in an autogyro. He met Amelia Earhart when she spoke at the high school auditorium. "From then on my ambition was to be a commercial airplane pilot!"

"World War II broke out when I was in high school," Puffer explained. "And when the V5 program was started I enlisted while still in school and 17 years old. We had to go through boot camp (Corpus Christi Naval Air Sta-

tion, Texas), then prep school, then WTS, where we learned to fly in Aeronacas and later the N3N. Primary training was at Glenview (Illinois), and advanced back at Corpus Christi again. When we started winning the war, they started washing a lot of people out of training, but I wanted to be a naval aviator worse than anything else, so I really applied myself and made it to graduation—just when the war ended.

"I went on to operational training where I checked out in SBD (Dauntless), F6F (Hellcat), F4U (Corsair) and the TBM (Avenger). I became carrier qualified aboard the *U.S.S. Ranger* out of Pensacola (nine landings) and put in for carrier duty. Unfortunately, the orders I volunteered for took me to shore duty at NAS Kobler Field on

Saipan. I became badly disillusioned by the conditions in the Pacific after the war and took advantage of an opportunity to get out in 1946.

"After getting out, I enrolled at the University of Minnesota in engineering. Aeronautical was overcrowded, as were the airlines, so a friend of mine talked me into chemical engineering. While in school, I stayed in the active reserve and flew weekends for \$50 per month.

"I graduated *summa cum laude* at the top of my class and accepted a job with duPont working in engineering

Designer Nat Puffer and wife Shirley beside the Cozy. The couple will make the Cozy project a full-time endeavor now that Nat is retired.





PUFFER

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research. They put me on an AEC (Atomic Energy Commission) project because the Navy wanted to call me back in for the Korean War and I helped to design and start up facilities to make heavy water.

"After four years, we got tired of living out east, so I took a job at 3M, again in engineering research. I was assigned to a secret project investigating and testing some secret coatings the Germans had developed which allegedly had zero friction."

During his career with 3M, Puffer did engineering work on duplication and photographic products. He was in charge of building a research photo lab in Harlow, England, and then returned to the United States to work with microfilm X-rays, research for which he was given a patent.

"It was at this time that I liked working in the model shop and decided to build an airplane as a hobby," explained Puffer. "I was attracted to the BD-5 for a number of reasons. It was like a fighter. Also, the plans were very complete and you could buy a complete kit all from one source. Little did I know that the kit would never be completed. I had the airframe almost all finished when the handwriting was on the wall—Bede didn't have an engine and was going under trying to develop one. I never did finish it. I gave it to the Winona Area Technical College, claiming a gift to charity on my income tax."

About this time, Puffer first saw the design of the VariEze in *Popular Mechanics*. "I was entranced by the simplicity of the design and the wonderful performance. I told my wife Shirley that I was going to drop the BD-5 and start a VariEze as soon as the plans were available. She thought I had lost my marbles. As soon as I learned plans were available, I rushed down to the post office and sent in my money. I also ordered a kit right away from Wicks and I got their last one (No. 13). That was in '76, and in '78 we flew our VariEze to Oshkosh."

Years later, Puffer sold his VariEze to an F-16 pilot, Lt. Col. William Looke. "It was a fantastic airplane and has had a very interesting history," said Puffer.

"All the while I was building, I sent in suggestions to Burt (design and procedure improvements), so we got to know each other pretty well. We also helped to man his booth at Oshkosh the first couple of years, which he deeply appreciated. I was the first person he asked, according to Burt, when he started hiring people for Scaled Composites."

The Cozy developer's entire career has involved high technology, trying to improve processes, to invent things, to do things better. During his final tenure at 3M, he had the technical responsibility for filament tape, which is a composite construction involving polyester backing, glass (fiberglass) yarn, and rubber or synthetic adhesives.

"Across the hall from me was the Industrial Specialties Laboratory, where they work with composite pre-preg

Nat Puffer shows the Cozy to onlookers at the Oshkosh fly-in. Puffer says he plans to attend more airshows with the Cozy now that he's moved to Arizona.

materials using glass, Kevlar, graphite and boron fibers in an epoxy matrix," said Puffer. He carpooled to work with a Ph.D. chemist, a Ph.D. chemical engineer, and an electrical engineer. "We discussed the shelf life of epoxies, how to alter viscosities, wiring airplanes and other fascinating subjects."

We asked Puffer for a picture of the shop he had in Minnesota, but the builder begged off. "I would be very embarrassed to send you a photo of my shop because the truth is I don't have one. For 31 years we lived in a split-level house with a half basement and a tuck-under single-car garage. I have built the better part of four airplanes in this half basement and one-car garage." Now that he is in Mesa, Arizona, he plans to build his first shop.

Nat and Shirley have four children: two are doctors, one working at the Mayo Clinic; one is a dentist, and the youngest is in dental school.

Shirley is an accomplished artist; she works in watercolors, charcoal and pastels and there's an art studio for her in the new house. Nat told us his wife is not a rated pilot, but loves to fly as a passenger. "She is willing to fly straight and level, but she has no desire to do more than that. [However,] I am going to insist on her taking lessons when we are established in Mesa." □

Cozy Builders

Builders of the side-by-side canard craft find Puffer's plans a cut above the originals.

BY DON DOWNIE

Jack Wilhelmson of Cheraw, South Carolina, is a first-time builder within 300 hours of completing his Cozy after 2300 hours of work. The 50-year-old electronics engineer has 2000 hours of flight time with instrument and single- and multi-engine-land ratings. When he's not building his Cozy, he golfs and toys with computers.

Wilhelmson chose the Cozy because of the efficiency of the Rutan airframe design. "The Cozy has more usable space and panel space for instruments," he said. "(I liked) the dual controls. The Long-EZ is very space limited."

His Cozy's canopy, windows, cowl-ing, wheel pants, NASA air scoop, exhaust manifolds, landing gear and some mechanical parts are prefabricated; he made 90% of the machined parts including the gear-retraction mechanism and engine mount. The homebuilt's O-320 E2A engine, with 600 hours since major overhaul, came out of a wind-damaged Cherokee.

Wilhelmson had his Cozy 30% complete before the plans were finalized. He felt that Puffer's plans, details and methods were greatly improved over Rutan's drawings. "Nat provided me with rough copies and advice over the phone," he said. "He helped get some parts for me. I used the first cowlings, canopy and windows from the suppliers."

Wilhelmson expects to have \$18,000 invested in the aircraft, including \$7000 of avionics: two Tierra TN200s—one with glideslope receiver—two TX 720s, a Tri Nav, Apollo I Loran, Narco 150 transponder, audio panel and marker beacon.

The Cozy builder recommends a construction area that will accommodate the assembled airplane. "I used a

double garage and it cost me at least 20% extra building time." Foam core cutting is not difficult, he says, but accuracy is very important to eliminate wasted foam and excessive contouring work later; finishing and wing-strake construction were most difficult. On a similar project, he says that he would buy all foam cores precut, including the fuel strakes.

The nosegear will be modified with flush fairings and gear doors. He'll install a bronze gear in the gear-retraction system for added strength over the casting, shock mount the instrument panel and move the engine two inches forward to take care of the added weight of the O-320 engine and starter. A 6-inch prop extension also will be added.

The South Carolina builder advises that he developed an allergic reaction to Safety Epoxy; he then used Rutan Epoxy for all his finishing without any adverse reaction.

Merle D. Musson, age 65, of Isabella, Missouri, is a retired instrument instructor from the U.S. Army Air Corps with over 3000 hours in the air. He built a VariEze and has been flying it for four years and chose the Cozy

because it was a basic Rutan design with dual controls, side-by-side seating and more cockpit room.

He used an almost-complete bill of materials and purchased a prefabricated cowl-ing and most metal parts. The completed aircraft will cost him about \$14,000 with \$1000 in radios. The builder has put 1400 hours into the project and expects to complete it in another 300 hours. He felt that builder support was adequate and found no difference in either detail or quality between the Rutan and Puffer plans. Building the wing flaps was the most difficult part of the project, yet he would make no changes if he were to build another. As far as advice to other builders, he says: "Jump in and get the job done."

To build their Cozy, Alan and Cathi Yarmey of Salt Lake City, Utah, converted their apartment's master bedroom, bath and closets into a workshop. During the project, Alan changed flying jobs and the couple moved to Denver, Colorado, where the builder is now flying a Lear 35 for Richmor Aviation. "I'm glad that I did not put the wing spar permanently in place before moving," he said.

Yarmey is 32 and has accumulated

To make working space to build their Cozy, Alan and Cathi Yarmey converted their apartment's master bedroom, bathroom and closets into a workshop.

Photo: Don Downie





BUILDERS

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over 7700 hours with all the ratings from ATP, A&P, CFII to commercial glider instructor. He still has some time for photography, tennis and aquatics.

Yarmey is an almost-first-time builder: he rebuilt a Smith miniplane before tackling this project. He chose the Cozy design because of the side-by-side seating, full dual controls, more room for baggage or a third person, excellent cross-country range and efficiency and the newness of the design. He used a complete bill of materials and most available prefabricated components, including engine mounts, most metal parts, leading-edge strakes and cowling. A 150-hp O-320 from a wind-damaged Cessna 172 will power Yarmey's Cozy. He put in 1477.5 hours in almost a year of building and estimates that his total building time will be 2200 hours.

When it comes to builder support, the Learjet pilot is enthusiastic. "Support has been excellent in every way," he advised. "Nat seems very sincere in developing a safe, successful design. His newsletter and personal contacts have been frequent, informative and very helpful. He has personally intervened in problems that I had with authorized suppliers of Cozy parts. This has made the construction project very enjoyable."

Yarmey felt that the Cozy plans were an improvement over the Long-EZ drawings because "many, many hints

and ideas were included in the Cozy plans that were derived from the problems and experiences learned by Vari-Eze and Long-EZ builders."

Predictably, the transport pilot plans to install a full IFR panel with Loran and digital monitoring equipment. He expects to have \$18,000 to \$20,000 invested in the project, including \$6000 to \$8000 in avionics.

"Nat Puffer has done a truly excellent job with the plans for the Cozy and his newsletter and builder support is great," said Yarmey. "All in all, I have no doubt that I made the right choice deciding to build a Cozy. But it's time to stop dreaming. I have a very understanding supportive wife who has other ideas for the master bedroom. And my twin brother Bob in Dallas (Texas) is finishing his Long-EZ and wants to plan some trips together. So it's time to get back to work. We definitely like it Cozy!"

Ulrich Wolter chose the Cozy because of performance and "... my wife (Linda) refused to be a backseater."



Robert B. Chambers

Ulrich Wolter built and flew the first plans-built Cozy. Its first appearance was at the Oshkosh fly-in and it's seen here at the Kerrville fly-in.

Bill Cotter of New Brighton, Minnesota, is a 34-year-old project engineer who started building a Long-EZ in mid-1982, but changed over to the Cozy because of the side-by-side seating, larger instrument panel and dual controls. This first-time builder's project is 60% complete, but has not kept track of the time evolved. His O-235 engine was found through *Trade-A-Plane*; the builder had looked at a larger O-290 engine but felt that the weight and balance would be a problem, so he stayed with the plans. The only prefabricated parts he has used were the welded units.

Cotter reports very good builder support and feels that the Cozy plans have more details than the Long-EZ drawings. He expects to have \$14,000 in his project when completed with \$2000 of that total in radios. His advice to other builders: "Be prepared to work." His problem was finding time to do it. Cotter's only modification was the addition of two attach points for a child's seat in the back. His first long cross-country will be to visit his parents in Philadelphia, Pennsylvania.

First of the plans-built Cozys to fly and arrive at Oshkosh '85 belongs to Ulrich and Linda Wolter. Ulrich is an Air Force jet pilot stationed in San

Antonio, Texas. At age 33, he is a 2300-hour instructor and evaluation pilot who takes the time to ski when time (and weather) permits.

Ulrich said that he liked the performance of the Long-EZ. "However, my wife refused to be a backseater. At that time there were no plans available and Nat Puffer didn't plan on making plans." There was no bill of materials when the military pilot started, but he was able to obtain a prototype turtle-back and cowling. His previous building experience had been with model airplanes only, but he reported nothing really difficult to build. He said, "The fuselage with gear, turtledeck, canopy and all the details is rather time consuming. Be dedicated and patient. Don't worry if you don't understand all the details the first time. They will make sense later."

Ulrich felt that the Cozy plans were more detailed and looked nicer than the Long-EZ plans, but he noted that the Rutan plans are a few years old.

The Texas builder installed a larger, 150-hp O-320 engine, added a little

Although Burt Rutan's quitting the plans business doubtlessly boosted Cozy plans sales, Puffer believes the appearance of the first plans-built version at Oshkosh was more influential.

more fuel, nosegear doors and performed some minor design changes. He has about \$24,000 in the project including \$7000 in avionics. He notes that he has had excellent builder support: "Nat always has time to answer your questions. However, he doesn't want to talk about bigger engines than the O-235." Ulrich's Cozy took the Grand Champion award at the 1985 Kerrville fly-in.

As we sat under the wing of his No. 1 Cozy at Oshkosh with Ulie Wolter's plans-built plane parked alongside, Nat said: "As long as we have good builders and good pilots, we'll stay in business."

Cozy builders, like most others, are innovative. Bud Guderian of Las Vegas, Nevada, worked with his son-in-law for a period of time on both a Cozy and a Long-EZ before the Long-EZ project was moved to Tempe, Arizona. Bud spent a month adding 4 feet to his shop—now 19x12½ feet with two 5-foot doors—so that he will be able to roll the Cozy in and out and flip it over.

"I've got sloping-beamed ceilings in my house with no attic and I've hung my two wings, two winglets, center span and canard from the ceiling in my bedroom," the builder explained. "It's a great place to store parts out of harm's way. Of course, when I attach the winglets to the wings, I'll have to store them in the garage."

The Las Vegas builder plans his first flights with a regular wooden propeller, but is interested in a new German variable-pitch propeller that is planned for Voyager. "Sounds like it would solve high-altitude takeoffs and also shorten the roll on landing," he said. "I'm sure I'll get a wood prop to start with and buy the variable one later."

Tackling a homebuilt project like the Cozy makes a lot of changes in a builder's life. Bob Long sent the Puffers a change of address form because: "I figured that in order to do a good job on my Cozy, I would need a better work area than my small one-room apartment, so I went out and bought a house. It has a big basement and a two-car garage."

Another builder, James Spencer advised Puffer: "I agree that my Cozy plans are better than the Long-EZ plans. A number of construction details and minor changes seem to be the more effective way of doing the construction. The side-by-side makes it much more pleasing to fly. I was a bomber pilot, not a fighter jock. I like help with navigation and room in the cockpit."

One young, recently married couple, Ron and Trish Lorimer of Tucson, Arizona, are building their Cozy in the living room of their mobile home and report that it seems to be working out quite well. Cozy, isn't it? □

