# Chapter 19

# Rutan Aircraft Factory
# The Home-Built Airplane Business

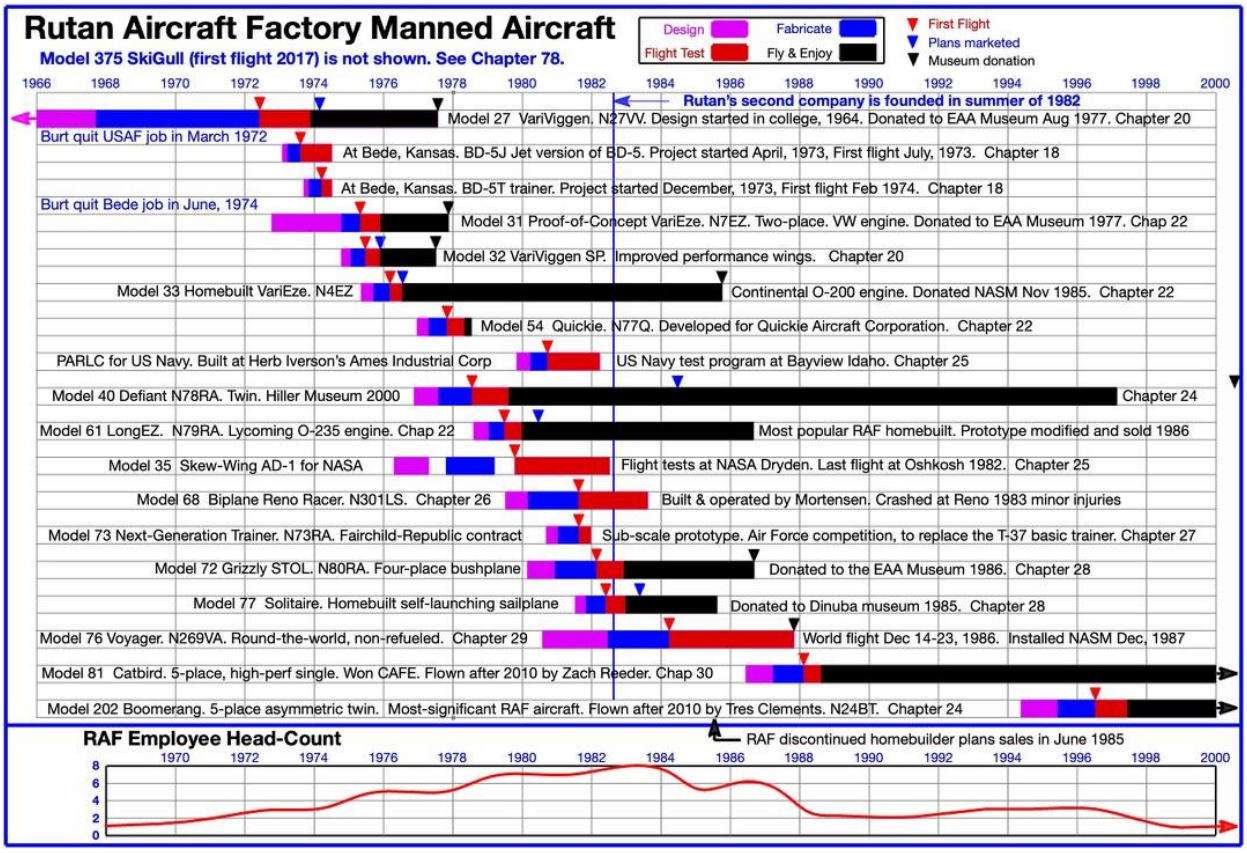
Updated May 5, 2025 (Version 28b)

## Briefing

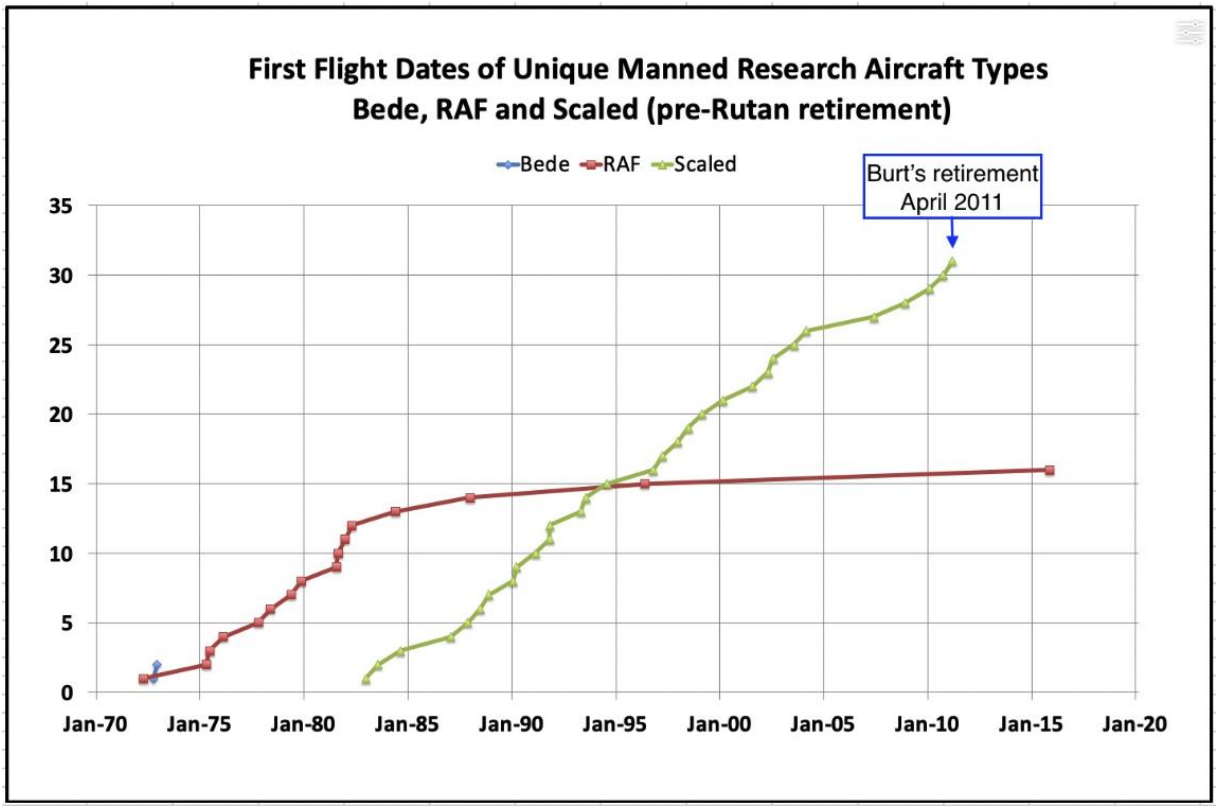
Three RAF Homebuilt Aircraft in Formation Flight
Defiant, VariEze & VariViggen.
After Dick's training we all could safely fly close formations.

Real - NOT Photoshop. Defiant on Koehn Lake.
An un-intentional water scrape, nose gear retracted.

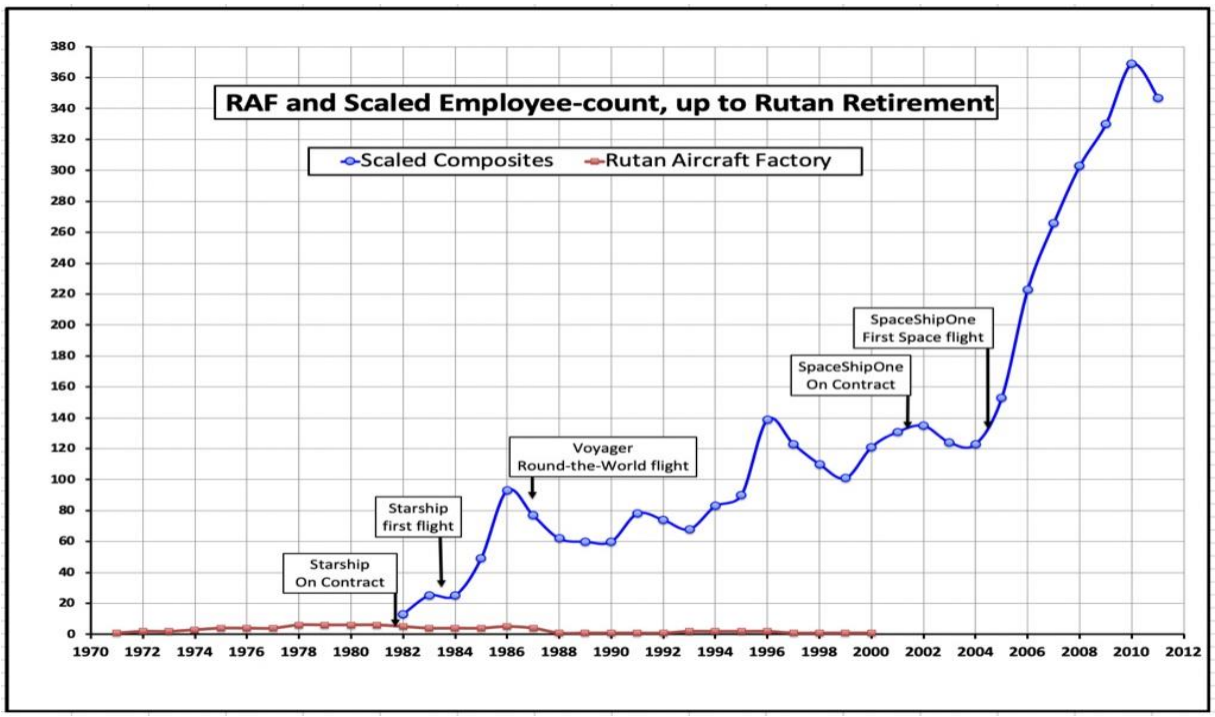
This chart shows many details of all the RAF designs.



RAF built & flight-tested 16 of Burt's 49 manned research aircraft.
The others were 2 for Bede & 31 for Scaled.




RAF staffing was never more than eight employees.
The peak was during the fabrication of Voyager.



Designing my first personal homebuilt airplane started in college in 1964. I built and tested a small, crude wind tunnel model of a canard-type design. I also built and flew a radio-controlled model of a canard design.

Later, in 1967, while I was an Air Force employee, I tested a large model using a car-top rig to measure 3-axis stability and performance of the design (See Chapter 17).

In 1968 I started building the full-scale, two-place VariViggen (Chapter 20) in my garage.

After leaving my Air Force job in 1972, and while working for Bede in Kansas, I flew the first flight of the VariViggen. Yes, the first airplane I owned was a weird unique design that I had built by myself.

During my two years in Kansas, I flew it more than three hundred hours, including airshows and multiple extended trips: Saint Louis/McDonnell factory, Washington/Molt Taylor, Indiana, Canada, California, Texas and New Orleans.

## Rutan Starts His First "Small Business"

When I decided, in 1968, to start a small business, it was not a typical company; it was really just a hobby. I initially had no plan to ever have a typical business that sells products. This was just my personal research effort - a hobby of building myself a unique, personal homebuilt airplane.

In late 1973, I began thinking about starting a real business - one that sells plans to home-builders. In June, 1974 when I quit my job at Bede in Kansas, **Rutan Aircraft Factory** became a real business, a full-time **JOB** for wife Carolyn and myself - no longer a **HOBBY**.

That business was initially focused on my VariViggen, an airplane intended to answer a question - "Can a unique-configuration airplane be safe from the risk of stall/spin accidents?" During flight testing, the VariViggen airplane proved to me that the answer was yes.

Over a period of 12 years, I used this "Natural Stall-Limiting" feature on nine different RAF flight-tested manned aircraft types. Details on the risks taken and my development methods can be found in Chapter 17.

In 1974, it was clear that I would not be able to make a living solely by marketing VariViggen plans and parts. I immediately concentrated my best efforts on developing a new preliminary design I had sketched in 1972, called the “MiniViggen”. It was later named “VariEze POC”. Then, a larger VariEze was built and tested. RAF sold homebuilder plans defining the larger airplane. That was named “homebuilt VariEze”, or just “VariEze”.

Here is a list of eight RAF manned aircraft that were developed without private customer income: VariEze POC N7EZ, Quickie N77Q, STOL Grizzly, Reno Biplane Racer, Voyager, Catbird, Boomerang and SkiGull. These eight developments were funded with profits from RAF selling plans for five airplane designs: VariViggen N27VV, VariEze N4EZ, Defiant N78RA, Long-EZ N79RA and Solitaire N81RA.

What?? Profits from selling plans to the public for five aircraft designs, was enough to fund the development of eight research aircraft? Even today, it’s hard for me to believe that we somehow accomplished that without needing outside financial investment.

These two reference tables show all the
RAF-developed manned aircraft.

**Aircraft Designed or Developed by Rutan Aircraft Factory**

| Name | RAF Model | Customer | Started Design | First Flight | Plans Sold? | Sold When? |
|---|---|---|---|---|---|---|
| VariViggen | 27 | Homebuilder | June-63 | May-72 | Y | January-74 |
| BD-5J Jet | | Bede Aircraft | March-73 | July-73 | N | |
| BD-5T | | Bede Aircraft | December-73 | February-74 | N | |
| VariEze POC | 31 | RAF | May-74 | May-75 | N | |
| VariViggen SP | 32SP | Homebuilder | December-74 | July-75 | Y | August-75 |
| VariEze | 33 | Homebuilder | September-74 | March-76 | Y | June-76 |
| Quickie Q1 | 54 | QAC | May-77 | November-77 | N | May-78 |
| Defiant | 40 | Homebuilder | December-77 | June-78 | Y | June-84 |
| Long-EZ | 61 | Homebuilder | January-79 | June-79 | Y | February-80 |
| Skew AD-1 | 35 | NASA | May-76 | December-79 | N | |
| Biplane Racer | 68 | Mortensen | November-79 | August-81 | N | |
| NGT POC | 73 | Fairchild AC | January-81 | September-81 | N | |
| Grizzly STOL | 72 | RAF | January-80 | January-82 | N | |
| Solitaire | 77 | RAF | July-81 | May-82 | Y | June-83 |
| Voyager RTW | 76 | Dick's VAI | June-80 | June-84 | N | |
| Catbird | 81 | RAF | October-86 | January-88 | N | |
| Boomerang | 202 | RAF | April-94 | June-96 | N | |
| SkiGull amphib | 375 | Burt | July-24 | November-15 | N | |

| Name | Model | Comments |
|---|---|---|
| VariViggen | 27 | Burt's first Manned aircraft.<br>The basis to found Rutan Aircraft Factory.<br>Designed and tunnel-tested at Cal Poly. Built 1968 to 1972, |
| BD-5J Jet | | Jet version of BD-5. Burt designed while working at Bede. |
| BD-5T | | Burt designed while working at Bede. AKA "Truck-a-Plane". |
| VariEze POC | 31 | The first 'Composite-Canard'. Tiny 2-place. VW engine.<br>Set distance record at Oshkosh 1975. Unsafe-engine unreliable |
| VariViggen SP | 32SP | Increased span 25%. Big improvements in performance.<br>Outboard wings composite, easier to build than Aluminum. |
| VariEze | 33 | RAF first Homebuilders' Plans for Composite-Canard aircraft.<br>Huge sales. Funded growth of all that RAF later accomplished. |
| Quickie Q1 | 54 | Design by Burt. Built and flight tested by RAF.<br>Marketed by QAC, not by RAF. |
| Defiant | 40 | Burt's first twin-engine design. Built and flight tested at RAF |
| Long-EZ | 61 | See Chapter 22.<br>Designed by Burt. Flight tested at RAF. Initially had poor stability.<br>Flown to Oshkosh, then re-designed wing with 23-deg sweep.<br>Then- excellent flying qualities. Became most-popular Homebuilt. |
| Skew AD-1 | 35 | Designed by Burt. The first NASA Ames-Dryden program.<br>A 15% scale of a Boeing transonic airliner. Wing skew 0 to 60 degrees. |
| Biplane Racer | 68 | Burt Designed. Built by Mortensen.<br>Now at MGM Grand Hotel- Reno NV<br>Amsoil racer. Two National and two World speed records. |
| NGT POC | 73 | Designed by Burt. Built at AIC. 62% scale demonstrator.<br>For Fairchild Republic. USAF Next-Generation-Trainer.<br>Now at the Long Island's Cradle of Aviation Museum. |
| Grizzly STOL | 72 | Four-place Bush Plane. Super Fowler flaps, 55% chord.<br>180Hp Lycoming. Level cabin for camping.<br>Not a good Bush Plane - needed high wing to clear bush. |
| Solitaire | 77 | Self-launching sailplane. L/D = 32. Towed by Grizzly.<br>RAF sold plans. Task Research sold prefab fuselage. |
| Voyager RTW | 76 | Milestone 'Round-the-World-Non-Refueled'.<br>Design by Burt, built at RAF.<br>Equipped and tested for World Flight by Voyager Aircraft Inc. |
| Catbird | 81 | Five-place high-performance aircraft. Won CAFÉ event.<br>Now operated by Zach Reeder. |
| Boomerang | 202 | Burt's best design for Gen Aviation. Immune from departure.<br>Twin-engine. Five-place. World-class speed & range.<br>Now operated by Tres Clements. |
| SkiGull amphib | 375 | Two place, long range amphibian. Design for rough water.<br>Salt-water- by using titanium, no aluminum.<br>A failure - the flexing water-skis do not allow water operations. |

RAF also did research on solar energy projects. A solar system, using a composite holding tank, provided all the hot water at the new RAF facility for several years. The photo below shows an initial test setup. The system required no pumps and no electrical components.

RAF Solar water heater research 1978

## RAF Summary Notes

All homebuilder plans sales were discontinued in June 1985, three years after founding my second company Scaled Composites. However, RAF stayed open until 2002 to support builders who had bought plans from 1973 until 1985.

Looking back decades later, I am surprised that we had the courage in mid-1974 to set out on our own - moving to the Mojave Desert, without a product that could make a profit, setting up an office and shop in a dilapidated WWII building, while needing to support a family of four (Wife Carolyn and her children Jetta, age 9 and Kye, age 8).

RAF, my first entrepreneur business, was a very significant chapter in my life. From 1974 to 1985 RAF was an active, full-time business – engaged in developing new aircraft, selling plans, pilot handbooks, t-shirts and some custom parts so that the public could build their own versions of my designs. I also took on the huge task of teaching our customers and future customers how to use my new “Moldless Technique” to build primary aircraft structure for manned airplanes.

The sources for this chapter's information are my memory, the 109 RAF VariViggen News/Canard Pusher newsletters, my pilot logbooks, hundreds of magazine articles (including Aviation Week and EAA's Sport Aviation) postal letters, the 40 people I interviewed (including journalists) notebooks, pocket calendars, thousands of photographs and old films/videos.

## End of Briefing

# Rutan Aircraft Factory History
# Sixty-One Years, 1964 to Beyond 2025

These 6 RAF aircraft actually flew in formation near Mojave. The image below was done in Photoshop to bring the airplanes even closer together with higher contrast over Burt's house in Coeur d'Alene, Idaho.

The RAF Defiant Gets Lots of Attention Arriving at Oshkosh 1979

## Organization of Chapter 19

The chapter 19 is organized into twelve numbered Topics. Most include Burt's personal-perspective stories about the RAF years.

# Topic 1 • RUTAN AIRCRAFT FACTORY
# 1964 to 2025

## First, it's Helpful to Describe the "Six Phases" of RAF's History

**Phase 1** • 1964 to 1968 - Burt did preliminary designs and wind-tunnel testing of a canard concept that later became the VariViggen - a light aircraft intended to prove that it is possible to reduce the danger of flying light aircraft via a "Natural Stall-Limiting" design feature.

Early Car-top WindTunnel

**Phase 2** • 1968 to 1972 - Detail design and fabrication of the two-place, wood-construction VariViggen. This prototype research aircraft was built in Burt's home garage in Lancaster, CA.

**Phase 3** • 1972 to 1974 - During Burt's Bede employment in Kansas he enjoyed flying this unique aircraft on many trips and airshows in the US and in Canada. Two highlights - Awarded "Best New Design" at Oshkosh (The World's Largest Aviation Convention) and performing with the USAF Thunderbirds in the New Orleans Air Carnaval.

Carolyn on cover Sport Aviation 1973


New Orleans Air Carnaval. Airshow with USAF Thunderbirds. Awarded "Key to City of New Orleans" by mayor Moon Landrieu.

**Phase 4** • 1974 to 1985 - Founding RAF, Burt's first entrepreneurial business in Mojave California which, by 1985 had developed and flight tested 13 new unique research airplane types. RAF sold about 14,000 homebuilder plans for five of the 13 types. Those homebuilders were supported by the "Canard-Pusher" newsletter mailed four times a year. Support was also provided by hundreds of lectures and structural demonstrations in the US, New Zealand, Australia, and several European countries.

Burt & Carolyn - RAF

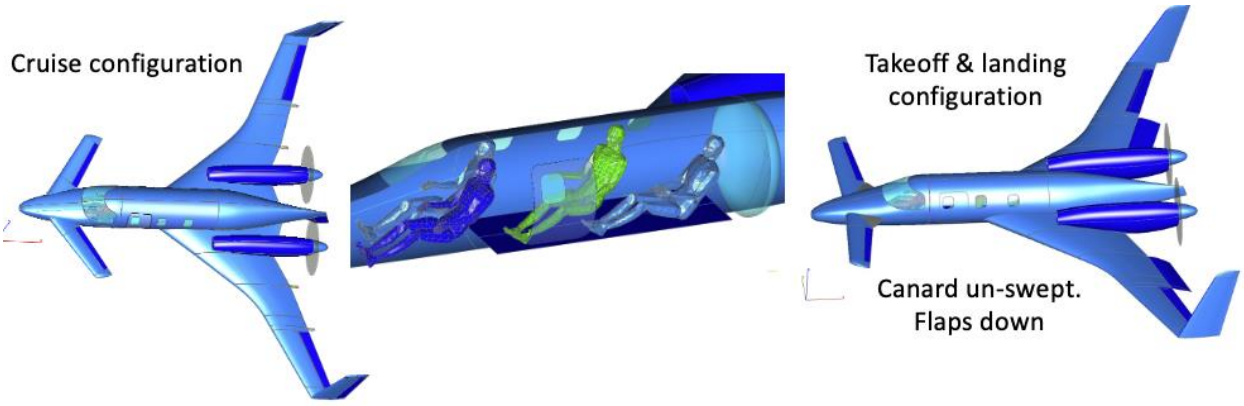
**Phase 5** • 1985 to 2002 - In June, 1985 all plan sales were discontinued so Burt could focus his efforts on his new, much larger company - Scaled Composites. During this phase RAF continued to support plans buyers and developed two more, very-significant research prototypes, the Catbird (1988) and the Boomerang (1996).


RAF continued to support those who had bought plans - until other homebuilder groups were formed. Now, more than fifty years after plans were first sold, those groups still support those who build and fly the five “Antique” RAF designs.

See Topic 9 for details on three of the active support groups.

**Phase 6** • 2013 to beyond 2024 - After Burt’s retirement and his move to North Idaho, he again activated RAF to develop SkiGull, a unique research amphibian prototype and to do preliminary designs of five new aircraft - one being a project intended for homebuilders. See Chapter 78 and these two links - “Oshkosh 2024 New Designs & Heroes” and “Homebuilt Starship.”

Homebuilt Pressurized 4-Place Sub-Scale Starship




## Driven to Solve a Huge Safety Problem
## 1967 to 1972

What I was doing in college was a hobby - a learning experience. During college, I never really considered that I would in later life build an airplane that I would actually fly myself.

My original basis for proving the stability and control of the VariViggen did not involve aerodynamic calculations. My college education was strong on what they called "learn by doing" and compared to the big universities, Cal Poly lacked teaching detailed analysis methods for aircraft design.

Thus, in 1967, I found myself testing a relatively large model with a four-foot wingspan - much larger than the six-inch wind-tunnel model I had tested in college. I mounted this model on a special rig which placed it about six feet above my 1967 Dodge Dart station wagon, where it would be above the turbulence of the air flow around the car.

With this model, I was able to measure the stability and control in all three axes: pitch, roll, and yaw.

I don't remember being surprised that the model exhibited my goal - regardless of whether it was nose heavy or tail heavy it was an airplane that, by its natural aerodynamics, would not stall or spin. I called that feature “Natural Stall Limiting.”

I was very proud of that stall-proof claim. While working on my pilot training, I had learned the most dangerous thing that happens to pilots is when they maneuver too aggressively or fly too slow. This is when a stall (or a “Departure from Controlled Flight”) occurs. When that happens at low altitude, it often results in a fatal accident.

In 1968, while working for the Air Force, I found myself fully exposed to the dangers of departures in military fighters. I was the “Stability and Control Test Engineer” for the stall and departure testing of the USAF’s primary jet fighter, the F-4E Phantom. In that job, I would not only be planning and working with engineering flight test data, I would also be flying in the back seat of the F-4 during its flight tests.

As detailed in Chapter 13, I found out - up close and personal, how dangerous it is to have high susceptibility to loss-of-control when maneuvering aggressively. Without ever trying to spin the F-4, we encountered 101 unintentional spins.

Two of the 101 were “Flat Spins,” a spin type that is not naturally recoverable with the F-4. With me in the back seat, the first was recovered after 37 rotations by deploying a special spin-recovery parachute. The second flat spin resulted in a “Smoking Hole” when the parachute failed and our fighter impacted the desert north of Edwards Air Force Base - see chapter 13.

I was shocked when I learned that more than 60 operational Air Force F-4s had crashed due to their high departure susceptibility when maneuvered aggressively. Yep, all those crashed without bullet holes in them!

**Now, I was driven** - to me it was like a personal calling to solve this problem with my canard design configuration. I absolutely HAD to build and test a real airplane that has a stall-proof safety characteristic.

In spite of the fact that I was working very long hours during 1968 to 1972, testing four types of Air Force aircraft for the Vietnam War, every moment of

my spare time was spent in my home garage building my first aircraft, the canard-type VariViggen.

I was already working overtime seven days a week at the Air Force when I took on the huge task of building the VariViggen. I was so overwhelmed and focused that I failed to pay attention to my family.

My seven-year marriage ended in 1969 - my wife kicked me out and, taking our two children, she moved to another state with her new husband.

## Some Comments About My Two Entrepreneurial Companies

Scaled facility on left, RAF facility on right (1984).

The RAF business continued after I founded Scaled Composites in 1982 (Chapter 33). My two businesses overlapped from 1982 to 1985.

Thus, I was the active CEO at both companies for three years - obviously taking on more than I should have. In those days, I was very reluctant to trust others to manage my companies.

## RAF Remained Small
## Limited to Plans-Sales & Builder-Support

I had decided to keep Rutan Aircraft Factory small. It never had more than eight employees. I did that by not selling complete materials kits. Instead, I referred those who purchased RAF plans to two competing materials suppliers - plus two other companies who sold components. RAF licensed each plans buyer so he could build one airplane. Builder support was provided only to licensed builders.

## RAF Communication with Customers

In 1974, the internet was still 25 years in the future. RAF communicated with customers by a newsletter mailed every three months, by telephone, by mailing personal postal letters and by presentations given at airshows.

In all, RAF published 109 newsletter issues. The first was in May, 1974 and the last was in July 2002.

## Scaled Composites' Operations Were Different

Unlike RAF, Scaled had different types of customers - Governments, US and foreign companies, Aerospace Primes, startup companies, foreign corporations and billionaires. Unlike RAF, Scaled did not sell to the public.

The main product of Scaled was flight test data and reports from the Proof-of-Concept prototype flight testing - verification of the design so the customer could proceed to Certification, Production or various applications for Military requirements.

The beginnings of the RAF company go back to my third year in college in 1964, when I started designing what later became my first homebuilt airplane, the VariViggen. To find the details on why I developed the VariViggen, refer to chapter 17. For other details on the VariViggen design, refer to chapter 20.

In 1967, when I was working at Edwards Air Force Base, I wanted to prove that my new design would have "Natural Stall Avoidance." When I set up my car-top wind-tunnel it had a faring under the model. I wrote RAC on the fairing, for "Rutan Aircraft Company."

When I started building the VariViggen in 1968, I changed the name to “Rutan Aircraft Factory”. That name did not mean to infer that I had a plan to have a real factory. It was just a silly reference to Great Britain’s Air Force which was called RAF, the Royal Air Force. Hey, I was a warrior at the time - An Air Force employee during the Vietnam War.

I really wanted to build myself a personal airplane, to further develop my idea that it might be possible to have “Natural Stall Avoidance” and thus reach a goal of making General Aviation safer.

At that time, I didn’t have the foresight or courage to start my own company, but merely to own a couple of fun homebuilt airplanes as a hobby. Both the VariViggen and a planned tiny single-place canard, with wings removed, could be parked in a single car garage. By trucking or towing them to an airport, I could avoid the cost of buying and maintaining an airport hangar.

## A Single-Place Homebuilt with Natural Stall Limiting?

In 1971, I was thinking about building a single-place, canard homebuilt that, like my VariViggen, would have stall-limiting characteristics. I could buy a majority of the materials to build it just by buying a BD-5 kit from Bede Aircraft (which included landing gear, engine, fuel system, electric systems, pusher prop, avionics, control system hardware, etc.).

As it turned out, I would later drop the idea of building a tiny single-place canard airplane, since it would need to use a snowmobile engine that was not intended to be used in a manned airplane - that cheap engine would likely be unreliable.

## Others Could Also Have Fun

In late 1973, while working in Kansas for Bede, after logging hundreds of flight hours in my VariViggen, I decided to allow others to enjoy this fun-to-fly airplane. I drew up a cursory set of plans for building it, had them printed and started selling them in early 1974 for $27.

Those crude initial plans did not have step-by-step instructions. They were intended only for experienced homebuilders - those able to sort out details on their own, when given the loft and basic definition of the structure and systems. This was then considered a part-time moonlight job, not a real

profession. At the time, I had little appreciation for the extent of my future responsibilities to support amateur airplane builders…

By April, 1974 my wife Carolyn agreed that I should quit my job at Bede. See chapter 18 for the details of why I quit the Bede Aircraft Kansas job. I don't remember needing to argue with Carolyn about the decision. She also was excited that we could be entrepreneurs and was willing to work hard with me for our success.

Facing the "What to Do Next" dilemma, we wanted to start our own company in the homebuilt airplane industry. It would initially be based on selling plans and some parts for the VariViggen. I did realize that to survive, we would have to have other products to sell. We would have to start soon to develop another new homebuilt airplane design.

I talked about our dilemma with my father Pop and he encouraged us to start a new company. He offered a $15,000 loan to fund our startup effort.

That did it. We decided to start a new full-time business. Addressing business ethics, we would sell nothing before flight testing was complete, and when we knew our costs, we could be assured profitability. That was one of the "Lessons Learned" from my two years at the failed Bede Aircraft company in Kansas. Refer to chapter 18 for Bede details.

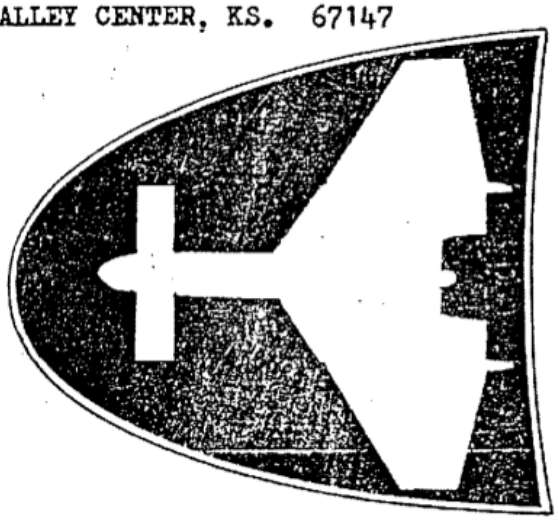
In May, 1974, we mailed out the first RAF newsletter - "VariViggen News." It went to those who had expressed an interest in the VariViggen, based on seeing it for two years at Oshkosh and reading the many magazine articles published about it. RAF was then based in Kansas, at our home for the last two years, but soon would be move to California.

Page One of the First RAF Newsletter.
It was mailed from our home in Kansas
while I was still working for Bede Aircraft.

# VARIVIGGEN NEWS NO. 1

MAY 1974

RUTAN AIRCRAFT FACTORY/P.O. BOX 111/VALLEY CENTER, KS. 67147



## THE NEWSLETTER

staff has finally organized: Burt Rutan, Editor-in-Chief; Carolyn Rutan, Proof Reader. This, being the first newsletter, will be mailed to all holders of VariViggen Tech. Reports and Plans. Future newsletters will be mailed only to those who actually plan to build an airplane and who have an Aircraft Serial Number assigned.

This is <u>your</u> newsletter, the sole purpose of which is to aid in your construction projects through exchange of information. Please feel free to send progress reports, comments, or photos of your project for printing in future newsletters.

**ACTIVITY** at the RAF - Carolyn and I have spent a busy Fall and Winter preparing the plans and getting them mailed. My apologies to those who waited several months. Our prototype, N27VV, has passed her 300th flight-hour, and our latest inspection and relicense revealed only that she needed new tires and brake pads. The low maintenance requirements have been very pleasing. Check around and see how much flying most homebuilt prototypes see in their first two years! We took several trips this winter - see May '74 "Sport Aviation". N27VV has given two airshow performances so far this year and we have approximately eight more on the schedule for this season, including Oshkosh, July 31-August 6, and Brantford, Ontario, August 10 and 11. Sales of plans now total 190, and 53 builders have already returned their "Page Two", requesting a serial number and indicating that they plan to build an airplane. Of these, 41, plan to build theirs similar to the prototype or with minor modifications, and the rest - wow! We will see some very interesting flying machines! To get on the Sport Aviation list of Aircraft Under Construction, I urge you to notify EAA Headquarters of your project. To the builders, I'm enclosing a complete list of all present builders (by Aircraft Serial Number), their addresses, and any major modifications they are considering. I will mail the list to other plan holders only if they return "Page Two" indicating they intend to build an airplane. This list will be updated each Newsletter.

In early July, 1974, I borrowed my uncle Pete's Ercoupe airplane and used it to scout out airports where the new RAF business could be located. I visited seven different California airports - Brown Field, Montgomery, Ramona, Corona, Oceanside, Lancaster and Mojave. I selected Mojave, mainly because everything there was low cost.

With the courage to make it on our own, in June of 1974, I quit my job as Director of Development for Bede Aircraft. Then, Carolyn and I flew the VariViggen to the 1974 Oshkosh Convention, where the VariViggen won the “Outstanding New Design Trophy.”

This was our first Oshkosh where we could announce our entrance into the homebuilt aircraft industry with the new Rutan Aircraft Factory. We didn’t have a formal Oshkosh booth. We just had information on our new company in a box hung on the VariViggen canopy rail.


Note the broad smiles from two people who had just escaped the demanding job at Bede and were looking forward to being on our own. We then had no idea how hard we would be working to start and run our new business. The hand gesture meant a bit more than 1970s silly humor.

During the 1974 Oshkosh convention week we flew the VariViggen over 10 hours, demonstrating it in front of hundreds of thousands of somewhat shocked attendees. Most of them had never seen a canard type airplane - especially one that could make those sharp, high turn-rate maneuvers.

We didn't directly return home after Oshkosh. Instead, we flew north to continue our adventure and enjoy our new independent freedom.

First stop was Gore Bay Canada - to an island on a lake in Manitoulin Island in the huge Huron Great Lake. There we visited a VariViggen builder (Ken Ashdown, VV S/N 069) and showed off our new trophy.

We then did some scary scud-running to make it to Brantford, Ontario Canada to perform in their airshow. After that airshow, we flew across Lake Erie, another Great-Lake, on our way to visit Carolyn's parents in Evansville. Taking off from the tiny Evansville Skylane airstrip, we kicked up a rock that damaging our propeller and we flew with a shaking engine to the Regional Airport. I rounded up some wood and epoxy and repaired the prop so we could continue our trip.

Arriving back at Kansas we stayed ten days to sell our home and pack all our belongings.

**The August 28-31, 1974 Move - Kansas to California**

This was a fun trip, with me flying the VariViggen and Carolyn driving our 1967 Dodge Dart station wagon. Our girls, Jetta and Kye (chapter 88) sometimes rode in the VariViggen and sometimes in the Dart. The trip took three days, with stops in Dalhart, Tucumcari, Grants, Gallop, Flagstaff and Needles.

This was long before cell phones and portable VHF radios, so we had no way to communicate while traveling. Each morning we selected an airport for a lunch stop. The Dart would start driving first, so I could scare them with an illegal low-level buzz job on the highway. I would land, refuel the VariViggen, wait for the Dart to arrive, eat lunch, then repeat the process for dinner and motel in the evening.

## Getting RAF Started

Our arrival at Mojave on August 31, 1974 to start RAF, was an experience that we will never forget. I was 31-years-old and for the first time, I would be working without a boss. It was up to me and my wife to succeed or to fail. I had a new family of four, having married Carolyn and moved her and her two daughters to Mojave - just two years and ten months earlier.

It was hectic, going through all of the normal stuff when you move a family and when you start a new business - like getting the kids enrolled in school, moving into a house, trying to keep up with the growing list of people who had bought VariViggen plans and the normal kind of stuff that you encounter when you're a stranger in a small town.

## Was Pop's Loan Enough?

With Pop's loan, we would be able to develop our first composite structure airplane - the VariEze. We knew we had enough money in the bank to survive for at least a year without any income from our new business.

Our fear then was running out of that $15k loan from Pop before the new business made enough for our family to survive. However, I did have a backup plan if RAF failed. Mojave is just a 20-minute drive to Edwards Air Force Base, and I figured I could return to the Air Force flight-test job I had left 2.5 years earlier, without the hassle of another family move.

At the time, I had no idea that in just two years, after the huge surge of customers buying VariEze plans, I would pay back the loan from Pop then spend my entire life without the fear or stress of personal financial failure. Either we were good managers, or were continuously lucky - I have no idea which it was.

## Business Ethics

I had learned a lot about business ethics (technical and financial) during my two years working for Bede in Kansas, and I learned a great deal more running RAF for 29 years. Those lessons-learned also formed the basis of my success in growing Scaled from its founding in 1982 to my retirement in 2011 - when it had 345 employees (Chapter 57). Scaled continues to grow now in 2025.

It's nothing more than a coincidence that my RAF and Scaled jobs each lasted 29 years.

### Note

In order to find more details about RAF, see “Oshkosh 2024 Talk 1 Video.”

Also, see the Link PDF Document “Oshkosh 2024 Talk 1 Slides: 50 Years of Homebuilt Composite Canards”

## Topic 2 • MOJAVE & THE RAF FACILITIES 1974 to 1977

**During the Ercoupe search I had four basic requirements:**

**1** • A home for my family with a nearby school.

**2** • A shop to build my next aircraft (that became a two-place homebuilt constructed from fiberglass and foam - later to be called VariEze POC).

**3** • An office to run the business and market RAF products.

**4** • A hanger to house my VariViggen. It's not practical to tie an airplane down outside in Mojave, because the occasional extreme winds can destroy a small airplane on the ramp. Also, the mid-summer sun can destroy interiors and avionics. If the airplane is vented, it will fill up with dust and sand.

### Mojave Airport History

During World War II, Mojave Airport was a busy place - training pilots to fly Corsair fighters before they got sent to battle in the Pacific. Mojave Airport also had a very interesting building that was justified for training Navy pilots to survive after ditching in the ocean. This “Water Tank” for that requirement was actually an Olympic-size swimming pool built in a huge Quonset hut building. In the 1940s, it had poolside chairs and was decorated with tropical plants. The Navy had some nice stuff during wartime!

When we arrived in Mojave, in 1974, the pool had been drained and was dirty. Most other airport buildings were abandoned. Forty years later, the pool building was restored and is now a convention center - a large meeting place for airport tenants and the local community.

I paid only $18 per month to hanger the VariViggen - since most of the large World War II wood hangers on the flight line were vacant. A short, 60-yard walk to the south of that hanger was a deserted building that I fixed up to be the first RAF facility. It was much larger than I needed, but the airport management insisted that I lease the entire building.

It wasn't long before I found a tenant to sublease most of it. I charged him the same amount I was paying to the airport - therefore RAF had its reception, design office and a workshop to build the first VariEze at no cost. It wasn’t air-conditioned – so, in the summer, I had to do composite layups only at night - because the “Swamp Cooler” raised the humidity too high for the epoxy.

I assumed that I would probably be renting a house for my family, but looking around to the west of the railroad tracks I found a home that had been built as a spec house. It had never been lived in. Its roof had leaked - damaging the carpeting. The roof leak had been fixed, but the owner decided that a buyer might want to pick out his own carpet color. So, we moved into a “New” house with bare floors and no carpeting.

The location was ideal. The kids could walk to the grade school. School busses then were only for larger cities. I used a borrowed motorcycle to run across the open desert to the RAF facility on the airport - just 2.6 miles to the east.

Home on Aberdeen Place - cost $27,000 in 1974.
Photo is modern via Google Earth Street View.

Original 1974 RAF Facility with Carolyn & Burt


VariViggen was Hangared on Flightline on Left

We were isolated - about a half hour drive to the closest real town. Mojave's population was and still is 2,300 - a number that coincidentally was the same as the elevation - 2,300 feet. The drive to a town to do grocery shopping or nearly any other type of shopping was 30 minutes south or 30 minutes west.

### An Early Success

Success came much sooner than I had dreamed it could. Within 30 months of setting up RAF at that old WW2 building, we had paid back Pop's loan and had the cash to build a new facility on the flight line of the Mojave airport. That building was sold to Scaled in 2001.

The New RAF Mojave Facility - 1977

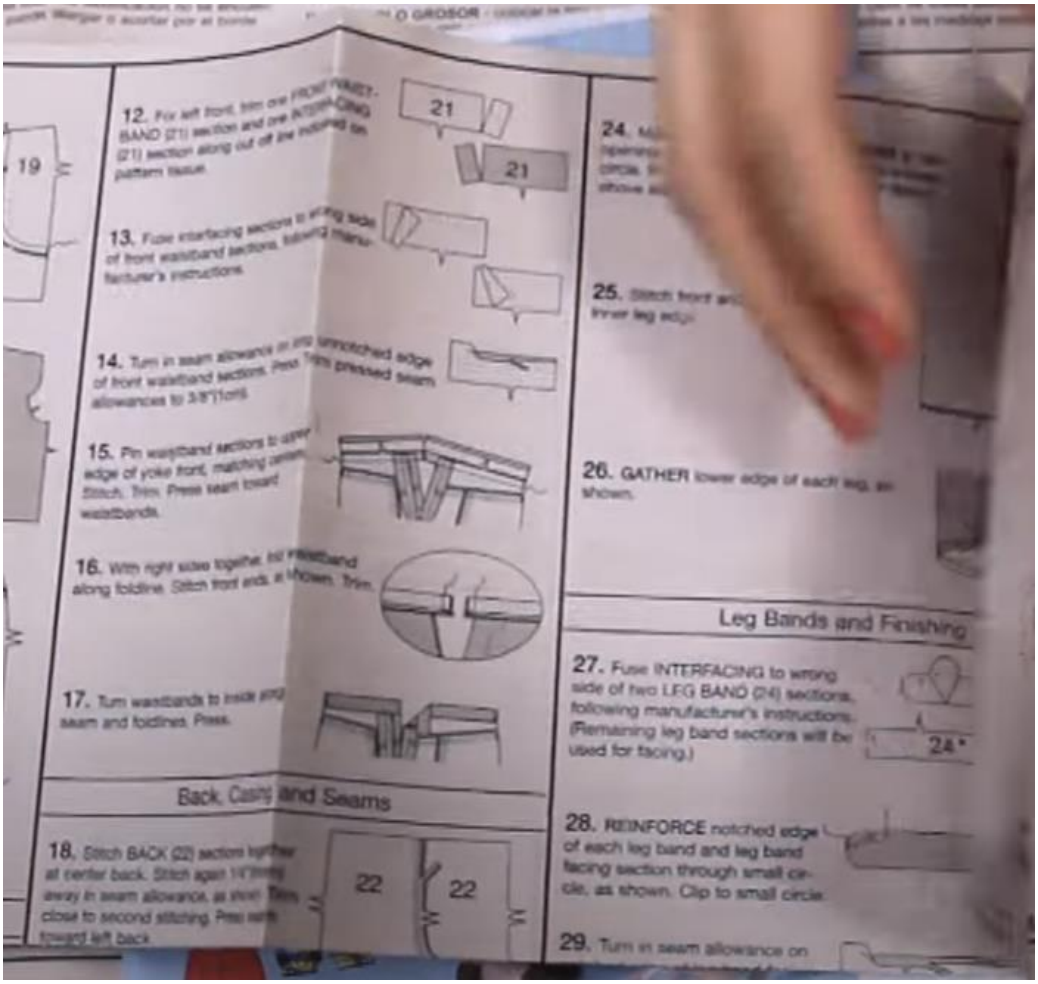
## Topic 3 • HOMEBUILDER SUPPORT 1973 TO 2002

### A New "Step-by-Step" Format for Homebuilt Airplane Plans

If you look at the popular homebuilt airplanes before introduction of the VariEze (Thorp T-18, Stits Playboy, Bowers Fly-baby, etc.) the format of the plans was generally large blueprint engineering drawings without a detailed direction on exactly how to proceed with the fabrication. Thus, someone who might never have built anything more complex than a dog house needed an "Expert" to guide him through his work to build a complicated manned airplane.

I knew there were few “Experts” around to help the beginner who’s attempting to build composite primary structure for a VariEze. Clearly, a detailed step-by-step plans format would be needed.

Someone suggested that the format a housewife uses to build a dress might work for airplanes. I took a look at the plans format that Simplicity uses to guide a housewife to “fabricate a dress.” She is supplied with full-scale patterns to cut the cloth. Once the cloth is cut, she refers to numbered individual steps, each with a description, accompanied by a simple sketch of what that task looks like. The dress fabricator checks off a numbered accomplishment - then goes to the next step. Once reaching the last step, she has a completed dress.



# Samples of the VariEze Plans Format

The center section spar is the most difficult part to build in your VariEze and includes the most important alignment task, positioning of both wings. Follow all steps carefully, be patient. It's ac VariEze when done one step at a time.

**Step 1 — Shaping the Urethane Foam and Glassing the Spar Box Interior**

This step takes about two hours.

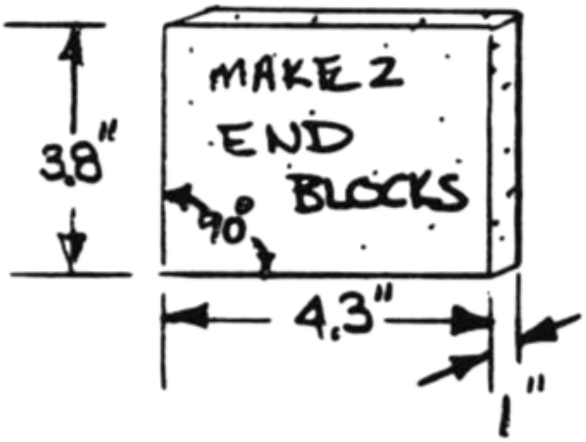



Fig. 10-1

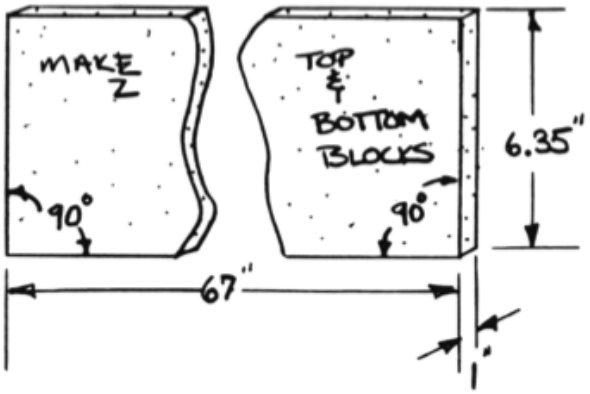
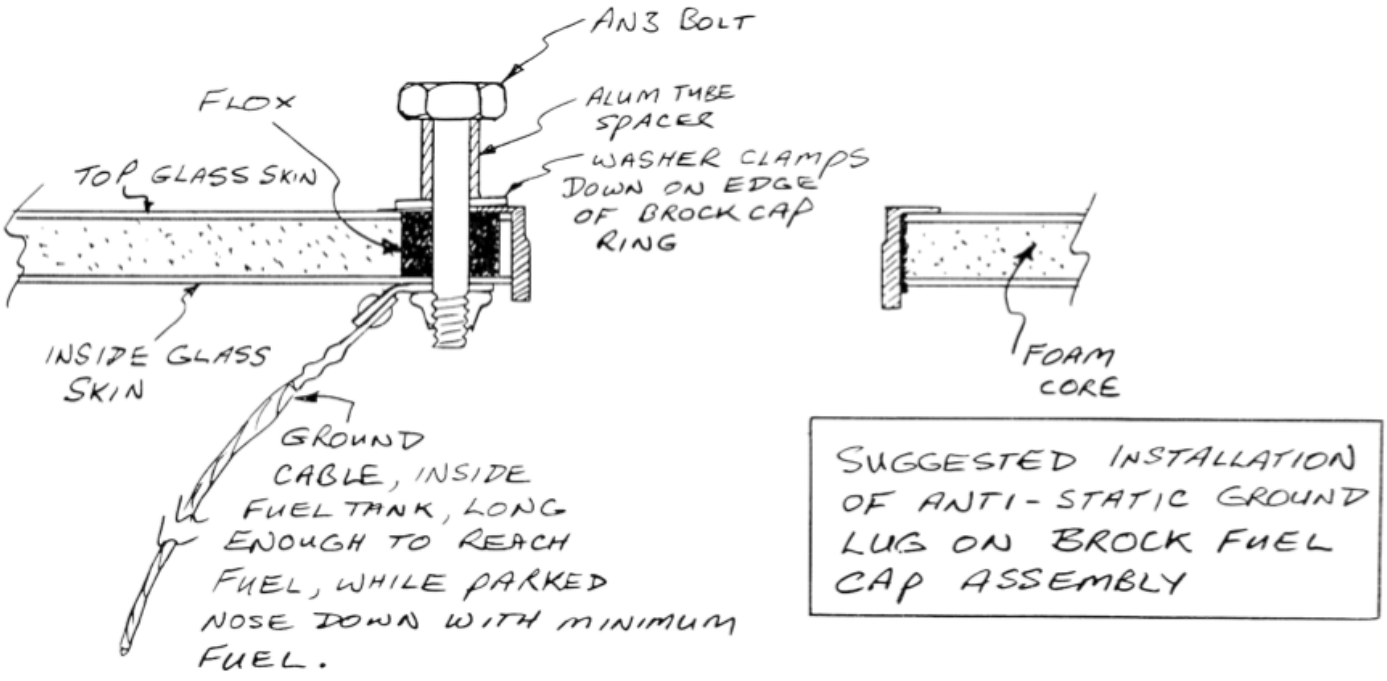



Fig. 10-2




Use a Dremel to cut a ⅜" diameter hole through the top skin of each fuel tank adjacent to the Brock fuel cap, as shown. Remove all foam and micro down to the inside skin, but do not penetrate inside

Gary Morris, a RAF employee, was a talented cartoonist. He always decorated the plans with numerous sketches and cartoons which were there not just to entertain, but to emphasize the task at hand and the importance of doing it right. It was Gary that named the newsletter the “Canard Pusher.”


“So how was I supposed to know that by just lookin' at the plans?”

Of course, the complete set of plans was only a small portion of the support needed for customers building their own airplanes. The average builder who managed to finally complete his airplane, had called RAF hundreds of times to ask questions. Building any homebuilt aircraft is very difficult.

Statistically, with any type of homebuilt, only about 10% who start building an airplane ever complete it.

RAF found that the work required to produce good plans for the homebuilders was roughly equivalent to the number of man-hours required to build more than two of the prototype airplanes.

## Communication was Different Before the Internet

RAF sold the homebuilder aircraft plans from 1973 until 1985. There was no email, no text messaging and no digital photographs. It was long before there was an Internet, so our ability to support customers was limited.

RAF had three ways to support those who were licensed to build airplanes from the plans:

**1** • A Newsletter. Published four times a year, it was typed, with each page pasted onto large poster boards along with photos and other graphics. A

local Lancaster printer printed them. Then the RAF employees had a "Copulation Party" (Dick's title) where we assembled the pages, folded them, stapled them and attached US postal stamps. We drove them to the Post Office. Those who subscribed to the newsletters received them in 3 to 10 days.

For those building airplanes from plans, the newsletters were Mandatory because they often had "Mandatory-Ground" safety modifications - a RAF recommendation to not fly until the modification was done.

**2** • Telephone. When someone called RAF, they talked to the receptionist and if she didn't know the answer, she would go to the design room or the shop and ask someone who did know.

**3** • Face-to-Face Lectures & Composite Manufacturing Demonstrations. These Burt gave at US locations and many foreign cities.

**Newsletters Published by RAF**

The first RAF Newsletter - "VariViggen News #1" was mailed in May, 1974.

1974-05_vvn-1.pdf

The last RAF Newsletter - "Canard Pusher #109" was mailed in July, 2002.

2002-07_cp-109.pdf

Since the RAF newsletters all show the dates, you can find lots of detailed information on RAF business by reading #1 through #45 (The RAF era).

| | | |
|---|---|---|
| 1974-05_vvn-1.pdf | 1974-10_vvn-2.pdf | 1975-01_vvn-3.pdf |
| 1975-04_vvn-4.pdf | 1975-07_vvn-5.pdf | 1975-10_cp-6.pdf |
| 1976-01_cp-7.pdf | 1976-04_cp-8.pdf | 1976-07_cp-9.pdf |
| 1976-10_cp-10.pdf | 1977-01_cp-11.pdf | 1977-04_cp-12.pdf |
| 1977-07_cp-13.pdf | 1977-10_cp-14.pdf | 1978-01_cp-15.pdf |
| 1978-04_cp-16.pdf | 1978-07_cp-17.pdf | 1978-10_cp-18.pdf |

| | | |
|---|---|---|
| 1979-01_cp-19.pdf | 1979-04_cp-20.pdf | 1979-07_cp-21.pdf |
| 1979-10_cp-22.pdf | 1980-01_cp-23.pdf | 1980-04_cp-24.pdf |
| 1980-07_cp-25.pdf | 1980-10_cp-26.pdf | 1981-01_cp-27.pdf |
| 1981-04_cp-28.pdf | 1981-07_cp-29.pdf | 1981-10_cp-30.pdf |
| 1982-01_cp-31.pdf | 1982-04_cp-32.pdf | 1982-07_cp-33.pdf |
| 1982-10_cp-34.pdf | 1983-01_cp-35.pdf | 1983-04_cp-36.pdf |
| 1983-07_cp-37.pdf | 1983-10_cp-38.pdf | 1984-01_cp-39.pdf |
| 1984-04_cp-40.pdf | 1984-07_cp-41.pdf | 1984-10_cp-42.pdf |
| 1985-01_cp-43.pdf | 1985-04_cp-44.pdf | 1985-07_cp-45.pdf |
| 1985-10_cp-46.pdf | 1986-01_cp-47.pdf | 1986-04_cp-48.pdf |
| 1986-07_cp-49.pdf | 1986-10_cp-50.pdf | 1987-04_cp-51.pdf |
| 1987-07_cp-52.pdf | 1987-10_cp-53.pdf | 1988-01_cp-54.pdf |
| 1988-04_cp-55.pdf | 1988-07_cp-56.pdf | 1988-10_cp-57.pdf |
| 1989-01_cp-58.pdf | 1989-04_cp-59.pdf | 1989-07_cp-60.pdf |
| 1989-10_cp-61.pdf | 1990-01_cp-62.pdf | 1990-04_cp-63.pdf |
| 1990-07_cp-64.pdf | 1990-10_cp-65.pdf | 1991-01_cp-66.pdf |
| 1991-04_cp-67.pdf | 1991-07_cp-68.pdf | 1991-10_cp-69.pdf |
| 1992-01_cp-70.pdf | 1992-04_cp-71.pdf | 1992-07_cp-72.pdf |

| | | |
|---|---|---|
| 1992-10_cp-73.pdf | 1993-01_cp-74.pdf | 1993-04_cp-75.pdf |
| 1993-07_cp-76.pdf | 1994-01_cp-77.pdf | 1994-04_cp-78.pdf |
| 1994-10_cp-79.pdf | 1995-01_cp-80.pdf | 1995-07_cp-81.pdf |
| 1995-10_cp-82.pdf | 1996-01_cp-83.pdf | 1996-04_cp-84.pdf |
| 1996-07_cp-85.pdf | 1996-10_cp-86.pdf | 1997-01_cp-87.pdf |
| 1997-04_cp-88.pdf | 1997-07_cp-89.pdf | 1997-10_cp-90.pdf |
| 1998-01_cp-91.pdf | 1998-04_cp-92.pdf | 1998-07_cp-93.pdf |
| 1998-10_cp-94.pdf | 1999-01_cp-95.pdf | 1999-04_cp-96.pdf |
| 1999-07_cp-97.pdf | 1999-10_cp-98.pdf | 2000-01_cp-99.pdf |
| 2000-04_cp-100.pdf | 2000-07_cp-101.pdf | 2000-10_cp-102.pdf |
| 2001-01_cp-103.pdf | 2001-04_cp-104.pdf | 2001-07_cp-105.pdf |
| 2001-10_cp-106.pdf | 2002-01_cp-107.pdf | 2002-04_cp-108.pdf |
| 2002-07_cp-109.pdf | | |

## Face-to-Face Lectures & Structural Fabrication Demos

Refer to Chapter 23 for details of the lectures Burt gave to teach homebuilders how to build an aircraft using RAF plans.

This table lists most of the lectures.

| RAF Teaching Events<br>How to Build Moldless Composite Aircraft | |
|---|---|
| **Dates** | **Location** |
| 1976 to 1985 | Every Sat, RAF hangar, Mojave airport |
| 1976 to 1986 | Oshkosh, Wisconsin, ~ 10 years |
| Oct, 1976 | Wicks Organ, Highland Illinois |
| Oct, 1976 | RAF, Mojave California |
| Oct, 1976 | Boston, Massachusetts |
| Nov, 1976 | London, England |
| Nov, 1976 | Paris, France |
| Nov, 1976 | Austin, Texas |
| Nov, 1976 | RAF, Mojave California |
| Dec, 1976 | Sacramento, California |
| Dec, 1976 | Atlanta, Georgia |
| Dec, 1976 | Daytona Beach, Florida |
| Feb, 1977 | Snohomish, Washington |
| Feb, 1977 | Denver, Colorado |
| Mar, 1977 | Anderson, Indiana |
| April, 1977 | St Paul, Minnesota |
| Dec, 1977 | RAF, Mojave California |
| Nov, 1978 | RAF, Mojave California |
| Nov, 1979 | RAF, Mojave California |
| Mar, 1980 | Melbourne, Australia |
| Mar, 1980 | Auckland, New Zealand |
| Apr, 1980 | Christchurch, New Zealand |
| Nov, 1980 | RAF, Mojave California |
| Feb, 1982 | Ft Lauderdale, Florida |
| ? | Van Nuys, California |
| ? | Canada |
| ? | Germany |
| ? | Netherlands |

RAF Demo at Mojave in 1976 (these were done every Saturday from 1975 to 1985)

An Oshkosh Lecture

## The “License-to-Build” a RAF Homebuilt

A description, as printed in the fall of 1985
in a Canard-Pusher Newsletter

LICENSE TO BUILD A RAF-DESIGNED AIRCRAFT. Those of you who are active builders know that your purchase of plans from RAF, entitles the holder to apply for a license to allow him to construct one aircraft from the purchased set of plans. Plans sold without the license indicate that the purchaser has obtained the plans for the purposes of using as a book or educational material to learn fabrication or design processes but not to build and airplane of this specific design.

In the past, RAF has accepted transfer of that license from the original purchaser to a second party when that transfer was requested by the licensee and the license was transferred. However - since this summer, current agreements specify that RAF support only those who are previously licensed to build the RAF designs and we cannot issue further licenses for any further production of the designs. In order to provide the best possible service to those licensed to build the aircraft with the remaining funds available for support we must insist that the support be limited to only those who are legally building the aircraft. i.e.; those who have obtained a license to build one of the designs from RAF.

We are aware that there are instances where people are fabricating an EZ without a license from RAF. If those people have gotten information or authorization to do so from one of the licensees it must be made clear as to what the licensees' responsibilities are. Keeping in mind that the individual that has obtained a license to build a Long-EZ for example, has the permission of RAF to copy the prototype Long-EZ for one airframe. He is the aircraft manufacturer and he is using certain design information purchased from RAF as well as other design information that he has generated himself or obtained elsewhere. There is no such thing as a conformal amateur built aircraft since there are no official conformity drawings accepted by the FAA or anyone. The FAA thus assumes that each aircraft is indeed a new type and does not have to conform to specific drawings or manufacturing processes. The drawings and manufacturing processes to be used on each airplane are totally the decision and right of the homebuilding manufacturer.

Now if you, as a licensee, wish to discontinue your project and sell it to someone, the new buyer is dealing with you, the licensed manufacturer, not with RAF.

RAF's responsibility is to support the individual that has the license, not a third party. Thus - keep in mind that if you are selling a project, don't expect that RAF can or will provide builder support to the person buying your project. That responsibility rests with you the manufacturer. You are then effectively licensing the third party to produce an aircraft of which you own all manufacturing rights. It is strongly suggested that if you do sell a project, either a completed airplane or a partially built airplane or a set of plans, that your contact an attorney and have him draw up an agreement between yourself as manufacturer and the new party whom you are authorizing to build an airplane and be certain that the agreement provides you with some release or indemnification from liability should that aircraft ever be completed and flown. Keep in mind that you are ethically obligated and responsible to the person who has trusted you for that information and that he may need continuing support to allow him to operate the aircraft safely. If you own a license from RAF, RAF will provide the support to you, however, it is your responsibility to pass that on to the individual that you have your own agreement with.

Refer to the adjacent diagram. In order for us to provide adequate support to those that have the legal right from us to manufacture the design, we must deal only with the licensee. Keep in mind that if you sell your plans, you are not merely selling someone a library book. You are authorizing them to build an aircraft and warranting the information. You ethically should promise to them that you will follow up whatever support is needed in the future to allow them to safely operate any aircraft built from the design information you have sold them.

Many people do not realize the responsibility that may be attached to providing an agreement or license for someone to build a design based on information provided in the sale of plans. We do and that is why we intend to maintain our policy of providing to those licensed to build the aircraft any safety information that may come up in the future as a result of operational experience indicating any modification required or revision in the operating limitations.

This is why we at RAF intend to continue to provide the support necessary to allow a conscientious homebuilder to have the information at his disposal to build and operate a safe aircraft. The support role is not an easy task, it is one that involves many facets. Communication with the builder, continued testing of required modifications, follow up communication with the operators to determine if safety problems exist, accident investigation to determine if a cause is something that could be common to more than just the one aircraft, etc. The costs of maintaining all these activities have been extremely high, thus we have had to seek out other jobs and activities for the personnel involved. We anticipate that the support will be limited to those items relating to safety of operation and to provide those licensed to build the aircraft.

RAF BUILDER SUPPORT It has become necessary to further clarify Rutan Aircraft's position in relation to the homebuilder and the support we give. Rutan Aircraft can only offer the assistance that helps them interpret the plans when they desire to build their aircraft like the prototype we have tested. We cannot assist in the design and construction of modifications. We cannot comment on the advisability of modifications. Many of the developments we design and test do not work as predicted. Thus, without testing your idea we cannot reliably predict its success. A similar situation exists for substitutions of materials. We will not be able to advise you on any material we have not tested ourselves.

# The RAF Contract (Page 2 of the Plans) Allowing a Plans-Purchaser to Build One Airplane from His Plans

RUTAN AIRCRAFT FACTORY
P.O. BOX 656
MOJAVE, CA. 93501

fill in your name and address → TO Robert E. Stillwell
7151 - 51 St. N.
Pinellas Park Fla.
zip 33565

YOU HAVE BEEN ASSIGNED AIRCRAFT SERIAL NUMBER 835

LICENSE AGREEMENT COPY ONE

(This statement is in agreement with EAA policy)

In consideration of payment for the VariEze manufacturing manual, Rutan Aircraft Factory licenses the undersigned to construct, one only, VariEze aircraft. This set of plans is sold with the condition that the drawings, related manuals, and other material are furnished and intended as a guide only for educational purposes to show typical construction of the aircraft. No warranty, either expressed or implied, is made as to the suitability of the plans or any part thereof for the construction of an aircraft. The plans do not guarantee the performance or the structural integrity of the builders product, and only reflect the design and construction of the prototype aircraft. If an individual or group of individuals constructs an aircraft from these plans or any part thereof and fly the aircraft, which will be licensed in the "Experimental" catagory by the FAA, they do so at their own risk and without any liability whatsoever on the part of the designer, his heirs, or any other party or organization. All such liability being hereby expressly waived by the acceptance of these plans by any person and by any person who flies the aircraft. The plan buyer, by acceptance of the set of plans enclosed herewith, agrees to hold harmless the designer for any failure or other dissatisfaction with any aircraft or part thereof built in accordance with these plans. This waiver shall be binding upon the heirs, executors, administrators and assigns of any such person. This disclaimer is stated for legal purposes only and is necessary since the designer has no control over the materials, workmanship, or processes used by the builder.

For FAA licensing purposes this aircraft will be assigned a serial number by Rutan Aircraft Factory upon receipt of this statement that the undersigned will begin construction.

Signed Robert E. Stillwell date 9-14-76
Plan Owner - Liecensee

Signed MD Me date 10CT76
Rutan Aircraft Factory - Licensor

**Newsletters had Critical Plans Upgrades.**
**Many Changes were the Result of**
**Lessons-Learned After Accidents.**

While RAF had no authority, it always directed owners to NOT FLY, until making the critical, “MANDATORY-GROUND” fixes. The VariEze plans had 40 “MAN-GROUND” directives.

| **Plans Changes and Safety Groundings** | | | | |
|---|---|---|---|---|
| **RAF Plans for Model** | **Year Plans Introduced** | **Minor Corrections** | **Critical Safety Changes** | **Not Safety Related** |
| VariViggen | 1974 | 87 | 6 | 21 |
| VariEze | 1976 | 164 | 40 | 115 |
| Long-EZ | 1980 | 110 | 7 | 114 |
| Defiant | 1984 | 54 | 0 | 6 |
| Solitaire | 1984 | 28 | 0 | 8 |
| Note: Plans were not sold after June 1985. | | | CP Newsletters continued until 2002. | |

## Topic 4 • WHAT RESEARCH AIRCRAFT TO DO NEXT?

After describing to my sister Nell that it would be very easy to build, she suggested that I call my second airplane the “very-easy.” Shortening this to a name that looked a bit classier, my name for this Proof-Of-Concept airplane became VariEze POC (N7EZ). It was tiny for a two-place airplane and used a modified Volkswagen car engine.

When we found in 1975 that the tiny POC was not safe for homebuilders due to engine failures, we built a 15% larger composite canard in 1976 that used a certified Continental Aircraft engine (N4EZ). We called it the “Homebuilt VariEze,” later shortening the name to just “VariEze.”

Wanting long range, a cockpit to handle larger pilots and the ability to use Lycoming engines, in 1979 we developed the “Long-EZ” (N79RA). The Long is 15% larger than the VariEze.

Inspiration for the name came from Lear, who had introduced a longer-range business jet called the “Longhorn.” The Long-EZ quickly became the most popular airplane in the homebuilt industry.

All 3 EZ aircraft types are described in detail in chapter 22.

The 3 EZ Types in Close Formation

Thinking about what to build next, I decided to build something for my own use - not to be marketed to homebuilders. I wanted to have propulsion redundancy, i.e., a twin-engine airplane. So, in 1978 I started building the Defiant - described in chapter 24. Starting in 1984, RAF sold plans for this Defiant twin. Those plans were sold for only a year, since RAF stopped all plans sales in 1985.

In 1978, brother Dick Rutan had retired from the Air Force and I brought him on board as a RAF employee - to manage the shop and to do test pilot duties. He was there when the question next came up - “What research project to do next?”

I wanted to do a self-launching sailplane - because I knew it would not only be fun to do soaring - but a kit for it could be much lower cost than for the Long-EZ. For takeoff and climb, it could be towed, or it could use a simple low-cost, two-stroke engine for “Self-Launch.” I thought of it as a good “first-project” for prospective homebuilders.

## A Fight Ensued

Dick wanted RAF to do a competition aerobatic homebuilt airplane. I refused, saying that aerobatic airplanes always have an extremely poor accident record even when flown by professional aerobatic pilots. I insisted that the Long-EZ keep its reputation of a safe airplane, so RAF had never tested nor approved aerobatics for it.

I had tried, often unsuccessful, to prevent brother Dick from flying aerobatics in my and his Long-EZs at airshows. Aerobatics was in his Fighter-Pilot's blood - so he quit RAF and tried, with his girlfriend Jeana, to develop an aerobatic kit-plane called "Monarch."

To learn the details of what happened next, read Chapter 29 - Voyager. Some portions of that story have never been told.

Four other Manned Prototype Research projects came to RAF from diverse customers: The NASA skew-wing research airplane AD-1 (Chapter 25) the Navy Wing-Ship PARLC (Chapter 25) the Reno Biplane Amsoil Racer (Chapter 26) and the Fairchild USAF Next Generation Trainer (Chapter 27).

In order to demonstrate the most efficiency possible for a light, single-engine airplane, the RAF Model 81 Catbird prototype was developed in 1987 and first flown in early 1988. It was built to win the CAFE definition of "World's Most Efficient Aircraft" (Chapter 30). The prototype Catbird has been operated by Zach Reeder since my retirement in 2011.

In 1996, RAF developed another personal experimental aircraft, the Model 202, twin-engine, five-place Boomerang. This prototype demonstrated new unique technology in several areas: Structures - a grid-stiffened-solid-laminate carbon fiber wound fuselage and boom; Aerodynamics - departure-proof and engine-out safety at full-aft-stick without needing rudder pedals; and Avionics - to use new glass-cockpit equipment years before their introduction to light aircraft.

The Boom was successful in all its goals and is definitely my best work in General Aviation (Chapter24). Also
Smithsonian Magazine: Rutan's Favorite Ride or
Rutan Boomerang: Unconventional Genius!

Boomerang has been operated by Tres Clements since my retirement in 2011.

Many years later, after I retired in 2011, I built another research aircraft that might have been marketed as a homebuilt if it were successful. The SkiGull project failure is described in Chapter 77.

## Topic 5 • DESIGNING THE PROTOTYPES & THE MATERIALS

Burt Drawing VariVIggen Plans in 1974

Burt Pencil Designing 1974 to 1982

With the exception of the VariViggen, and the two designs I did in Kansas while working for Bede, each one of the 19 RAF prototypes were built with all-composite structures. So, the typical hammering of rivet guns was never heard and the typical welding of steel tube fuselages were never seen in the Mojave RAF shop.

### Structural Design Methods in the 1970s

Composite structural design manuals existed, but I quickly found that they were useless for sizing the structures for our light airplanes. Finite Element Analysis (FEA) methods were just being used at the big Aerospace Prime companies, but - keep in mind that my first six designs were done before the personal computer. We bought Apple 2 computers 3 years before the first IBM PC, but they could not run CAD design software.

So, the approach for the first six aircraft was to do the basic hand-calculations for sizing the structure, and then load-test full-scale structures.

We tested parts with poor workmanship to see if they still had adequate structural safety. The general approach was to make the structures strong enough to account for workmanship variance.

## Inventing a New Way to Build Structures for Prototype Composite Aircraft

While in Kansas in my basement, I had experimented with composite construction making an elevator control surface with foam and fiberglass for the MiniViggen. My focus had turned to building a MiniViggen - whose primary structure was all-composite.

After moving into my Mojave shop in 1974, I met Gary Morris, a single, composite fabricator who worked at the nearby “Fred Jiran Glider Repair” facility on the airport. Gary had a lot of experience with composite structures by repairing damaged European sailplanes. He was interested to see what RAF was doing with composites.

The learning worked both ways. Since I had very little experience with fiberglass, Gary’s help was critical. He taught me how to get the correct ratio of epoxy to glass fibers in a layup by showing me how to “Stipple” with a brush and how to remove excess epoxy with a squeegee.

## The Production Way vs the Fred Jiran Way

European sailplanes were typically built then in factories in Germany and Austria. Their primary structures were made by doing layups in expensive production molds (female tooling).

However, when Fred Jiran needed to repair damaged sailplanes in America, he didn’t have access to any production tooling. So, he repaired them by removing the broken rigid foam core from their sandwich structure, locating the broken parts together, fabricating new foam core then laying up the new inside and outside composite skins. This was done without using female tools - it was essentially a “Moldless” process.

Watching this process, I had an idea that it might be possible to build a new, entirely-composite homebuilt aircraft, even primary structure like wings and tails - without using any female tooling.

For wings and tail I could buy large blocks of rigid Styrofoam. Then, following root and tip templates, I could use a hot-wire to cut the wing

shape. This is a technique that was being used for small model airplanes. I was the first to use it for full-scale, manned airplanes.

By doing fiberglass skin layups on the outside of the full-core you would have a wing without ribs. This would be far easier than making sandwich skins and gluing them to ribs and shear-webs. You would essentially be using the core as your only mold - a male mold.

A “Full-Core” wing would likely be heavier than a hollow wing, but it would be safer for the homebuilder - since he could inspect the entire structure from the outside. He could even inspect for skin dryness or dis-bonds by tapping with a US Quarter. A defect sounds like a dull noise, but a good structure returns a sharp, higher-pitch noise. Thus, the homebuilder would not need expensive inspection machines.

Bottom line - a “Full-Core” tail or wing turned out to be safer structure for a homebuilder than the conventional “Hollow-Wing” method.

For the fuselage, the builder could layup a fiberglass skin on one side of a rigid core sheet, assemble the pieces, carve the desired outside shape, then layup the outside. That outside layup could even be continuous, avoiding any secondary bonds. Since the riskiest mode of composite structure failure is the dis-bonding of secondary bonds, this new method would result in safer structure, even with poor workmanship.

That was the genesis of the “Moldless Composite Structure” method I used on most of my future research prototype aircraft. Even portions of my Mach-3 SpaceShipOne (Chapter 35) used the Moldless method.

To address the “heavier” question - in 1981, while building the 4-place Grizzly STOL bush-plane, I built the right wing using the full-core method of the EZs and the left wing using the traditional hollow configuration. The right wing was built in half the time and both wings weighed about the same.

In 1974, each evening, Gary Morris would leave his Fred Jiran job at quitting time, walk over to my shop and help me build structure for what would become the VariEze POC. After we were both tired, I then “paid” him by buying him a hamburger dinner.

In 1975, Gary quit Jiran and RAF hired him as a normal salaried employee. In addition to cartoons, help writing plans, and building prototypes, his main

job for a while was building the composite main landing gear that RAF sold to the homebuilders.

These were heavily-loaded, very strong, solid S-Glass hoops that required production tooling and an oven. They could not be built by the average homebuilder. The hoops were difficult to package and were too large for postal delivery. Truck shipping was too slow and too expensive. We finally found the best way was to attach an address tag on the hoop and take them to the Greyhound bus station. In the 70s without UPS or FedEx, the Greyhound busses carried cargo as well as people. There was even a Greyhound stop in the tiny town of Mojave.

We had no problem with the solid hoops getting scratched or damaged during bus shipment, since the homebuilders had to later sand them and lay-up bi-directional fiberglass on the outside of them. When we were questioned about why we didn't put them in a protective box, our answer was "You could not damage them even if the bus drove over them."

## The Fiberglass Weave Type is Important

I was concerned about homebuilder skill doing fiberglass layups when I built the first Proof-Of-Concept VariEze - using the satin-weave type 181 fiberglass cloth. However, that concern disappeared when I first used the cloth that Fred Jiran was importing from Europe. We tried to get the US manufactures to weave these fabrics. However, they required a purchase of at least $100,000 before they would do it. Our key materials suppliers, Aircraft Spruce & Specialties and Wicks Organ Company made the commitment - and that is why the homebuilder could get his glass fabric woven in America by Hexcel and stocked for the homebuilders by ASAS and Wicks. The 7725 BID and 7715 UND types were not just easier to wet out, but they didn't hide trapped-air laminate defects like the 181 Cloth did.

## The Cancer Crisis

In 1974, to thicken the epoxy for bonding cured composite parts and for structural filling, I mixed asbestos fibers into the epoxy. Then, when we were sanding, there was asbestos dust in the air - and none of us wore dust face masks!

Aircraft Spruce had already bought bulk asbestos fibers for the VariEze kit when the CBS 60-Minutes TV program reported that asbestos had been

found to cause human cancer. Spruce tried, but could not get the supplier to accept return of the bulk supply. Spruce and Wicks had to destroy their bulk asbestos supply.

RAF immediately did structural tests which showed that cotton fibers worked as well as asbestos fibers. We called our thickened epoxy “Flox” if it stood up like peanut butter and “Wet Flox” if it sagged like honey. We destroyed our box of asbestos fibers. I think Fred Jiran continued to use the asbestos fibers.

If the 60-Minutes expose had been aired a month later, RAF homebuilders would have received bags of asbestos fibers. As it turned out, they received a bag of “Flocked Cotton Fibers”, the material that RAF called “belly button lint.” It’s identical to what you find trapped in your belly after wearing a cotton t-shirt. Fifty years later, you can still order a 1-pound bag for $4.80. I guess I’m among the millions who guess that asbestos is not a real leading cause of cancer – but we avoided that controversy just in time.

### Critics Said I Was Crazy

Critics said I was crazy to allow inexperienced people to build primary structure for manned aircraft out of composites. Martin Holman, who marketed kits for aluminum airplanes, even visited EAA meetings, saying the Rutan designs would kill many people when wings failed in flight. Fortunately, Martin was wrong. The RAF composite designs have a better record (lower incidents) of in-flight structural failure than all the other structural types.

## Topic 6 • FLIGHT TESTING & FOLLOW UP

What follows is a summary of my flight test background and how RAF conducted its flight testing with new research prototypes in the early years.

Starting even before my graduation from college, I had been focused on what I loved to do - the specific engineering function of flight testing and how to fix an unacceptable airplane. To be able to do that, you must also be a competent aircraft designer.

For my first post-college employment, I was very fortunate to find a Flight Test Job that did not require previous flight test experience. Typically, in the

aircraft industry, a person spent many years as a member of a design team before he could land a flight test job. On my first day as an Air Force employee, I was assigned as a lead stability test engineer on the XC-142 program - a complex cargo aircraft that had the capability to take off and land like a helicopter without the need for a runway (Chapter 11).

At the same time, I was being qualified to fly in Air Force test airplanes by being trained in ejection seats, altitude chambers, operating of test instrumentation, etc. Several months later, I had 25 people working for me offsite, at a Navy facility 200 miles south, near the Mexican border (Chapter 12).

Likely the main reason this 22-year-old rookie was trusted to manage importance flight tests of the latest Air Force aircraft is that there was a shortage of young engineers. 1965 is half way between Gagarin's first space flight and the Apollo 11 moon landing. All my fellow aircraft engineering college graduates at the time were excited to be part of the moon landing milestone - even though the old guys had already designed the basic rockets and capsules.

My flight test job at Edwards Air Force base was far more exciting than any Apollo entry-level design job. Every day was an adventure. My unusual decision to not join the moon program turned out to be the best choice I ever made.

A typical job on an Air Force flight test program would last only a year. I had eight USAF test programs in less than seven years:

**June 1965 to March 1972**

- XC-142 Stability and Control
- C-130 LAPES and Airdrops
- XC-142 Aerial Delivery
- A-7A Flying Qualities
- F-4E CAT II Stability & Control
- F-4 Agile Eagle I and II
- F-4E Stall/Departure/Spin Program
- F-15 Stability & Control Test Planning

Compare that to the average design engineer at Lockheed - it was not unusual for him to spend his entire career working on only two or three airplanes!

In just seven years after college, my résumé allowed me to accept the responsibility in a private sector company, with the title “Director of Development,” managing all design and flight test activities on four new airplane types (Chapter 18).

## Flight Testing Manned Aircraft at RAF

At 28 years old, with the world focused on Apollo, I felt fully confident that I could properly test the first flight of my first personal airplane, the VariViggen - even though it had a unique/very different configuration. I remember how much fun it was to finally see if it really would exhibit my “Natural Stall Avoidance” goal.

One of the reasons RAF was able to do flight tests on very short schedules is that I had done many flight test programs and had a good gut-feel for what testing is most critical. I usually did the critical tests early in the program. Those tests are the ones that are more likely to require aircraft modifications. Then, the bulk of the flight test points would only need to be done once.

That is very different from how other companies run test programs. They tend to do the dangerous stuff, like spin and flutter testing, at the very end of

the program. Thus, if the spin testing indicates significant modifications are needed, the bulk of other testing may have to be repeated.

## First Flight Testing

I used the following method for the First Flight of the VariViggen and continued using it for many later RAF research prototypes. This method is also recommended for testing the first flight of an old design:

The pilot who flies a first flight must have recent pilot-in-command experience in the airplane's type or in an airplane very close to the one to be tested. You likely have spent years and a lot of $dollars building your airplane - so take a month or more to do a lot of flying before First Flight Day and get a lot of rest the night before.

Select an airport with the longest runway available. Your first flight testing method will require at least three times the length that you will later need for normal operations.

IMPORTANT - do not invite un-needed spectators. Safety personnel (Fire truck and ambulance) are important, but often a pilot will fly when conditions are not perfect, so as not to disappoint the spectators.

Wear your parachute, even for the low-speed taxi tests. Often taxi tests extend to the point at which the pilot thinks he cannot stop and then he applies full power to fly. Be sure you have at least an hour fuel supply.

If you have wheel pants, remove them. I would not have them installed for the first several flights.

Do extensive taxi tests while remaining below 50% of the predicted stall speed. These tests are mainly to evaluate the wheel braking effectiveness, and the directional control, with rudder, nose-wheel steering, or differential braking. Get a feel for your ability to keep it straight in crosswinds, even with a failed wheel brake.

At a light weight and mid-cg (center of gravity) accelerate to about 80% of the predicted stall speed. As you approach that speed reduce power so you are no longer accelerating. Stay there long enough to be sure the speed is not accelerating. Evaluate all the things you earlier did at 50% Vs (stall speed). Use lateral stick to rock the wings in roll. You won't get much roll with both main wheels on the ground but try to get an idea if roll power is symmetric. If you have flaps, repeat everything at several flap positions.

Important - when doing multiple runs check for over-heating of the brake discs. Multiple runs will heat the brakes a lot more than your normal landings. If you don't have an IR gun, have someone spray water on the brake discs if it immediately boils off, it's too hot. Also, if it is a hot summer day these extensive tests can over-heat your engine even though your cooling system is adequate for normal flight operations.

While stationary on the ground outside, jack or hold the attitude to less than the stall attitude. Then use a grease-pencil marker to draw a line on the windshield to match the horizon with you sitting on your parachute in your flight position.

Next, determine the nose wheel lift-off speed using full-aft stick for various power settings and flap positions. Be careful to not accelerate beyond 80% of stall speed. Be sure to never rotate such that your grease-pencil windshield mark is below the horizon. Once the nose wheel is off the runway, determine how difficult it is to hold various pitch attitudes, all below the stall angle. Also evaluate the difficulty to maintain direction and get a better feel for roll symmetry.

If all is good, now proceed to something that is more difficult than a normal takeoff and landing, but should be done to prevent serious injury in the event something is dangerous in the airplane's stability and control. It is called a "runway flight." Accelerate on the runway to 20% faster than the predicted stall speed. Reduce power enough to be sure the airplane is not accelerating, or better yet - is slowly decelerating. Then rotate the nose to lift off and carefully fly at a wheel height of 1 to 6 feet above the runway. DO NOT change throttle position while initially airborne, because that will give you less workload. Control pitch to carefully maintain the wheel height as you do mild maneuvering in roll and yaw to determine if you have a "Good Airplane." Then smoothly reduce power to idle and fly it onto the runway. Do not do a "full-stall" touchdown.

If your new airplane happens to have an uncontrollable departure from controlled flight, the fact that you are flying very low will likely save your life. Example: In 1977, on the first flight testing of the model 54 Quickie, a pitch control linkage failed when I was flying at just 2-feet height. The result was a hard, bouncy landing. Had I been flying higher - the failure might have killed me.

Now, before committing to fly, taxi over to your best friend, who might be your spouse, and ask if he/she is comfortable that you and the airplane are safe to leave the vicinity of the runway. If the answer is yes, and if you are comfortable then go fly and enjoy flying the test maneuvers of your first real flight.

Hooray! The prototype VariViggen did indeed meet my goal of "Natural Stall Avoidance." At all CG positions it could be maneuvered at full-aft-stick without departure from controlled flight.

## All Test Methods are not Yet Included Here

Chapter 19 Topic 6 is intended to include a lot of other flight test methods besides the First Flight Method shown above. However, in order to get this chapter published in a timely manner, I have decided to not yet include those other test methods. Check back later to find chapter 19 updates -

which will show all methods of flight test we used after the first flight method shown above.

Also, details of the problems experienced during my flight tests of all RAF airplanes intended for homebuilders are shown in chapters 18 (Bede) 20 (VariViggen) 22 (EZs & Quickie) 24 (Defiant) and 28 (Grizzly & Solitaire).

**This paragraph about the homebuilt VariEze N4EZ test program was printed in a Canard Pusher newsletter…**

The test program was probably the most extensive and successful ever conducted on a homebuilt. It included basic flight tests for flying qualities, performance and systems, spin and dive test to FAR part 23 requirements, static load tests and landing gear drop tests exceeding part 23 criteria, environmental/thermal tests on structural materials/components, manufacturing methods testing, and many others.

## Topic 7 • THE OSHKOSH CONVENTION

Introducing VariEze POC at Oshkosh - 1975
Dick on left, Burt in photo center.
Gary Morris with the RAF hat/shirt & long hair between us.

One cannot write about RAF without mentioning the part that the Experimental Aircraft Association had in helping both my companies company grow and thrive...

## EAA Annual Convention History

Wikipedia: EAA AirVenture Oshkosh

The Experimental Aviation Association was founded at Hales Corners, Wisconsin in1953 for homebuilders and restorers of recreational aircraft. It held a small fly-in that year. In 1959, the annual convention was moved to Rockford, Illinois. In 1970, when the convention outgrew that airport, it was moved to Oshkosh, Wisconsin.

Most aviation people refer to the event merely as “Oshkosh.” In 1998, its name was changed to “AirVenture Oshkosh.” The annual convention lasts a week - usually starting the last week of July. It’s known as “The World’s Largest Convention.” The attendance in 2024 was over 686,000!

I have attended Oshkosh 48 times - from 1971 through 2024. Chapter 67 (Greatest Challenge, Heart Health) describes why I missed Oshkosh several years.

## Carolyn & Burt’s First Oshkosh - August 1971

My first visit to Oshkosh convention was while I was employed by the Air Force and on temporary duty at McDonnell Aircraft, St Louis - planning the flight test program for the F-15 fighter. On the convention’s last day, I rented a Piper Cherokee from “Rent-A-Plane” (a business operating in St Charles, MO). “RAP” had checked me out the evening before the trip by having me just fly a single pattern circuit of the airport.

I didn’t have an instrument rating and knew my flight back from Oshkosh would be at night. I didn’t inform RAP that I was not current for night flying. Since we might encounter clouds on the return flight, I brought a friend along as my co-pilot - who did have an instrument rating. That decision was a very good one, as without him, we probably would have crashed when we entered clouds on our night approach to St Charles airport.

At the time, my then girlfriend Carolyn had no experience flying in light airplanes. Later, as my wife, she got certified as an FAA Private Pilot.

Carolyn at Oshkosh - 1971

We were amazed at how large the Oshkosh convention was, and we had only one day to explore it. We did see the Bede-5 with its original V-tail. Bede was claiming that he had flown it, but I later learned it had only briefly jumped off the runway about a foot then was dangerously yawing as it slammed back on the runway - breaking its nose landing gear - definitely NOT a “flight.” He had run its snowmobile engine at the show, but when we were there, it was being tied to a truck-bed for the drive back to Kansas (Chapter 18).

## Carolyn & Burt’s 2 Oshkosh Conventions while Burt was Employed by Bede Aircraft - 1972 and 1973

My next two Oshkosh conventions were while I was employed by Bede Aircraft in Kansas - both with my new wife Carolyn.

We flew the VariViggen to Oshkosh in 1972 and 1973, but we didn’t market it - since I was paid to be there by Bede and thus my job was to get new customers for the BD-5 and BD-4 homebuilt kits. I did two joint forum talks with Jim Bede. However, when not giving Bede talks, I was flying our VariViggen in the pattern - giving rides to journalists.

The BD-5 was the huge excitement for the audience those years, but the spectators were also amazed to see this unique “Tail-First” homebuilt fly and do its signature full-aft-stick tight turns. For the first time, the Oshkosh crowds were learning who Burt Rutan was.

## Stories About RAF at Oshkosh - 1974 through 2019

RAF Oshkosh stories are not being published now - check back later for chapter 19 updates. Also, Oshkosh stories will be presented in detail in Chapter 31.

## RAF at Oshkosh for the 50th Anniversary of My Development of Composite Canards - 2024

Tonya and I flew to Oshkosh in 2024 from Idaho in Robert Scherer's Beech Starship. I was experiencing poor heart health and had poor balance, but I gave five talks, each over an hour and each to audiences of four to seven thousand people. You can see most of those talks using the links below and also in the BRAB Links page.

Oshkosh 2024 Talk 1 Slides: 50 Years of Homebuilt Composite Canards

Oshkosh 2024 Talk 1 Video

Oshkosh 2024 Talk 2 Slides: Commercial Space & Russian Wing-Ships

Oshkosh 2024 Talk 2 Video

Oshkosh 2024 Talk 3 Slides: New Designs & Heroes

Oshkosh 2024 Talk 3 Video

Oshkosh 2024 Talk 4 Slides: Why Starships Didn't Replace King Airs

Oshkosh 2024 Talk 4 Video

# Topic 8 • THE DECISION TO STOP PLAN SALES • 1985

## Why Did RAF Exit the Homebuilt Business?

By 1985 it was clear that Scaled had huge growth potential and the company was demanding my full focus. I was not comfortable handing the reins of RAF to someone else, because many of the homebuilders required significant personal help to fly safely. Much of that personal help included designing and flight-testing fixes to flaws in the designs that became known when a customer's airplane had crashed.

To provide continued future financial health of RAF, I would have needed to develop at least one new homebuilt airplane type every two years. This would have required a huge effort to provide future homebuilders with support during the building and flying of their airplanes. Individual builder support was clearly not what I wanted to do full-time for the rest of my life. I

always wanted to focus on the fun of developing the next innovative research airplane.

I knew that by allowing the number of RAF-licensed homebuilders to grow, builder support would quickly not be manageable. I had learned in Kansas that most amateur builders would need a lot of support in order to fly their airplanes safely.

So, In June, 1985 RAF sold its last set of plans, and licensed its last builder to build a Burt Rutan-designed airplane. RAF did not liquidate assets nor vacate its facility at that time. We knew that we would need to support the current builders, and the money in RAF's bank could be used to provide that support. It was anticipated that support would be needed for at least several years to give the current homebuilders time to complete their airplanes. Fortunately, about 18 years later, several new groups would provide the needed homebuilder support. After that, RAF would no longer need to support the homebuilders.

## A 1974 Question - Should I Just Be a “Normal Engineer?”

I was horrified - the first RAF homebuilder to fly a plans-built airplane nearly died right in front of me, the Jim Cavis VariViggen accident. (See these links - Oshkosh 2024 Talk 1 Video and Oshkosh 2024 Talk 1 Slides.)

Someone needed to guard the wreckage before the FAA could arrive. I spent all night in that Volkswagen, parked next to the wreckage.

That sleepless night I considered closing RAF, selling no EZ plans and being a “Normal” engineer working for Cessna or Lockheed. But that experience became yet another building block of motivation to persevere in my pursuit of a solution to reduce aircraft accidents.

## A Decision is Needed in 1985

The RAF business continued after I founded Scaled Composites (Chapter 33). The two businesses overlapped for three years. I was the active CEO at RAF and Scaled companies from 1982 to 1985 - obviously taking on more than I should have. I was reluctant to trust others to manage my companies. So, in 1985 I had to “Let-Go” of one of the companies. Which one?

During the 3-year overlap I enjoyed working at Scaled a lot more than RAF. I really enjoyed developing new prototypes, and I hated the continuous RAF builder support, especially since most of it was for the least-qualified homebuilders.

Clearly, I had to at least stop the growth of the support requirements - to do that in June, 1985 all RAF plans sales were discontinued, so I could focus my efforts on the new, much larger company- Scaled Composites, which had huge opportunities for growth.

Addressing flight safety, in order to not strand homebuilders who had bought RAF plans, Mike Melvill and I continued homebuilder support for 17 years after June 1985.

### Another Reason we Stopped RAF Growth - Lawsuits

RAF was occasionally sued following accidents. The suits were always from an injured passenger or from someone flying another's homebuilt. I never got sued by someone who had bought a product from RAF - the very definition of Product Liability. Of course, lawyers would sue me, not just RAF.

At one point I even considered moving RAF and my home to Australia where the loser pays both sides' legal costs - essentially stopping most frivolous lawsuits.

Overall, the suits caused me a lot of time and stress, but not much money. I had addressed having RAF buy insurance for my product liability exposure, but found the policies were definitely not affordable.

For details on how RAF responded to lawsuits, see chapter 61.

## Topic 9 • RAF HOMEBUILDER SUPPORT After 1985

All homebuilder plans sales were discontinued in June 1985. RAF stayed open until 2002 to support builders who had bought plans from 1973 until 1985. In gearing down RAF in 1985, I didn't simply close and liquidate its assets. Instead, I decided to keep the RAF building and use the money in

the bank to continue to provide builder support to those that had bought plans for Rutan-Designed homebuilts.

At the time I had assumed that maybe two to four years would be an adequate time for someone to complete his airplane and I believed we would be doing the same sort of builder support that we had been doing for the last nine years, then we could close RAF entirely.

Of course, the builder support was not only answering the phone, sending out newsletters and answering postal letters but it included the teaching as described in chapter 23 and of course the support at the big Oshkosh AirVenture convention (This was all pre-internet).

After Carolyn was gone in 1978, Sally Melvill ran the RAF office while her husband Mike helped Burt with builder support.

Starting in 1986 Sally and Mike began working at my larger company, Scaled Composites. At that time the RAF office was run by Joan Richie, the wife of Chuck Richey. Chuck was one of the early VariEze home builders and later worked for Scaled Composites.

From 1989 to 2002 my wife Tonya Rutan ran the RAF office and wrote the CP newsletters. She collected the questions from customers, relaying them to Mike Melvill or me to answer. By 1990 the RAF office was open only three days a week and we did our best to continue the support requirements for those still building and flying their airplanes.

In 2002 RAF published its 109th and final Canard Pusher newsletter and ceased being a business. At that time homebuilders were getting builder support help from independent groups of people that were building and flying composite homebuilts.

Now, nearly 40 years after RAF stopped selling plans, three of those groups are still active. They help each other, even inspecting airplanes before they are purchased by new owners.

The support group “Rutan Aircraft Flight Experience” (RAFE) provides a service to evaluate, train and checkout builders. They own and maintain the largest “Squadron” of the RAF homebuilts.

If you want a ride in a Rutan design that is more than 50 years old (the definition of an “antique aircraft”) you can buy a ride at:

Rutan Aircraft Flying Experience

COBA publishes an excellent newsletter:

Canard Owners & Builders Association

The most active forum group in 2025 is the Canard Owners & Builders Association: forum@canardowners.com. Unlike the old RAF, they will even help each other with major modifications that haven’t been validated by professional flight testing.

Here is a recent comment from them:

Fellow Canard Builders and Owners:

Our COBA Forum and website, started more than thirty years ago by people like Terry Schubert and others, is growing into a world-recognized organization. It has been built by the members for the use of its members. We should all take pride in this highly effective communication tool that further promotes the ideas and goals of both the EAA and Burt Rutan.

Reiff Lorenz, our System Manager, plays a quiet, unassuming role behind the scenes, fulfilling the truest form of management: enablement and support. We have no governor or president or controller. We each fulfill that function ourselves by participating, contributing, and responding. As one of several associate administrators, I am pleased to be a part of this Association.

Currently, we are trying to increase Forum participation by COBA membership. With hundreds of members worldwide, we only see a small handful of people using some of the organization’s tools. We are attempting to change this shortcoming through education about what is available to you and how to use it.

While we all share a common and rather intense interest, we each are individuals with unique experiences and points of view. This fact means there will be differing opinions and debate. Our Forum fully supports any exchange of ideas, even disagreement, provided that each of us is aware of and tries to follow COBA Forum Policies. What exactly are these policies?

We will post the revised policies on our Forum this weekend and a copy will be posted in the COBA Library. Since this Forum is for, of, and by its members, your comments are welcome. We will also be working with membership, sometimes individually, to promote features that lie dormant now. Your cooperation and support are appreciated.

John Caulkins

Now, with the internet, the groups can provide much better support than RAF was able to in the 1970s and 1980s.

### Aircraft Manufacturers Have Specific Responsibilities

RAF in general discouraged homebuilders from selling their aircraft to people who had not built airplanes. This is because the complex safety issues that you encounter while you're building a homebuilt airplane are not understood very well by someone who just buys it to fly it. The buyer cannot count on FAA support like he can on Certified, production aircraft.

## Topic 10 • TIMELINE EVENTS
## 1964 TO 2002

The following RAF-Event Timeline is generated from my memory, pilot logbooks, RAF newsletters, interviews, pocket calendars, notebooks and magazine articles (Aviation Week, Sport Aviation, etc.).

**Oct 1964** • At Cal Poly - started research on design config that would have “Natural Stall Avoidance.” First drawings of a canard config airplane. Conducted wind tunnel tests on small model and flew large R/C model - both with canard config.

**Jun 1968** • At Fox Field, CA - Now a licensed Private Pilot. Learned that the most common fatal accidents are un-intended stall/spin. My “Natural Stall Avoidance” canard design would avoid those accidents. I am now driven to develop and demonstrate my solution.

**Jul 1968** • At Lancaster, CA - set up Rutan Aircraft Factory, a hobby, not a real business. Did “Car-Top” tests on a four-foot model of an early VariViggen design. Obtained good-quality aerodynamic data and concluded

that the design had acceptable stability and “Natural Stall Avoidance.” Started building the wooden homebuilt VariViggen in my Lancaster CA garage.

**Dec 1969 to Jun 1970** • At Edwards Air Force Base during Vietnam war - Flight Test Engineer flying in back seat of F-4E fighter. Found that the F-4E had horrible tendency to Depart from Controlled Flight. During our flight tests we experienced 101 un-intentional spins. Our F-4E crashed when spin-recovery parachute failed during a flat spin. Our data clearly showed why the Air Force had lost 61 aircraft. I am now REALLY driven, since military as well as private aviation would benefit from my solution (Chapter 13 & 14).

**Sep 1971** • In St Louis while TDY during Air Force job planning tests for the F-15 - Married Carolyn, an assembly language computer programmer at McDonnell. She, as my partner, (three years later) founded RAF - our first entrepreneurial business.

**Mar 1972** • Quit Air Force job, moved to Kansas and became Director of Development at Bede Aircraft. A real learning experience about the Homebuilt Aircraft industry.

**May 1972** • At Newton Kansas - I flew the first flight of the VariViggen, my first airplane. Flight tests confirmed that it had “Natural stall Avoidance.” The first 2 years I flew it hundreds of hours for airshows including Oshkosh and for personal trips.

**Nov 1973** • At New Orleans my VariViggen performed on the same show as the Air Force Thunderbirds. Mayor Moon Landrieu awarded me the “Key to the City.”

**Nov 1973** • During Thanksgiving trip to San Francisco, after takeoff from Burley Idaho, had engine failure. Forced to land in muddy field, no damage to VariViggen. Then, during a job interview in Longview Washington, I demonstrated the VV to Molt Taylor.

**Apr 1974** • Burt and Carolyn decide I will quit my job at Bede.

**Jun 1974** • Quit the Bede job.

**Jul 1974** • Flew uncle's Ercoupe around southern California's airports to find location for RAF business. Airports visited: Brown field, Montgomery, Ramona, Corona, Oceanside, Lancaster and Mojave. Selected Mojave.

**Aug 1974** • First Oshkosh show for Burt and Carolyn as entrepreneurs. Won "Outstanding New Design" trophy for VariViggen. I was to later win the same award in 1975, 1976 and 1978.

**Aug 7 to 18th 1974** • Big VariViggen trip: Manitoulin Island Canada, Brantford, Canada airshows, Evansville, Indiana, Damaged VV prop at Skylane airstrip, wedding at St Louis, then to Newton Kansas to pack our belongings.

**28 Aug 1974** • Start 3-day trip to move family from Kansas to Mojave - VariViggen and Dodge Station Wagon. Stops at DHT, TCC, Grants, Gallop, Flagstaff and Needles.

**31 Aug 74** • Burt, Carolyn, Jetta and Kye arrive in Mojave to start the new RAF business.

**Feb 1975** • Burt flew VariViggen as Stunt Pilot for the movie "Death Race 2000" (Chapter 21)

**May 1975** • Burt flew first flight of VariEze Proof-of-Concept Model 31 N7EZ. Volkswagen engine.

**Jul 1975** • Burt flies first flight of Model 32SP. Long wing VariViggen. Better performance but less Natural Stall Avoidance.

**Aug 1975** • VariEze POC sets distance record at Oshkosh. Dick was pilot.

**Sept 1975** • RAF decides to not market plans for the POC VariEze because of the danger of using engines not intended for aircraft. Fabrication begins on the larger VariEze, the Model 33 - which had an FAA-certified Continental O-200 engine.

**Mar 1976** • Burt flew first flight of homebuilder's VariEze Model 33 N4EZ.

**Aug 1976** • At Oshkosh, NASA's Richard Whitcomb convinced that Rutan's use of his Winglets were indeed designed correctly.

**Nov 1977** • Burt flew first flight of single-place Quickie. Its kits were later marketed by QAC, Quickie Aircraft Corp.

**Dec 1977** • Burt starts development of his Model 40 twin, the Defiant. Burt refuses to certify it per Howard “Pug” Piper’s request. Pug is a grandson of Piper Aircraft’s founder. The Defiant will just be Burt’s personal aircraft.

**Mid 1977** • First flights by US Navy of PARLC. Pilot unknown (Chapter 25).

**25 May 1978** • RAF hires Mike and Sally Melvill. Mike can support builders since he built a show-quality VariViggen. Sally will run the RAF office.

**1 Jun 78** • Carolyn divorces Burt, remains a good friend (Chapter 88).

**30 Jun 78** • Burt flies first flight of the Model 40 Defiant, not then intended for homebuilding.

**Aug 1979** • Brother Dick retires from Air Force and joins RAF. He will later quit in 1981 to do Voyager with his girlfriend Jeana.

**Sep 1979** • First flight of long-range Long-EZ, which will become RAF’s most popular homebuilt. Improved wing configuration for homebuilders, 15% larger than VariEze, more docile flying qualities.

**Dec 1979** • First flight of AD-1 skew-wing research aircraft for NASA. NASA test pilot (Chapter 25).

**Mar 1981** • RAF decides what type aircraft to develop next. Dick wants aerobatic, but Burt says they have a high accident rate. Lawsuits after accidents are determined to likely be the biggest risk for RAF survival.

**Apr 1981** • Burt designs the Voyager - for Non-Refueled-World-Flight milestone attempt. Dick and Jeana try to raise $ to fund development.

**May 1981** • RAF contracts with Fairchild to design, build and test NGT (Next-Generation-Trainer). Prototype built by AIC, flight tests by RAF.

**Aug 1981** • First flight of Rutan-designed Amsoil Biplane Reno Racer. Prototype built by Mortensen.

**Sep 1981** • Dick flies first flight of NGT, 62% scale Air Force trainer for Fairchild. Four pilots fly it (including Burt) the first two days.

**Oct 1981** • Beech contracts RAF to design Next-Gen-Business-Aircraft, a King-Air replacement. Contract transferred to Scaled ~ Jun 1982. Later called Starship by new Beech CEO Linden Blue.

**Jan 1982** • First flight of Grizzly, RAF’s STOL, four-place bush plane.

**May 1982** • First flight of RAF's self-launch sailplane, the Solitaire. Towed by Grizzly.

**Jun 1982** • After VAI fails to raise $ for construction of the Voyager, RAF signs agreement for a two-phase scenario to design, build, and flight test it. RAF is lead through initial flight testing, then VAI leads the completion and the World-Flight phase (Chapter 29).

**Jul 1982** • RAF hires Bruce Evans as shop-lead to build Voyager. Dick and Jeana join as un-paid fabricators. Other fabricators: Mike Melvill, Sally Melvill and Burt.

**Jul 1982 •** Tom Jewett dies in "Big Bird" crash, a Quickie Aircraft Corp competitor to Voyager for the World Flight milestone. Dick, while he is out in the desert jogging, observes the crash.

**Jun 1984** • RAF sells plans to allow homebuilders to build model 40 Defiant twin.

**Jun 1984** • Voyager Model 76 first flight. Dick is pilot.

**Jun 1985** • RAF discontinues sales of all homebuilt plans, but continues to support current builders/flyers until 2002.

**Oct 1986** • Burt met Tonya, his future wife. Starting in 1989 she ran the RAF office and wrote & published the CP Newsletters. She also brought homebuilder questions to Burt and Mike.

**Dec 1986** • On first attempt, Voyager achieves the RTW, Non-Refueled milestone with a 9-day flight - Dec 14th through 23rd. Burt's first grand-daughter Whitney was born Dec 17th - as Voyager was flying over the Philippines.

**29 Dec 86** • Ronald Reagan awards Dick, Burt & Jeana the President's Citizens Medal.

**29 Jan 87** • At Paris France. Dick, Burt & Jeana awarded the Grand Medal City of Paris. Same medal awarded to Charles Lindbergh in 1927.

**May 1987** • Dick, Burt, Jeana & Bruce awarded the Collier Trophy for Voyager Milestone.

**Sep 1987** • Dick awarded the SETP Kincheloe trophy and Burt awarded the Doolittle Trophy at SETP symposium for the Voyager milestone.

**Sep 1987** • Burt award “Aviation Man of the Year” at Gathering of Eagles event. Plus - many other Voyager awards & Honorary Doctorates (see list in Chapter 85).

**Jan 1988** • First flight Model 81 Catbird. Mike Melvill pilot.

**Jun 1996** • First flight Model 202 Boomerang. Burt’s most significant design for General Aviation. Burt and Mike pilots.

**Apr 2002** • RAF published its final homebuilder’s newsletter, CP number 109. RAF closes its doors and turns homebuilder support over to several independent support groups. Burt still helps homebuilders at Oshkosh and at other events.

**Apr 2011** • Burt retires from Scaled Composites and with Tonys, moves to Coeur d’Alene Idaho.

**Apr 2013** • Construction starts on model 375 SkiGull.

**Nov 2015** • First flight Model 375 SkiGull, RAF’s 16th research aircraft. At Idaho KCOE, Glen Smith pilot. M375 fails to reach its main goal- operation from rough water. Program discontinued in 2019.

**2022-2024** • Burt does preliminary designs for hovering Model 382-4 Urban Transporter, Model 396-2 Round-the-World-One-Refuel race aircraft and Model 404 Dynamic-Launch minimum-cost for Man-to-Earth Orbit system.

**May 2024** • Burt’s brother Dick dies due to incurable lung disease.

**July 2024** • After missing Oshkosh for five years, Burt is flown to Oshkosh AirVenture in Robert Scherer’s Starship. The show includes a 50th Anniversary Celebration of the Invention of Composite Canard Aircraft. Burt presents four forum talks, a tribute to brother Dick and he gives the talk normally done by Dick at the Voyager exhibit in the EAA Museum.

**Aug 2024** • Burt does Preliminary Design for homebuilt Starship, Model 405 (reciprocating) 406 (turbocharged reciprocating) 407 (turboprop) and 408 (turbofan FJ-33).

**Feb 2025** • 50 years after plans were first available from RAF, some people are still building RAF homebuilt aircraft, without license and without approval from RAF, using bogus plans and getting some support by the independent groups.

# Topic 11 • RAF HOMEBUILDER ACCIDENTS

Even though ten of the RAF aircraft were canards that were configured for natural stall-limiting, their overall accident statistics were not good.

The main reasons: engine failure, buzzing, unapproved aerobatics, weather, modifications to the RAF building plans, etc.

Another reason is that most owners had only conservative flying experience in Cessna types. When they flew their VariEze they tended to think they were “fighter-pilots.” As such, a lot of them flew dangerously aggressive.

None of the accidents were caused by departures from controlled flight.

All the accidents RAF heard about and those we investigated were listed in the 109 Canard Pusher newsletters. Descriptions and causes are discussed in chapter 61.

It was important that RAF personally investigate accidents because it was our responsibility, not the FAA to ground airplanes that had a fault that contributed to an accident. FAA has the authority to ground certified airplanes, not experimental homebuilts.

Another reason that RAF needed to investigate accidents was that in the 70s and 80s, The FAA was incompetent in their investigations. The canard airplanes, looking so much different, confused the FAA or NTSB investigators. They often had no idea looking at the wreckage which was the nose and which was the tail of the airplane! So, RAF was usually welcomed to assist the FAA investigations. RAF’s ability to identify the wreckage components and to determine the cause was critical to the accuracy of the FAA or NTSB accident investigation report.

On one accident, a non-survivable VariEze crash, we were not allowed to help in any way because the FBI had taken over the investigation. The hospital had concluded it was a shotgun murder since they found shotgun lead pellets in the body. After a huge effort, we were finally able to convince the FBI that it is normal for a homebuilder to carry a lead shot bag in the nose as ballast to adjust the cg for light pilots…

There was never an accident blamed on structural failure caused by amateurs' poor workmanship while building all-composite main airframe structure. That original fear turned out to not be an issue.

The only in-flight structural failure was caused by the builder not installing the main layup that keeps a winglet from failing inboard (see below).

## Accident Reports

**Note:** Full data showing all the accident descriptions and statistics is included in Chapter 61. For this chapter, I include below just a sampling of accident reports to indicate some "Typical" causes. In general, these are presented here exactly as they were published in the Canard Pusher newsletters.

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Inflight Airframe Failure  The thought of an airplane coming apart in the air brings chill to most aviators and certainly to aircraft designers. Despite many horror stories related to severe weather, drastic overspeed in dives, and even airframe flutter (unbalanced elevators) we had yet to hear of an inflight failure of a Rutan design - until June 21st when the caller described a winglet ripping off a VariEze at 200+ mph during an airport buzz job. Within two hours Mike Melvill and Dick Rutan were airborne in the Defiant for a non-stop flight to Dallas, Texas to investigate. What they found, though, did not lead to grounding or flight restriction of other VariEzes. The cause was tantamount to leaving the wing attach bolts off your Cessna and expecting the fairing strip to hold the wing on. Their report follows:

An aerobatic pilot witness standing nearby described what happened when the winglet came off. The aircraft yawed, rolled, and pitched up 90 degrees. The calculated 13-g loads did not fail the wings but twisted the fuselage enough to shed most of the plexiglass from the canopy frame. The aircraft impacted inverted on the prop and top cowling, then it slammed down, shearing the pilot's rollover structure, the top of the instrument panel and impacted the canard/fuselage fairing. It then bounced back into the air, rolled left to upright, and struck the ground upright, failing the main gear (pulled brackets and major glass structure from the fuselage). The aircraft came to rest 90 feet from the initial impact point at a heading of 110 degrees right of flight path. The nose gear was retracted. The right winglet was

located about 1,900 feet short of the wreckage. Parts of the plexiglass canopy were found 1,000 feet short. With the exception of the right winglet and rudder assembly, and parts of the plexiglass canopy, the wreckage was essentially complete and in one spot. Although it had sustained major damage, the airplane was located in a small area, not over 20' x 30'.

The right winglet failed inward during the high-speed low pass. Sample sections were cut out of the winglet-root/wingtip. Skin coupons were burned out and the number of plies were counted. The type of glass and fiber orientation were determined.

Figure 1 shows the VariEze design structure, and the structure found on the wreckage of N11CH. The major tension layup (#8) that was omitted was, without question, the primary weakness which allowed the winglet to fold inward and fail at high speed. The winglets lift inward and, at high speed (with zero sideslip) have an inward bending moment that is equal to that attained in a 15-degree sideslip at the maneuvering speed. Note that with layup #8 omitted, and with layup #9 not extending to the lower skin, the only structure opposing the bending was the foam core acting through rib #6 to the bottom skin. It is conservatively estimated that the structural strength of the winglet- to-wing joint of N11CH was less than 1/20 of what it should have been. It is very surprising that it did not fail sooner. The incredible thing that was not answered was how the builder could have omitted the primary structure and why it had not been noticed. Even after the final paint job, it was obvious that the #6 rib could be seen on the surface!

This aircraft throughout showed evidence of poor workmanship. Poor workmanship in itself had not precipitated structural failure with these construction materials. Prior to this accident the VariEze types had amassed approximately 150,000 hours flying without inflight airframe failure, even though many of the aircraft have relatively poor workmanship. The omission of important primary structure was clearly the cause of the structural failure.

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A VariEze got away from its owner recently while hand propping. A friend, a non-pilot, was asked to monitor the throttle while the owner propped it. It started, unfortunately the throttle was full forward, and the non-pilot did not retard it but did hang on for the ride of his life as it scooted across the ramp on its nose. It finally struck a steel fence post which cut a 3-inch-wide slice

from just left of the pitot tube in the nose, all the way aft to the spar cap of the canard! An expensive lesson. Fortunately, no one was hurt but the damage was extensive.

Always have a pilot who understands the EZ throttle and mag switches monitor your controls if you hand-prop it.

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Charlie Mottier sent this letter to RAF regarding his ditching in the ocean off the Berry Islands in the Bahamas. Unfortunately, the airplane was a total loss, but the good news is that Charlie and his wife survived with only minor cuts and bruises. His letter is printed in its entirety in the hope that this information may help someone someday.

Following Sun-N-Fun '94,19 canard-type aircraft flew to Great Harbor Cay in the Berry Islands (67nm south of Freeport, Grand Bahamas) for some well-deserved R&R.

On the flight home our Long-EZ experienced a loss in engine power about 15 minutes into the flight and we subsequently ditched the plane in Big Stirrup Cay - part of the Berry Islands.

When the problem developed, we immediately advised our flying partner and then changed frequency to call in a Mayday which was acknowledged by Customs at the airport. We advised that we were attempting to return to the airstrip and requested landing priority. On that frequency, all inbound and departing aircraft were advised of the emergency.

When it became apparent that we would not make the field, the decision was made to ditch rather than to put the plane in the trees on the adjacent island as I felt there would be less chance of fire in a water landing. Our landing speed into the wind and with calm seas was about as low as possible to keep the sink rate to a minimum. The main gear hit first and pitched the plane forward. The canard was sliced off cleanly at the fuselage on both sides. The plane dove under water and the canopy was lifted right out of its frame. We came to rest in the water, perfectly level. With the canopy gone, I simply stood up and turned to check up on my wife who was in the back seat. Boats to help arrived within 3 minutes and towed the plane to the shore.

I suffered no injuries other than some minor cuts and bruises and required no medical attention. She suffered some sore ribs on her left side and some minor cuts, but on complete examination in Ft. Lauderdale, was pronounced fit and was released from Browder Memorial hospital.

There are at least two important points for EZ drivers from this experience: 1) A water landing is survivable although it is hard on the plane. My plane floated, it was heavily loaded, and it floated entirely level. We walked on the wings as did others and it was very stable. In attempting to stretch the glide to reach the airport, the nose gear was not extended. If I had to do it over again, I would put the nose gear down. That might help soften the forward pitch when the main gear digs into the water. (Also, the landing brake should be deployed - ED.)

In summary, we do not know what happened to our factory-new, 250-hour, Lycoming 0-320, 150hp engine. The plane took all of the licks, and we elected to total it. The passengers suffered almost not at all. Not a pretty story but we think one with a happy ending.

We want to thank our Canard friends who agonized with us as we splashed down and for their continued support through phone calls and cards.

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Long-EZ - Runway & Visibility - a Long-EZ crashed on takeoff from a small Minnesota airport. Conditions were clear, it was dark (about 1 hour before sunrise) the runway was hard surfaced, but covered with ice and snow, some large lumps of ice up to 4-inch-thick. The runway was 2,000 ft. long and ended near the edge of a lake. The aircraft was in excellent condition with approximately 60 hours total time, with 5 hours flown the previous day. It had been hangered and had no frost on the wings, however an eye witness reported that the canopy was frosted over on the inside such that he was unable to see the pilot just before takeoff. The pilot commented that it was no problem because his experience was that the canopy would clear as soon as he had some speed. It appeared from wheel tracks in the snow that he had a very extended takeoff roll, in fact rolled virtually the full length of the runway. He struck several hard lumps of packed snow/ice with nose and main wheels, which probably slowed him down. When he lifted off, he did not climb enough and flew into the tops of some small trees of the end of

the runway. The left canard and left elevator were torn off at this point, which caused the airplane to roll left. The left wing then struck the ground and was broken off. The airplane rolled inverted and crashed into a frozen swamp on the edge of the lake. It then slid over a small embankment and broke through the ice coming to rest in four feet of water. The fuselage remained essentially intact. However, the pilot was killed instantly.

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Composite Structure Fire - There were no instances of fire on any VariEze type structure in over 200,000 flight hours of operation - until last fall. Here's the report from Ron Walter:

“I pulled in front of my hangar, shut down the engine and put the plane on its nose. Looking back, I noticed flames coming out the back and proceeded to get an extinguisher to control the flame. This was to no avail and resulted in completely destroying the plane within approximately 12 (more) minutes.”

A fellow VariEze builder arrived on the scene after the entire engine area and cowl were involved and he offered the following, cautioning that some is conjecture.

“At runup area engine did not sound normal. After several tries at runup he taxied back to hangar parking. Time of run was about seven minutes. On shutting down the engine with the idle cut off he noted smoke from engine compartment. He retracted the nose gear, got a small fire extinguisher and emptied it into the fire. By that time however the fire was out of control.”

“Fire definitely was well along in the engine compartment when aircraft was shut down. It might have been arrested if fuel valve had been closed when smoke was detected and fuel burned through engine. Initial cause was stuck float in carburetor which kept feeding fuel to point of overflow (conjecture).”

“The aircraft was headed west and wind was from 240 degrees about 3-5 knots. This fact inhibited the fire somewhat but I was surprised at the slow propagation of the fire, about 2 to 3 inches per minute forward on both wings. The heat softened the upper wing strake to the point that when the gas in the tanks ignited there was only a large “Poof” - no contained explosion or any shattering. Even at this point neither the outer wing spars nor the center section box, showed deformation. Obviously, they were

getting soft but no sag. Within the next minute the fuel from the tanks intensified the fire to where everything melted down and completed burning forward to the front cockpit. At this point the main gear softened and gave up. Fire truck arrived and put out remaining fire.

Findings: Fire wall took a lot of heat before allowing fire to progress forward. Fuselage tank failed through sight gauge first. I could not tell whether the fuel feed line from the tank to the shut off valve had softened and burned feeding the fire. Engine mount distorted but intact. Top of wing tanks burned but bottom remained intact.

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While doing touch-and-goes at Clark Co airport in southern Indiana, my VariEze (N64SJ) was extensively damaged. I had elected to go around because of a slower aircraft ahead (C-150). While traveling along the right side of the active about half throttle in a very shallow climb, just past the take-off end of the runway, I moved the throttle to full power. The engine (0-200) started to respond then tailed off to nothing. I turned back toward the airport but came up about 50 yards short of the intersecting runway. It had rained quite heavily for several days previously and the sod was very soft.

The aircraft rolled several yards before the nose gear failed causing the plane to flip forward landing inverted and traveling another few yards before finally coming to rest, tail first, upside down.

After removing the cowling, the cause of the engine stoppage was obvious. The aeroduct between the carb heat valve and the carb had collapsed. A further check confirmed that both ends of the coiled wire were held tightly under the worm clamps. The wire coil had become completely disorganized and, in fact, parts of it looked somewhat like a Slinky that had been mistreated.

On a subsequent engine run, the engine repeated the in-flight shutdown. After removing the aeroduct, the engine ran normally.

I feel the shoulder harness and seatbelt and rollover structure worked very well as I was uninjured.

I can't say how much I enjoyed and miss my EZ. I would appreciate any advice you might have about possibly rebuilding.

Please pass on my experience with the aeroduct.

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A homebuilder damaged his VariEze in an aborted takeoff. He took time off from the repair job to write the following story for us in the hopes that publishing this information may prevent someone else from having the same problems: The takeoff direction was to the SE with a mild left cross wind. The runway is 2,650 ft. long, very narrow, and very bumpy and rough. There is considerable grass that is six to eight inches high growing onto the edges of the runway. There had been considerable rain in the early hours of the morning and there were numerous puddles of water on the runway. My takeoff attempt was intended to miss the majority of the puddles but my right wheel hit a long puddle causing the aircraft to veer about ten degrees to the right. I was near take off speed and saw the grass on the runway ahead of me so I attempted to lift off unsuccessfully. Seeing that flight was impossible I reduced the power, the nose dropped sharply breaking off the nose wheel followed by the nose strut collapsing into the retracted position. Additional resistance of the grass on the right side caused the aircraft to veer off the runway and into the muddy plowed field where the main gear collapsed and we all came to a stop. From the spot of the main gear collapsing to the stopped position was around fifty feet. I turned the switches off then got out and assisted my passenger out. There were no injuries other than my passenger having sore knees from pressure against the back of the front seat. We both wore seat belts and a two-strap shoulder harness. The ELT did activate.

Later, upon investigation, I found a small piece of broken fiberglass wedged between the right brake puck and the brake disk. I was unable to rotate the wheel. Since the right wheel pant was torn off the landing gear prior to the main gear collapsing I now wonder if this could have caused more drag on the right side far greater than what the grass caused. Without this additional drag a “Save” may have been possible.

I can understand now that when I hit the water and was pulled slightly to the right the wheel entered increasingly deeper water causing more drag and more turning to the right. There is that moment of delay while the mind digests what is happening until a response is initiated. That moment is too long.

It is interesting to me what thoughts go through the mind during the short interval of an emergency.

Some of my thoughts... Look at all those puddles of water. Better choose a good path and try to miss most of them. Narrow runway, run the engine up full before releasing the brakes. 2,500 rpm ok, oil pressure up, let's go. Boy is this a rough runway, nose bouncing, come on airspeed let's get the nose off this rough stuff. Ah here comes some airspeed, nose slightly off, not too much. Now here comes that long puddle, left cross wind, going to hit the water a little bit with the right wheel. Airspeed approaching lift off, my God that water is pulling me right, this isn't supposed to happen, come on airspeed, here comes that grass, can't hit that, can't fly if I hit that, try for a lift off, nose up... up... nose is plenty high, if it does lift off can I fly out of ground effect, don't want to end up in the bay at the end of the runway, what if the wing drops and hits the ground, no good, won't fly, damn, hit the grass, noisy, lots of drag, being pulled to the right, this can't happen... chop the power, keep wings level, bang! my gosh, I broke something, this is a crash, What an experience for my passenger, first time in a homebuilt and doesn't particularly like flying... sick... sick... sick... there goes the main gear, here comes the field, turning right, keep it level, keep eyes open, keep thinking, look... I'm still ok, hang on, brace, keep looking, it's stopped, I've really messed it up. Switches off, get out now, what about a fire, get my passenger out. We are both ok but look at my pride and joy, belly in the mud, mud everywhere, look back at where I've been!

———————

Engine Failure, on top, over Lake Michigan. A VariEze accident claimed the lives of a New York couple and their son enroute home from Oshkosh. The pilot was a low-time relatively new private pilot taking his first cross-country trip in the airplane, which had 49 hours total time. The following information is from a VariEze pilot who was flying with the Eze that crashed, and from FAA investigators.

The flight was heading east across Lake Michigan to save trip length even though it was over a solid under cast with tops at 10,000 feet. They were cruising at 11,500 feet directly over the center of the lake when the pilot noticed zero oil pressure. They continued another 10 to 15 miles when the engine lost power, then quit. The wingman noted that the pilot kept turning

right during the trip and he had to keep instructing him to turn left to remain on course. He repeated this instruction as the pilot descended into the clouds in a right turn. Radio communication was lost when he tried to get him to switch to Muskegon Tower frequency for vectoring. Weather at the surface was a variable ceiling ranging from 500 scattered to 1,500 broken to 4,000 overcast.

It is not known whether the pilot became disoriented in clouds during the descent. The last call heard by the wingman was a very upset voice repeating “engine quit, going down.” Flight service received a call of “shoreline in sight” with no further communication. The aircraft crashed while in a turn in a down-wind direction at the far end of a 150-foot-long clearing, immediately cartwheeling into trees. There was no way to survive a landing where the aircraft impacted. There was no fire. It is not known why the pilot selected the small clearing when the shoreline with alignment into the wind was apparently available to him.

Investigators determined the cause of engine failure to be oil loss through a broken oil pressure sender line.

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Canopy Emergency  Joan Richey, Los Cruces, NM experienced a canopy emergency in her VariEze. As is generally the case, she forgot to lock it due to an unusual break in routine. Her full story follows: Charles, and my instructor, Joe Gold, had started the Eze and said he'd like to fly it a little, too. So - I took off, flew over town and up the valley some, came back, landed, taxied up to where Joe was waiting, got out, he got in (engine still running) a friend came up and asked for a ride. Joe shot a landing, came back, jumped out, ran around the plane sniffing - smelled something burning. Took up the passenger, came back, changed passengers, said the radio had burned up. Took off, flew a short time, came back and I decided to fly again. “Ok” says he “but don't even fool with the radio because it's not working.” Didn't turn off the engine. I climbed in, said I'd shoot 3 landings and take it to the hangar. I always fly with earplugs under the head-set - didn't take time to put them in. That's #1. Engine hadn't been stopped - didn't do my standard check with run up. That's #2. Took off and did not bring up the gear since I was just going to shoot landings. On turning downwind to base, the sound in the cockpit changed but I could not identify

it (no earplugs). Base to final, the canopy popped up to the full throw of the safety latch.

I panicked! All the stories Charles had told me and I had read of canopies coming open, all of a sudden, seemed to have culminated in funerals. My initial thought was “I’m dead.” Tried to hold the safety latch down, tried to latch the canopy. After the initial panic, I remembered some words of wisdom in a CP Charles and I had discussed. FLY THE AIRPLANE! Next thought – “Climb, gain altitude and latch the canopy.” Third thought – “Land it!” By now, the panic is gone, I'm a little high and a little fast. Have not managed to trim it to landing speed. After all, a girl's only got two hands and both are holding down the canopy! Actually, I manhandled it down, long and hot luckily 12/30 at Las Cruces is 7,500 feet. Let it roll to a stop and then drove it to the departure end of the runway. (Furthest from buildings and people). Stopped - knees weak could not latch the canopy. Opened it completely, latched it. TURNED ON THE MASTER - CHECKED THE SAFETY LIGHT AND BUZZER - turned around and took off on 12. Shot two more landings, took it to Las Cruces Aviation. NO ONE EVEN NOTICED! but to me it was scary.

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A VariEze crashed soon after takeoff in Aspen, Colorado. The pilot and passenger were both killed. Engine failure is suspected. The damage to the prop is such that the engine was not running when it crashed. The FAA has not officially come up with a probable cause for this accident, but their investigation is looking seriously at fuel exhaustion or, at least, a fuel stoppage as being the likely cause. This VariEze had been flown for at least 3-1/2 hours since the last time it was known to be refueled. Depending on the power setting and fuel tank capacity, this is very close to enough to have used a full side tank of gas.

At the last known refueling, this VariEze was refueled while parked nose down. Also, the pilot did not supervise the refueling, rather, the line boy was told to fill it up.

First of all, it is not possible to completely fill the fuel tanks of an EZ while parked nose down. If for some reason you require all the fuel you can get, top it off in the 3-point position. Second, we have had it happen to us, that a line boy failed to top off an EZ fuel tank when using a very high rate of fuel

flow due to the baffles in the tank causing the tank to momentarily appear full. Some refueling trucks and pumps have more flow capacity than the baffles in the fuel tank can allow the fuel to drain to all corners of the fuel tank. Don't forget this fact if you absolutely need to have the maximum fuel for a long trip. Most important of all, remember it is the pilot's responsibility to check how much fuel he or she has onboard, not the line-boy's. On a VariEze, built per plans, you have a 2 gallon-plus emergency reserve fuel tank in the area above the center-section spar forward of the firewall. Don't forget to check the level in this tank and to fill it if necessary. This is a get-you-home fuel supply, but it will do you no good at all if it has been used or has drained through a leaky fuel valve into the main fuel tanks. Keep this tank full, always - it could save your bacon.

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A Louisiana Long-EZ crash-landed on its first flight. The pilot was not injured. Although we have very sketchy data on this incident, as is our policy, we are publishing all we do know as we do on all accidents and incidents we hear of.

Apparently, the pilot got behind the airplane on final, got too slow and developed a high rate of sink. The airplane hit hard failing the gear, slid along leaving the runway and flipping over. The winglets were broken, one wing was ripped off and the canopy was smashed. The head rest broke off, but incredibly, when the airplane was lifted, the pilot had only minor cuts and bruises.

As with all accidents and incidents reported in the CP, the only reason we print them is to hopefully help someone else and maybe prevent a similar situation by being forewarned. There is no intention of judging a pilot or his or her actions.

What can we learn from the above accident? Although our own records do not show it, the FAA says that a high percentage of accidents in homebuilts occur on the first flight. This is one that did. There is no question that the sight picture out of the front seat of an EZ on final, is not like anything the average low time private pilot may have seen. It is unlikely that he has ever sat on the aircraft centerline before. The EZ must be set up to land a little differently than the "Standard" Cessna, Piper, etc. In fact, it is much closer to a modern jet fighter in some respects. There is no prop in front of the

pilot, the airplane does not pitch nose down as a Cessna or other single engine certified airplanes do when flaps are lowered, and it does not have to be rounded out or flared when close to the ground as a Cessna does. Rather, the landing attitude is set on 1/2 mile final by simply slowing to 80 or 90 knots. The landing brake creates no lift, no pitching moment as flaps do, all it does is provide drag to steepen the glide slope a little. The nose high attitude necessary to land is strictly a function of airspeed. Slow to approach speed and the airplane will automatically set itself to the correct touchdown attitude. Now, simply fly it onto the runway. When you have 20 to 50 landings in your logbook, you can finesse the touchdown with a tiny flare, but for the new EZ pilot, this is not necessary or desirable.

Because of this “Difference” in an EZ, whenever it is possible, always try to get at least a back seat ride in an EZ before you attempt your first flight, particularly if you don't have much flying experience. This can easily make the difference between a successful and unsuccessful first flight.

Just as you carefully, even meticulously, prepare your airplane for first flight, so must you prepare yourself if you are to be the pilot. Get yourself current and proficient in at least two different aircraft: A Grumman TR-2 and a Luscombe would be excellent, or a Champ and a Piper Cub would be fine. The point is to be as sharp as you can be.

Then find someone who will give you a ride in their EZ. A VariEze or a Long-EZ, it does not matter. Get a little stick time, maybe even fly an approach, it will make an enormous difference if you have at least flown in an EZ.

(Or buy a ride and lesson in one of the RAFE airplanes)

That is not to say they are difficult to fly - they are not, they are just a little different. Another thing to keep in mind is this - ANY aircraft will develop a high sink rate if you get it too slow, including canard types. Don't be lulled into a false sense of security by thinking you can pull the stick all the way back on short final and the airplane, because it is a canard, will look after you! A canard airplane is just like a conventional airplane, it must be at or above flying speed to fly. Get it too slow and a canard airplane will sink just as a Cessna or Piper will.

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A California Long-EZ struck a pine tree on short final. The airplane pitched down and crashed. The pilot was killed, and the passenger was seriously injured. It was late in the evening and the runway lights were on. The pilot had not flown this airplane at night although he had night experience in certified aircraft.

The NTSB has not yet completed their investigation, but we feel compelled to point out that a night approach over trees to a short runway (3600 ft.) can be very tricky. The “Black Hole” effect on short final can be very deceptive with little or no visual cues as to altitude. Practice night landings (if you must fly at night!) at airports with clear approaches and long, well lighted runways. Always aim to touchdown about 1/3 of the way down the runway. Do not try to hit the numbers at night.

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A VariEze crashed on departure from the Kansas City GIG on June 13, 1993. Since there were a lot of EZ builders and flyers on the field at the time, a rather extensive investigation was conducted on the spot, not only by FAA/NTSB personnel, but also by several EAA members, all of whom are very familiar with EZs. Tragically, two people died in this accident.

By all accounts, the airplane was refueled some time prior to take-off. The fuel caps on this particular VariEze were not the plans-recommended Brock-type fuel caps. They were the “Thermos” expanding ‘O’ ring-type. This type of fuel cap requires regular lubrication of the 'O' rings at 25-hour intervals. If this is not done, the 'O' rings will crush and crack and, even though you may have the locking tab down and “locked,” the cap in fact will not be locked!

Shortly after take-off, the engine was heard to surge and loose power. The airplane began a 45-degree bank turn to the left. After completing 90 degrees of the left turn, the nose began to drop and the aircraft impacted in a plowed field, 30-degree nose low in a 45-degree left bank.

The investigators located all airframe parts except for the tip of one blade of the prop and the right fuel cap. The next day, parts of the fuel cap and pieces of the wood prop blade were found near the center line of the runway on the airport. This verified the theory postulated by the investigators that a fuel cap had come off and gone into the prop disc, breaking the prop. The

resulting heavy vibration probably caused the pilot to pull the power back. For some reason, he elected to try to turn back to the runway. With little or no thrust, a heavy airplane in a steep bank (which causes high inducted drag) simply got too slow to fly and descended to the ground at a high sink rate.

It is too late for the couple in this VariEze but it is not too late for all of us who fly to learn from this tragedy. If you are flying a RAF design and have not complied with the CP advisories recommending you chain your fuel caps to the filler neck - do not fly again until you have corrected this omission. If the fuel cap on this VariEze had a chain to retain it, this accident would not have occurred. Please check your back issues of the CP for more information about chaining the fuel caps to the filler neck. See CP28, pg. 7&9; CP 31, pg. 5; and CP50, pg. 5&7.

Another lesson we should all learn from this accident is the problem of trying to make a 180 degree turn back to the runway while low and slow. A landing straight ahead into the wind (which was 15-20 knots that day) even if near the end of the runway, is much more likely to be survivable than a landing with a 15-20 knot tailwind. Think about it. Assume 100 knots airspeed. With 20 knots of headwind, your ground speed would be 80 knots. Downwind, it would be 120 knots! The kinetic energy in a downwind landing, in this case, is 2.25 times as high as it would be in an upwind landing. This could turn a survivable 15 “G” impact into an unlikely-to-survive 34 “G” impact! This assumes that you have not caused a higher sink rate due to the extra drag in the steep turn!

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A California Long-EZ experienced an engine failure while flying level at approximately 10,000 feet. The ensuing emergency, off-field landing, attempted on a California “dry” lake that was not all that dry, resulted in the nose gear collapsing, the nose digging in, and the aircraft flipping over onto its back. The pilot suffered only minor injuries, but the aircraft was badly damaged.

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An Indiana VariEze departed after refueling. The control tower operator noticed a fire on the wing trailing edge and notified the pilot, suggesting an

immediate return for landing. The pilot put the airplane into a high-speed dive while returning to the airport to land - and succeeded in putting out the fire. The left aileron, wing trailing edge and engine cowling were slightly damaged by the fire. The fire was caused by the fuel cap being left off during refueling and fuel syphoning out of the fuel tank onto the hot exhaust system.

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VariEze takes on Cessna 172 at the Cable Airshow, 9 January 1979 - - both lost. Gerald Gardner's VariEze was on takeoff roll and at rotation speed a Cessna 172 pulled out for takeoff right in front of him. The VariEze rotated abruptly to try to fly over him and almost made it. The EZ's left lower winglet struck the 172's right wing in the flap area, followed by the left main gear hitting the right wing-tip of the 172.

The EZ struck the ground beyond the 172 in a right turn. The canard tip and nose gear hit first, folding the nose gear back.

The canard came off the airplane removing part of F22 bulkhead. The canard and elevators including lift tabs were undamaged. The left lower winglet was damaged. The wing attach fittings were not damaged. The main gear folded back, failing three glass tabs and pulling one aluminum extrusion from the fuselage. The main gear strut was not failed. The right wing - trailing edge split open from the aileron to the trim tab. The right winglet failed at midspan. The Cessna's right wing was totaled. There were no injuries. Gerald had 118 hours on his EZ at the time of accident. He said he loves his galactic wonder and will rebuild it.

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ACCIDENTS In December an Australian VariEze crashed just after takeoff fatally injuring its owner/pilot. The information we have received to date is sketchy at best, but what appears to have happened is that the pilot made a normal take off to about 20 ft AGL then dove back to the runway hard enough to hit the prop and wheel brake discs. The aircraft then pitched up nearly vertical (70 degrees) rolled inverted and crashed from about 100-foot altitude. This was the pilots first flight in the aircraft.

The aircraft however, had flown 5 hours by a competent pilot, had completed its basic tests including stalls and found to be normal. The

accident is still under investigation. If any significant finding is received, we will pass it on.

We have learned that the pilot's total flight experience in the last 2 years had consisted of 1 hour solo and about 3 to 4 hours dual. He grossly over-controlled the aircraft in pitch on his first take off, flying at a relatively heavy weight at a relatively aft cg. Based on this and analysis of a previous accident with similar statistics, we are recommending additional limitations for the VariEze operators manual. These are listed in the VariEze plans changes section of this newsletter.

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A VariEze crashed as it entered the downwind leg of the busy approach pattern at the Oshkosh EAA convention. The aircraft was observed to maneuver erratically then turn and dive at very high speed, with high power maintained to impact. Both occupants died immediately. The aircraft struck a concrete street in a near vertical (60-70 degree) dive, at a low angle of attack. A pilot witness 200 feet away observed that it did not appear that the pilot was attempting to pull out of the dive. This points to a possibility of either a pitch control system-disconnect or pilot incapacitation. All but two parts of the control system were found - they did not indicate control system disconnect. The aircraft did not have a rear seat control stick. Thus, pilot incapacitation is the suspected cause.

Destruction of the aircraft was unbelievable, only small parts remained. The engine struck the concrete road at the same point that the nose did. The bow shape of the main gear strut was clearly imprinted on the concrete at the impact point.

Initial investigation at the scene of this accident suspected fuel starvation because there was no evidence of fuel and there was no fire. It was determined that the tremendous force of the estimated 200 mph impact resulted in a fuel and oil explosion, however there was no resulting fire. There have been no fires associated with any VariEze accident.

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Power Loss - A southeastern VariEze crashed into trees after power loss on its first flight. The power plant was a conversion of a Chevy Corvair automobile engine. The aircraft was destroyed. The pilot was not injured.

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Known Icing conditions/fuel management - A Midwest VariEze pilot began an extensive trip in IFR and icing conditions. His flight was a classic condition of many things going wrong in combination. He reluctantly accepted an altitude assignment in known icing conditions, only 1,000 ft. above the MEA. The pilot became quite busy as ice was building, switching the single Nav to identify intersections then noting an impending failure of the gyro horizon - nose high at normal airspeed. Also, he reported a Nav problem and center lost radar track of him. They were talking to him but did not know his position. At 40 minutes from takeoff the engine abruptly quit - cold. He descended through the clouds breaking out at about 500 ft. AGL and put it in a freshly plowed field approximately 30 miles off course, carrying a large amount of airframe ice. The pilot received a fractured vertebra. The aircraft's wing, belly, landing gear and canopy received major damage. Investigators found the fuselage tank empty, speculating that the pilot had departed on the fuselage tank and the engine failed due to fuel exhaustion. Probably the pitot-tube had iced up resulting in his thinking the speed was ok and the gyro horizon was failing. His airspeed was thus too low to allow a restart even when main fuel was selected during the power-off descent through the clouds (windmilling not maintained).

Many builders, including this one, have modified the positioning of the fuel valve on the VariEze, defeating its feature of reminding the pilot (by interference with his right wrist) that the fuselage tank was selected. There have now been two accidents caused by a combination of incorrect fuel management and defeating the interference design feature of the valve handle.

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Since CP #23 there have been two off-field forced landings in VariEzes due to engine failure. No injuries, but both aircraft received major damage. The one in Southern California landed in the desert after the engine failed (reason yet unknown) taking the gears off and buckling the forward fuselage. The other in central California - engine failed just after take-off when the pilot selected a tank with water in the fuel. (non-standard fuel system). The field was undulating soft grass. When the aircraft touched down it took the main gear off and damaged the under fuselage and wings.

The nose gear was not extended. Rain water got into the tank due to a very badly deteriorated “O” ring in the fuel cap. The aircraft had no gascolator or tank drains.

What is learned from the above? First, we don't recommend the nose be retracted for any landing no matter what the terrain is, even water. The nose gear provides extra cushion and keeps the nose from slapping down and digging in after the mains hit. The one possible exception could be brake-failure after landing to retract the nose to keep from running off into unfavorable terrain or obstacles.

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The CP July 1986 newsletter reports accidents and discusses their conditions and causes for information purposes for all operators. We have always investigated accidents in the interest of determining information that we can disseminate to you, the builders, to help prevent reoccurrence. It should be recognized in our discussion of accident conditions or causes that generally this information is preliminary, since it is published before the availability of the FAA or NTSB accident report.

A Long-EZ in Illinois landed in a row of trees after the engine quit. The pilot was on a 1/2 mile final at 300 feet at idle power due to another plane in front of him. When he added power, the engine quit. Two attempts were made to start the engine using the electric starter, to no avail. He hit a small electric wire, then landed in a row of trees planted as a wind break. The canard broke on both sides, the right wing broke at 1/2 span, the left wing was damaged near the strake. The main gear was still attached but bent aft. The left wheel/axle was sheared off breaking all four bolts. The pilot received a small cut on his hand and that was all. No cause for the engine quitting has been determined. The first thing that comes to mind, of course, is the engine idle speed. This may or may not have had anything to do with this accident, but we have seen airplanes set up with such low idle speeds that they do have a tendency to quit on short final. However, that is normally an occurrence in the flare where it is only an annoyance as far as taxiing after the landing. An excessively high idle RPM is not satisfactory in that it makes it tough to land an airplane with the L/D of a Long-EZ. In general, if your engine will idle OK on the ground, it will idle even easier at approach due to inflow assisting the propeller.

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A Northern Nevada VariViggen was involved in a first flight, take-off accident. The airplane was demolished but the pilot suffered only minor cuts and bruises. Unfortunately, this accident could easily have been avoided. The pilot had no current medical or biennial, nor had he flown at all in the past 3 years. He did not inform the FAA of his fly and he attempted to take-off on an uphill runway with a tail wind.

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A California VariEze crashed on Final approach. The pilot was seriously injured, and the airplane was badly damaged. His approach was at a busy fly-in with a lot of airplanes on final. He got down too low and far too slow. Eyewitnesses saw the airplane very low with wing rock. The airplane caught a wing on the approach light system, 800 feet short of the runway and 15 feet above the ground. The airplane cartwheeled and hit upside down and slid to a stop 300 feet short of the runway. The moral here is “never be too proud to execute a go- around, no matter how much pressure there is to land.”

## Topic 12 • STORIES FROM THE RAF ERA 1973 to 2002

**Note:** In order to get Chapter 19 published in a timely manner, this section is currently blank.

In a future update the “Stories from the RAF Era” will be added.

# Jacket Patches



The Cyclops patch was for a NASA program. Burt was one of 10 pilots that flew many day and night takeoffs and landings with normal vision and with one eye blocked. They wanted to see how much precision was lost by blocking one eye. As a result, they put test pilot McMurtry back on flying status after he lost an eye during a Lifting-Body landing accident.

**END OF CHAPTER 19**