

**Subject: [c-a] RETROSPECTION ON A 25 YEAR OLD DESIGN**

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**From:** "Fink, Allen L" <Allen.Fink@West.Boeing.com>

**To:** "Canard Aviators" <canard-aviators@canard.com>

[The Canard Aviators's Mailing list]

Hi Team:

Art Bianconi's insightful post on the Rutan designs has triggered a nostalgia attack. I would like to extend the retrospection to 25+ years and include the VEZ and Vari-Viggen in the pot.

**BURT'S STRUCTURAL DESIGN:**

After 4 years in engineering school and 27 years in the aerospace structures business, I am developing an ever-growing respect for good clean, simple structural design. In the construction of my VEZ, I was continually impressed with how simple and efficient Burt's structural design work was. Ask yourself how would you make it better and almost any other configuration would be heavier, more complex and more expensive. Additionally, Burt recognized the "bootstrap" effect of size on aircraft structure. A little bigger aircraft = a little more weight = a little more lift = a little more wing = a little more power = a little more fuel = a little bigger aircraft etc. The high performance "homebuilt rockets" we see now have some roots in Burt's minimal aircraft size philosophy. (Semi-reclined seating, low frontal area etc.) The high performance designs today, like the fighter aircraft before, consist of a minimal airframe to carry a honkin' powerplant. (Like a P-47 thunderbolt for instance) It is interesting to see how Burt progressed towards design simplicity from the Vari-Viggen forward. If you ever have a chance, look closely at the famous Douglas A-4 series. ("Heinemann's Hot Rod") Thanks to Ed Heinemann the chief designer, simplicity and lightness were the rule. Wing spars were machined complete from a single piece of aluminum plate, leading the "integral structure" revolution we are experiencing today.

**BURT'S MATERIAL SELECTION:**

The fiberglass aircraft structure revolution, including "moldless composite" construction, actually developed from the German sailplane construction methods before Burt. Burt studied at the feet of Fred Jiran at Mojave. Burt's genius was in recognizing and adopting the method to homebuilt aircraft design. Part of the genius was in recognizing the benefit of not having to make a set of tools for each "one off" aircraft. The other part was recognizing that the solid core, hand lay-up, room temp cure composite construction, while heavier than some other materials and methods, was still quicker and cheaper than any alternate design, particularly for the compound contours that we love. i.e. The weight penalty for a non-optimum composite design was very small for a very small aircraft. A 10% weight penalty for a non-optimum structures design was maybe 20 to 30 pounds for an EZ size airframe. The EZ airframes could have been done lighter in aluminum, maybe wood or other composite methods, but none would have been quicker or cheaper. Burt initially picked the materials and "moldless composite" design because RAF was a prototype shop and "quick and cheap" worked. He then realized it also worked for most homebuilders and presto, a revolution was born.

Burt's next BIG job was to convince the public that composites were just another aircraft construction material. His Saturday demo's, fly-in appearances and very conservative design margins of safety (backed by full scale tests) helped convince a sceptical public. In addition, Burt traveled around the world talking to certifying agencies and homebuilder organizations everywhere. There has never been a major structural failure

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