



CAFE Triaviathon

# The World's Most Efficient Aircraft!

## Gary Hertzler Surpasses Dick Rutan's CAFE Challenge Record

### Comparative Aircraft Flight Efficiency, Inc.

A Non Profit, All Volunteer, Tax-exempt Educational Foundation

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CAFE Challenge

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N99VE's has a smooth belly, armpit cooling inlets, special narrowed wheel pants, custom prop and spark-advanced O-235 Lycoming engine, custom induction system with Ellison Throttle Body and ejector exhaust. It is here being weighed to .1 lb accuracy on the CAFE Foundation Scales.

by **Brien A. Seeley M.D.**  
EAA 120126

**FANTASTIC** is the word that best describes the CAFE Challenge performance of Gary Hertzler's highly modified VariEze; nearly 170 mph with 48 MPG! With its 400 lb payload, the sleek N99VE set a new world's record in aircraft efficiency, a CAFE Challenge score of 1.38 million! Gary's name will now be enshrined permanently on the perpetual CAFE Challenge Trophy in the lobby of EAA's Air Adventure Museum in Oshkosh. (See "A Tale of Two Trophies", Sport

Aviation, October, 1993.)

Gary's new record eclipses that of the Rutan Catbird set in May 1993 at 1.31 million. Burt Rutan had designed the Catbird as the ultimate in CAFE racers, and many thought that its score would never be beaten. Its special Roncz airfoils and tidy cabin for 5 people were thought to be the most efficient combination possible. But not to Gary!

Gary Hertzler was already a household name in CAFE racing, having dominated the 2 seat class in the CAFE 400 races in the 1980's. On June 3, 1994, he brought N99VE to the CAFE

test facility in Santa Rosa, California from his home in Phoenix.

Upon arrival, CAFE members C.J. Stephens and Crandon Elmer helped Gary drain all of his fuel, and the 118 BHP O-235 Lycoming-powered VariEze's empty weight was measured at 665.25 lbs. This is only 32 lbs. heavier than the old empty weight with the 80 hp Continental engine, a very worthwhile tradeoff.

Careful weighing of crew, test gear and necessary fuel gave a final impounded takeoff weight of 1147.2 lbs., including 112.45 lbs. of fuel. The aircraft was then locked up in the CAFE



**Gary Hertzler, builder/owner of the world's most efficient aircraft, is an engineer with Garrett's turbine engine division in Phoenix.**

Aircraft Performance Evaluation Center overnight for a dawn takeoff on June 4.

Steve Williams briefed Gary's flight engineer, Dick Townsend, on the use of the Trimble Flightmate Pro GPS and the special Mentor Plus GPS software program developed for the CAFE Challenge. Trimble and MentorPlus have been extremely generous and helpful to the CAFE Foundation in developing the GPS system to document these record flights.

Early the next day, Gary took off in about 1500 feet on Runway 1 at Santa Rosa and climbed using full throttle to 10,000' within 19 miles of departure. He began leaning at 7500' and continued to climb up to 12,000' cruising altitude, where he remained for about 450 miles. There he set 15" Hg. M.P. and 2530 RPM while burning just over 3 gph with 42 degrees of spark advance. He initiated his gradual descent for landing about 25 miles out. The helpful FAA tower crew at Santa Rosa expedited Gary's landing pattern for runway 19 after the speed clock was stopped with his 1500' flyover of the runway intersection.

The winds along the route were a steady 15K from SSE throughout the flight. Gary did a superb job of staying on course according to the Mentor Plus FlightMap's retrospective "trail of bread crumbs" track record on the computer display. He covered the 500 miles in 2.9536 hours. With an average of 3.527 gph, total fuel burn was 10.42 gallons for the 500 miles! The new record bettered the Catbird's already impressive mark by 4.8%.

Gary's aircraft is capable of 180 mph TAS on just 3.2 gph. He states that if he could do it again, he would

fly faster into headwinds on the Challenge course and would probably redo his winglets with a lower drag airfoil. He would also use more of a cruise propeller than the current model.

After the successful record was set, Gary and his wife Betsy joined the CAFE Board to celebrate at a relaxing and enjoyable BBQ hosted by C.J. and Betty Stephens.

The CAFE Challenge score is computed as follows:

$$\text{Speed} \times 1.3 \times \text{MPG} \times \text{Payload} \times .6$$

The table shows what MPG would be required to tie Gary's score for aircraft of between 1 and 8 seat capacity. It should be noted that the accompanying table includes an MPG value of .5 for the Boeing 747, as necessary to tie Gary's score. Assuming 5,333 gph at 550 mph cruise with 350 people of 200 lbs. each, we estimate the actual mileage of the 747 to be roughly .1 MPG. Thus, amazing as it may seem, the professionals who are in the business of transporting people efficiently (airlines) are five times less efficient than our best small aircraft. In addition, it should be noted that the airliner could never satisfy the CAFE Challenge requirement to takeoff in less than 2000 feet of ground roll. Instead, the jumbo's runway requirements restrict it to only the largest of airports, a far cry from the usefulness of being able to land at any 2000 foot uncontrolled airport. Adding in the further time required for airport security, baggage check-in, clearances, etc. and the advantages of personal aircraft travel become even more impressive.

The CAFE Foundation hosted the CAFE 400 aircraft efficiency races for 10 years, ending with the 1990 event. Many of today's popular drag reducing ideas grew from those races. Since that time, our main efforts have been to serve EAA by developing the equipment and techniques for producing Aircraft Performance Reports (APR's) which appear here in **Sport Aviation**. The APR program is now well established and a comprehensive APR testing new wingtips, cowls and exhaust systems is underway. Meanwhile, the CAFE Challenge and Triaviathon Trophies represent the touchstone of CAFE orthodoxy. They stand as an epic legacy of CAFE racing and serve to inspire people like Gary Hertzler to raise the bar up to new heights.

Gary expressed his sincere hope

Payload	Speed	Mpg	Payload	Speed	Mpg
200.0	100.0	144.2	1000.0	100.0	54.9
200.0	150.0	85.1	1000.0	150.0	32.4
200.0	175.0	69.7	1000.0	175.0	26.5
200.0	200.0	58.6	1000.0	200.0	22.3
200.0	225.0	50.3	1000.0	225.0	19.1
200.0	250.0	43.8	1000.0	250.0	16.7
200.0	300.0	34.8	1000.0	300.0	13.2
200.0	350.0	28.3	1000.0	350.0	10.8
200.0	400.0	23.8	1000.0	400.0	9.1
200.0	450.0	20.4	1000.0	450.0	7.8
400.0	100.0	95.2	1200.0	100.0	49.2
400.0	150.0	56.2	1200.0	150.0	29.1
400.0	175.0	46.0	1200.0	175.0	23.8
400.0	200.0	38.6	1200.0	200.0	20.0
400.0	225.0	33.2	1200.0	225.0	17.2
400.0	250.0	28.9	1200.0	250.0	15.0
400.0	300.0	22.8	1200.0	300.0	11.8
400.0	350.0	18.7	1200.0	350.0	9.7
400.0	400.0	15.7	1200.0	400.0	8.1
400.0	450.0	13.5	1200.0	450.0	7.0
600.0	100.0	74.6	1400.0	100.0	44.9
600.0	150.0	44.0	1400.0	150.0	26.5
600.0	175.0	36.0	1400.0	175.0	21.7
600.0	200.0	30.3	1400.0	200.0	18.2
600.0	225.0	26.0	1400.0	225.0	15.6
600.0	250.0	22.7	1400.0	250.0	13.6
600.0	300.0	17.9	1400.0	300.0	10.8
600.0	350.0	14.6	1400.0	350.0	8.8
600.0	400.0	12.3	1400.0	400.0	7.4
600.0	450.0	10.6	1400.0	450.0	6.4
800.0	100.0	62.8	1600.0	100.0	41.4
800.0	150.0	37.1	1600.0	150.0	24.5
800.0	175.0	30.3	1600.0	175.0	20.0
800.0	200.0	25.5	1600.0	200.0	16.8
800.0	225.0	21.9	1600.0	225.0	14.4
800.0	250.0	19.1	1600.0	250.0	12.6
800.0	300.0	15.1	1600.0	300.0	9.9
800.0	350.0	12.3	1600.0	350.0	8.1
800.0	400.0	10.4	1600.0	400.0	6.8
800.0	450.0	8.9	1600.0	450.0	5.9
			Boeing 747-	80000.0	450.0 0.5

MPG required to tie the 1994 CAFE Challenge record.

that his new record would challenge others to improve upon it. The record will be sanctioned by the NAA and formally awarded on Monday evening of this year's Oshkosh Convention at the Theater in the Woods. Please come to the ceremonies and recognize Gary's world class performance.

The CAFE Foundation is extremely proud and pleased that light aircraft efficiency has again been pushed to new heights by this achievement. The world of personal air travel is thus showcased to be not only a justifiably valuable form of transportation, but one in which never ending progress is possible. We deeply appreciate the inspiration, encouragement and support that EAA has given to make this possible. For those who are planning future record assaults with other outstandingly efficient aircraft, the table above should guide your designs.