Another World's Record For Gary Hertzler

EZ Does It

Gary Hertzler (AZ) - "Ontario Approach, this is Vari-Eze N99VE, 25 miles east of Homeland VOR at 10,500 ft. Request transition to Homeland for a 180 turn."

"Vari-Eze N99VE, Ontario Approach. We've been waiting for you. Approved as requested. Will Call your turn."

Two hours down and 14 more to go I thought. All of that planning over the past 3 months is paying off. Fuel consumption and time are better than planned, the air is smooth, no significant wind, and the moon is full. Couldn't ask for better conditions. Looks like a go for the record . . .

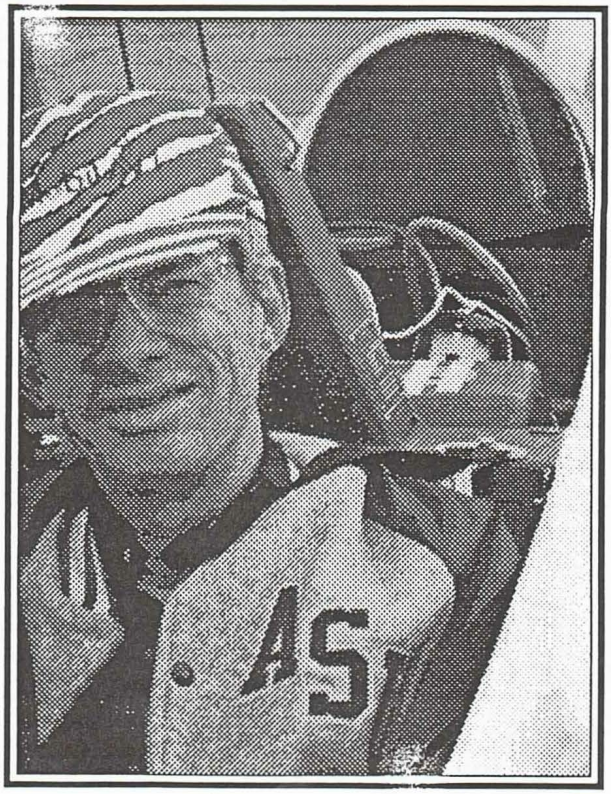
It was almost ten years ago, on the weekend of July 14 and 15, 1984, that Jeanna Yeager set the same closed course world's record for aircraft weighing between 661 and 1,102 pounds in the same aircraft, N99VE. Jeanna circled a course from Bakersfield, CA to Merced and back for a total of 8 laps and 2,428 miles. several hours later I followed up with a distance over a straight line departing Mojave, CA and flying non-stop to Martinsburg, WV, just west of Washington, DC for a total of 2,214 miles - - two records in one weekend. Turning 50 this month, and needing a mid-life crisis thing to do, nothing seemed more appropriate than to test all the improvements I have made to the plane by getting both distance records in my name.

In each of the old records, the plane averaged about 150 mph and 50 miles per gallon. Since the fully loaded take off weight was right up against the maximum of 1,102 pounds allowed for the class, my weight over Jeanna's meant that I would be carrying about 10 gallons less fuel. Aircraft improvements, since that time would have to make up the difference.

Since 1983 I have been very active in the CAFE 400 events, taking my share of trophies, like those shown in the Sport Aviation article. To be competitive with people, like Klaus Savier, in his very efficient and fast Vari-Eze and Gene Sheehan with his highly refined Q 200 prototype, took some dedicated effort to constantly modify and test, looking for every last knot of speed and efficiency.

Major changes since the original records are: addition of custom designed high compression pistons for the Continental A-65, lower drag wheel pants replacing the original "football" shaped pants, an Ellison throttle body injection carburetor, a modified oil tank and induction system to accommodate a low drag cowl, and an electronic ignition, supplied by Light Speed Engineering with manifold pressure regulated spark advance.

An exhausted "smile" after almost 16 hours in the air.



Getting Ready

After I finish a typical modification, I try to gauge how much effort was expended for the speed gained; some mods are more successful than others. The wheel pants are perhaps the highest payoff of any mod to date, adding about 5 knots to my top speed. The pants are carved from a single block of foam with a top planform using a 65-025 symmetrical airfoil. The side view is driven by the requirement for a constant pressure distribution at each station down the pant.

To achieve this, the angle that the top and the bottom of the pant make with the waterline is the same as the angle that the left and right side make with the line of flight. All of the flow lines appear laminar, traveling straight aft without curling back. A plug and female mold were made, on which two layers of glass were laid up. The finished weight was about 1.5 pounds per pant.

The original A-65 was designed with 6.5:1 compression in the days when general aviation fuel over 80 octane wasn't readily available. It is well known that the thermodynamic efficiency of a piston engine increases as a function of compression ratio. After several iterations (some not so sucessful) I designed and had constructed, by a custom automotive piston manufacturer, a set of forged 9.0:1 compression ratio pistons. I also installed a set of modern technology automotive rings with a 3 piece oil control ring

and a Total Seal gapless 2nd compression ring. As a result, I average about 25 hours per quart of oil and have very low idle manifold vacuum reading of about 7 inches. Crankcase blow-by is almost non-existent.

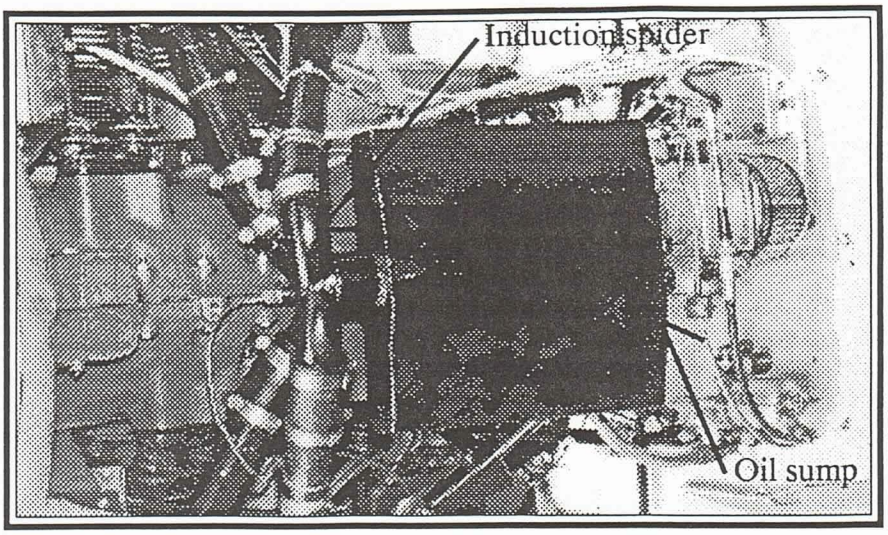
The Ellison throttle body injection unit has become a familiar piece of equipment in the homebuilding community. The ability to lean much beyond a conventional carburetor, and still run smoothly, gives nearly a 10% savings in fuel consumption.

The Ellison is mounted horizontally in front of the oil tank to allow the installation of a low profile cowl. The induction tube passes through the tank and exits at the distribution spider *(see top photo)*. The induction air heating lowers volumetric efficiency somewhat thus reducing maximum power, but provides a longer mixing length to give better fuel distribution prior to reaching the spider. Since efficiency is the primary goal, the trade off was worth it. Also an added benefit of oil cooling eliminates the need for an oil cooler.

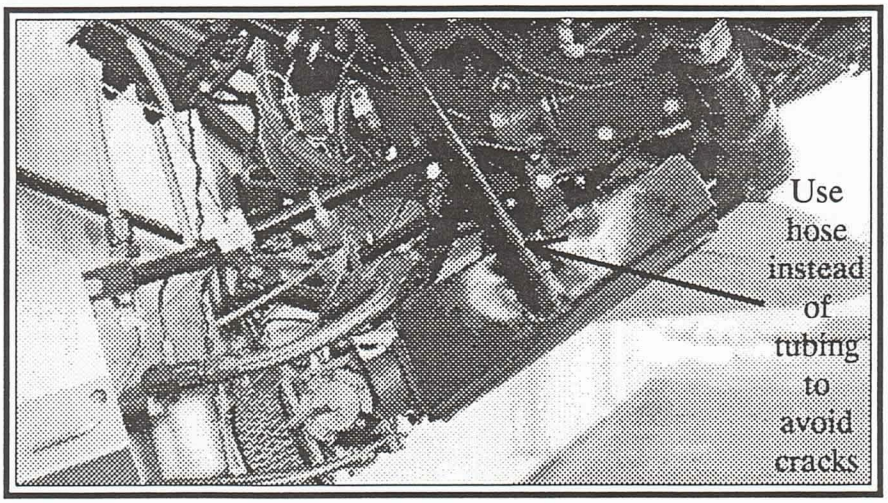
Over the years, I have had three different engine cooling systems on the airframe. When originally built, being convinced that Burt's way was the only way, I installed the conventional EZ pitot cooling scoop.

Since that time, I have had the flush NACA scoop, and now the "arm pit"scoops. The arm pit scoops show a slight advantage over the flush scoops, but this is one of those modifications where the speed increase per hours spent is very poor. The place where this modification is a real winner is in the way it looks and how it cools the engine. Head temperatures in cruise are in the 260-280 F range. Many other aerodynamic cleanup changes that contribute to overall efficiency, can be classified as attention to detail, such as fairings and leak sealing.

The standard magneto is designed with fixed timing to give detonation-free operation during worst case operation (maximum power, hot day sea level condition). At high altitude, where conditions are cool and power is reduced, the optimum ignition timing is considerably advanced to account for a much slower flame travel within the combustion chamber. The light weight electronic ignition, supplied by Light Speed Engineering, replaces one of the magnetos with an electronic processor and a set of ignition coils. The system senses manifold vacuum and adjusts spark advance up to a maximum of 17 degrees above the nominal setting. The effect of this advance is dramatically illustrated at altitude by noting a 50 RPM drop when switching from the full advanced setting of 43 degrees back to the nominal setting of 26 degrees.



Long straight mixing induction tube goes through oil sump



Clean bottom cowl lines are the resultant of a great deal of engineering and modification.

All of these efforts to increase efficiency have also paid off in speed. When first constructed, the plane would not quite reach 180 mph. Recently, at an EZ racing event held at Wendover, NV over the Bonneville Salt Flats, the airplane turned 204 mph on a 125 mile triangular course. Not bad for a two-place plane with 170 cubic inch displacement engine at 7,000 ft density altitude.

Flying the Record

I had not given much thought to going after a second record and was even unsure that the aircraft had the capability of breaking the existing record until I received encouragement from Dick Rutan at this past year's Oshkosh event.

On the trip home I started doing some serious data taking. Calculations confirmed that, indeed, the aircraft had the range necessary to beat the old record if the empty weight had ot crept up over the years. To my surprise, my attention to weight additions had paid off. The empty weight, with auxiliary fuel tank installed, was about 10 pounds more than at the time of the previous record attempt. This gain more than accounted for all those "essentials" such as LORAN and autopilot.

Next I contacted Art Greenfield of the NAA and received all the forms necessary to sanction and certify a World's Record. Turnpoint verification can be accomplished by either a NAA certified observer of the FAA. I chose the FAA route and contacted the Approach Control people at both Phoenix and Ontario, CA. Both groups were delightful to work with and anxious to help in any way they could.

The NAA, US certifying authority for the Federation Aeronautique Internationale (FAI), requires that a NAA observer must witness the aircraft weighing, barograph installation, gas tank sealing, takeoff, and landing. Klaus Savier, NAA member and present record holder for the 1000 and 2000 kilometer speed record in his Vari-Eze, filled the requirements for a qualified observer.

Planning for the right time takes a little bit of common sense and a lot of luck. Since part of the flight occurs at night, I wanted the moon to be as full as possible in case an off-airport landing would be necessary. On the weekend of October 30/31 the moon was at its full brightness. The closed course turn points of Chandler, AZ and Homeland VOR on the eastern edge of the LA basin were chosen for the low altitude terrain and the safety of paralleling Interstate 10 the entire route.

As the departure time approached, the Santa Anna conditions which fanned the fires in the LA area were developing. The airplane gods were smiling, however, and what was forecast to be peak wind conditions all weekend actually varied from light and variable to 10 knots from the south at altitude.

Klaus flew to Phoenix in mid-afternoon on Saturday the 30th to help in final preparations of the airplane. We fueled up, less an anticipated 4 gallons and parked the plane. I went home to try to get some sleep. After a largely unsuccessful attempt to rest, I dressed with ski pants, down booties, and a warm coat. Leroy Castle, local EAA member and keeper of the Arizona EAA Council platform scales showed up at the airport at about 9 PM.

TURN POINT	ELAPSED TIME(HR)	LEG TIME(HR)	LEG MPH	FUEL BURN(GAL)	LEG FUEL BURN(GAL)	LEG BURN RATE(GPH)	LEG MPG
P10							
	1:57	1:57	159.5	6.3	6.30	3.23	49.38
HDF							
	3:59	2:02	153.0	11.65	5.35	2.63	58.14
P10							
	5:59	2:00	155.5	16.75	5.10	2.55	61.00
HDF							
	7:58	1:59	156.8	21.87	5.12	2.58	60.76
P10							
	9:58	2:00	155.5	27.12	5.25	2.63	59.25
HDF							
	11:57	1:59	156.8	32.09	4.97	2.51	62.59
P10							
	13:57	2:00	155.5	37.22	5.13	2.57	60.64
HDF							
	15:50	1:53	165.2	42.49	5.27	2.80	59.03
P10							

SUMMARY:

ELAPSED TIME(HR):	15:50
AVERAGE MPH:	157.1
TOTAL FUEL BURN(GAL):	42.49
AVERAGE GAL/HR:	2.68
AVERAGE MPG:	58.55

P10=CHANDLER, AZ.
HDF=HOMELAND VOR
LEG LENGTH=311 STATUTE MILES
TOTAL LENGTH=2488 STATUTE MILES

After rolling N99VE onto the scales, I climbed in with all needed equipment. Fuel was added to bring total weight up to the 1,102 pound class limit before Klaus sealed the tanks. Total fuel was calculated to be 49.3 gallons. My conservative "how-goes-it" chart said that I would need 48 gallons to make four laps of the predetermined course for the record. At 10:50 PM I departed into the night for Homeland VOR. The rest is history. The plan went off without a hitch. Fuel flows, engine temperatures and all the electronics worked flawlessly. At each turn point, I beat my anticipated times, speeds, and fuel flows. Taking data with a calibrated fuel flow meter at each point, I generated the previous page's summary:

After all the concern for adequate margin, I landed with almost 7 gallons of fuel on board or almost 400 additional miles possible. At this writing all of the paperwork has been submitted for final NAA and FAI approval.

The CAFE Challenge formula, as explained in Brian Seeley's October 93 Sport Aviation article, measures an aircraft's ability to carry a payload over a 500 mile out and back course in a fast and fuel efficient manner. Although the requirement to climb to 10,000 feet within 25 miles of the takeoff point limits participation to aircraft with higher power loading, I calculated my score using the first and last leg from the above data. The resulting score of 146 compares favorably to the benchmark score of 131 set in the Catbird earlier this year.

What next? Well, I may try to better my existing, but somewhat vulnerable 1984 straight line record. I know that, with favorable wind conditions, a distance of over 3,000 miles is possible. Also, I have a freshly overhauled O-235 Lycoming sitting on the work bench ready for installation. Speed records ???

The Central States Newsletter has done an excellent job of informing the EZ builders and flyers about modifications that have met with some success. However, **we must realize that when we deviate from the original prototype, we are incurring a degree of risk.** Not all of the changes which I have done over the years have been successful.

Twice, **I have had forced landings** because of experimentation; once with a siezed engine caused by insufficient piston clearance and the other with a controllable pitch prop with a failed pitch change mechanism. When you elect to make modification to your aircraft be sure that the change away from the plans is well proven by others or that you are a competent designer and have thoroughly studied all the possible ramifications.

Poor Workmanship

Editor note: Robert and Valerie Harris have purchased several Ezes to rebuild and resell. They have seen some things that should not be. Do you know of airplanes like these? We must guard against such sloppy workmanship ever leaving the garage lest we lose the unique Experimental certification procedure we have in this country.

Robert Harris (TN) - We had two Vari-Ezes this year and just purchased two Long-EZs and a Cozy this fall. One thing you might pass on to our members relates to workmanship and quality control.

The last three Vari-Ezes we owned all had under balanced ailerons. One of them, with 100 hours TT, had the canard incidence set at six degrees nose up. We blew the engine on the first flight, however, the landing was uneventful. Valerie said the gray hairs caused by that airplane make me look more distinguished.

For Sale

Male inlet for Long-EZ - $25. Complete set of Brock landing brake linkage (all LB 1-21 parts) - $75.

Larry Danner
407-288-2117

Snap Roll in an EZ??

Jimmie Hays (AZ) - During the third test flight I had a most interesting experience. I couldn't get my landing gear to extend after a pressure switch failure which disabled my electro-hydraulic system. I was able to gravity drop the mains but the nose gear failed to extend fully.

I left the pattern with the idea of trying some G's to get the nose gear down. Knowing that too much speed would keep the nose gear from fully extending, I slowed to 80-90 knots and pulled the stick back fairly sharply - - make that **WAY WAY !!** too sharply.

In a heartbeat the airplane was over the top in a snap roll left. I completed the roll and found, somewhere along the way, I had lost elevator feel. I pushed the nose down and, finally after two eternities, started to get elevator feel back. I very gently recovered to level flight.

This maneuver does prove to be another way to get a reluctant nose gear down and locked. Please be assured the next time I use it though, I'll certainly have a lot more altitude than I did on this occasion. I did not have vortilons installed during this little episode, contrary to the absolute insistence of the designer that the aircraft not be flown without them.

Of course, I now have vortilons firmly in place, triple redundant switching of the down side of the electro-hydraulic system, and the airplane is finally clean again.

Y'all be careful.
See you at **KCGIG 94.**