

Le-Speed Modifications

Bob Eckes (AZ) - I have been asked many times what I did to my Long-EZ to make it a R.A.C.E. winner. The only secret is I started with an incredibly straight and beautiful airplane. George Nopper did a meticulous job in building this Oshkosh Grand Champion airplane exactly to plans. For a full description see the November 1990 issue of Sport Aviation.

It all started back in 1990 when I attended the Wendover 1990 R.A.C.E. event. This was my first race in the Long-EZ. The aircraft was turning a Warnke propeller and streaked around the course at 179.25 MPH. This speed was somewhat of a shock to me for I envisioned something a little more exciting. The next year, turning a Ted Hendrickson propeller, the Long recorded 182.9 MPH. A little improvement, but drastic changes were needed. I started by learning what made the big boy's airplanes so fast. I listened to Gary Hertzler, Klaus Savier, Charlie Airesman, Mike Stolle, and anyone that had something to say about speed. Also I became an enthusiastic reader of the Central States Association newsletter. In the fall of 1995 I started on the modifications which took most of the 1996 race season to complete.

The now famous Jackpot saying, "When the Flag Drops the Bull Shit Stops" predicated a need for the improved instrumentation. It is nice to have some confidence in the numbers when hanger talking. Besides, I mistakenly thought I wanted to know the "airspeed increase per dollar" ratio. Without good instrumentation my numbers would be just more BS.

The Long was already equipped with a Rocky Mountain Instruments microENCODER. This amazing instrument combines a mode C altitude encoder with a graphic/digital vertical velocity indicator, digital airspeed indicator, sensitive altimeter, and outside air temperature. At the touch of a switch you get true airspeed, den-

sity altitude, pressure altitude, and true air temperature. See April 1991 Sport Aviation. To round out the instrumentation package, I added an Equus digital tachometer as per Gary Hertzler's suggestion in July 1993 Central States.

The flight tests consisted of three runs in smooth early morning air at 8,500 feet density altitude. The runs were over 10 miles long, allowing time for the airspeed and RPM to stabilize.

The Long-EZ started life in July 86 with a Lycoming O235-L2C, male intake scoop, to plans carburetor induction, 5X5:00-5 tires with Aircraft Spruce wheel pants, Brock exhausts, Warnke propeller which was later changed to the Ted Hendrickson 62X66 propeller, three inch propeller extension, Aircraft Spruce spinner, and ACS/Task cowls.

Modifications

Pistons: "F" pistons replaced the "L" pistons. This increased the compression from 8.0/1 to 9.5/1. I did not get the benchmarks for this modification, but considering the expense and effort I would definitely not do this again. I should have put the money and effort toward an O320 installation.

Carburetor Air Induction: The Rutan plans induction system was replaced by a Dave Ronnenberg ram air box sold by Hal Hunt. This accounted for the biggest increase in speed (seven knots), was easy to do, and relative inexpensive. However, there is a down side to my ram air induction. I get carburetor ice at cruise settings in all but the driest air. This includes air with no visible moisture. Fortunately I have an optical ice detector. I am forced to use carburetor heat during most flights. The light comes on, I pull the carburetor heat lever for about 10 sec, the light goes out and the sequence starts over a few minutes later. Yes, the engine does quit if I ignore the carburetor ice light. If anyone has a suggestion I would like to hear about it.

Exhausts: The Brock exhausts were replaced with the Hal Hunt internal four-pipe system. No glasswork was required. This modification was easy to do, but I was disappointed in the performance.

Spinner: The original Aircraft Spruce spinner was sitting on the hanger floor for the above modifications. I replaced it and noted a marginal airspeed increase. You should leave it off unless you are racing or you like the esthetics of a spinner. It is a lot easier to check prop bolt torque when the bolts are looking at you.

Propeller Extension: The original three inch extension was replaced with a six inch extension. The thought was to increase the distance between the propeller and the cowl.

Wheel Pants: I removed the large wheel pants and replaced the 5X5.00-5 tires with the 11X4:00-5 lamb tires. The aircraft was flown to determine the speed without wheel pants. Afterwards, I installed a set of medium size Light Speed Engineering wheel pants. This netted a 10 knot increase. The change from the larger wheel pants and tires to the smaller size resulted in a 4 knot increase.

Propeller: One weekend Gary Hertzler and I carved on the Ted Hendrickson propeller. The objective was to increase the pitch to lower the engine speed and hopefully not hurt the aircraft performance. The propeller was carved to increase the pitch and thin the profile. Two plies of UND graphite were added to both the face and back. They crossed each other at 30 degrees to the span line and each blade's cloth overlap at the hub. Our efforts netted a 70 RPM decrease in engine speed and one knot increase in aircraft speed. We increased the pitch from 66 to 71 inches. We were trying for a larger decrease in RPM but this was under shot because we were too conservative.

Desired Future Speed Improvements

letter has touched on many ideas to increase speed. Of those, the ones I would like to incorporate in my Long include: an engine change to an IO320, an NACA scoop with a boat tail or the Gary Hertzler arm pit scoop modification, and a streamlined top cowl.

Conclusion

Use my test results only as an indication of what may be achieved in each case. Some of the improvements were so small it is impossible to be absolute. What is real is the improvement in the R.A.C.E. results. The combined changes resulted in a 26

mile per hour speed increase. My first race speed of 179.25 MPH at Wendover increased to 205.33 MPH at Wickenburg. It was also rewarding to receive the 1996 R.A.C.E. High Points plaque for the Long-EZ category. I trust this information may be of benefit and remember it only takes time and money.

Date	knots	mph	RPM	Comments
02/28/96	156	179.65	2,930 2,430 static	Stock Long-EZ, Lycoming 0235-L2C with "F" pistons and Hendrickson 62X66 Prop
04/09/96	163	187.71	3,010 2,520 static	Rutan carb induction replaced with the Ronnenberg ram air box.
05/16/96	165	190.01	3,030 2,590 static	Replaced the Brock Exhausts with the Hal Hunt internal four pipe system.
05/17/96	166	191.17	3,050	Installed a spinner.
05/18/96	166	191.17	3,050 2,550 static	Removed the spinner. Replaced the 3" prop extension with a 6" prop extension.
05/19/96	168	193.47	3,070	Replaced the spinner.
06/02/96	162	186.56	3,040	Removed the wheel pants and replaced the 5X5:00-5 tires with 11X4:00-5 lamb tires.
06/18/96	172	198.08	3,110	Installed Light Speed Engineering wheel pants.
07/02/96	173	199.23	3,040	Re-pitched the propeller.

LONG-EZ N-2X R.A.C.E. Results

Date	knots	mph	Race	Parts For Sale
1990	156	179.25	Wendover	12v Presto-lite starter (new) any reasonable offer, removed from O-235.
04/06/96	164	189.15	Kilo Trials	Heated pitot tubes 12v, (new) \$75 each (I have 3)
05/26/96	163	187.86	Kanab	T&B indicator Allen, 12V (new) \$175.
07/06/96	172	197.80	Jackpot	LORAN, Micrologic ML-6500 best offer.
09/01/96	172	198.10	Mesquite	
10/06/96	178	205.33	Wickenburg	Bill French 173 Ridge Rd Marlboro, NY 914-236-3683
11/30/96	179	206.58	Kilo Trials	

Maryland State Representative

Howard Caulk has generously offered to become the first Maryland state representative for Central States Association. He can be reached at 410-385-2042 or howard@sclrules.com Howard is building chapter 11 of a Long-EZ.

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Book Review

Ian Huss - (CO) I just finished Carroll Smith's "Nuts and Bolts and Plumbing" book. It is a MUST READ for any homebuilder. Available from: Steve Smith Aero Sport 714-639-7681.

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