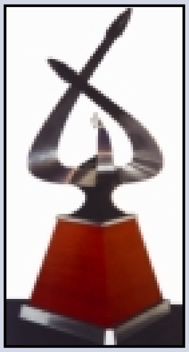
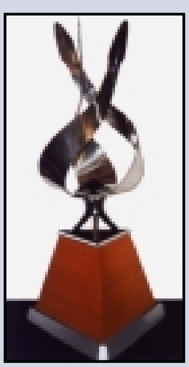


TRIAVIATHON TROPHY

CHALLENGE TROPHY



CAFE FOUNDATION

AIRCRAFT PERFORMANCE REPORT

Sponsored and Funded by the Experimental Aircraft Association and the Federal Aviation Administration

Legend

BY BRIEN A. SEELEY, C.J. STEPHENS AND THE CAFE BOARD

This report documents the extremely high performance capability of a new prototype aircraft, the Legend. It is an all composite, 500 hp V-8 powered kitplane. Jeff Ackland, the builder of this aircraft and President of Performance Aircraft in Olathe, Kansas, brought the prototype Legend to the CAFE Foundation flight test facility primarily for the purpose of setting a new all-time high score in the CAFE Triaviathon. However, he also prepared the aircraft with the necessary equipment for a complete Aircraft Performance Report.

The Legend's visit to Santa Rosa served as the stimulus for a world-class gathering of engine experts at the CAFE Foundation's Reno Air Racing Engine Symposium on March 22, the same day the Legend flew for the Triaviathon record. The engine meeting is reported elsewhere in Sport Aviation.

The Legend is built from molded composite sandwich skins using graphite facings and nomex honeycomb core. It's engine is a 620 cubic inch Donovan "high deck" aluminum block, fuel injected derivative of the big block Chevrolet. It uses steel cylinder sleeves, four-bolt main bearings and Brodick single-plug cylinder heads.

The propeller turns at 1/2 engine speed through a Hy-Vo 2"wide, chain-driven speed reduction unit designed by Fred Geschwender. An excellent summary of the development of the Legend appeared in the October 1996 issue of Sport Aviation.

For the future, Jeff plans to standardize the Legend on a 541 cubic inch Donovan block Chevy-based V-8 with a shorter stroke crankshaft than that in the prototype N620L. It is possible that the new en-

Triaviathon Flight Data	Average R.O.C.	Vmax	Stall	Score
Legend N620L	3310.4	313.4	70.1	1071
Legend N620L	3341.2	310.5	68.6	1153
Legend N620L	3331.5	319.6	69.6	1158
Harmon Rocket II	3330.2	244.8	56.4	1316

Triaviathon Flight Data. Legend N620L, 29.27' span, 2700 lb. takeoff weight.

gine will use a different cylinder head which may include dual spark plugs.

TRIAVIATHON FLIGHTS

Jeff Ackland performed his Triaviathon record attempts solo with reduced fuel to improve the climb and stall speed performance. The current record score of 1316 was set by John Harmon in the Harmon Rocket II on May 8, 1993. The table shows how the Legend performed.

The Triaviathon scoring formula is:

$$\text{Score} = \frac{28110625 \times [\text{Vmax} \times \text{ROC}]^2}{[4100625 + \text{Vso}^4] \times 10^9}$$

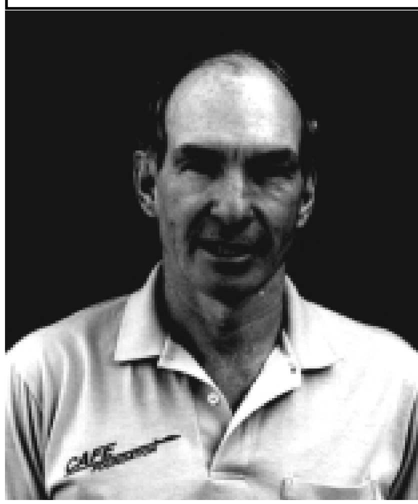
This formula rewards aircraft which combine a high maximum speed, a rapid rate of climb and a low stall speed. It is a curve fit in which stall speeds between 35 and 70 mph are rewarded somewhat proportionately. Stalls below 35 mph do little to improve the score and stalls above 70 mph impose a progressively stiffer penalty upon the score. The measured rate of climb is converted to be that for the altitude window of 2500'-3500' in standard day atmosphere.

It is remarkable that the Legend's stall speed is so low. Only 1300 prop RPM were used during these stalls, which were approached at 1 G. The flap system and Viken airfoil on the Legend are apparently delivering exceptionally high lift at low speed.

Although the Legend did not break John Harmon's CAFE Triaviathon record, the computations show that the Legend could break the record with only minor improvements. Jeff Ackland said that he hopes to soon have a new supercharged 800 horsepower engine installed for another assault on the record.

Jeff has plans to race the N620L at the Reno National Championship Air Races in September 1997.

The Legend's big block V-8 and SRU are packaged in a snug and sturdy cowl which removes relatively easily.



FLYING QUALITIES REPORT

by

C. J. STEPHENS
CAFE Foundation Test Pilot

A 'Legend' In Its Own Time

By the time the Legend arrived at the CAFE Foundation's test facility in Santa Rosa, rumors about its upcoming Trivathon record attempt had been circulating at the airport for several days. This was exciting.

At first look, it was apparent that the Legend designer had done a beautiful job of making a good looking ship with clean lines.

The 620 cubic inch aluminum block V-8 under the cowl made a throaty sound with its short stacks protruding directly from each cylinder. The sound reminded me of the Merlin engine that hangs on the front of the famous P-51 Mustang.

Most of the planes tested by the CAFE Foundation have had conventional aircraft engines. This has lent a lot of commonality from one test airplane to the next. It also has given me confidence, as the test pilot, to fly behind conventional engines that have proven to be reliable in many years operation. Because the Legend uses a unconventional V-8 engine, I was very attentive during all of Jeff's briefings regarding each feature of this airplane. There were a number of unfamiliar systems that had to be studied and related to one another.

GENERAL IMPRESSIONS

The landing gear system and the wing design (with the exception of the airfoil) were similar to the Glasair III design which was the subject of our last report (see Sport Aviation Feb. '97). The tires and brakes were slightly larger (6.5"x6") than those of the Glasair III. The tricycle landing gear was powered hydraulically and the flap operation was by electric motor. With the propeller length necessitating long landing gear legs, a large step up onto the wing was required to gain access to the cockpit without stepping on the flap. A no-skid step area was conveniently located on the wing root.

The large clamshell canopy fits perfectly flush to the outer surfaces of the fuselage. Gas shock struts hold the canopy in the open position for easy cockpit entry. During all engine running operations it is necessary to either manually hold the canopy nearly closed or to completely close and lock it to prevent damage caused by the significant propeller wash.

COCKPIT IMPRESSIONS

The Legend is a two place craft with a tandem seating arrangement. This puts the pilot in middle of the cockpit with an equal field of view over each side of the cowling. Both the front and rear seats have adequate shoulder room and lots of elbow room, giving an overall feeling of spaciousness. One CAFE member who is 6’3” fit comfortably into the rear seat with his knees just touching the forward seatback.

The cockpit layout was beautiful, with a conventional throttle quadrant on the left in a very natural location. Instruments were only installed in the front cockpit; however many of the instruments could be read while sitting in the rear seat. Rudder pedals were fairly standard, with toe brakes which lacked a provision for leg length adjustment.

I felt that the mixture control was a little too sensitive and required too little movement to achieve the required settings. The fuel system included a panel-mounted fuel shut-off knob. Dual boost pumps were used during all operations below 1,000’, with each pump connected to a separate battery. Above 1,000’ it was acceptable to operate with only one boost pump. There was no mechanical fuel pump and the engine would die quickly if both boost pumps were turned off. There was a fuel flow measuring system which automatically subtracted the fuel burned from the total fuel amount, which the pilot could set before engine start. By our measurements it provided better than 0.7% accuracy for fuel flow. The panel-mounted analog fuel gauge would only read approximate fuel status and then only when the fuel remaining was below the top of the sensor (about 2/3 tank remaining).

The ignition system was interesting in that it used dual batteries and inductive pickups, but only a single distributor. There was a single spark plug installed in each cylinder. No flop tubes were installed for inverted flight.

ENGINE START

The plane started quickly after minimal priming. It had to be started with the boost pump off (to prevent overpriming) , but the pump then had to be turned on immediately after start to prevent fuel starvation. After a couple of starts the procedure proved to be manageable. After about four minutes the engine was warm enough to complete the preflight run up. The tachometer displayed the engine crankshaft RPM, rather than propeller RPM. Simple arithmetic would compute the propeller RPM as one half the engine speed, given the speed reduction ratio of 2 to 1. During run-up, both ignitions and both boost pumps were independently checked for function on each battery position at 2,000 RPM. This important step to insure maximum redundancy of these critical systems was emphasized in my briefing on the aircraft’s operation. The propeller was cycled at 2,500 engine RPM using very conventional methods.

GROUND OPERATIONS

Even with full tanks, the plane can be moved about on the ground by one person using a tow bar connected to the nose wheel. Refueling of the single fuel tank can be done through either fuel cap located near the wing tips. Since the airplane is mostly carbon fiber, adequate static discharge grounding can be accomplished by connecting the grounding wire to the nose wheel strut. During taxi operations the castering nose wheel worked very well with only light braking required for directional control. The tricycle gear afforded a good view of the pavement ahead.

TAKEOFF

Everything checked perfectly at run up and the flaps were visually set to approximately 15 degrees. The plane was taxied into position for takeoff. As the throttle was advanced, the hefty V-8 sounded like the throaty purr of a big racing boat or a Merlin engine. With one last scan of the engine gauges, the brakes were released and the throttle was advanced to the forward stop. The sensation was exhilarating as the 500 hp engine accelerated the plane down the runway like a high performance Corvette. Only slight right rudder was required to keep the nose wheel tracking straight down the center line of the runway. As the airspeed approached 90 MPH, slight backward stick pressure was applied and the plane lifted off smoothly at 95 MPH. Gear and flap retraction were normal with only

Using an automotive timing light to set the ignition timing was a windy job when the full amount of centrifugal advance was being measured.


LARRY FORD

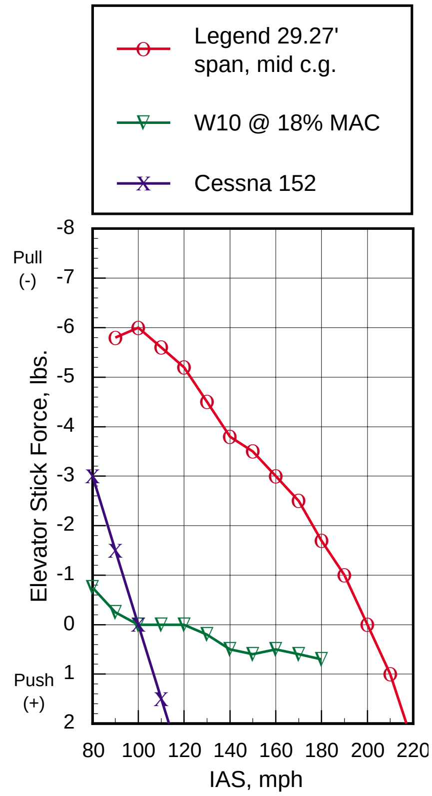
slight rocking of the wings as I adjusted my hand to the sensitivity of the ailerons. The airspeed rapidly increased to and stabilized at 160 MPH for the climb.

WATER COOLING

It was necessary to use somewhat unconventional cockpit procedures for proper operation of the Legend's water cooled V-8 engine. The radiator was evidently sized very well for this application. Both the oil and engine coolant circulate through the radiator for cooling; therefore, coolant door operation directly affects the temperature of both fluids. We did not evaluate any long duration ground runs, but all normal ground operations had plenty of cooling available. During the takeoff, climb, and all high-powered flight regimes the cooling door was left in the open position and both the oil and coolant temperatures remained normal (Water: 180° F/Oil: 210° F).

Upon leveling off at a cruise power setting, the coolant door could be closed and temperatures remained normal. On the brief full power Vmax run with the coolant door closed (minimum drag) the temperature began to rise but recovered as soon as the 5 minute run was complete and door was opened. The door had to be activated manually. I think that the door's operation should be automatic. While no intermediate door position indicator was available, there were limit lights that indicated when the door was fully open and fully closed. An emergency "T" handle was provided to release the door to trail freely in the event the electric drive motor failed. During cruise and descent the door was left in the closed position. It was opened in the traffic pattern to anticipate any event in which a high power setting would be needed. With the door open a very slight aerodynamic vibration could be felt throughout the airframe.

At first I felt that the time required to monitor and operate the engine cooling system caused an excessive added work load for the pilot. As I got more used to the systems that level of distraction was reduced. With practice, or on flights that had fewer speed and power changes, the pilot workload would be tolerable.



Static longitudinal stability
trimmed hands-off at Va

STATIC LONGITUDINAL STABILITY

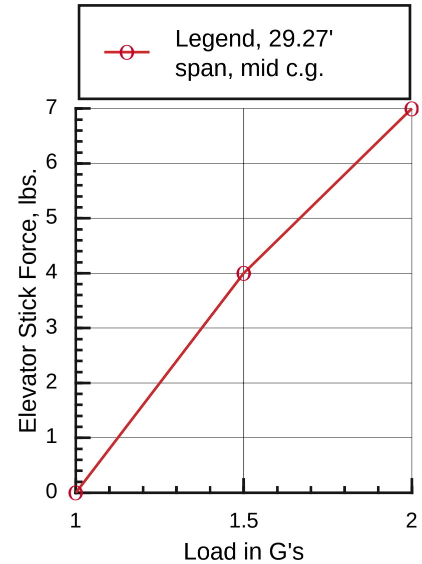
The airplane was trimmed to an estimated Va of 200 mph IAS and stick force measurements were taken over the full range of normal airspeeds at each 10mph increment without retrimming. The graph indicates the findings and shows the relationship to other airplanes tested at the CAFE Foundation facility. A hand-held stick force gauge was used for these measurements.

DYNAMIC LONGITUDINAL STABILITY

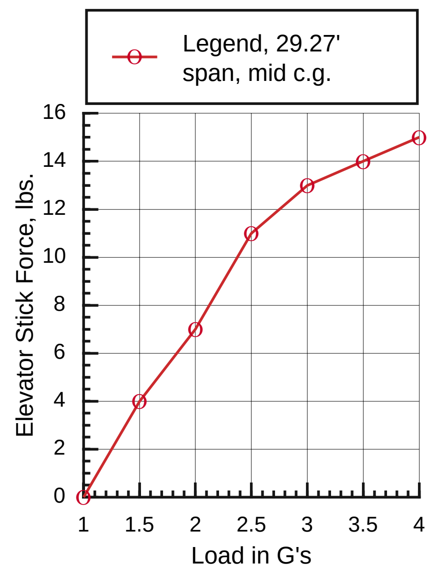
Pitch doublets were introduced at several representative airspeeds. The damping qualities were then observed using both stick-fixed and stick-free situations. The dynamic stability qualities of the Legend were excellent in every mode sampled.

MANEUVERING STABILITY

The aft stick forces were measured at 200 mph in the clean configuration and at 120 mph in landing configuration. The results are shown graphically. The control feedback felt wonderful. There was a natural har-



Maneuvering stability, 120 mph IAS
gear and flaps down



Maneuvering stability, 200 mph IAS
gear and flaps down

mony in the blending of the controls in all axes. With the light roll forces and relatively heavy elevator forces, there is a nice sense of high maneuverability without the fear of inadvertently tearing the wings off.

ROLL RATES

The roll rates were exceptionally high in the Legend. The feel was light and roll response was crisp and immediate. The table shows the measured rate of roll at the two airspeeds tested. It must be kept in mind that this method of measurement includes the

Level Flight Data	Mode	A/C Weight	IAS baro	TAS baro	Pres. alt.	OAT °F	Dens. alt.	M.P.	Prop RPM	Gph	BHP	%Power	Speed, mph
Legend	Vmax/12K	2882.0	241.1	296.5	11945.5	40.7	13510	20.0	2178	30.0	335.0	67.0	300.4
N620L	55%/12K	2901.0	236.5	289.9	11780.5	40.7	13308	20.0	1870	24.3	275.0	55.0	294.3
airspeeds	75%/8K	2849.0	263.9	305.1	7889.9	57.7	9619	23.7	2174	34.7	375.0	75.0	310.5
corrected	65%/8K	2831.0	252.6	292.0	7943.9	56.5	9611	22.8	1885	29.9	325.0	65.0	297.5
for drag	55%/8K	2822.0	243.1	280.9	7968.9	55.8	9594	21.4	1788	25.4	275.0	55.0	286.2
due to the	Vtouring/6K	2798.0	170.6	190.0	6045.5	55.2	~6900	14.0	1700	14.5	165.0	33.0	192.2
barograph.	Vx/6K	2811.0	115.5	128.0	5905.6	52.7	~6700	10.5	1622	9.2	104.0	21.0	na
****these**	Vmax/6K**	2701.0	274.4	307.3	5983.7	62.2	7574	w.o.t.	2178	37.1	420.0	84.0	313.0
settings are	Vmax/6K**	2690.0	272.1	304.4	5937.9	62.0	7506	w.o.t.	2178	37.1	420.0	84.0	309.9
estimates at	Vmax/6K**	2708.0	279.4	313.4	5931.6	65.0	7683	w.o.t.	2178	37.1	420.0	84.0	319.6
6000' @													

acceleration time to start the roll as well as the 120 degree change of bank angle. In addition, these tests were performed at gross weight with full fuel and using the extended wingtips. Jeff Ackland states that his measurements have shown roll rates with the short wing to be nearly double those of the long wing.

The stick forces were measured in roll and showed 15 lb to achieve full aileron travel at 200 mph and 10 lb at 130 mph.

ROLL RATE, degrees/second, includes input time		
Speed, IAS	Va	1.3 Vso
RV-6A	80	36
Cessna 152	47	34
Glasair III, 27' span	75 Rt./ 67 Lt.	52 Rt./ 60 Lt.
Legend, 29.27' span	120	75 Rt./ 85 Lt.**

** At 120 mph IAS

SPIRAL STABILITY

There was a very nice flight control trim system in each of the three axes. The pitch trim system has a trim tab and was very effective by use of the hat switch on the control stick. The aileron trim was accomplished with a spring system in the aileron linkage. At speeds above 180 mph this trim system was inadequate in providing enough force to fully trim the airplane in roll. Performance Aircraft has plans to change the installation to use a trim tab. The tab system has a greater advantage because as the airspeed increases the force also increases, whereas the spring force is constant across the full airspeed range. The tab system, however, must be designed to tolerate athis aircraft's high speeds without exciting aileron flutter.

ROLL DUE TO YAW

The Legend demonstrated a moderate tendency for roll due to yaw. Wing leveling could be accomplished from 30 degrees of bank in either direction with rudder alone. The tendency for the airplane to follow any banking with rudder input was examined by slowly inputting rudder and observing the bank required to keep the aircraft on a constant heading. At 200 mph with full right rudder input, 22 degrees of bank was required and with full left rudder, only 15 degrees of bank. At

CJ Stephenas and Jeff Ackland ---Slide enclosed. All photo credits are Larry Ford

Show slide of belly of the Legend--enclosed. All photo credits are Larry Ford.

LEGEND, N620L

Estimated Cost: $155,000 total cost including materials, engine, prop, interior, instruments and radios.
Hours to build: 2500 incl.
Completion date: June 19, 1996

SPECIFICATIONS

Empty wt/gross wt, 29.27'span	2308 lb/3300 lb with oil
Payload, full fuel	572 lb
Useful load	992 lb
ENGINE:	
Engine make, model	Chevrolet-based GIV8-620
Engine horsepower	500 BHP
Engine TBO	1000 hr
Engine RPM, maximum	4500 RPM
Man. Pressure, maximum	30 in Hg
Turbine inlet, maximum	na
Coolant temp., maximum	230° F
Oil pressure range	25-100 psi
Oil temp., maximum	245° F
Fuel pressure range, pump inlet	20-90 psi, 30 psi for idle
Weight of prop/spinner/crank	130
Induction system	fuel injection
Induction inlet area	11.2 sq in
Exhaust system	2" O.D. ss, 14" long individual stacks x 8
Oil capacity, type	14 qt. 20-50 automotive racing
Ignition system	dual electronic, single plugs and distributor
Cooling system	liquid, aluminum heat exchanger
Cooling inlet area	111 sq in, radiator + 6.2 sq in engine accessories
Cooling outlet area	variable
PROPELLER:	constant speed
Make	Hartzell HC-B3TN-2EX, 3 blades
Material	steel hub, aluminum blades
Diameter	91 in, 3 blades
Prop extension, length	integral to hub, standard hub
Prop ground clearance, full fuel	7.0 in
Spinner diameter	20 in
Electrical system	60 amp alternator, dual batteries
Fuel system	1 tank in wing, dual elect. pumps
Fuel type	100LL
Fuel capacity	70 gal
Fuel unusable	na
Braking system	Cleveland discs
Flight control system	push-pull rod aileron + elev, rud by cable, elec. flap
Hydraulic system	Electro-hydraulic landing gear actuation
Tire size, main/tail	15 x 6.00 x 6(8 PR)/ 5.00-5 (10 PR)
CABIN DIMENSIONS:	
Seats	2
Cabin entry	aft hinged bubble canopy
Width at hips	front 18.25 in, rear 21.75 in
Width at shoulders	front 28.0 in, rear 25.75 in
Height, seat to canopy	front 43 in, rear 42 in
Baggage capacity, rear cabin	4.6 cu ft/10.8 cu ft optional
Baggage door size	load past folded rear seat
Lift over height to baggage area	63.75 in
Step-up height to wing T.E.	32.5 in
Approved maneuvers:	aerobatics with 25.5' span at 3000 lb with inverted systems: rolls, loops, Immelman's, Cuban eights, but no intentional spins or snap maneuvers.
CENTER OF GRAVITY:	
Range, % MAC	8-28 %MAC
Range, in. from datum	78.78-87.61 in
Empty weight c.g., by *CAFE*	2308 lb
From datum location	front face of prop reduction output shaft
Main landing gear moment arm	99.125 in
Nosewheel moment arm	28 in
Fuel moment arms front/rear	82 in
Crew moment arm	pilot 105 in, rear passenger 140 in

Panel IAS	Barograph CAS
115	119.97
140	147.25
160	170.53
220	237.15
234	252.97
248	265.54

N620L, Airspeed Calibration

120 mph the right rudder sample required only 12 degrees of bank and left rudder required 15 degrees of bank.

STALLS

A number of stalls were performed in both the clean and landing configurations. I was interested to see how the characteristics might differ from more conventional airfoils. I was pleasantly surprised to find that the exhibited characteristics were mild and predictable. In all configurations a mild aerodynamic buffet would occur about 5 mph prior to the stall. Stick force build-up appeared to be normal with steadily increasing stick force to the point of stall. The stall was crisp with one wing or the other dropping 45-60 degrees as the stick was repositioned forward to reduce the angle of attack and effect the stall recovery. The stall recovery was immediate, leaving only about a 15 degree nose down attitude from which recovery was not difficult. Overall the experience was mild and pleasant. The pitch attitude was not excessively nose high during approach to stall.

DESCENT

Returning to the airport was a nice experience with the Legend. The rate of descent that could be generated comfortably made it easy to place the airplane at about any point or any altitude the pilot might choose. The barograph documented a maximum descent rate of 3000 fpm at 147 mph IAS with full flaps, gear extended, closed throttle and full RPM. At one point I was indicating 300 mph while descending 3,500 fpm with 10” manifold pressure and 3800 RPM. The easy banking, great field of view and maneuverability made this airplane’s flying qualities very enjoyable.

LANDING

Cockpit management was fairly normal excepting the one additional requirement of opening the coolant door on down wind. The base turn worked out very well at 110 mph IAS, and 95 mph was the target speed for “crossing the fence”. The engine was very responsive when power was called for. It was easy to hold any targeted airspeeds. The Legend it has light and docile flying qualities in the landing pattern with flaps down.

After initial touchdown, the nosewheel could be held off nicely to take advantage of the aerodynamic drag for braking. Holding the canopy in a slightly opened position was required for ventilation during taxiing.

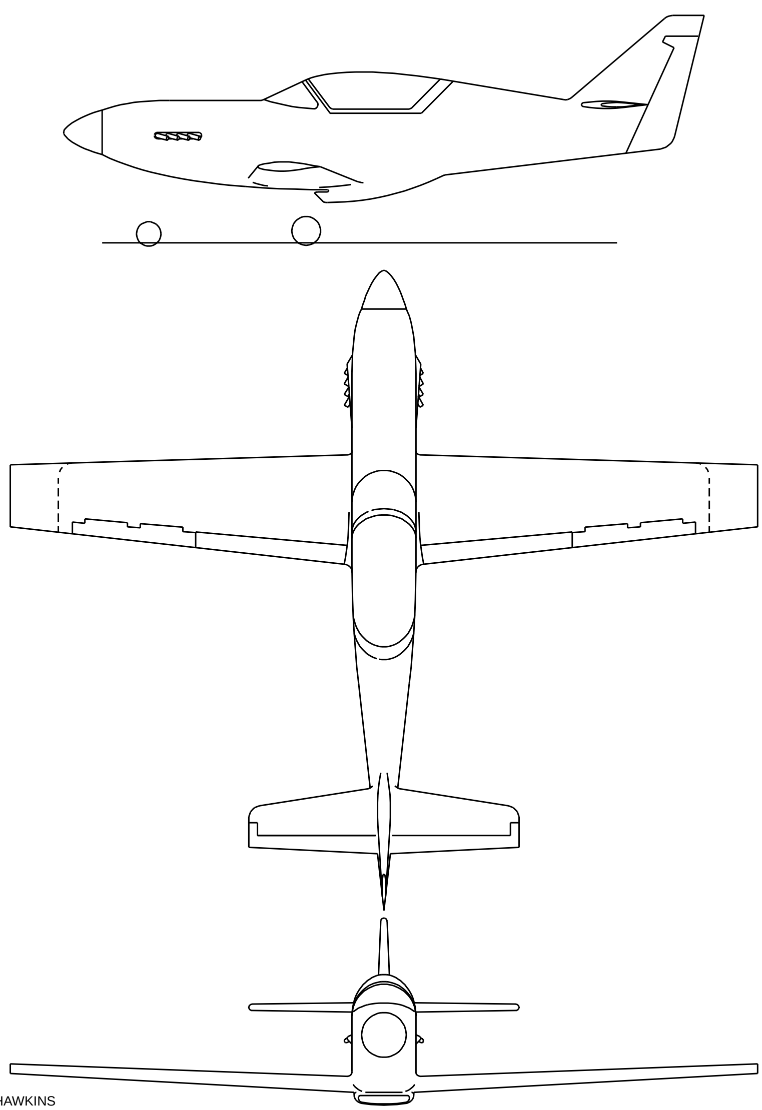
CONCLUSIONS

The Legend is a powerful sport airplane with excellent flying qualities. It can carry two people with limited luggage at high speed for a modest range. It is very fast and has excellent potential to fly even faster with further engine development. It also is very maneuverable. It is unusual in that it uses a large, powerful, V-8 automotive type engine with a speed reduction unit and this requires some unconventional operational procdedures.

If the air racing industry develops a new division for this class of plane. the Legend would be an excellent candidate for success in that division.

SAMPLE C.G. CALCULATIONS, Legend N620L, 29.27' Span

Aft sample item	Weight	Arm	Moment		Forward sample item	Weight	Arm	Moment
Main gear	1653.8	99.1	163925.0		Main gear	1653.8	99.1	163925.0
Nose gear	654.6	28.0	18329.0		Nose gear	654.6	28.0	18328.8
Pilot	170.0	105.0	17850.0		Pilot	140.0	105.0	14700.0
Passenger	210.0	140.0	29400.0		Passenger		140.0	0.0
Fuel, 70 gal. in wing	212.0	82.0	17384.0		Fuel, wing tank	420.0	82.0	34440.0
Oil, included	0.0	0.0	0.0		Oil, included	0.0	0.0	0.0
Baggage	100.0	156.0	15600.0		Baggage	0.0	156.0	0.0
TOTALS	3000.4		262487.0		TOTALS	2868.4		231393.0
Gross weight	3000.0				Gross weight	3000.0		
Empty weight	2308.4				Empty weight	2308.4		
Empty weight c.g.	78.95				Empty weight c.g.	78.95		
c.g. range, inches	78.78-87.61	8.83			c.g. range, in	78.78-87.61	8.83	
c.g. range, % MAC	8-28				c.g. range, % MAC	8-28		
c.g. in inches	**87.48**				c.g. in inches	**80.67**		
c.g. in % MAC	27.71				c.g. in % MAC	12.28		



CRIS HAWKINS

CAFE HONORARY ALUMNI

Steve Barnard--RV-6A
Jim Clement--Wittman Tailwind
Jim Lewis--Mustang II
Ken Brock--Thorp T-18
Larry Black--Falco F.8L
Chuck Hautamaki--Glasair III
Jeff Ackland--Legend

KIT SUPPLIER	OWNER/BUILDER N620L
Performance Aircraft 12901 West 151ST Street Olathe, KS. 66062. 913-780-9140 FAX: 780-1774	Performance Aircraft Jeff Ackland

DESIGNER'S INFORMATION

Cost of kit, no engine, prop, avionics, paint	$78,500
Plans sold to date	7
Number completed	1
Estimated hours to build, from prefab kits	2500
Prototype first flew, date	June 19, 1996
Normal empty weight, with V-8 big block	2200 lb
Design gross weight, with V-8 big block	3300 lb/3000 lb aerobatic
Recommended engine(s)	Chevy-based V-8's, 400-800 cu. in. of 500-1000 BHP
Advice to builders:	Build it light and per factory manual, communicate with builders & factory.

CAFE FOUNDATION DATA, N620L

Wingspan, long wing/short wing	29 ft 3.25 in/25 ft 6 in
Wing chord, root/tip, long wing	54 in/ 29.25"
Wing area, long wing/short wing	101.25 sq ft/91 sq ft
Wing loading, 3300 /101.25 or 3000/101.25	32.6 lb/sq ft /29.6 lb/sq ft
Power loading, 3000 lb/500 hp long wing	6 lb/hp
Span loading, long wing, 3000 lb/29.27'	102.5 lb/ft
Airfoil, main wing	Viken GTO, NLF root, tip
Airfoil, design lift coefficient	na
Airfoil, thickness to chord ratio	14%
Aspect ratio, span^2/ sq ft wing area	8.46 with long tips
Wing incidence	+1.5°
Thrust line incidence, crankshaft	0°
Wing dihedral	3° per side
Wing taper ratio, root/tip, long wing	33 in/54 in = 0.54
Wing twist or washout	0°
Wing sweep	0°
Steering	differential braking, toe brakes
Landing gear	electro-hydraulic retractable, tricycle
Horizontal stab: span/area	127 in/22.25 sq ft
Horizontal stabilator chord, root/tip	31.75/18.75 in
Elevator: total span/area	120 in/ 5.88 sq ft
Elevator chord: root/tip	8.5/5.6 in
Vertical stabilizer: span/area incl. rudder	64 in/ 14.5 sq ft
Vertical stabilizer chord: average	33 in
Rudder: average span/area	54.2 in 5.43 sq ft
Rudder chord: bottom/ top	20.3/8.5 in
Ailerons: span/average chord, each	na
Flaps: span/chord, each	na
Tail incidence	-1 °, but will be 0 ° on kits
Total length	25 ft 1 in
Height, static with full fuel	9 ft 5 in
Minimum turning circle	na
Main gear track	na
Wheelbase, nosewheel to main gear	see Sample c.g.'s
Acceleration Limit Loads	+6.0/-4.0 at 3000 lb
AIRSPEEDS PER OWNER'S P.O.H., IAS	
Never exceed, V_{ne} , final design target	434/500 kt/mph
Maneuvering, V_a , estimate	173.6/200 kt/ mph
Best rate of climb, V_y	130/150 kt/ mph
Best angle of climb, V_x	99/114 kt/mph
Stall, clean, 25.5' span, , V_s	73/84 kt/mph
Stall, dirty, 25.5' span, V_{so}	65/75 kt/mph
Flap Speed, full 38°, V_f	148/170 kt/mph
Gear operation/extended, V_{ge}	130/150 kt/mph

ACKNOWLEDGEMENTS

This work was supported in part by FAA Research Grant Number 95-G-037. The CAFE Foundation gratefully acknowledges the assistance of Anne Seeley, Daniel Vetter, EAA Chapter 124, the Sonoma County Airport FAA Control Tower Staff, and the engineering departments at Avco-Lycoming and Hartzell Propellers.

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