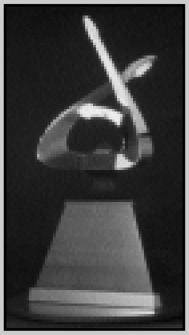

TRIAVIATHON TROPHY

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AIRCRAFT PERFORMANCE REPORT

Sponsored and Funded by the Experimental Aircraft Association

RV-8A

BY BRIEN SEELEY, OTIS HOLT AND THE CAFE BOARD

Photo: Larry Ford

The RV-8A is an all metal, tandem, low wing, low aspect ratio monoplane like its predecessor, the RV-4. Both are creations of Van's Aircraft in North Plains, Oregon. However, the RV-8A is a distinct new design with substantially different features. It is intended to be a high performance sport plane with a mix of capabilities ranging from basic positive G. aerobatics with nimble handling qualities to limited cross country travel.

The prototype RV-8A presented to the CAFE Foundation for this report is serial # 1 of this design and it first flew on April 4, 1998. The RV-8 is the taildragger version of this aircraft while the RV-8A has tricycle landing gear. Thirty two RV-8's have been completed as of this writing.

Among the innovations on the RV-8 are a new wheel pant design that is reportedly of lower drag than those used by Van's Aircraft in the past. The Cessna Aircraft Corporation has engaged Dick VanGrunsven for help in the process of adopting a similar wheel pant design for its new 182.

The RV-8A is offered in kit form with a Quick Build kit which the manufacturer claims may be assembled in as little as 800 hours

The testing of this N58VA emcompassed 3 weeks in February 1999 during which the CAFE Board members installed, tested and refined several new performance flight testing upgrades. A new data acquisition package that allows real time display of angle of climb, glide ratio, Barograph derived rate of climb and mpg was created for these tests.

We wish to thank Ray Richter and Dick VanGrunsven for transporting the aircraft to the CAFE Foundation for testing and for the opportunity to keep the aircraft long enough for a thorough evaluation.

Photo: Larry Ford

SUBJECTIVE EVALUATION

RV-8A, N58VA

By

OTIS HOLT

I was really looking forward to Dick VanGrunsven's arrival in January to hand over the keys to N58VA for this APR. Dicks reputation for honest, efficient designs precedes him, so it was a safe bet that the RV-8A would be predictable, free of serious bad habits and a delight to fly. During the subsequent three weeks, with more than twenty hours logged in a variety of loading and flight configurations, the RV-8A would prove to meet and generally exceed these expectations.

I was impressed by the casual ease with which Dick surrendered the only existing RV-8A before departing homeward in a waiting RV-4. I'd like to believe it was because he'd been impressed by my piloting skill during our brief checkride, but a more likely explanation is that he already possessed such confidence in the aircraft itself that he had little cause for concern. Today homebuilders can choose from a number of aircraft kits offering very high performance, but the RV-8A stands apart from the others in this group with respect to the modest demands it places upon the pilot's skill.

FIRST IMPRESSIONS

The "8" sits quite handsomely on tricycle gear, appearing to be larger than it really is. The width of the large sliding canopy increases for several inches above the level at which it joins the fuselage, contributing to an almost military presence. The full engine cowling blends smoothly into the fuselage, and the absence of cowl cheeks sets the RV-8A apart from Van's earlier tandem and single place designs. A walk around the aircraft reveals elegant simplicity and balanced proportion from every viewing angle. This airplane is, indeed, very easy on the eyes.

Close examination of N58VA reveals workmanship rarely seen on factory prototypes, and suggests that the staff at Van's Aircraft includes some very talented builders. Nearly all metal seams on the airframe are flawlessly butt-joined using precisely installed flush fasteners, and display none of the distortion often seen along rows of closely-spaced rivets. The fit and finish of the canopy, cowl, and other challenging parts are also superb. Construction of N58VA employed the use of many components from the now fully matured RV-8 kit inventory, including the very clean cowling, with a Nomex honeycomb core, and lightweight wing-tip fairings. The upper surfaces of the wing-tip fairings,

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
Jerry Sjostrand--Express
Randy Schlitter--RANS S-7C
Stoddard Hamilton Aircraft, Inc. GlaStar
Fred Baron--Lancair 320
Mark Beduhn--Cozy Mark IV
Dick VanGrunsven--RV-8A

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IMPORTANT NOTICE

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which form a flat-wrap conforming to the upper airfoil shape, do display some waviness, which might be remedied by the reinforcement of those areas with foam or Nomex.

True to the designer's philosophy, N58VA is equipped and finished with simplicity and minimal weight in mind, so there are few items installed that could be described as non-essential. Instrumentation is basic VFR, and the cabin interior is painted instead of being upholstered. Builders would do well to follow Van's lead by limiting extras; the reward being an aircraft that can be flown solo at just over seven pounds per horsepower, and that is a recipe for excitement.

THE DESIGN

There is no magic to the means by which Dick extracts such great performance from his aircraft. His choice of a thick, constant-chord, low aspect ratio wing takes maximum advantage of the high strength-to-weight potential of aluminum construction and results in one of the more structurally efficient designs available today. Dick's forte has been to identify the ideal point of balance between the structural advantages and aerodynamic penalties associated with low aspect ratio wings to optimize performance of his aircraft for their intended missions. Coupling this wing with a lightweight, aerodynamically clean fuselage and well-faired landing gear results in an aircraft with a very impressive operating envelope.

The large body of experience and customer feedback Dick has accumulated from the RV-4 clearly provides the foundation upon which the RV-8/8A was designed. It is almost universally agreed that the RV-4 is a true "pilot's airplane", but also that it presents a load management challenge when carrying large passengers or gear for travel, and that the rear seat can be somewhat limited in space and creature comfort. These issues have been significantly improved with the RV-8A while retaining good flying qualities.

In my opinion, the single most profound difference between the two aircraft is load management design philosophy, and this is worthy of some discussion. The RV-8/8A is intentionally designed with a very forward empty center of gravity. The seats are located as far forward and close together as practical, and a forward luggage compartment has been added, lending to much broader loading options. The table below includes a selection of sample loadings we calculated for N58VA. Here c.g. position is given as a percent of the total range, so zero corresponds to the forward limit, and 100 to the aft limit.

The first example represents a typical loading with two adults at gross weight with full fuel. Use of luggage as forward ballast allows this flight to depart at a very comfortable mid-range c.g., and even with fuel reduced to a 30 pound reserve, the c.g. ends up just 67% aft of the forward limit. Even the extreme condition described by example B, with a heavy passenger, maximum rear baggage, nothing in the front compartment, and fuel to gross weight is within published limits. In this case, as fuel is reduced to zero, the c.g. moves very near the aft limit, as indicated by the next example.

As is always the case with aircraft design decisions, there is trade-off for the N58VA's near immunity to aft loading.

SAMPLE LOADING: RV-8A N58VA 200 HP CONSTANT SPEED/1127 LBS. EMPTY								
	FORWARD LUGGAGE	FRONT SEAT	REAR SEAT	REAR LUGGAGE	FUEL POUNDS	TOTAL WEIGHT	C.G. % AFT OF FWD LIMIT	LBS/ HP
A	30	170	170	50	252	1799	61	9.00
B	0	180	200	75	218	1800	87	9.00
C	0	180	200	75	0	1592	97	-
D	0	180	0	50	120	1477	25	7.38
E	0	160	0	55	78	1420	22	7.10
SAMPLE LOADING (ESTIMATED): RV-8A 180 HP VARIANTS								
F	0	180	0	25	120	1422	25	7.90
G	0	180	0	25	120	1384	25	7.69

ABOUT THE DESIGNER

Richard VanGrunsven learned to fly in 1955 and soloed at age 16. He rapidly advanced through private, commercial, and instructor levels, eventually acquiring a multi-engine ATP. His total flying time is around 9000 hours which includes over 5000 hours in homebuilts and over 1300 hours in sailplanes.

Dick has been designing and building aircraft for over 35 years. The RV-3, his first original design kitplane, entered the market in 1973. The design objective of the RV-3, and all other RV models through the RV-8A, was that of a general purpose sport aircraft with good handling qualities and a wide performance envelope. Additional business objectives have been affordable kit pricing and kits which could be constructed with modest skills.

His designs have enjoyed great popularity, with 2158 examples of the RV designs completed. The RV-9 is another new, lower cost, 2 place design whose kit development is now in progress at Van's Aircraft.

Mr. VanGrunsven has a Bachelor of Science Degree in General Engineering. He has conducted his own self-study training in various aspects of aircraft design. The RV-8A, along with other recent Van's Aircraft kitplanes, is a product of their engineering team including an aeronautical engineer and two other mechanical engineers. There are currently no plans to FAA certify the RV-8A.

Dick recommends that a 180 pound pilot carry about 50 pounds of ballast in the aft compartment for solo flight, putting the center of gravity about 25% aft of the forward limit. Lighter pilots would require slightly more ballast. This is also the range he recommends for solo aerobatics, and our flight test experience would confirm that it represents a good combination of positive stall recovery and comfortable stick force gradients during higher g-load maneuvers. Example D represents N58VA configured for solo flying with about two hours of fuel onboard. In addition to the .25 lb./hp power-loading penalty the ballast represents in solo flight, the need for ballast might be an inconvenience prior to the solo continuation of a flight that had a passenger aboard previously. Perhaps a lightweight, collapsible water container could be carried to compensate for off-loading a passenger enroute.

It might be argued that the empty c.g. is a bit too far forward, but it should be noted that the 200 hp/constant-speed installation is the most forward-c.g. configuration rec-

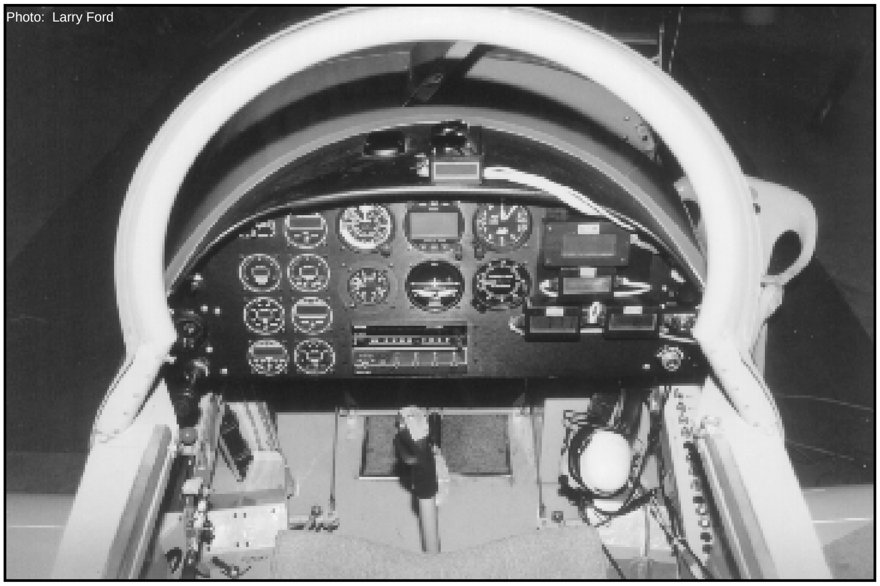


Photo: Larry Ford

ommended for the RV-8/8A. Example F represents N58VA with a 180-hp Lycoming substituted. The useful load is increased by about 30 pounds, and the need for ballast is cut in half. Example G is a rough calculation for an RV-8A with a 180-hp Lycoming and a fixed-pitch metal propeller. In the prior examples, the battery is installed below the aft luggage compartment floor, but in this case it is installed at the optional firewall location. Again, ballast is reduced by half, but takeoff weight is nearly 100 pounds less than for example D with the same pilot and fuel. As a result, the power loading is only slightly higher, while the wing loading is much less. I'm sure that this version would be a pleasure to fly, and it would certainly offer great performance at much less cost.

CAFE Barograph designer Steve Williams, installing the data network cable in the RV-8A.

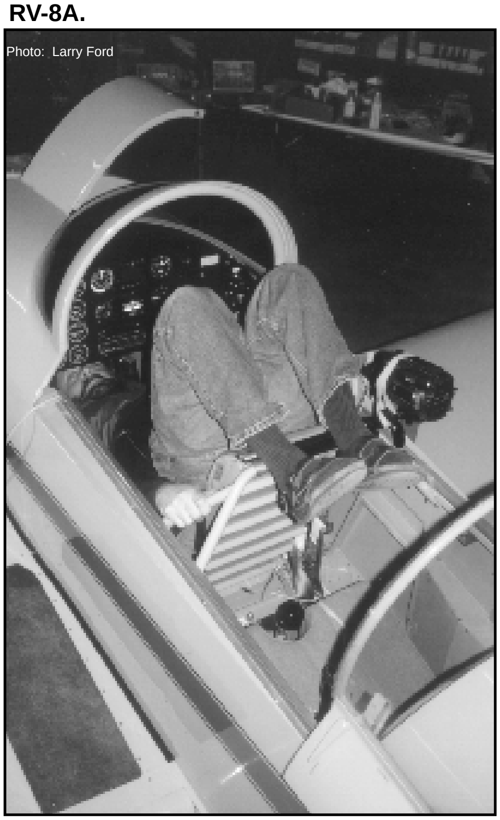


Photo: Larry Ford

ERGONOMICS AND COMFORT

The front seat of the RV-8A begins to feel like home right away, and just climbing aboard inspires a strong desire to launch skyward. The canopy's convex sides provide a nearly straight-down view in any direction with a slight tilt of the head, and its large size permits the pilot to sit high up, yielding an excellent view forward over the cowl. All switches and controls fall readily to hand and separation of the rudder pedals is just right, adding to a sense of stability. In flight, the pilot's sense of "linkage" with the aircraft is immediate and complete, due in large measure to a nearly flawless control system that translates the pilot's desires into immediate action with little conscious effort.

There are a few very minor detractions. The instrument panel is just a little too close for those of us with compromised visual accommodation and I often found myself referencing it through the reading portion of my bifocals. Also, a massive roll bar and forward canopy shroud combine to trace an arc more than two inches wide located about a foot from the pilot's eyes that occupies a bit more of the field of view than would be ideal. This was most noticeable during formation flying, causing me to alternately lean forward and back to keep the lead plane in clear view. In spite of the roll bar, the pilot's field of view both in flight and on the ground would have to be described as excellent, contributing greatly to the joy and safety of flying the aircraft. Finally, both of these conditions as well as the pilot's comfort level would be improved if the seat were tilted rearward a few more degrees.

The pilot's seat is fixed, but the entire rudder/brake pedal assembly slides fore and aft on tracks, and is easily adjusted through a full six inches of travel by pulling on a release cable while pushing on the pedals with your feet. Sitting height is adjusted by adding or removing cushions. Tall pilots should have no trouble fitting in. Although the parallel rails carrying the sliding canopy limit width at the pilot's shoulders to about 24 inches, cabin width just below them and at the pilot's elbows measure a full 32 inches, and canopy width in the vicinity of the pilot's head is about 26 inches. The overall feeling is of spaciousness, with plenty of room for tasks like chart folding, and there is sufficient legroom to comfortably rest your feet flat on the floor aft of the rudder pedals. Speaking of charts, a few pockets for stowage of these and other items would be nice to have to supplement the glove box that is built into the panel.

The large sliding canopy is a work of art, and is blended into the fuselage by an

Van's RV-8A	Panel IAS, mph	Cabin Baro #1	CAS, Wing Baro #3	config.
N58VA ASI calibration	57	56.97	52.98	full flaps
	59	58.92	53.63	full flaps
Cabin Baro has	61	59.97	56.66	1/2 flaps
same pitot/static	64	62.61	58.06	clean
as panel ASI	65	63.30	59.84	clean
	70	69.40	64.72	clean
Wing Baro uses	75	75.04	70.26	full flaps
a calibrated, certified	75	74.97	69.49	clean
gimbaled pitot/static	80	80.25	76.52	clean
	85	84.79	80.32	full flaps
	85	84.25	81.02	clean
	90	89.65	86.57	clean
	100	99.74	96.22	clean
	110	109.34	106.21	
	115	113.57	110.91	
	120	118.07	115.96	
	130	128.43	126.56	
	140	139.17	136.53	
	150	148.31	145.79	
	160	158.97	155.48	
	170	168.00	164.43	
	180	175.91	172.29	
	190	185.57	182.43	
	200	200.46	195.81	
	210	210.05	204.90	
	215	215.04	209.96	
	?	236.64	230.94	

integral fiberglass skirt, which moves with it. At first, I was concerned by the fact that the canopy is secured in the closed position by a single over-center latch on the left side. When I asked Dick about this he responded that pressure recovery at the rear portion of the canopy actually puts significant forward pressure on it in flight. It would have been nice to have some type of detent to hold the canopy open a few inches for taxiing, and evidently a detent "bump" along the track is included in the kit version. The canopy is not designed for flight in the open or partially open position.

CAFE MEASURED PERFORMANCE, N58VA

Propeller max. static RPM	2720 RPM
Vmax, TAS, 690' dens.alt., 1668 lb, 29.9", 2741 rpm, 13.9 gph	191/220 kt/mph
T.O. dist., 0 mph headwind, 3 ° C, 125 ft MSL, 1789 lb/1420 lb	390 ft/236 ft
Liftoff speed, by Barograph, 1789 lb, CAS	53.2/61.3 kt/mph
Touchdown speed, Barograph, 1738 lb, CAS	50.9/58.6 kt/mph
Minimum sink rate, 1723 lb, 81.6 mph CAS, 87.6 mph TAS	907.7 fpm
Glide ratio, idle, 106.8 mph CAS, 115.3 mph TAS	9.5
Noise levels, full power climb/75% cruise	103/99 dB
Peak CHT in climb, 90 kt, full power	360° F
Cowl exit air temp @ 339°F CHT, 61°F OAT	163° F

N58VA's Spartan VFR instrumentation leaves room to spare on the 33" wide panel. A vernier-type control located in the lower left corner operates the very effective elevator trim. Because it resembles a throttle control, I would recommend defeating the function of the push button release to prevent it from being erroneously rammed home in an urgent moment. An eyeball valve above the trim control directs ample ventilation supplied by a small NACA vent on the left side of the fuselage. The glove box and cabin heat control are located on the right side. The cabin heater is quite effective but does not include a provision for de-fogging the windscreen. I should think this important feature would be easy to add.

The throttle quadrant, with prop and mixture controls descending in size from left to right, is located within easy reach on the left cabin wall, but the pilot's hand is slightly crowded by a structural bulkhead just aft of its location. The Left/Right/Off fuel selector is just below the throttle quadrant. The 16 inch center control column carries a push to talk and a toggle switch that operates the electric flaps, and has a range of travel of about 8 inches fore and aft and just under 12 inches laterally. A row of stout toggle switches and a few breakers are located within easy reach on the right side of the cabin below the panel, and their operation quickly becomes second nature.

The rear cockpit provides a very different environment than that of the RV-4. Gone is the prominent rollover protection structure that so dominates the rear-seat experience in the RV-4. The passenger can see forward over the pilot's shoulders and has a much better sense of participation. In its place is a tubular structure, which supports the front seat and serves well as a passenger's handhold, but does not extend above the pilot's shoulders. This bar could also be a forehead bumper for the passenger during rapid deceleration, so some padding would be in order. The bar also serves as the attach point for the front seat shoulder harness. Unfortunately, the attachment is well below the pilot's shoulders and could contribute to spinal compression during an accident.

The passenger is provided with basic controls including stick, throttle and rudder. The rudder pedals are actually 1 1/2" diameter steel buttons welded to the ends of simple push rods, a clever and lightweight solution.

The first data flight: foreground, left, Brien Seeley and Steve Williams start the Barograph while pilot Otis Holt and engineer Ed Vetter wait on board.

The control column, which is removable, had scratched an arc in the paint on the back of the pilot's seat, indicating that it was limiting forward control travel slightly when installed. Shortening the column a few inches would eliminate this interference, with the added benefit of giving the pilot's control a greater mechanical advantage than that of the passenger.

The passenger's backrest parallels the same 25-degree angle measured for the front seat, but is perceived as being more reclined. This might be due to the sunken foot wells, which have a 23-inch spread. Although the fuselage tapers down somewhat, the passenger still has more than 29 inches of elbow room. CAFÉ Foundation Secretary Cris Hawkins, who is 6'-3" tall, served as flight engineer for several of the data collection flights, and one day spent more than five hours in the back seat. Cris had plenty of headroom and felt that the rear cockpit was just large enough for him. He did indicate that a more reclined seat with better thigh support would improve comfort for long-range flights. I had two opportunities to ride in the back seat with C.J. Stephens at the controls, and found it to be quite roomy and comfortable for my 5'-10" frame during those shorter flights. I felt that contouring or narrowing the lower portion of the pilot's backrest would allow the passenger to sit in a more natural position.

Ingress and egress is quite easy for either seat for aircraft of this type. An optional step just aft of the wing makes it easy to climb onto the anti-skid wing walk on the left side. From there it is simply a matter of stepping onto the seat or floor and lowering yourself into the seat. The flaps should be placed in the full down position prior to shutdown to protect them from being stepped on and to improve access to the step. The rear seat backrest is removed or tilted forward to provide access to the spacious rear luggage compartment, requiring that the seat be empty. As with most light aircraft available today, neither seat is equipped with any special provision for energy absorption during a crash landing, except for that which the

RV-8A, N58VA, 1800 lb GW	Flight/Date	Start time	Presalt., ft.	Densalt range	Weight, lb	CAS, mph	TAS, mph	Angle, deg.	ratio	fpm
Same airspace for all climbs on flt. #3	Climbs									Rate of climb, fpm
26.5", 2710 RPM, 13.5 gph, C.X.T.	#4--2/2/99	16:05:49	2552	2501.8-3501.9	1800	99.5	103.3	13.2	4.3	2069.2
27.8", 2720 RPM, 19.0 gph, C.X.T. 140°F	#3--2/2/99	11:08:38	1047	465.0-2499.3	1799	106.8	109.0	12.5	4.5	2179.6
27.8", 2720 RPM, 19.1 gph, C.X.T. 140°F	#3--2/2/99	11:14:06	954	469.0-2512.7	1793	106.0	109.0	12.5	4.5	2078.3
27.8", 2720 RPM, 19.1 gph, C.X.T. 145°F	#3--2/2/99	11:19:45	965	481.9-2502.5	1788	97.4	98.3	14.0	4.0	2090.3
27.8", 2720 RPM, 19.4 gph, C.X.T. 150°F	#3--2/2/99	11:25:00	983	495.9-2491.8	1782	85.5	88.0	14.9	3.8	1995.9
27.8", 2710 RPM, 19.2 gph, C.X.T. 157°F	#3--2/2/99	11:31:12	989	492.2-2517.6	1776	74.3	76.0	15.5	3.6	1787.1
27.8", 2714 RPM, 19.4 gph, C.X.T. 156°F	#3--2/2/99	11:37:26	969	477.1-2515.1	1770	86.3	88.1	14.7	3.8	1972.3
**Triaviathon, 1412 lb., solo	#5--2/11/99	08:08:56	na	3447.6-4447.6	1415	96.6	100.0	14.9	3.8	**2263.45
C.X.T. = cowl exit air temp.										
All descents at idle throttle, coarse pitch	Descents									Rate of sink, fpm
Vne descent, clean	#2--2/1/99	16:07:34	7687	8079.9-6924.7	1734	205.2	228.7	9.6	5.9	3362.0
Va descent, clean	#2--2/1/99	16:09:10	5081	5210.9-4154.4	1734	142.0	152.9	6.7	8.5	1567.0
clean	#2--2/1/99	16:14:30	6950	7051.2-5815	1729	95.9	105.0	6.2	9.2	1004.0
Vy descent, best glide, clean	#2--2/1/99	16:16:00	5353	5406.4-4734.2	1729	106.8	115.3	6.0	9.5	1059.0
clean	#2--2/1/99	16:23:20	6255	6325-5327.6	1724	76.2	83.2	7.5	7.6	956.5
minimum sink, clean	#2--2/1/99	16:24:35	5033	5074.3-4347	1723	81.6	87.6	6.8	8.4	907.7
clean	#2--2/1/99	16:26:00	3841	3796.6-3256.8	1723	71.5	75.5	8.7	6.6	1001.1
clean, idle, coarse pitch	#6--2/12/99	09:19:10	4535	4606.8-3562.9	1747	96.2	102.1	6.2	9.2	968.7
clean, idle, fine pitch	#6--2/12/99	09:15:50	4704	4778.1-3449.4	1749	96.2	102.1	7.8	7.3	1227.0
full flaps, idle, coarse pitch	#2--2/1/99	16:30:05	5338	5374.5-4284.9	1720	80.4	86.0	8.6	6.6	1133.9
full flaps, idle, coarse pitch	#2--2/1/99	16:31:25	3933	3935.9-3160.3	1720	70.3	74.1	8.1	7.1	1061.4

fixed landing gear would provide as it collapsed.

Cabin noise levels in flight are quite high, as can be seen in the measured performance section. I found it helpful to wear foam earplugs under the headset, but I think I'd budget for a pair of very high quality active noise canceling headsets if I owned the aircraft.

GROUND OPERATIONS

Taxiing the RV-8A is a breeze, thanks to an almost unobstructed field of view and the short wingspan. The free-swiveling nose wheel permits taildragger-type turns when one main-wheel brake is locked. Steering is by rudder and differential braking, though in reality the brakes are rarely required. The rudder is effective for steering at very slow speeds, and responds instantly to a slight burst of power, if needed, to initiate turns.

Photo: Larry Ford

It is also easy for one person to move the 1,125-pound RV-8A about on the ground manually without the use of a towbar. The nose wheel has stops at about 60 degrees to either side of neutral, but there is enough anti-shimmy friction built into the pivot to allow the aircraft to be pushed backwards slowly and steered by pushing the nose from side to side. Preflight is straightforward, with everything except tire pressure easy to access and check. The wheel fairings are very clean aerodynamically, but are not provided with ports for filling the tires. Some pilots might be tempted to launch with marginally low tires instead of removing and replacing the nine screws securing the forward portion of each wheel fairing.

TAKEOFF AND CLIMB

This is where the real fun begins, especially when flying solo with a light fuel load. During one such flight on a cool morning, intended to simulate a CAFE Triaviathon run, my takeoff distance was measured at 236', and sustained climb rates in excess of 2,500 fpm were indicated. If you refer back to the table of sample cg loadings, example E represents the configuration for that flight. One might expect an aircraft capable of such performance to be quite a handful for the pilot, but this is not the case with the RV-8A. Mind you, things do happen quickly, and low-time pilots will require enough high-performance experience to insure that they can keep up with the aircraft during takeoffs, go-arounds and touch-and goes. The brisk climb performance offered by the aircraft at relatively low speeds actually enhances safety by providing the pilot with more options more quickly should a power loss occur during the climb-out.

The rudder, being sized to satisfy the needs of the RV-8 taildragger, has an abundance of authority on the RV-8A. A modest amount of pressure on the right rudder serves to keep the nose on the centerline during the brief ground roll. The aircraft levitates readily with a smooth rotation initiated at 50 mph, with no tendency to over-control. One hundred mph produces excellent climb rates with a good field of view over the nose. All speeds given here are panel indicated airspeed in mph unless otherwise noted. Even at a nose-low cruise-climb speed of 125 mph with power set at 24.5 square, the indicated climb rate remained over 1300 fpm at a takeoff weight of 1600 pounds. Aileron input to counter torque during high performance climbs is barely noticeable. The use of flaps is recommended for takeoffs at higher weight or density altitude, but generally not required when flying solo. Naturally, takeoff and climb performance is degraded significantly at higher takeoff weights, but they remain impressive. Takeoffs at maximum gross weight lead me to conclude that the published value of 1800 pounds is just about right, as distinctly longer takeoff rolls are seen and a slight sense of sluggishness begins to be felt at weights near that value.

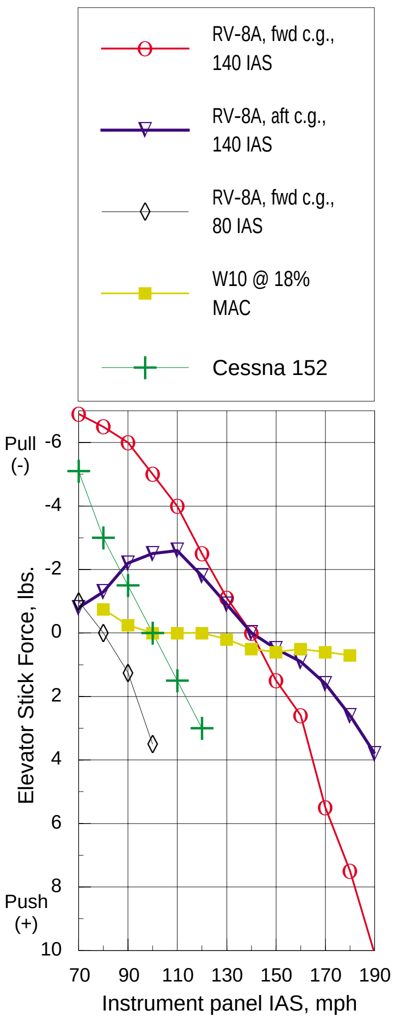
STABILITY AND CONTROL

It could be that Dick did employ some

kind of magic in the design of the control system, because it is extraordinarily good. The feel is silky smooth and there is no detectable control slop in any axis. The aircraft embodies the rare combination of an unhesitant willingness to obey the pilot's wishes and a low pilot workload during cruising flight. Control harmony between the three axes is excellent, in that none stands out in relation to the others in the pilot's perception of magnitude of movement or force required. Input forces are pleasantly light within a wide range of any trim condition, yet generally increase substantially to give the pilot adequate feedback when deviating by a large amount from that trim point.

CAFE test pilot Otis Holt, lt., and Dick VanGrunsven

We flew N58VA to evaluate stability and control at multiple center of gravity loadings ranging between 15%-85% aft of the forward limit. Takeoff weight at the most forward c.g. was about 1550 pounds, and about 1700 at the most aft. With a very generous c.g. range of 8.2", it is not surprising that we observed substantial differences in control force and authority at the extremes. It would be prudent for each pilot to consciously and deliberately explore the edges of the envelope and establish their own comfort range. The chief effects of very forward c.g. we observed were markedly increased weight on the nose wheel, higher stick-force/G gradients and diminished power-off elevator authority at slow speeds. I would personally tend to operate within the 15%-85% region to preserve slow-speed, power-off flair power at the forward end and reasonable stick force gradients near the stall toward the aft end of the range.



Static longitudinal stability

Trimmed to zero pounds with stick- free and flaps up at Va. RV-8A at 80 IAS with full flaps.

LONGITUDINAL STABILITY

Dynamic longitudinal stability was explored by inducing elevator doublets, and found to be deadbeat at all speeds tested both stick fixed and stick free. This contributes to the aircraft's secure, rock solid feel during maneuvers and in cruising flight.

Static longitudinal stability was measured by trimming to Va (140 mph indicated) and measuring stick force required to hold speeds in ten-mph increments from 70-190 mph, while maintaining altitude by adjusting power. Note that for the forward cg condition, the result was a very substantial positive force gradient as speed varies in either direction from the trim condition. In the aft-cg test, however, a reversal of the force gradient was encountered as speed was reduced from 140 to 70 mph indicated, with the maximum force occurring at about 110 mph. It is generally desirable that some positive force gradient exists as speed deviates more and more from the trim point, and imperative that no actual force reversals occur. I would recommend that pilots explore aft-cg stalls with some care to familiarize themselves with stick force behavior in this region. We did not conduct tests with loadings further aft, but the trend would indicate that the gradient reversal observed would become more pronounced, and stick force during stalls at the full aft limit could be near zero when trimmed for a normal approach. The forward luggage compartment makes it quite easy to ballast loading well forward of the aft limit by placing heavier items there.

ROLL RATE, degrees/second, includes input time

	Va	1.3 Vso
RV-8A N58VA	109 Rt./102 Lt.	78 Rt./80 Lt. **
Cessna 152	47	34
RANS S-7C	61 Rt./63 Lt.	50 Rt./53 Lt.
GlaStar	52 Rt./50 Lt.	47 Rt./43 Lt.
**full flaps 80 IAS		

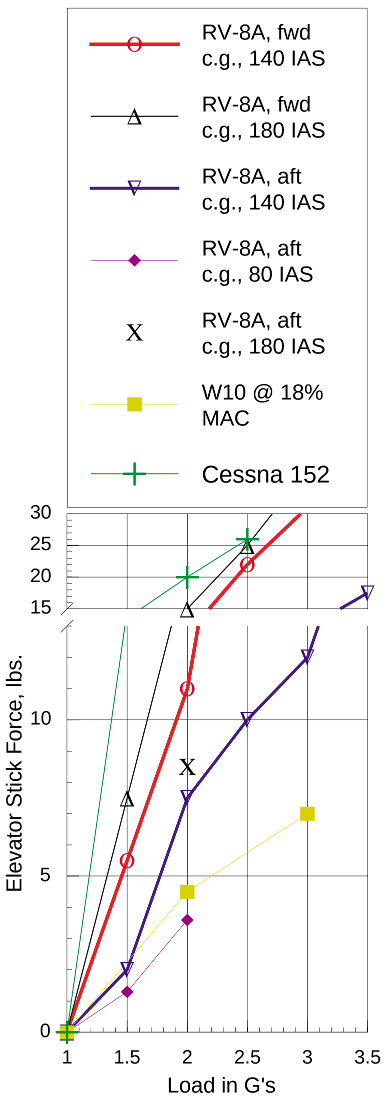
DIRECTIONAL STABILITY

The RV-8A responded to rudder doublets with about 2 overshoots before damping rudder-free and about 1 overshoots with the rudder fixed. This is well within the acceptable range, given that it resulted in no discomfort or annoying Dutch-roll tendency. There was no detectable dead- band or excessive breakout force when actuating the rudder. It is interesting to note that the RV-8A has no rudder centering springs or devices installed, so the fixed vertical stabilizer provides nearly all directional stability. In fact, the aircraft even lacks any type of pedal-return springs. As a result, the cables go slack when there is no foot pressure on the rudder pedals. Dick's response, when asked about this was "didn't need 'em", and that seems to be the case.

ROLL DUE TO YAW

Roll due to yaw was tested by measuring the bank angle and opposing stick force required to hold a constant heading with the rudder deflected. At 1.5 Vs (93 mph) in the cruise configuration, right rudder required 2.5 pounds of opposing force and a 20-degree bank angle, with 2.0 pounds and 20 degrees required to oppose left rudder. A stick force of 3.5 pounds was needed to counter a full rudder deflection in either direction, with bank angles of about 30 degrees. These results indicate modest but adequate dihedral effect. Full rudder deflection also resulted in an apparent partial stall of the rudder in both directions at this speed, as evidenced by a strong buffet in the control, but of course this would not be encountered during normal operations.

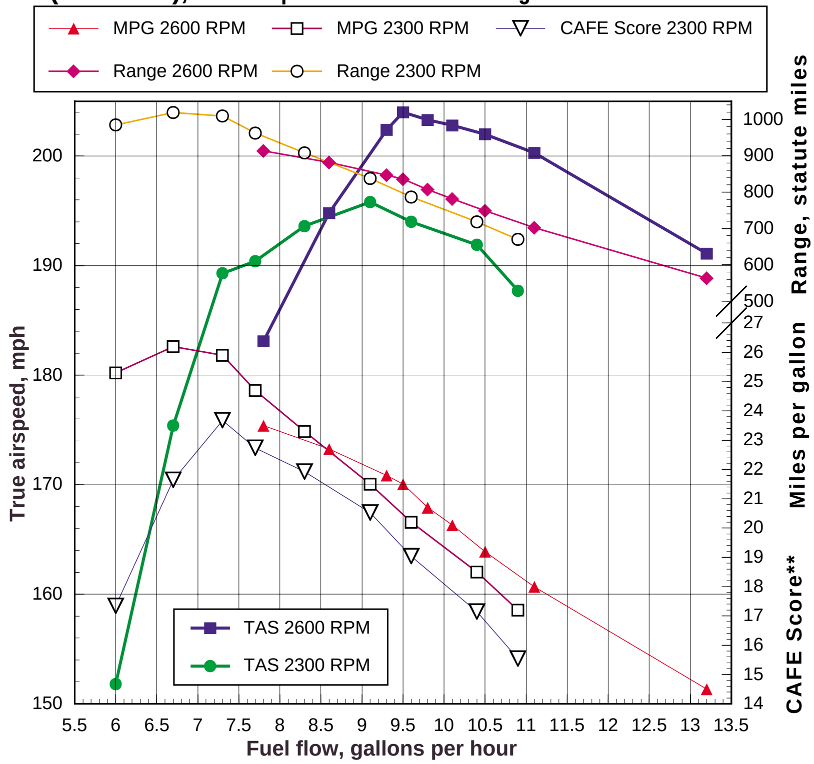
The rudder has adequate but much reduced authority to induce rolls when the flaps are down. In the landing configuration at 1.3Vs(78 mph), deflection to the left requires ten degrees of opposing bank to maintain a constant heading, and full



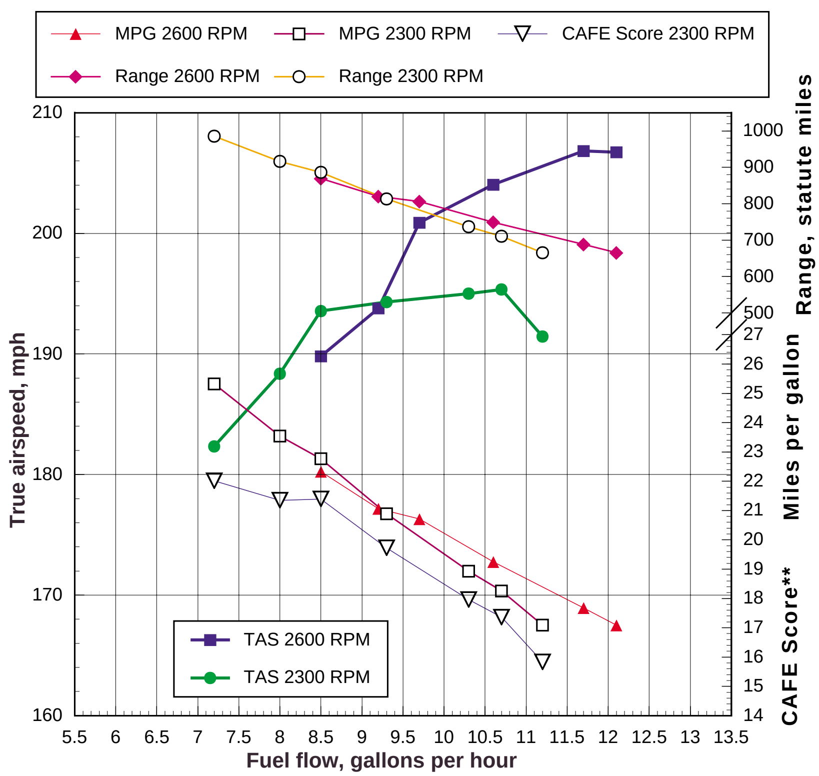
Maneuvering stability

Note: At 3.0 g's, fwd c.g. showed readings > 30 lb.

The graphs below use a Power-Performance data plotting technique developed by Klaus Savier. The peak CAFE score occurs at the fuel flow and cruise velocity, V, which optimize the trade-off between speed and MPG and is typically lean of peak EGT. The relative CAFE scores shown here, scaled to fit the graph's Y axis, are based on the computation ($V^{1.3}$ x MPG), which is part of the CAFE Challenge formula.



RV-8A: 12000' density altitude, w.o.t..
****Comparative aircraft flight efficiency score**



RV-8A: 8000' density altitude, w.o.t..
****Comparative aircraft flight efficiency score**

Cruise flight data	Flight#/drag/Baro#	DAD Clock	CAS, Baro #3	CAS, no cuffs, mph	Densalt, ft	Dens. ratio	New TAS, mph	MP, in.Hg.	RPM	GPH	MPG	Weight, lb.	Range, miles	**CAFE score	Endur, hrs.	Comment
RV-8A N58VA	#6, no cuffs, Baro #1	08:52:50	na	217.0	597.0	0.983	218.9	30.2	2752	15.0	14.6	1772	568	16	2.6	Vmax s.l., no cuffs
	#4, with cuffs, Baro #3	05:14:04	212.0	217.8	690.1	0.980	220.0	29.9	2741	13.9	15.8	1739	616	18	2.8	Vmax, s.l., with cuffs
New TAS computed	#5, no cuffs, Baro #1	09:11:06	na	217.0	651.4	0.981	219.1	29.7	2780	14.4	15.2	1812	592	17	2.7	Vmax, s.l., no cuffs
based on CAS and	#5, no cuffs, Baro #1	08:13:56	na	196.9	6086.2	0.834	215.7	w.o.t.	na	na	na	1412	na	na	na	Lightwt. Triav Vmax
density altitude and	#4, with cuffs, Baro #3	04:12:47	189.3	193.9	5838.5	0.840	211.6	25.2	2760	12.8	16.5	1791	643	17	3.0	Vmax @ 6000'
compensated for																
wing cuff drag	#4, with cuffs, Baro #3	04:33:02	179.1	183.2	8019.7	0.786	206.7	23.4	2589	12.1	17.1	1774	665	17	3.2	w.o.t., rich, 8000'
41.92 gallons fuel	#4, with cuffs, Baro #3	04:34:23	179.2	183.3	8013.6	0.786	206.8	23.4	2594	11.7	17.7	1772	688	18	3.3	w.o.t., rich, 8000'
for computing range	#4, with cuffs, Baro #3	04:36:24	176.8	180.8	8025.4	0.785	204.0	23.4	2597	10.6	19.2	1770	749	19	3.7	w.o.t., near peak
3 gallons VFR reserve	#4, with cuffs, Baro #3	04:38:23	174.2	178.1	7998.5	0.786	200.9	23.3	2595	9.7	20.7	1768	806	20	4.0	w.o.t., lean of peak
Measured wing cuff	#4, with cuffs, Baro #3	04:40:17	168.1	171.7	8026.3	0.785	193.8	23.2	2583	9.2	21.1	1766	820	20	4.2	w.o.t., lean
drag penalty = 5.8 mph	#4, with cuffs, Baro #3	04:40:44	164.7	168.2	8034.1	0.785	189.8	23.2	2575	8.5	22.3	1766	869	20	4.6	power loss
at 212 mph CAS																
Baro #3 = wing pitot	#4, with cuffs, Baro #3	04:43:05	166.1	169.7	8030.1	0.785	191.4	23.3	2295	11.2	17.1	1763	665	16	3.5	w.o.t., rich, 8000'
Baro #1 = stock pitot	#4, with cuffs, Baro #3	04:45:03	169.3	173.0	8075.0	0.784	195.3	23.2	2299	10.7	18.3	1761	711	17	3.6	w.o.t., rich, 8000'
Flight #1= 1/31/99	#4, with cuffs, Baro #3	04:46:39	169.1	172.8	8039.6	0.785	195.0	23.3	2295	10.3	18.9	1759	737	18	3.8	w.o.t.
Flight #2= 2/1/99	#4, with cuffs, Baro #3	04:47:44	168.4	172.1	8079.7	0.784	194.3	23.3	2291	9.3	20.9	1758	813	20	4.2	w.o.t., lean of peak
Flight #3,4 = 2/2/99	#4, with cuffs, Baro #3	04:48:39	167.7	171.3	8106.3	0.784	193.6	23.2	2292	8.5	22.8	1758	886	21	4.6	w.o.t., lean
Flight #5= 2/11/99	#4, with cuffs, Baro #3	04:51:10	163.3	166.7	8101.7	0.784	188.4	23.1	2284	8.0	23.5	1755	916	21	4.9	w.o.t., leaner
Flight #6= 2/12/99	#4, with cuffs, Baro #3	04:51:56	158.3	161.5	8050.4	0.785	182.3	23.0	2285	7.2	25.3	1755	986	22	5.4	rough engine
Flight #7= 2/15/99																
See IAS/CAS calib.	#4, with cuffs, Baro #3	04:56:40	97.7	98.9	7702.2	0.793	111.1	16.9	1747	5.1	21.8	1752	848	10	7.6	low power, near Vy
for Baro #1 corrections	#4, with cuffs, Baro #3	05:04:26	102.4	103.8	7678.1	0.794	116.4	16.6	1769	5.1	22.8	1748	889	11	7.6	low power, near Vy
**TAS^1.3 x MPG/1000	#4, with cuffs, Baro #3	04:59:21	84.9	85.8	7856.9	0.790	96.6	16.3	1765	5.0	19.3	1751	752	7	7.8	low power, near Vx
	#4, with cuffs, Baro #3	05:00:59	71.7	72.4	7915.4	0.788	81.5	16.3	1749	4.9	16.6	1750	647	5	7.9	max endurance
	#3, with cuffs, Baro #3	12:28:49	155.1	158.2	12355.8	0.685	191.1	19.3	2592	13.2	14.5	1724	563	13	2.9	very rich, 2600 RPM
	#3, with cuffs, Baro #3	12:52:22	163.2	166.6	12046.9	0.692	200.3	19.8	2583	11.1	18.0	1697	702	18	3.5	w.o.t., extra rich
	#3, with cuffs, Baro #3	12:53:34	164.4	167.9	12128.7	0.690	202.0	19.8	2586	10.5	19.2	1695	749	19	3.7	w.o.t., 99.8 dBA
	#2, with cuffs, Baro #3	03:56:21	165.8	169.3	11814.0	0.697	202.8	19.2	2587	10.1	20.1	1744	781	20	3.9	w.o.t., rich of peak
	#3, with cuffs, Baro #3	12:55:11	165.4	168.9	12126.7	0.690	203.3	19.8	2586	9.8	20.7	1694	807	21	4.0	w.o.t., rich of peak
	#2, with cuffs, Baro #3	03:57:42	166.0	169.6	12113.4	0.691	204.0	19.2	2588	9.5	21.5	1743	836	22	4.1	w.o.t., best power
	#2, with cuffs, Baro #3	04:00:31	164.6	168.1	12148.5	0.690	202.4	19.1	2589	9.3	21.8	1740	847	22	4.2	w.o.t., near peak
	#3, with cuffs, Baro #3	12:57:42	158.9	162.2	12020.7	0.693	194.8	19.8	2580	8.6	22.7	1692	882	21	4.5	w.o.t., lean
	#3, with cuffs, Baro #3	12:59:13	149.6	152.5	11985.8	0.694	183.1	19.6	2576	7.8	23.5	1690	914	21	5.0	w.o.t., sl. rough engine
	#3, with cuffs, Baro #3	01:01:28	152.7	155.7	12221.2	0.688	187.7	19.6	2301	10.9	17.2	1688	670	16	3.6	w.o.t., 2300, rich
	#3, with cuffs, Baro #3	01:03:03	156.0	159.1	12255.0	0.688	191.9	19.6	2296	10.4	18.5	1686	718	17	3.7	w.o.t., less rich
	#3, with cuffs, Baro #3	01:04:37	158.5	161.7	11913.7	0.695	194.0	19.8	2289	9.6	20.2	1685	786	19	4.1	w.o.t.
	#3, with cuffs, Baro #3	01:06:49	159.9	163.2	11945.2	0.694	195.8	19.9	2304	9.1	21.5	1683	838	21	4.3	best power
	#3, with cuffs, Baro #3	01:08:37	158.2	161.4	11915.8	0.695	193.6	19.9	2301	8.3	23.3	1681	908	22	4.7	near peak
	#3, with cuffs, Baro #3	01:10:44	155.6	158.7	11923.5	0.695	190.4	19.9	2303	7.7	24.7	1679	962	23	5.1	lean of peak
	#3, with cuffs, Baro #3	01:12:09	154.8	157.9	11905.2	0.695	189.3	19.9	2298	7.3	25.9	1678	1009	24	5.3	best CAFE score
	#3, with cuffs, Baro #3	01:13:20	143.7	146.4	11869.2	0.696	175.4	19.7	2289	6.7	26.2	1678	1019	22	5.8	economy cruise
	#3, with cuffs, Baro #3	01:15:10	124.8	126.8	11808.7	0.698	151.8	19.4	2286	6.0	25.3	1676	985	17	6.5	engine rough

rudder requires about 18 degrees. Only three degrees of bank was sufficient to oppose right rudder and about ten degrees for full right rudder. Although the nose drops when rudder is held in either direction with the flaps down, multiple light taps on the rudder are able to alter and control bank without the use of aileron. Strong positive rudder force gradients were observed throughout the rudder's range of travel at all speeds and configurations tested.

MANEUVERING STABILITY

The substantial stick force per G gradients we measured for the RV-8A came as something of a surprise. The pilot's perception when maneuvering the aircraft is generally that forces required are fairly light, and certainly that no undue effort is ever required to obtain the desired result. At the same time, the sharp gradients we measured at forward c.g. insure that the pilot is getting excellent feedback from the aircraft when imposing structural loads, making unintentional overloading unlikely. Naturally, the aft-c.g. force gradients are less, requiring more awareness on the part of the pilot, but even these are quite adequate.

ADVERSE YAW

It's tempting to write "nothing to report" here, because it comes close to describing N58VA's adverse yaw behavior. The design features Frise ailerons, which are hinged such that the leading edge projects below the wing when the trailing portion is deflected upward, thereby creating drag to counter adverse yaw. On the RV-8A these are almost perfectly "calibrated", so the ball stays centered during mild turning maneuvers with no rudder input at all. A mere touch of rudder is all that is needed to coordinate turns with more abrupt aileron inputs. Abrupt inputs without rudder result in a slight hesitation before the nose follows into the turn.

When I suggested to Dick that the RV-8A, in the hands of a good instructor, might actually be suitable for primary flight training, he correctly pointed out that its self-coordinating tendency would leave the student ill prepared for most other aircraft. Conversely, old habits do die hard, and I never did entirely overcome a tendency to use excessive rudder during turns.

ROLL RATES

The brisk roll rates we measured for the RV-8A can be found in the table below, but the quality of its roll behavior is really of more interest than the absolute rate. Very effective ailerons and the low inertia of the lightweight wing work in concert to produce gratifyingly crisp and immediate response to control inputs, and the roll ceases promptly when the stick is returned to the neutral position. Point rolls should be easy in this aircraft. Rapid aileron deployments are light and fluid, with stick force just sufficient to provide good feel, with no accompanying tendency for the nose to rise or drop. It should be noted that the roll rates in the table below are calculated from the time required to roll from a stabilized 60 degree bank to a 60 degree bank in the opposite direction including time for the control input and acceleration. The absolute rate once established in a sustained roll would be higher. A fairly casual full aileron roll entered at 160 mph indicated produced a rate of about 135 degrees per second.

The only quirk encountered was during very abrupt full deflections of the ailerons at speeds near Va, which resulted in a strong buffet being transmitted back through the stick, and slightly reduced roll rates. This was evidently due to flow separation along the leading edge of the Frise aileron that had been deflected upward, and was easily avoided by applying the aileron input less abruptly. Dick is aware of this phenomenon, and said he was experimenting with different leading edge profiles in hopes of finding one that preserved the adverse yaw behavior without the separation. I'd guess that most pilots flying the RV-8A are unlikely to deploy the ailerons in this manner.

SPIRAL STABILITY

You would not necessarily expect an aircraft so ever-willing to roll as the RV-8A to display neutral spiral stability, but that is indeed the case. After being placed in a stable, coordinated turn with a 20-degree bank in either direction N58VA showed no particular tendency to deviate from that position with the stick free neither at Va clean nor at 1.3 Vs in the landing configuration. Although the RV-8A does require a modicum of continuous attention during cruising flight, it won't roll over into a death spiral just because the pilot's attention was diverted by a moment of chart reading.

TRIM AUTHORITY

The aircraft is equipped with a bungee-type aileron trim actuated by a lever on the lower left side of the cabin. Although it exerts only mild authority, it is quite adequate for keeping the wings level so long as the fuel load is kept roughly in balance by switching tanks every half-hour or so.

Elevator trim authority is excellent on the RV-8A. When trim control was operated through its full range of motion (ten turns of the vernier knob) while holding the airspeed at 140 mph, the stick force

RV-8A, N58VA, SPECIFICATIONS

Empty weight/gross weight	1127.2 lb/1800 lb
Payload, full fuel	421.3 lb
Useful load	672.8 lb
ENGINE:	
Engine make, model	Lycoming IO-360-A1D6
Engine horsepower	200 BHP
Engine TBO	2000 hr
Engine RPM, maximum	2700 RPM
Man. Pressure, maximum	atmospheric
Turbine inlet, maximum	na
Cyl head temp., maximum	475 ° F
Oil pressure range	55 - 95 psi
Oil temp., maximum	245 ° F
Fuel pressure range, pump inlet	14-44 psi
Weight of prop/spinner/crank	na
Induction system	Bendix RSA-5 AD1 fuel injection
Induction inlet area	28.75 in
Exhaust system	4 into 2 crossover
Oil capacity, type, cooler	8 qt., 50 wt.
Ignition system	Slick 4373
Cooling system	Downdraft, hot accesssory section
Cooling inlet area	54 sq in
Cooling outlet area	44.6 sq in
PROPELLER:	
Make	Hartzell HC-C2YK-1BF/F7666A-4
Material	aluminum
Diameter/Pitch	72 in
Prop extension, length	0
Prop ground clearance, full fuel	13 in
Spinner diameter	13.25 in
Electrical system	12 V battery/35 amp mini-alternator
Starter	Skytech starter 12 v.
Fuel system	2 wing tanks - fuel injection
Fuel pump	engine driven pump, elect. boost pump
Fuel type	100 LL
Fuel capacity, by CAFE scales	41.92 gal
Fuel unusable	8 oz
Flight control system	center stick -dual
Braking System	Cleveland
Tire size, mains/nose	500 x 5 / 11x4:00 x 5
Seats	2
Cabin entry	sliding canopy
Width at hips, front/rear	27/ 23 in
Width at elbows, front/rear	32/ 29 in
Width at shoulders, front/rear	24/ 24 in
Height, seat front to canopy	42.5 in
Baggage capacity, front/rear	14Lx34Wx15H/ 27Lx23Wx27H
Baggage door size, front /rear	13 x 19 / 21.5 x 23 in
Baggage lift over height, frt/rear	51 in / 21 in (above with walk)
Baggage capacity, front/rear	50 / 75 lb
Step-up height to wing step/T.E.	17.5 / 26.5 in

FLIGHT TEST DETAILS

13 flights were made during the first 2 weeks of February, 1999, all during day VFR conditions. A Flowscan 201A fuel flow transducer was used for the gph determinations and was calibrated by measuring the weight of fuel burned on each flight. A PropTach digital tachometer was mounted on the top of the instrument panel. Performance data flights were conducted with pilot and flight engineer aboard and flying qualities were evaluated with solo flights using an analog G meter and Brooklyn Tool & Machine Co., Inc. NJ hand-held stick force gauge.

Cruise flight data was obtained with the wingtip CAFE Barograph (#3) mounted on a wing cuff with a dummy barograph and cuff mounted on the opposite wing. These were correlated with the panel airpseed indicator to produce the airspeed correction table shown here. Our data suggest that Vy is 105 mph CAS and Vx is 80 mph CAS.

A temporary mixture control linkage was fabricated and installed so as to allow mixture adjustment by the flight engineer in the rear seat. The flight test equipment was mounted in the forward baggage compartment along with 2 large gel cell batteries to power the recorders.

Cowl exit temp (C.X.T.) is a function of the OAT & CHT and is a measure of the efficiency with which the cooling system removes heat from the hot engine. This can be expressed as the temp rise relative to the hottest CHT observed during climb:

$$(163 - 61) / 339 = 0.30$$

Compare this to 0.25 for the Cozy Mark IV. The RV-8A, with its fixed cowl exit size, never reached a CHT above 360°F and could probably reduce cooling drag by use of a cowl flap.

The CAFE scales were used to determine the moment/arm of the aircraft's fuel. This was found to be 80.11" aft of datum rather than the 80.0" described in Owner's Manual.

ranged from a 21-pound pull at full forward trim to an 18-pound push at full aft trim. The only time we reached the trim's limit of authority was during 80-mph power-off approaches at very forward c.g. loadings

STALLS

One-G and mildly accelerated stalls were found to be benign in all configurations and loadings tested. Stall onset was indicated by very mild airframe buffeting and stick-shake, which preceded the stall

KIT SUPPLIER

Van's Aircraft, Inc.
PO BOX 160
North Plains, OR 97133
503-647-5117

OWNER/BUILDER N58VA

Van's Aircraft, Inc.

DESIGNER'S INFORMATION

Cost of airframe materials, no engine or inst.	$15,255 Standard, $22,750 Quick Build
Kit starts sold to date	1018
Number completed	32 RV-8, 1 RV-8A
Est. hours to build	1600-2000 Standard, 800-1000 Quick Build
Prototype first flew	1998
Normal empty wt. per Owner's Manual	1030-1125 lb
Design gross weight, lb, Takeoff/Landing	1800 lb
Recommended engine(s)	IO-360 A1D6 Lycoming
Advice to builders:	Basic positive G aerobatics approved, keep it light and simple.

CAFE FOUNDATION DATA, N58VA, Serial #1

Wingspan	**23 ft**
Wing chord @ root/tip	**58 in/ 58 at tip joint**
Wing area	**111.2 sq ft**
Wing loading	**16.2 lb/sq ft**
Power loading	**9.0 lb/hp**
Span loading	**78.3 lb/ft**
Airfoil, wing	**NACA 23000 series**
Airfoil, design lift coefficient	**na**
Airfoil, thickness to chord ratio	**13.5%**
Aspect ratio	**5.31**
Wing incidence	**0.5 °**
Thrust line incidence, crankshaft	**0 °**
Wing dihedral	**3.5 °**
Wing taper ratio, tip/root,	**58 in/ 58 in**
Wing twist or washout	**0 °**
Wing sweep	**0 °**
Steering	**Differential braking, castoring nosewheel**
Landing gear	**Fixed tricycle**
Horizontal stab: span/area	**105 in/ 13.71 sq ft**
Horizontal stab chord, root/tip	**na**
Elevator: total span	**100 in/ 8.8 sq ft**
Elevator chord: root/tip	**15.5 in/ 10.5 in**
Vertical stab: span/area incl. rudder	**57 in/ 13.45 sq ft**
Vertical stab chord: average	**34 in**
Rudder: average span/area	**54.5 in/ 5.96 sq ft**
Rudder chord, bottom/top	**10.5 in/ 21 in**
Ailerons: span/average chord, each	**54 in/ 13.25 in**
Flaps: span/chord, each	**58 in/ 13.25 in**
Total length	**20 ft 11 in**
Height, static with full fuel	**87.5 in**
Minimum turning circle	**30 ft at wingtip extremes**
Main gear track	**76 in**
Wheelbase, nosewheel to main gear	**61 in**
Acceleration Limits per factory:	**+3.8 g at 1800 lb/ 6.0 g at 1550 lb**

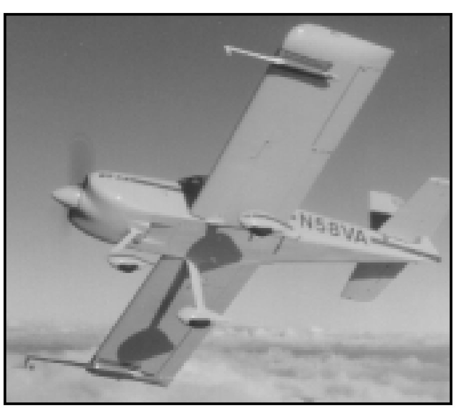
AIRSPEEDS PER OWNER'S MANUAL	
Never exceed, V_{ne}	**200/ 230 kts/mph**
Maneuvering, V_a	**123/ 142 kts/mph**
Best angle of climb, V_x	**69/ 80 kts/mph**
Best rate of climb, V_y	**91/ 105 kts/mph**
Stall, clean, 1800 lb GW, V_s	**55/ 63 kts/mph**
Stall, dirty, 1800 lb, GW, V_{so}	**50/ 58 kts/mph**
Flap Speed, extended, V_{fe}	**87/ 100 kts/mph**

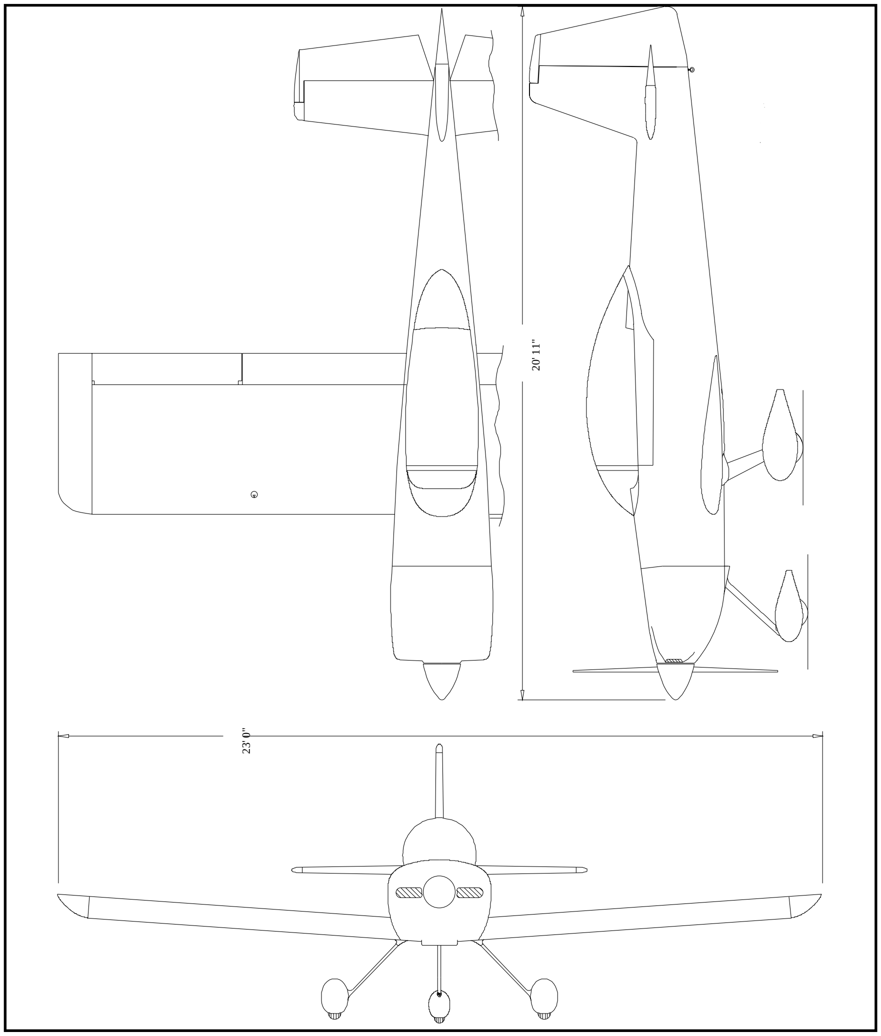
by about 1-2 mph, depending upon the configuration. There were no stall warning or angle of attack devices installed on the aircraft. Stall behavior was generally quite benign, but low-time pilots should practice stalls at altitude in all configurations to enhance their ability to recognize stall onset. With the flaps fully extended, the aircraft displayed a tendency to fall off to the left somewhat at the stall. Recovery in all cases occurred almost instantly upon release of back pressure on the stick, and resulted in the loss of no more than 100-200 feet of altitude. Clean 1-G stalls occurred between 56-59 mph with full flaps and 60-63 mph clean, depending upon weight. CAFÉ calibrated stall speeds, which are lower due to installation/position error, can be found in the measured performance section. The slowest 1-G stall we measured, at a flying weight of about 1400 pounds and using the Triaviathon rule of 15" mp/1500 RPM, was 47.5 mph!

APPROACH AND LANDING

The excellent field of view, fixed landing gear, and benign handling all contribute to safety and a low pilot workload during approaches to land in the RV-8A. The aircraft decelerates and descends readily when power is reduced, so descents from cruising altitude do not require a lot of planning. This ability, in combination with the great climb performance, gives the pilot a sense of freedom of movement in all three dimensions.

A speed of 100 mph works well in the pattern and also corresponds to Vfe. Electric flap actuation is one of the few extras that Dick was willing to include, and I feel that it was an appropriate choice. With the flaps effortlessly activated by a toggle switch on the control column, the pilot can give full attention to flying a safe pattern. As speed is reduced to 75-80 mph with the flaps extended and the prop at fine pitch, the sink rate rises quite dramatically, so considerable power is required to maintain a standard approach angle. Everything goes to slow motion during a properly executed flair, with the resulting touchdown speed being about that of a Cessna 150.





Dead-stick landings are worthy of some practice due to the increased power-off sink rate, and are made easier by leaving the prop in coarse pitch until the runway is assured. Extra speed is in order when practicing power-of landings with very forward c.g. loadings, as elevator authority becomes quite limited at speeds normally used for landing. In normal operation, a small amount of power carried into the flair restores ample elevator authority. When doing go-arounds or touch-and-goes, the pilot should be mentally prepared to provide substantial forward pressure on the stick after power is applied and until the flaps are up and the elevator re-trimmed for the climb-out. The aircraft has ample control authority to negotiate crosswind landings, and these require no special technique or skill. The brakes are excellent and control during the deceleration to a stop is very positive.

CONCLUSIONS

As C.J. put it, the RV-8A is a dream airplane for the well-prepared low-time pilot, and I agree wholeheartedly. At the same time, its exhilarating performance and great handling qualities will never leave the veteran pilot bored. Imagine several categories of homebuilts, one being those with intrinsic safety, another those featuring great value, another those promising high performance, and finally the group of those with great handling qualities. The RV-8A would be equally at home in all of them. The group of homebuilts for which that can be said is small indeed!

Stall speeds-- RV-8A	Flight/Clock	Mode	MP/RPM	Weight, lb	CAS, kt/mph
fwd c.g. at various	#3/16:17:39	clean	12.0/1852	1788	52.4/60.4
M.P. and RPM's	#3/16:20:54	1/2 flaps	12.9/1868	1785	48.5/55.9
Wing Baro #3	#3/16:25:32	full flaps	13.8/1975	1782	47.0/54.2
gross wt. = 1800	#5/08:17:53	full flaps	14.9/1470	1410	40.9/47.1