
# GEORGE MEAD'S ADVENTURE

(Photo by Ted Koston)

*By Jack Cox*

IN SOME WAYS the world of today's homebuilt airplane designer is reminiscent of that of his civil aviation forebearers of the late 1920s. It was a small world then — there were but a few aeronautical engineers and even fewer steady jobs in the lightplane industry. In too many instances little airplane companies sprang up in the wake of the Lindbergh mania, flourished for a few months and quietly faded into oblivion. Engineers moved from job to job, chasing their aeronautical dreams. In the course of their wanderings, many inevitably crossed paths with each other, often working for the same concerns for periods of time. This resulted in a valuable cross pollination of ideas for which aviation is the richer to this day. Sometimes even differences of opinion were valuable — witness the example of Walter Beech, Lloyd Stearman and Clyde Cessna. The trio formed Travel Air in 1925 but eventually chose to go their separate ways to develop their own ideas of what an airplane should be.

Today, the number of homebuilt designers is equally small . . . and through EAA most have had the opportunity to meet, exchange ideas and, in rare instances, work together. The incredible variety of homebuilt designs we enjoy today is at least in small part a result of this cerebral interchange.

An unlikely benefactor of our present age has been the ill-fated Bede Aircraft enterprise. One thing Jim Bede did right during the concern's heyday was to assemble a large group of young, very talented, very enthusiastic people to create the BD-5. History, no doubt, will deal harshly with the managerial failures of the Bede endeavor . . . but in one of those curious convolutions of fate we often see emerging from an otherwise unfortunate situation, homebuilding **has** benefited from what went on at Newton, Kansas. From that Bede group, you see, came Burt Rutan, Tom Jewett of Quickie Aircraft . . . and now, George Mead.

George zipped into Oshkosh this year with a sleek little single place, all-composite original design . . . without fanfare and with few outside of Mojave and Wichita even knowing of the existence of the airplane. As you read in the October issue, he competed in the LBF 500 and did extremely well — flying the 500 miles on less fuel than any other contestant and turning a fast lap of 183.99 mph on just 80 horsepower. The remainder of the week George patiently submitted to innumerable interviews, answered countless questions and posed for piles of pictures — escaping only to go

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bombing around the fly-by pattern whenever his performance class was called. The high aspect ratio wings and tail surfaces of the little airplane plus its impressive speed made it stand out in the pattern — an attention arresting planform even in a pattern full of VariEzes.

George calls his airplane the Adventure . . . and his experience with it during Convention week certainly was that.

O. K., so who is George Mead, you ask? Well, VariEze builders know him well because he worked for Burt Rutan during the development of the "production" version of the Eze and the writing of the unique building instruction book one gets in lieu of conventional engineering drawings to build the airplane . . . but let's go back to the beginning for the benefit of the rest of you.

George was born in Knoxville, Tennessee in 1949 and lived for a time in Birmingham, Michigan while his father was getting his masters degree . . . but he really grew up in Tallahassee, Florida where his father teaches art. He can't remember not being fascinated by airplanes but it was the C.A.P. that galvanized his interest and got him his wings. In 1967 George spent the summer at a C.A.P. encampment in Rock Hill, SC and earned his Private ticket in a Cessna 150.

The following year found George enrolling at the University of Florida and embarking on a course of study that would see him graduate in 1972 with a degree in Aerospace Engineering. He had also been a member of the University's Air Force R.O.T.C. unit, so went on active duty shortly after accepting his sheepskin and commission . . . just in time to get caught up in the massive government cutbacks that followed the end of the Viet Nam war. Given the opportunity to muster out, he did so and shortly took a job with an outfit in Lynchburg, VA that built components for nuclear reactors. It was here he came in contact with homebuilts for the first time.

George ran into a couple of fellows who were building a BD-4 and jumped in to lend a hand during the final stages of construction. He also did some of the test flying and quickly fell in love with the airplane. Compared to the Cessnas and Pipers he had become accustomed to, the BD-4 was a real thoroughbred. In the fall of 1973 George flew the BD-4 to Newton, Kansas to visit friends and to tour the Bede facilities — and wound up taking a job there. He was assigned to Burt Rutan who headed up the flight test and development section. In September of 1975 George left Kansas for a position with the previously departed Burt Rutan at Mojave, helping to put the VariEze on the market. That project completed, he returned to Wichita in July of 1977 and went to work for Cessna's flight test department — where he soldiers to this day.

O. K., now that you have had a formal introduction to George Mead, let's get on to the Adventure. When it came time to get serious at the drawing board, it was only natural that past experience flying and working on the BD-4, BD-5 and the VariEze would shape his ideas to a degree, but so did the conventional aircraft George had flown since he was 17. At Mojave a part of his job was customer service — translate that as his being the one who took the phone calls from builders, would-be builders and just plain tire kickers. Among other things, George noted that a significant number of the callers were people interested in composite construction but not the canard configuration of the VariEze. He had already decided he eventually wanted to design his own airplane . . . "to determine if his college education had any connection with the real world," as he puts it today. The callers provided some direction for this desire — design a conventionally configured airplane utilizing composite construction.

The project, of course, had to be something not in conflict with his work at the Rutan Aircraft Factory, so (this was in the fall of 1976) George ultimately decided on a single place job to "blow Kenny Rand's doors off." It had to be single place so it would not require a lot of space to build — specifically, it had to fit his 13' x 18' garage — nor involve a large initial investment. It also had to have a conventional aircraft engine (George toyed with the idea of a McCulloch at an early stage of the project, but ultimately decided he did not want to embark on an engine development program). In the end the Continental "A" series engines were eventually settled upon.

Actual work on the airframe began around Christmas time of 1976 — starting with bulkheads and the fuselage sides. Progress was slow through the winter and spring . . . and came to a complete halt in July when George moved his family back to Wichita. In fact what with the move itself, acclimation to a new job, settling into a new house, etc., work was suspended for about 3 months. Once work recommenced in October, however, it was high gear all the way, with the plane flying about a year later.

### Construction

According to George, there is nothing in the construction of Adventure that would be new to VariEze or Quickie builders. There are detail differences, but the basic moldless glass/epoxy/foam sandwich now familiar to EAAers is utilized. No urethane foam is used, period. It carves nicely, George concedes, but is so incredibly messy that he prefers to avoid it. Instead, Adventure is built using blue polystyrene foam almost throughout. Exceptions are the major load carrying fuselage bulkheads and the fuel tank sides, all of which are high density Klegicell.

The wing cores are hot wired out of bats of 2 pound **Styrofoam** (ordinary Dow insulating **Styrofoam**) and are sandwiched between layers of unidirectional and bidirectional glass cloth impregnated with a low toxicity epoxy. More unidirectional cloth is used on Adventure than on RAF planes, George points out. The wing spars are built up much like the VariEze's — likewise the tail surfaces. Finishing is the same as for all the composite aircraft, the most critical part of which is the application of an ultraviolet light barrier.

### Wings

Adventure's wing is built in two halves. There is no center section or separate carrythrough structure of any sort — rather, the extended spars of each wing panel are plugged in through very close tolerance slots in the sides of the fuselage, are pinned to mounting lugs and the ends are bolted together at the centerline of the fuselage. Four splice plates of .15 2024 aluminum do the job. Pieces of plywood are moulded into the fuselage sides to reinforce the wing spar slots and additional layers of glass are laid up on the load bearing surfaces so the strength is there to hold the wings on even in the highly unlikely event that someone forgets some nuts and bolts.

Initially, the wings were designed for and built with spoilers for roll control . . . and, in fact, were flown with them for the first 20 hours of the aircraft's existence. They worked — but not to George's satisfaction. Spoilers simply did not have the roll authority expected, and by the time he worked out a linkage that had low enough friction to provide the desired harmony with the rudder and elevator, the system was as complicated and as expensive as if ailerons had been installed! Consequently, the spoilers were removed in favor of small but very effective balanced ailerons. Everyone comments on their small size — they are 24 inches long and of narrow chord — but George points out that the moment arm of each is perfectly adequate to supply the muscle to roll the little bird. Adventure's size and the high aspect ratio of the wing and tail surfaces are deceptive — the airplane actually has quite normal moment arms, but you almost have to see a 3-view drawing to realize it.

The wings are also fitted with narrow chord, slotted flaps designed to generate optimum lift with the airfoil used . . . which is a 23018 at the root, tapering to a 23012 at the tip. Pushrod actuated, the flaps have 3 positions — $0^0$ for cruise flight, $15^0$ for take-off and approach and $45^0$ for landing.

The right wing has a VariEze-type trim tab mounted between the outboard end of the aileron and the wing tip.

### Tail Section

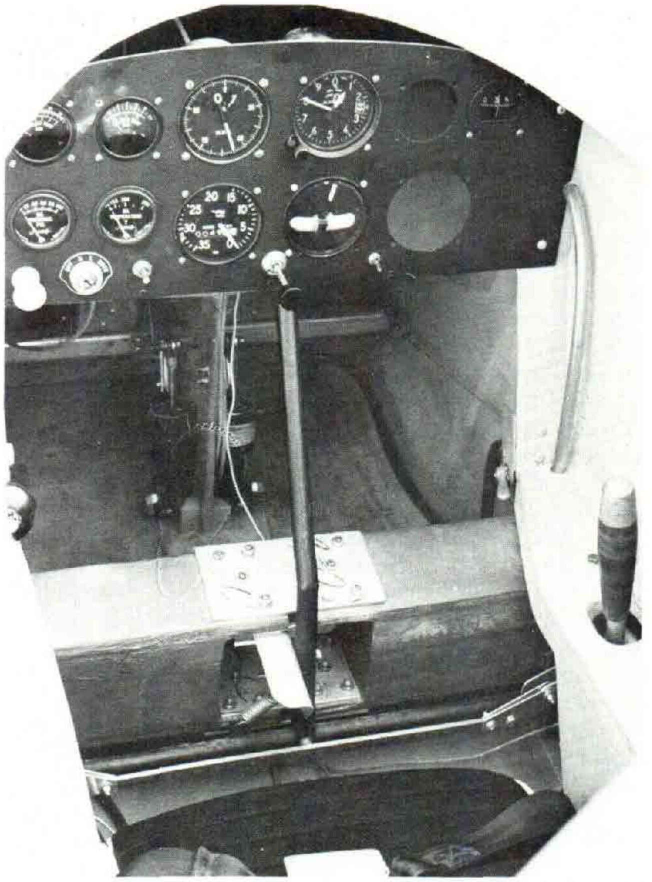
Adventure has a horizontal tail volume coefficient that is "more like a jet airliner than a lightplane," according to George. It was designed this way to provide more than adequate pitch dampening. George points to the fact that a common problem with tiny airplanes has always been hyper sensitivity in the pitch mode — so, he was determined to avoid the condition. That he succeeded is perhaps best summed up by his statement that . . . "It's the kind of airplane that if you don't like what you are doing, you can let go of the thing and it will behave itself." The elevator forces are light, but the natural dampening is definitely there.

The vertical tail is not so overwhelming, yet it has about half again the amount of area and authority as most factory airplanes. The airplane was "deadbeat" in yaw until a fairing was added to the nose gear strut. The added side area ahead of the CG is destabilizing just to the extent that with release of full rudder, Adventure overshoots about ¼ of a cycle before it comes back to a straight ahead attitude — not bad, but not as good as before the fairing was added. The trade-off is a 3 mph gain in airspeed at 50 percent power with the fairing. A nosewheel pant was tried and produced an additional 2 mph — but caused the nosewheel to shimmy. George doesn't think the 2 mph is worth the development work that would be necessary to solve the problem.

### Engine

Adventure's engine is a somewhat rare Continental A-80. George found it quite by accident while looking for the more common A-75 or C-85. He paid $1000.00 for a zero time engine, which is cheaper than most VW conversions. You have to hunt for a while, but such "finds" are still out there, he says.

The cooling system incorporated in Adventure is one of the aircraft's principal strong points. It is an updraft system very similar to that used on the front engine of the Rutan Defiant — natural, since George was working at RAF when the research was done on it. Adventure's nose contains just one small air inlet. Its 25 square inch area is about half what is normally provided to cool an engine like the A-80. Air enters the inlet just below the spinner, flows over the exhaust system, oil tank and accessory section — then shoots up through the cylinders and into a plenum chamber on top of the engine. From there it passes through a small, rearward aimed outlet that accelerates the air back to very near its inlet speed. A lot of work was done to keep the air flowing as smoothly as possible during its trip through the engine compartment. The inlet, for instance, is not



(Photo by Randy Bennett)

**Spartan cockpit of the prototype Adventure. The long handle in the center is the flap. The stick is at the right. Rudder bar and inboard mounted brake cylinders can be seen under the instrument panel. The attachment of the massive wing spars is obvious.**

simply a sharp edged hole in the cowling. Rather it is the opening for a sort of tube that extends a full 8 inches back into the engine compartment, defusing and slowing the airflow to about a third the speed at which it entered. Thus high pressure, (relatively) low speed air is cooling the engine.

The bottom line is that the system works extremely well. George figures that with about half normal inlet size, he is escaping about half the normal cooling drag — yet is cooling his engine more than adequately. At max climb . . . for any length of time . . . the highest CHT is $400^0$F, as measured at the spark plug thermocouple. $550^0$F is red line, according to Continental. And with no oil cooler, $190^0$F is the maximum oil temperature observed to date. At cruise, CHT is $365^0/375^0$ and oil temperature $150^0$. The entire system is pumping air so efficiently that the edges of the fiber glass cowling bulge ⅛" between the Camloc fasteners, which are spaced only 4 inches apart!

The Adventure's landing gear is adapted from a VariEze — tacit recognition of the expense of tooling up for one-off glass/epoxy struts. The main gear bow is shortened and is mounted a little differently, but the geometry is virtually identical to that in the VariEze. Fred Jiran's VariEze wheel pants are used to streamline the Rosenhan wheels. The nose strut is almost straight VariEze, because it is a known quantity and is free from shimmy, if built properly. It is faired, however, as was earlier related.

Two foam and glass fuel tanks are built into Adventure's fuselage — 10.5 gallons just ahead of the instrument panel and 9.5 gallons in the turtledeck behind the pilot's head. For the LBF 500 at Oshkosh this year,

### ADVENTURE SPECS
(Source: George Mead)

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|---|---|
| Wing Span | 20.0 ft. |
| Wing Area | 40.0 sq. ft. |
| Dihedral Angle | 4.5 degrees |
| Horizontal Tail Span | 8.4 ft. |
| Horizontal Tail Area | 9.8 sq. ft. |
| Vertical Tail Span | 3.5 ft. |
| Vertical Tail Area | 6.0 sq. ft. |
| Length | 13.0 ft. |
| Height | 6.5 ft. |
| Wheel Track | 5.0 ft. |
| Wheel Base | 3.5 ft. |
| Tire Size (main) | 340x300x5 |
| Tire Size (nose) | 280x250x4 |
| Cockpit Length | 54 in. |
| Cockpit Height | 38 in. |
| Cockpit Width | 23 in. |
| Mean Aerodynamic Chord | 25.15 in. |
| Maximum Take-Off Weight | 780 lbs. |
| Maximum Landing Weight | 780 lbs. |
| Prototype Empty | 460 lbs. |
| Useful Load | 320 lbs. |
| Full Fuel Payload | 200 lbs. |
| Fuel Capacity | 20 gal. |
| Wing Loading | 19.5 lbs./sq. ft. |
| Power Loading | 9.75 lbs./bhp |
| Span Loading | 39.0 lbs./ft. |
| Stall Speed, Flaps 0° | 70 mph |
| Stall, Flaps 45° | 57 mph |
| Maximum Speed, Sea Level | 180 mph |
| 75% Power Cruise, 8000 ft. | 175 mph |
| 50% Power Cruise, 8000 ft. | 155 mph |
| Best Rate of Climb Speed | 100 mph |
| Fuel Consumption/Miles Per Gallon: | |
| 75% Cruise, 8000 ft. | 5 gph/35 mpg |
| 50% Cruise, 8000 ft. | 3.3 gph/47 mpg |
| Range, including take-off, climb, descent and VFR reserve: | |
| 75% Cruise, 8000 ft. | 550 sm |
| 50% Cruise, 8000 ft. | 800 sm |
| Climb, Sea Level | 1600 fpm |
| Climb, 10,000 ft. | 750 fpm |
| Runway Requirement | 2500 feet of smooth surface |

Note: These performance figures represent test data and expansion of test data from the Adventure prototype, N36ME, with bare wheels and no nose strut fairing.

George had to install a temporary 4½ gallon tank behind the pilot to meet the requirement for a minimum of 22 gallons . . . and allow for a little fudge factor.

### Controls

A "side controller" stick is used to actuate push-pull tubes to the ailerons and elevator. The rudder is cable-controlled . . . with an old-time rudder bar being used rather than two individual pedals. Toe brakes are provided by mounting the pedals inboard on the rudder bar — so that no fancy parallelogram linkage is necessary to use them at extreme rudder deflection. A parking brake is provided by a simple cable/bellcrank system that allows both brakes to be set simultaneously.

The flaps are also pushrod actuated . . . through as long a handle as could be accommodated in the cockpit to reduce the force needed to yank 'em down at speed. Flap speeds are: First 15° — no faster than 130 mph; last 30° (to 45°) — no faster than 110 mph.

A bungee elevator trim system is used in the Adventure. A fixed up elevator spring and a down elevator spring are stretched to the proper tension by a small lever in the cockpit that is fitted with quite a number of detents so that very progressive "feel" can be clicked in. The VariEze "aileron" tab is driven by a model airplane servo powered by a battery mounted in the cockpit — since the airplane has no electrical system. There is no rudder trim.

### Performance

So much for the nuts and bolts . . . how does it perform? Well, as with a lot of prototypes, it wasn't easy for George to find out. First he had some teething problems to work out. The initial flight was in October of 1978 . . . and on the second time up the nose gear decided to stay down — a bad nose fork casting snapped and the nose wheel dropped off. During the subsequent landing the nose strut and prop were crunched but the tough fiber glass cowling held the nose up and off the **really** expensive and normally vulnerable item ahead of the firewall — the carburetor. A new Ted Hendrickson prop did not arrive until February . . . and when it did, there were three feet of snow on the ground (!) so the third flight was postponed until March.

The design rational of the Adventure had been to have an airplane with good performance, but one docile enough so that it could be safely flown by a Cessna 150 pilot. This, in George's opinion, meant heavily dampened control response — something often difficult to achieve in a tiny airplane. He went about realizing his design goals by making sure the little bird had adequate moment arms, adequate tail volume and adequate control surface area. One can't scale down the pilot of an airplane or the engine, so there is only so much one can do to reduce the size of the fuselage. The wings and tail can go several directions as long as the area is maintained. Traditionally, tiny high performance airplanes, such as the midget racers, have had short, stubby wings and tail surfaces — low aspect ratio surfaces. George went the other direction — long, skinny wings and tail surfaces, or high aspect ratio surfaces. There's nothing new or, from an engineering standpoint, different about this — it's just that we aren't accustomed to seeing tiny airplanes shaped this way. The result is an airplane with a more or less normal Formula One sized fuselage with wings and tail surfaces that look like they were scaled down from a Comanche. One has to look at the airplane a bit to get used to this "different" look, but shortly the reasoning behind it begins to register. The wings, for instance, have an aspect ratio of 10 to provide as much all around performance as possible on just 40 square feet of area, according to George.

Any way, the bottom line reads as follows: Without wheelpants, various cuffs, fairings, etc., George was able to obtain 155 mph at 50% power and 175 mph at 75%. With the pants and fairings he now gets 185 mph at 75%. Stall at the 780 pound gross is 58 mph with the flaps down and 70 mph clean.

George says it is no problem to fall in behind Cessna 150s in the landing pattern. The airplane is capable of 80 mph approaches, but he normally flys them at 85-90 and is turning off the runway in about 1500 feet under average conditions.

Just as is the case with the VariEze, range is an

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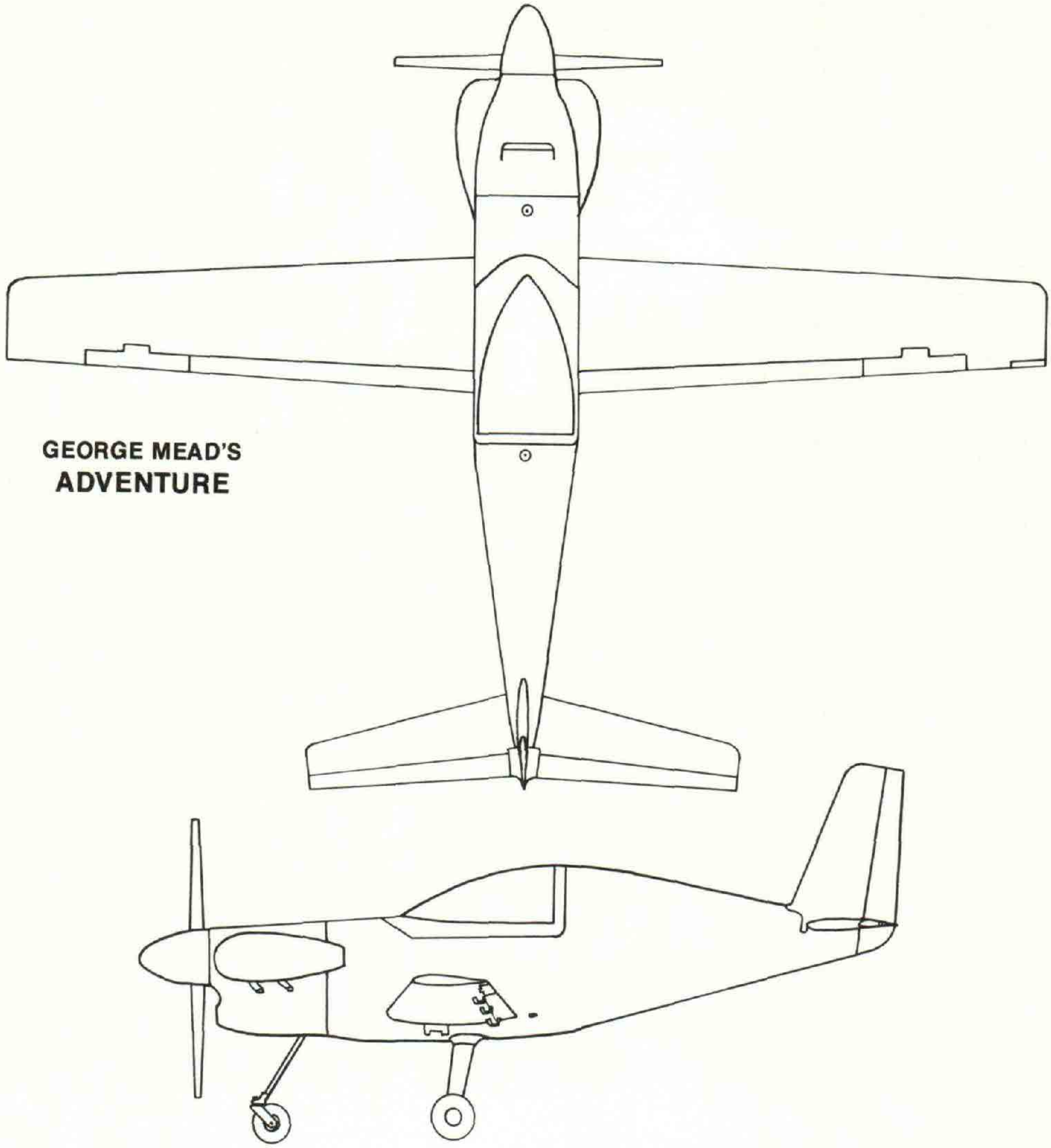

Adventure forte. At 75%, 550 statute miles are possible and 800 miles are within reach at 50% power. George flew non-stop from Wichita to Oshkosh, which is 620 statute miles. The trip was 4 hours enroute from lift-off to touchdown and 16 gallons of fuel were consumed . . . and George admits to a little time in Iowa "trying to find the right road." The prototype is bereft, you see, of nav/com so he was navigating strictly by the time honored finger-on-the-chart method. (You are allowed to laugh ONLY if you are a master of the art of pilotage and ALWAYS fly with sectionals in your aircraft so you can resort to them in case of a complete electrical failure. It happens, you know.)

One other little tidbit that relates to the Adventure's performance envelope is worth a mention. The propeller George ordered from Ted Hendrickson was a 62 incher with a 64 inch pitch. In the aircraft's original form — no fairings, cuffs, wheelpants — the prop was perfect. At 175 mph the engine would be right at its 2700 rpm redline. After the goodies were added, however, the engine turned 2900 — so a little more pitch will probably be added to the next one ordered.

Following Oshkosh, George did spin testing and found the airplane to recover normally. This was the last item in his flight test program, so now he has decided to make plans for Adventure available to homebuilders. They will be similar in format to those of the VariEze which, as we have mentioned, George did much of the original work on. A detailed, illustrated info pack is already available and the plans should be available by the time you are reading this. Contact George Mead, Mead Engineering Co., P. O. Box 354, Colwich, KS 67030. His phone (after 5:00 p.m.) is 316/796-1399.

The Adventure is a little more conventionally configured example of the new breed of high performance lightplane designs available to homebuilders — designed by professional aeronautical engineers to utilize the latest in construction materials and building techniques, and carefully configured to fly and ride like much larger, heavier airplanes . . . but still retaining a sporty look and control feel.

We look forward in the years to come to seeing the efforts of those of you who chose to share George Mead's Adventure.