# AJ Smith on the AJ-2

*Interview By Jack Cox*

*MY FIRST LOOK at the spectacular AJ-2 was as it led the pack into the fly-by pattern at Wittman Field – the victory parade for the Oshkosh 500. After all the racers landed, they were marshalled in front of the speaker's stand and the winner was introduced to the massive crowd of EAAers assemblying for the Monday afternoon air show. Afterwards, I was able to tape an interview with A. J. Smith . . . under the very worst of conditions. Amid a shoulder-to-shoulder crowd of admiring EAAers, bombarded by the thunder of successive waves of warbirds on take-off and blasted by a nearby PA speaker, A.J. somehow managed to piece together enough coherent thoughts to produce the following interview . . . a feat almost as amazing as his resounding and complete victory earlier in the day in the 1981 Oshkosh 500. We had to do the tape under those circumstances because shortly afterwards he slipped out between air show acts and flew the AJ-2 back to Fond du Lac.*

*I initially asked A. J. to run down the design rationale . . . as best he could between strafing runs by a pack of snarling P-51s.*

"The design started out as a cross-country airplane, a touring airplane. I wanted a lot of baggage space, high speed cruise and good fuel economy. I looked at two configurations — side-by-side and tandem. The tandem had slightly better performance, of course.

"My final decision was influenced by the efficiency races — the LBF race.

"I completed the preliminary design and the working drawings with the idea that the front seat would serve a dual purpose. It would be a passenger seat for local pleasure flights and short cross-country flights . . . and as a baggage compartment when the airplane is flown solo. By using the baggage compartment behind the rear cockpit and the front seat, I can carry about 240 pounds of luggage, fly rods, shotguns or whatever. And with 30 gallons of fuel and at about 55% power, I can cruise at 200 mph and get about 40 miles to the gallon."

*What sort of additional performance figures do you want to reveal at this early stage of the aircraft's development?*

"It appears that normal cruise will be about what our book says — probably 250, 255 mph at 75% power, at which point the mileage will drop down to 23 to 24 miles per gallon. Something like that."

*What engine is used?*

"A Lycoming IO-360 . . . fuel injected. It's a new engine. We tore it down, matched the ports (but didn't polish them) and matched all the moving parts for weight and dimension. The dynamometer said it produces about 215 hp . . . and it's very smooth. The propeller is a sort of one-off McCauley constant speed.

"The exhaust and cooling systems are not completely sorted out yet. Our original cooling calculations, as it turns out, were pretty accurate, however, at the last minute . . . just to be certain I wouldn't have any problems here . . . we increased the area of the exits by about 50%. As a result, I'm getting cylinder head temperatures of only about 250°F, so, I don't even use the cowl flap. Obviously, I have to begin closing down the exits — as well as necking down the inlets."

*How was the airplane constructed?*

"Construction is similar to the techniques developed by the Germans back in the 1950s . . . it consists of bulkheads and some kind of material to span between the bulkheads — balsa, foam or whatever — which, in turn, is very carefully contoured and fiber glassed. After the glass has cured, the form material (balsa or foam — Ed.) is removed, so that you end up with what is essentially a monocoque form of construction. It's not a very weight efficient method; obviously, we could save 100 to 150 pounds if we made molds and built the thing from the outside in rather than the inside out way we did it.

"It has a one-piece, 'plug-in' wing. The spar fits up into a notch in the bottom of the fuselage. It was designed that way so the next project could be a follow-on wing with a retractable gear. We can keep flying the airplane this way while we build the new one. Later, we can just bolt the new one on and go.

"It's a wet wing. The D-tube section is a sandwich, about ⅜" thick, and the spar is approximately at 40% — so you get a considerable area ahead of the spar. This area is fuel tank out to about 80% of the span. Each side holds 15 gallons, for a total of 30. There are 3 sort of 'ribs' within the tank (on each side), but they are there to act as baffles, not as primary structure.

"Flaps are electrically driven. Goes to 45° for approach and you use about 20/25° for take-off. We were running the LBF at a wing loading of nearly 24 pounds per square foot. We had absolutely no problem in getting over that 1400 feet, 5 foot high barrier — cleared it by 20 or 30 feet. So, take-off and climb are pretty good."

*What air foil are you using?*

"A NACA 64212 . . . 12% thick, constant section all the way out. The taper ratio is .5 . . . no twist."

*How does it stall?*

"At the outset, stall characteristics were not good — it had a tendency to snap to the left. However, we rigged the ailerons up a quarter of an inch, which gives an effective twist, added stall strips and that corrected the problem. Stall speed is about 68 mph now, right on calculation.

"Stability is really first rate. It's a very neutral airplane . . . it was designed to be neutral . . . and easy to fly. The stick forces are very low and they don't build up with Gs. Response times, as you might imagine, are very short. It's a very quick airplane."

*What sort of trim system are you using?*

"We thought our trim system was going to be unique. We designed printed circuits and components to fit in a 2½ inch instrument case which would give us 3-axis trim. You'd just twiddle little knobs on the front of the case to activate trim tabs that are an inch and a quarter in chord and about ten inches in span, driven by model airplane servos. Since we've gotten it built, however, others have shown me airplanes that have used similar systems for maybe ten years . . . so it's not unique. However, we find it to be a very effective trim system."


hoto by Jack Cox)

*How about instrumentation?*

It really could be an instrument ship, however, I don't think I'll ever fly it on instruments unless I'm forced to. But it does have full instrumentation, including a King area nav."

*Did you use it during the race?*

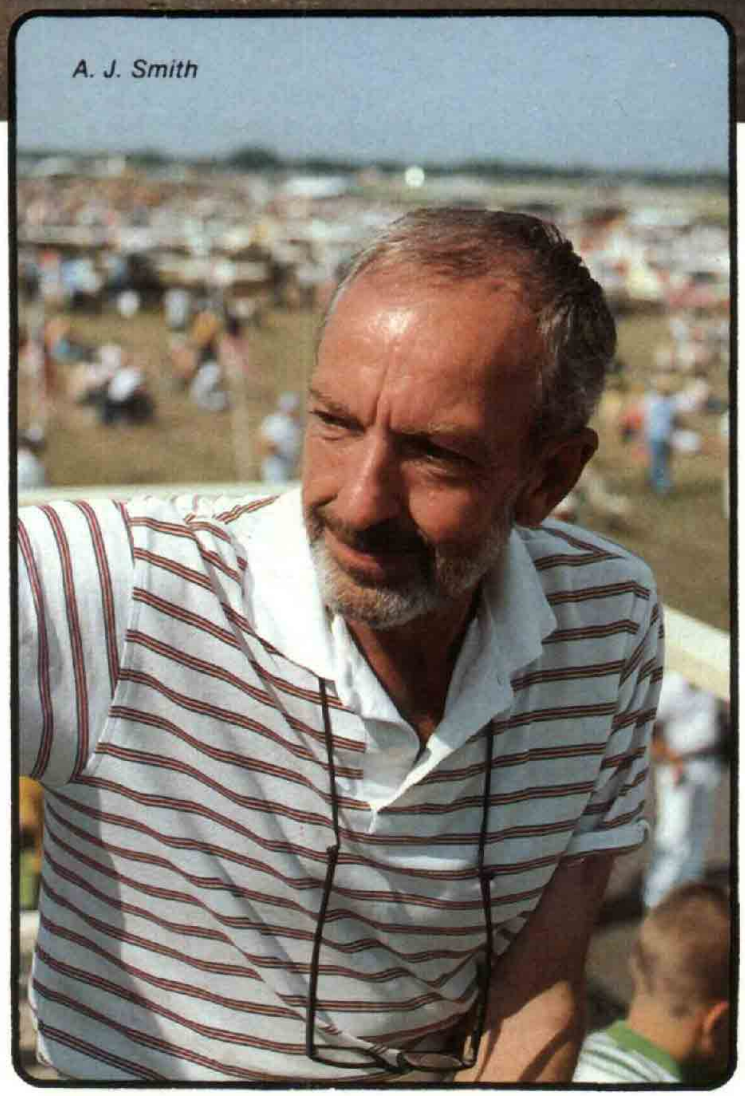
"The idea was to use the race turnpoints as waypoints, mainly to get accurate distance readouts as we went around the course. It turns out, however, that the LBF is a very straight forward race, really quite a simple one to fly, so we didn't need to use the area nav. You don't need that kind of sophistication or accuracy in order to control your fuel flow. We backed up the system with a Hoskins fuel flow meter, which I like very much. Its accuracy doesn't appear to be as good as it should be yet, however when I learn more about it, it probably will be more useful. It does give you a lot of confidence because you can play around with power settings and immediately see a change in fuel flow."

*Go on to the tail section.*

"It has a T-tail. Airfoils are also NACA sections — 9% for the horizontal tail and 12% for the vertical tail.

"The tailwheel is a Henry Haigh locking tailwheel and I like it tremendously. It's mounted on a Wittman-type tapered rod spring buried in the tail cone so all that is sticking out is the wheel and fork . . . with a pant around it. There aren't any weak points in the tailwheel, no steering rods or cables or whatever. It provides tremendous steering capability so that take-offs and landings are very good."

*How about a little background on the actual building of the airplane – who was involved, what was the time frame, etc.?*




(Photo by Jack Cox)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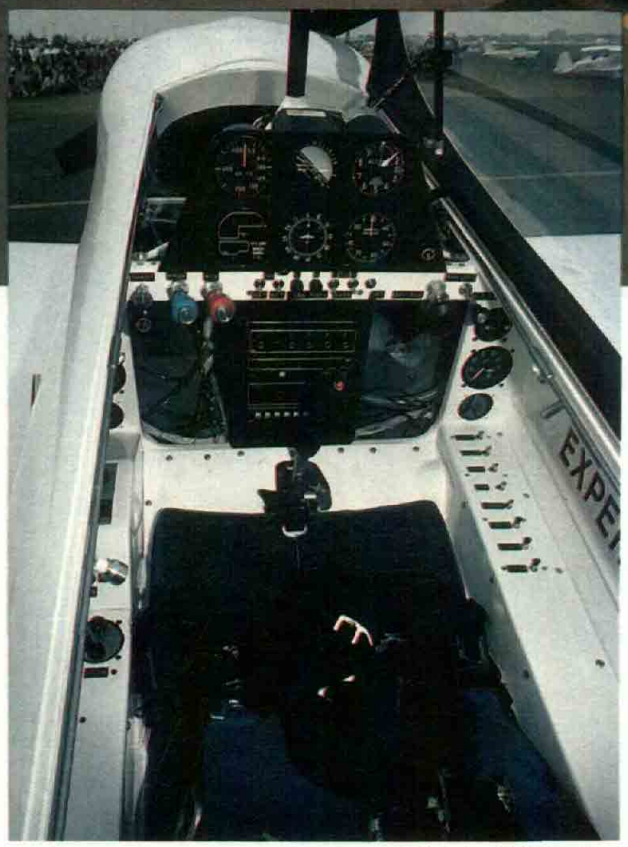

(Photo by Dick Stouffer)

"About two years ago Leonard Niemi and I had a discussion, during which we looked over some of the sketches of designs I had done over the past 10 or 15 years. We both had become interested in the LBF race and our thoughts were focused on something that would be suitable for that event. *(Editor's Note: Len Niemi [EAA 4058] of Greenville, SC is a well known aircraft designer in his own right. He designed, certified and for a time produced the record breaking Sisu sailplane and, more recently, designed and built an all-metal single placer, the Sprinter. In addition, he has built a number of other homebuilts, including a VariEze.)* Leonard picked out a particular design and said, 'Why don't we build that?' I said, 'O.K., we'll do it.' So, I completed the preliminary design and the working drawings and Leonard went to work a couple of months later. He worked for the next 20 months, doing all the basic construction. He had the help of some very skillful EAA people in the Greenville, SC area who helped with the forming and the lay-ups.

"I managed to fill in on long weekends when I could, three to five day stints during the major part of the construction. I really poured it on during the last three months — night and day — to get the ship contoured and painted. *(Editor's Note: For EAAers not familiar with 'contouring' – this is a common practice among truly dedicated competition sailplane pilots . . . such as A. J. Smith. They spend prodigious amounts of backbreaking labor filling and sanding down the wings of their fiberglass sailplanes – with long, perfectly straight sanding blocks – to obtain as close to an absolutely ripple free surface as is humanly possible. They do this to squeeze out the last percentage point of efficiency from a given air foil . . . and to psych out less ambitious competitors! A. J. did such a competition contouring job on his AJ-2. At Oshkosh he stood a cigarette lighter on the wing near the root and invited several of us to stand at the tip and sight down the wing to see the reflection of the lighter. Incredibly, the reflection was as straight as if it had been projected by a laser . . . the full length of the wing! This, I suppose, is the aeronautical version of the 'racer's edge.')*

"The work schedule ran from about 8:00 each morning until midnight each day, seven days a week for three months. Cheap labor, except that it cost me 25 pounds of my weight.

"We really don't have the ship complete yet. There are a lot of interior panels and bits and pieces not essential to flight that haven't been installed. They are essential to comfort and utility, however, so we've got a lot of work to do yet."

*When did it fly for the first time?*

"It flew for the first time on the 15th of July, more or less two weeks ago! We've got about 22 hours on it now, including the race time. Everything worked really well. We had all the usual little detail problems — chafing here and there — but those things are easy to see and correct immediately."

*Summation?*

"It's fun to fly!"