al backstrom's FLYING PLANK

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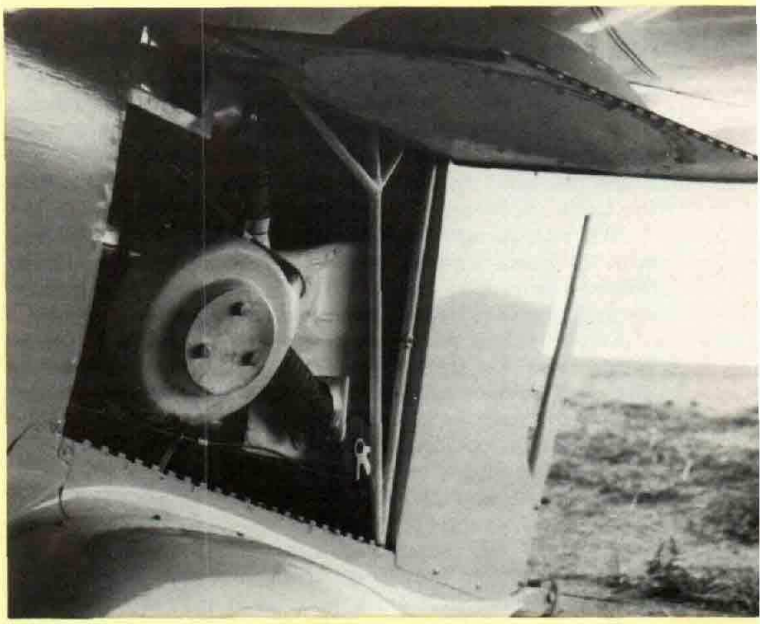
AS VERY FEW developmental airplanes, even the hobby type like the Flying Plank, are ever done by one person, I would like to start by thanking the people who have been most involved in helping on the development of this airplane. They are: Van White, who did the primary building as covered in the *SPORT AVIATION* article of February 1976, and who has provided a whole lot of continuing help. John Powell, who is the "P" in the airplane model designation, has provided continuing assistance, moral support, and all kinds of labor on the airplane. Jim Swick, who has provided moral support, shop space, consultation and some hard labor.

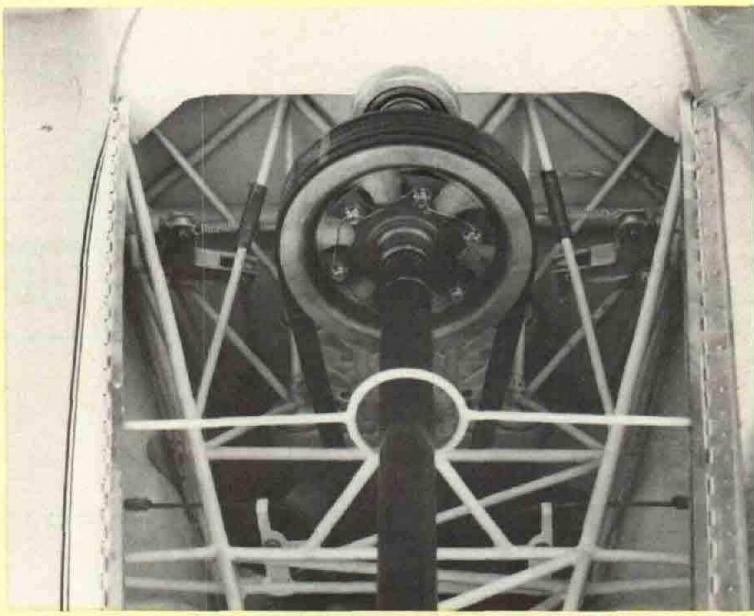
As covered in the previous article, in 1975 the Flying Plank had made numerous down-the-runway flights but had not done any significant flying. During the winter of 1975 and 1976, Van built a narrow gaged tricycle-type landing gear and 1976 became . . .

The Year of the Cracking Truss

During the early part of the year, several additional down-the-runway flights were made and it was decided to improve directional control by adding extensions on the drag rudders. On May 2, 1976, the first flight around the pattern was made. The primary problem found was that of needing significant spring tension for loading the elevons to the up position. On the 14th of May, several additional flights were made, and on the last attempt just at liftoff, we found the engine would not run when one spark plug lead became detached. If you must have an engine quit, just as you lift-off is as good a time as any when on a long runway. At this time, modifications were made to make the ignition system semi-dual and by the 28th of May, the first extended flight out of the pattern was made. Late in this flight it was noticed that the vibrations in the airplane changed. Inspection after landing revealed that the truss which supports the propeller drive pulley was cracked. John Powell and I came back to Dallas and left Van to repair the truss. Additional flights were made in June and August with no problems except finding inadequate attachment of the canopy which was repaired. On August 20, we found the truss cracked again. At this point, total time was approximately five hours. We had noticed that the rudder area seemed excessive, so during September, part of the extensions that had been added were trimmed off. During all of the above flying, trips to Lubbock were necessary and John Powell and I were traveling back and forth by highway, but on the 19th of October, Jim Swick decided he would like to look at the ship, so we flew to Lubbock in his Mooney. After flying the Plank for approximately two hours, we found the truss cracked again. It was decided to quit the repairing of the original truss and build another one using one size larger tubing. As the original truss had to be hammered and pried into position after all the repairs, the new truss was built in a jig. When all the welding and fabrication was completed, it was furnaced normalized in the jig to remove fabrication stresses. The new truss fabricated this way has performed satisfactorily ever since with no indication of problems.



Left side engine access.



Rather intricate but lightweight fuselage truss supporting the propeller reduction/drive shaft system.

1977: Fly, Fly, Fly!

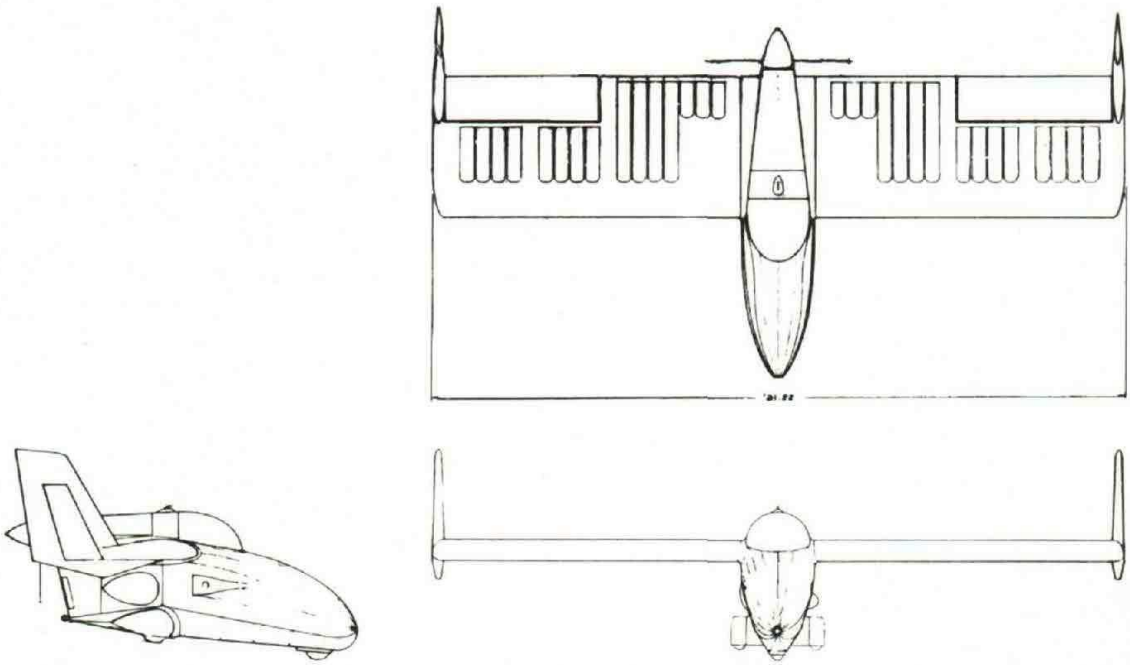
In March, 1977, John and I returned to Lubbock after Van had completed the truss rework and flights were made during which we made another reduction in the drag rudder extension. It was decided to move the ship to the Dallas area so I could take over the flying and development from there, and because of this move, it was possible to accumulate flight time quite a lot fas-

ter since I could fly every weekend and now we didn't have to fix the truss every other weekend. In late April, the remainder of the rudder extensions were removed and flying continued. As the weather warmed up in May, it was obvious that some rework would be needed to reduce the cockpit temperatures. I was able to borrow shop space from Jim Swick for a few days to make several changes. These included: shrouding the exhaust in the fuselage to reduce the heat entering the cockpit, revising the trim system, installing new engine area side panels, and revised induction system. In early June, I had some more excitement when a broken spark plug filled the cockpit with sparks and caused a rapid return to the airport. About this time, it was obvious that if emphasis were placed on building up flight time, rather than spending time developing the airplane, we should be able to obtain the necessary 75 hours to have the flight test area restrictions removed and take the ship to the Oshkosh fly-in.

All was going fine on this plan until July 4th, when with 71 hours and 30 minutes accumulated, an engine failure occurred. I hollered to Van for help, and in his normal manner, he was in Dallas the next Saturday.

It was found that we had scuffed the pistons on the engine without significant cylinder damage. We determined that the cause of the failure had been the Lake carburetor opening up, admitting air into the induction system. Also, by accident, we were operating on 80/87 fuel instead of the normal 100LL, and the outside air temperature was about 105° F. We should have been able to survive any one of these problems, but the three of them at once was more than the poor little engine could take. When the extent of the problems was known, Van returned to Lubbock and we helped Ma Bell the next week by subsidizing the long-distance business and I was able to get Red Muirhied to do a rush job on honing the cylinder bores. Van was in Dallas the following Saturday with new pistons, new piston pins, needle bearings, and a complete spare engine. Before you let this shock you, I must add that the complete spare engine cost was only about the price of a chrome overhaul on one aircraft engine cylinder. I have always been amused at Dick Johnson on this Saturday morning as he looked at Van and I with engines scattered around all of Jim's shop, but still somehow expecting to be in Oshkosh later the next week with the airplane flying. In the typical EAAer fashion, Dick pitched in to help get things going. One nice thing about two-cycle engines is that they do not have many parts. Before sundown, we had the engine together, back in the airplane and running on the ground. On the following day, I was able to fly off the additional time required, plus a little, to get the flight test area restrictions removed. We noted during this repair that we had heavy wear in the belt area of the small high-speed pulley which we had made of aluminum. There was a small amount of wear in the large pulley, also aluminum. This convinced me that some of the little things I had noticed in operation had probably been belt slippage, but we considered that it would be safe to operate for the rest of the test period and a few hours at Oshkosh. Fortunately, my friend John Blair was on vacation and gave us a couple of days of hard work helping me rig a boat trailer borrowed from another boating friend, Jay Colburn. Basically, the trip Van and I made to Oshkosh, both the trailering and the flying at Oshkosh, were quite uneventful — just the way you'd like it. I learned one very interesting thing while under the wing of the ship at Oshkosh answering questions, and that is that the ladies asked the most intelligent of the questions. Figure that one out when you get time!

When we returned from Oshkosh, the ship went to



Drawing by Dick Johnson

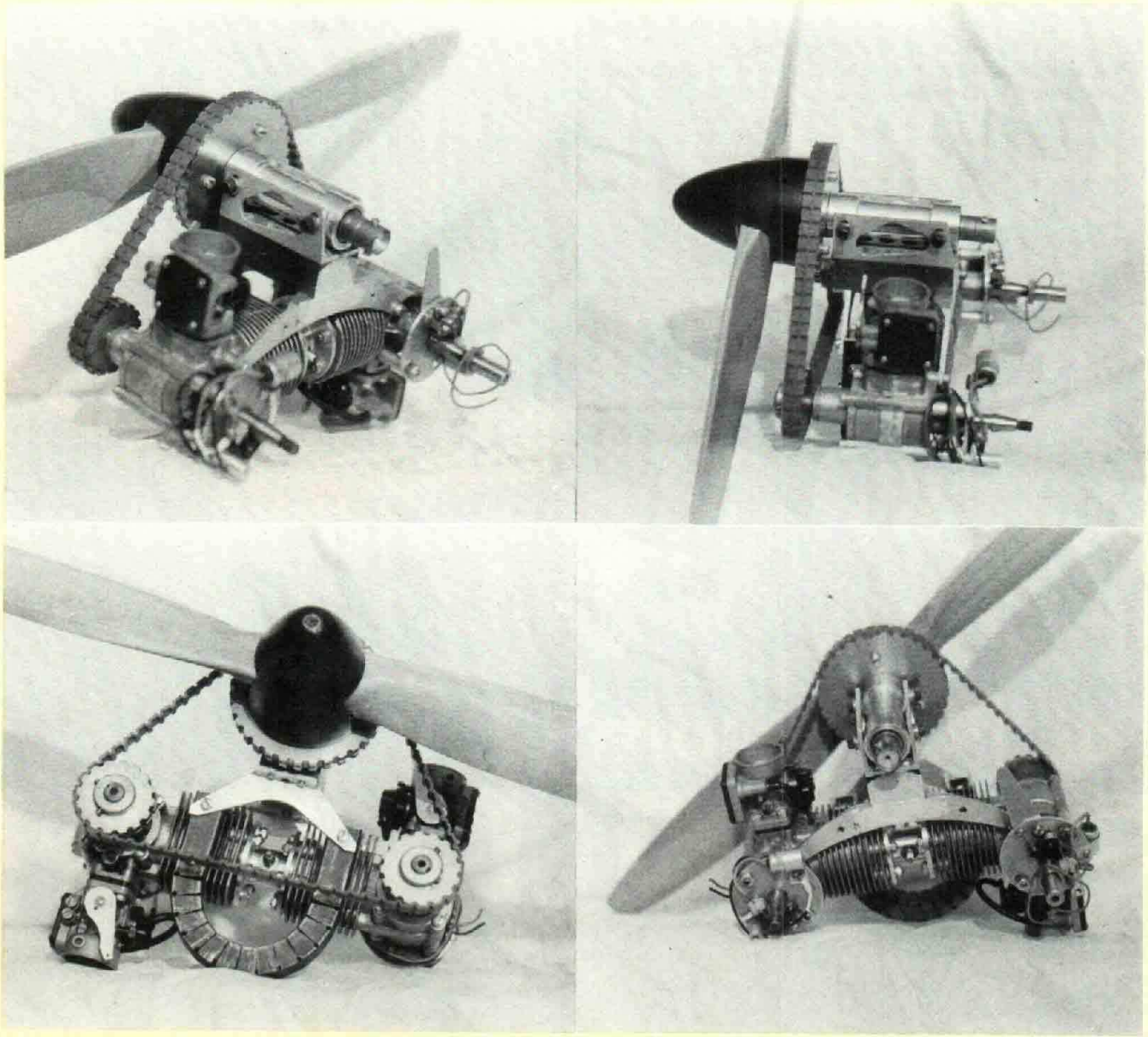
my garage (shop) where the propeller drive system was removed and other modifications started. Van completed some machine work on the pulleys and I got them hard anodized, and I faired the fuel cap so it looked like part of an airplane instead of the front end of a tractor, and sealed the canopy joints. We had been dissatisfied with the many times reworked propeller and Lake carburetor for some time. So during the fall, several flights were made checking a Warnke propeller, the Tillotson carburetor designed for the engine, and a new fixed pitch wood propeller. It was decided that the combination which looked best on the engine was the Tillotson carburetor and Warnke propeller, so the ship was taken home at the end of December for extensive rework.

1978: Modify and Piddle

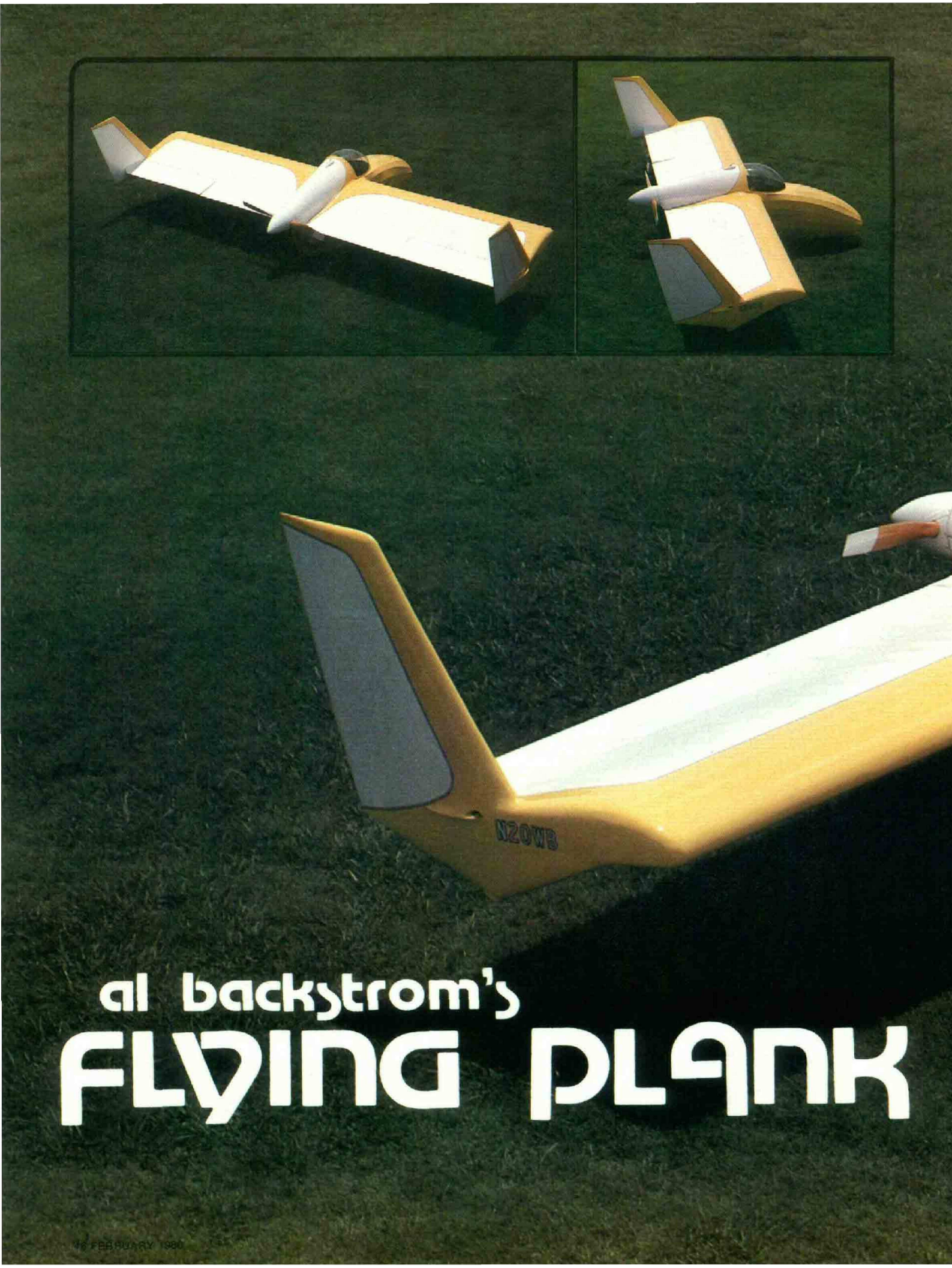
The first six months of 1978 were spent doing extensive modifications which included: a steel lower (high-speed) drive pulley being installed, firewall installed, the rigid main landing gear taken off and an aluminum spring gear installed, induction system revised again for the Tillotson carburetor, piano hinged panel installed for easy access for minor engine work. One little side thing I did which has been very helpful in maintaining the airplane was simply painting all the interior in the engine area white so I can find the stuff I dropped! After starting to fly in June, everything went well until the weather got hot and we went through a continual series of irritating engine problems which continued until the weather cooled off.

1979: Finishing Up

At the end of 1978, the ship was removed from the airport again and taken to my garage (shop). The changes made were to build landing gear fairings and a fairing for the exhaust system. The ship was returned to the airport in June, and initial flying convinced me that there was no additional aerodynamic rework that I would do. The drawing shows the current configuration. There are many changes I would like to make, but right now they are not worth tearing the pod open and going in to perform them. In early July, I prevailed upon Jim Swick again for shop space and help. Then he, John Powell and I moved in and spent a few days applying a paint job. This is the first time the airplane had looked good since after Oshkosh '77. All the various changes



Dick Johnson's proof of concept 16-20 hp twin.



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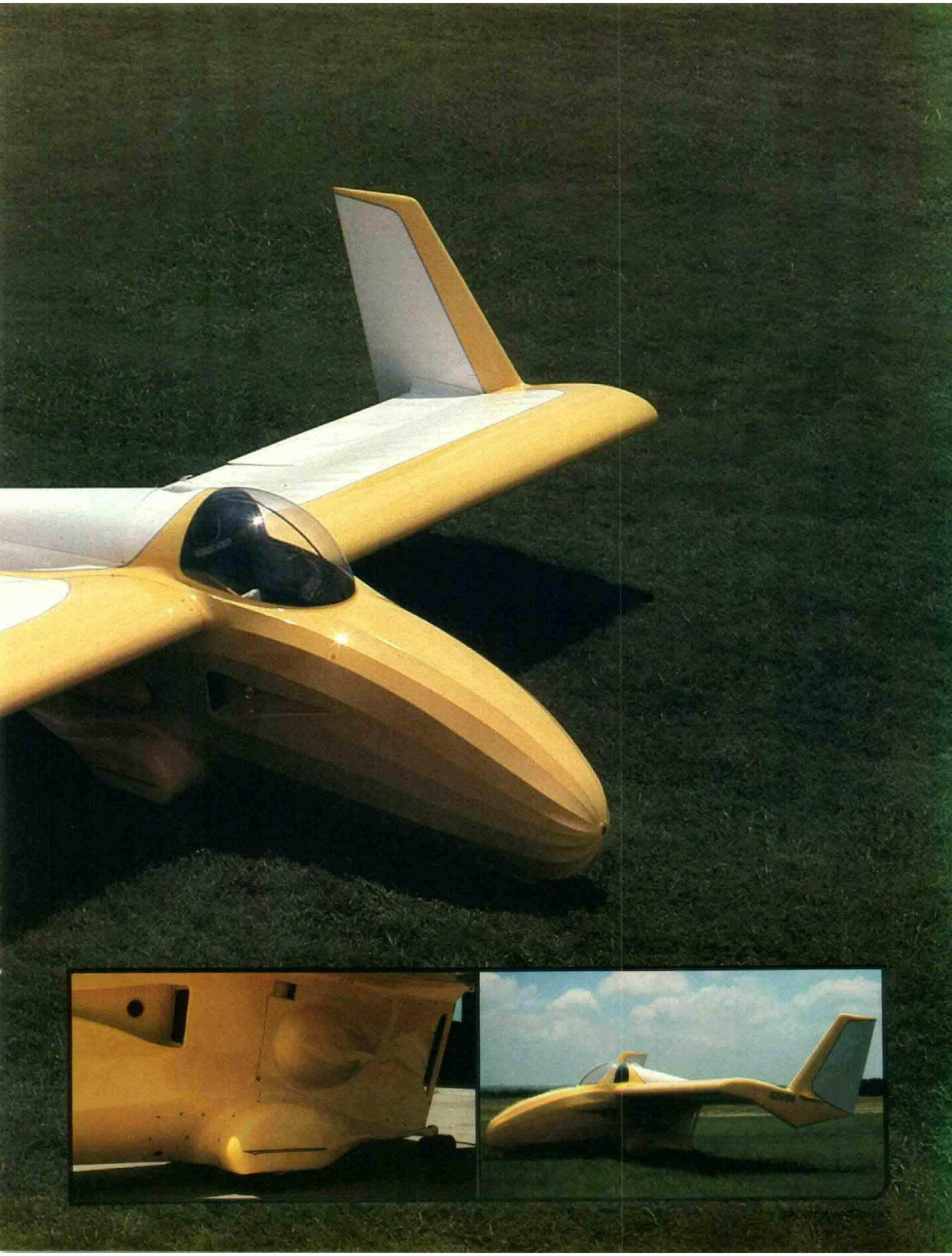

had been done in patch form. I had decided I might make a try at flying the ship to Oshkosh this year, so I started some cross-country flying. On the 8th of July, a short cross-country flight was made to Sherman, Texas. Fortunately, I had chosen a field with friends because I sure wound up needing them! On taxiing to Don Ort's hangar at Sherman, the engine was acting up, apparently from carburetor problems. Don and I worked on it until late in the afternoon when we had it to where it wouldn't run at all! Since one of my excuses for going to Sherman had been to clean spark plugs and check them on a bomb tester, I did this the next morning, installed clean checked-out plugs, and the engine started immediately. After some fussing around, we had the engine adjusted and running fine, and I flew home in the afternoon. There is a long story that goes with this, but let's just say thanks to Don Ort and Tom Lloyd, because it was around midnight when I was able to get home with all the equipment in the normal hangar, driveway, etc.

After putting in fresh plugs had corrected the apparent carburetor problem, I thought that last year's irritating problems in hot weather were not what they seemed. The ignition system was driving 2 CD boxes with a single charging coil and we could have, effectively, a full dual ignition system by installing an additional charging coil which we had in stock. I thought that the improvement in the ignition system would correct the spark plug problems. This was done with very little trouble except that my ignorance as an electrician showed up in the manner in which I wired in the electric tachometer. As John had to work when I was making this change, Dick Johnson came to help me again. Unfortunately, Dick is about the same kind of electrician I am. After only a few minutes of operation, the tachometer quit (burned out). I guess finding snowmobile tachometers in July would be a problem anywhere, but wait until you try it in Dallas, Texas! We were able to obtain promises of a tachometer in 4 or 5 weeks from a local outfit, but not feeling inclined to wait this period, Van was able to obtain a go-cart tachometer in Lubbock. This was hooked up but never was really satisfactory in operation. Fortunately, John Powell, who also is great in the electric and electronic area, was able to come back to the rescue with his knowledge of electronics and repair the tachometer I had burned up. By the time all this was done, it was too late for Oshkosh.

When flying again, we found that the ignition system change had made the starting much easier. In a little over two hours, plug troubles appeared again. Dick Johnson was able to enlist the help of Tom Splanger, a new EAAer with a lot of engine background. Tom was able to obtain information from Champion on surface gap spark plugs. His analysis of the problem was that we were having oil fouling problems. We are now working on reducing the fuel-oil ratios. I hope to have time to find out how this goes in the near future. I also want to make some tuft studies for kicks and get some reasonable performance information. Right now my best guess is cruise of 90-100 mph with 2-2½ gallons per hour fuel consumption. This is at about 60-65% power, whatever that is. I'll write this up if it ever gets done.

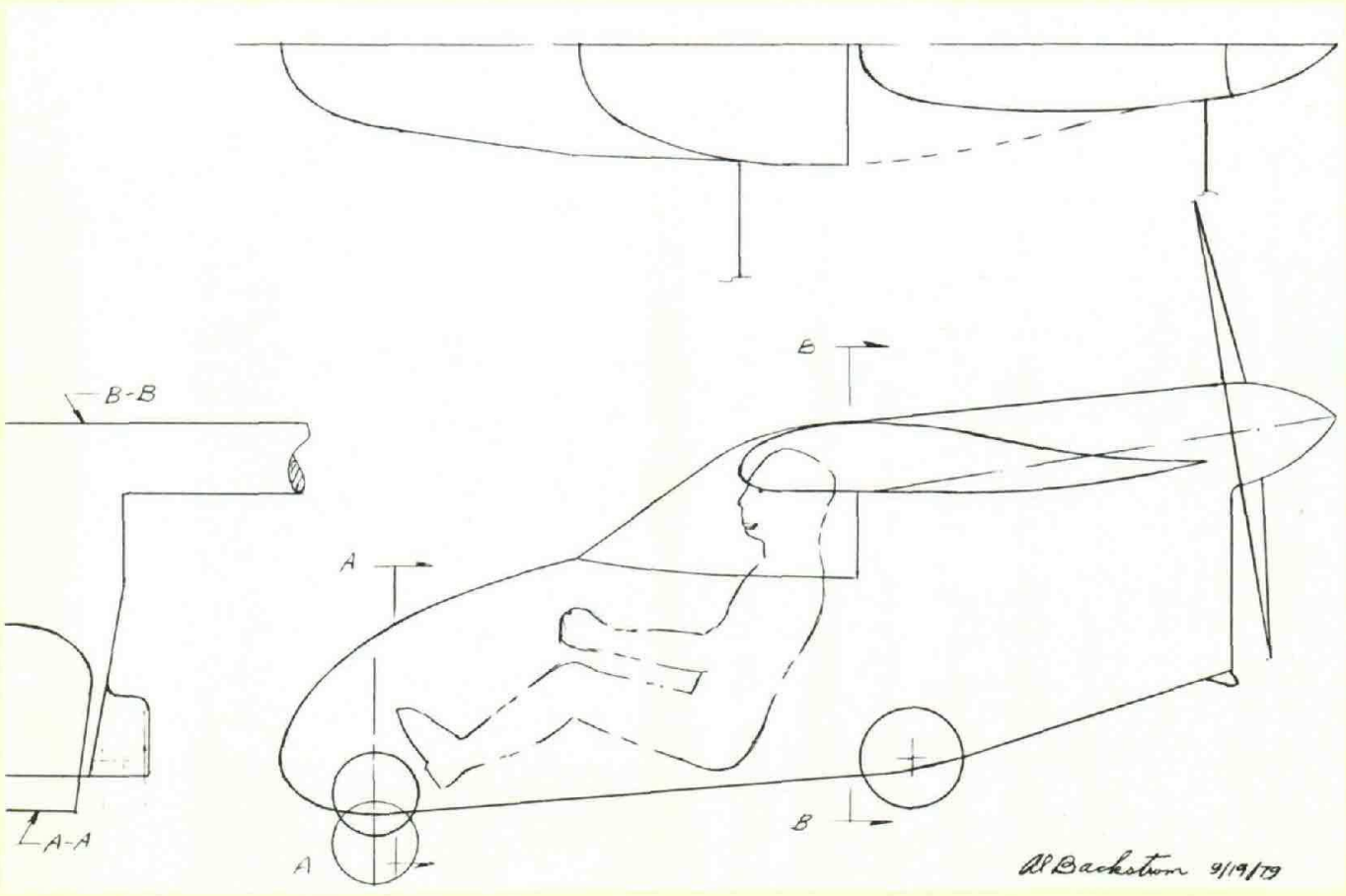

FIGURE 1

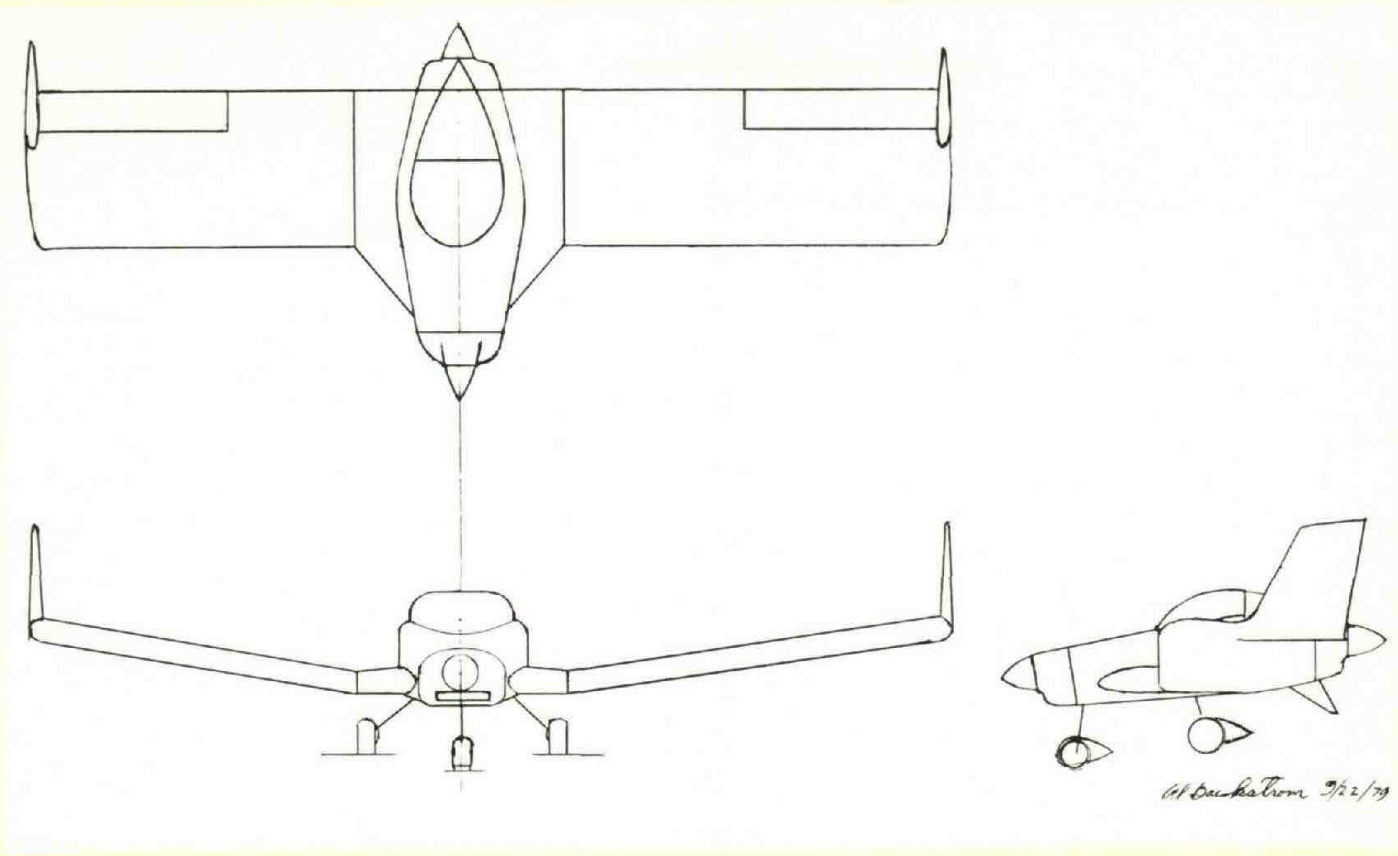

FIGURE 2

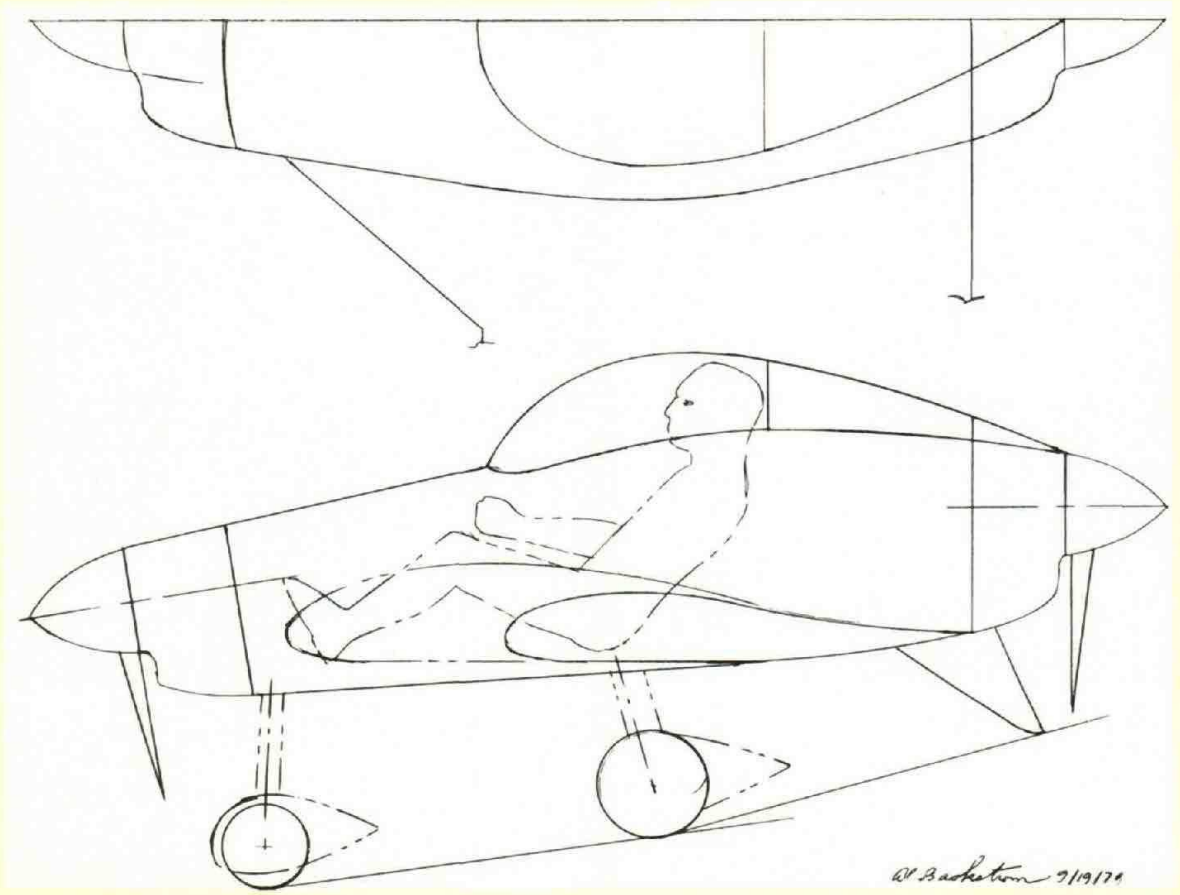

FIGURE 3

Where To Now?

The experience with flying this ship for approximately 110 hours and the other developmental problems have shown me that if I were to start the ship today, it would be done like the drawing in Figure 1. The primary changes, in addition to the high wing, are canting the thrust line down to minimize pitch changes with changes in throttle setting, and the two-position nose wheel to allow better nose wheel steering authority, but still allow lifting the nose for take-off. The wings and tip fins would be unchanged. I am watching Molt Taylor's work on the "Micro IMP" closely as the engine and drive system should fit this machine very well. The paper based structure might work in well, also.

As a flight of fancy, one of the more interesting things to come up is the idea illustrated in Figures 2 and 3. This is a tandem engine 1½ place airplane which would be powered by two of Dick Johnson's little opposed piston twins. A composite photo of a proof of concept prototype is shown. The engines should have 16-20 hp and use Everel type single-bladed propellers. The light weight of the engines would allow an air frame empty weight not much heavier than the current ship, and the additional wing area in the center section would allow the performance to be reasonable. I personally am not going to build these. If I start anything soon, it will be an auxillary powered sailplane or maybe the amphibian shown in the May 1979 *SPORT AVIATION*.

In closing, I need to thank the people often overlooked, mainly my wife and daughters who understand that a meaningful life must extend beyond making a living and mowing the lawn. Also, my wife and oldest daughter have suffered through taking dictation and typing this and the other articles I have written.

THE SEATBACK PACK

When designing the Plank, room was provided for a small baggage compartment, but it disappeared when the change was made to a larger engine. Before this past summer, there had been no problem without a baggage area because all flying had been done in local areas. The decision to fly cross-country made it imperative that storage be provided.

I think there are many homebuilts with similar problems, so, for your information, here is the solution I worked out for the Plank. The sewing was graciously done by Mrs. Jan Bates.

The only prerequisite for copying this idea is that you must normally use cushions in your seat to have the needed space. The following photos show my seat for the Plank.

Left to right: 1) Stuff you need: Oil (4 qts.), tie-down kit, tools, etc., 2) Stuff, stuffed in seat in seatback pack and seat. Roll at top of seatback pack is for more tools, etc., 3) With seat cushions, as it will fit in the cockpit.