

PIPER AIRCRAFT CORP., LOCK HAVEN, PA. REPORT  
 DRAWING NO. 10000 PAGE 1  
 PREPARED BY Fred C. Strickland CHECKED MODEL PA-24  
 SUBJECT Chief Design Engr. DATE 1/11/52 NUMBER (S) REFERENCED

Preliminary Specification

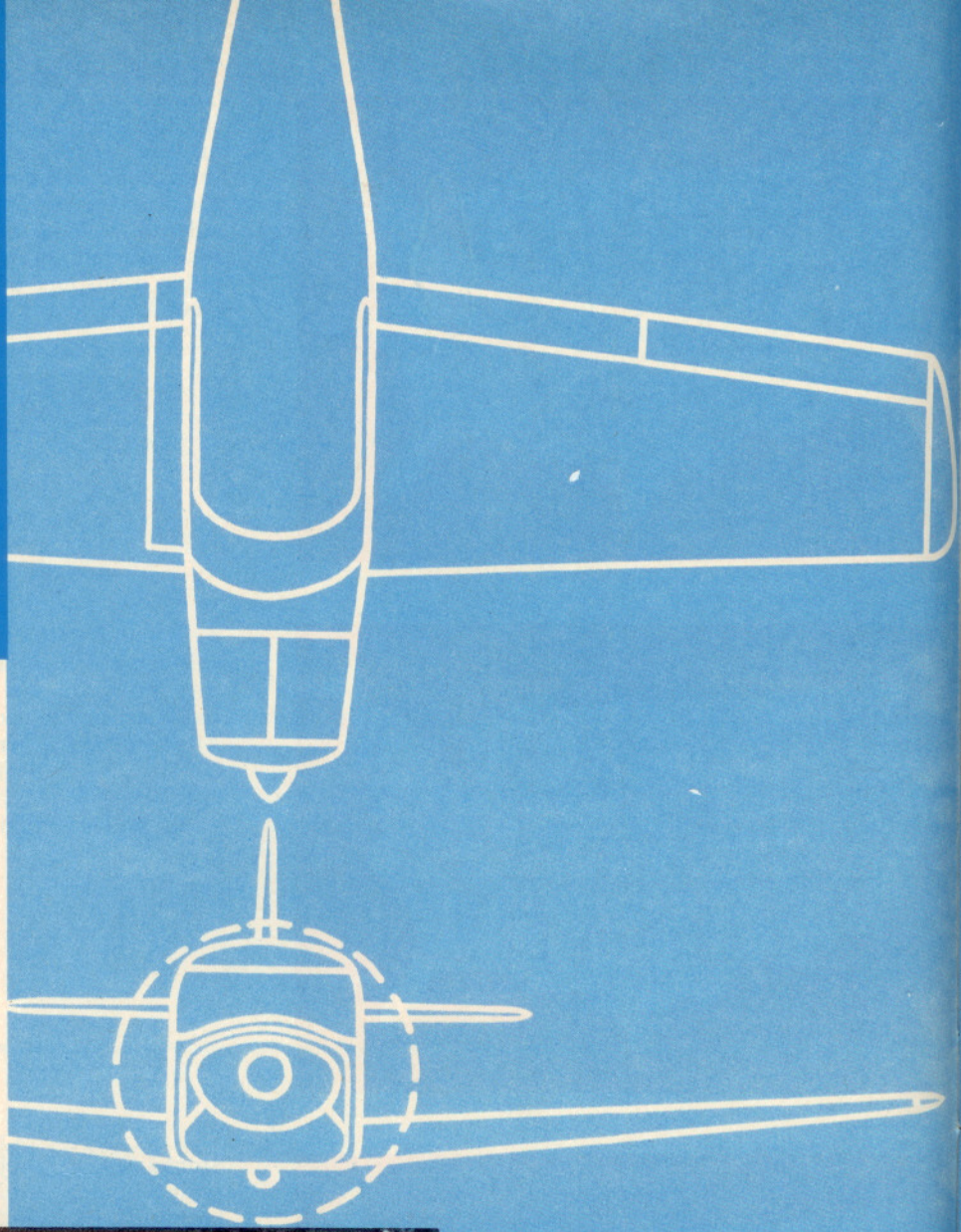
Piper Model PA-24  
 (4 Place, Low Wing, All Metal)

The following data is based on information furnished to Engineering by the Management and the Sales Department during a meeting with engineering representatives on December 28, 1951. The specifications as presented for the subject model were quite generalized and may be taken as two possible design characteristic trends were indicated, preliminary three view drawings and design sketches have been prepared to cover these so that further consideration may be given towards choosing a definite type.

As noted from the heading the airplane is to be four place, low wing, all metal with a retractable tricycle landing gear. The general specifications which apply to both types are as follows:

Weight Gross	2200 lb.
Empty (optimistic estimate)	1233 lb.
Useful Load	967 lb.
Pkt. 3 Passengers	680
Fuel, 36 gal	216
Oil, 2 gal	15
Baggage	50

Engine - Lycoming O-290-D2  
 Wing Area 150 sq ft  
 Horizontal Surface Area 30 sq ft  
 Vertical Surface Area 15 sq ft



100001 PIPER AIRCRAFT CORPORATION, LOCK HAVEN, PA.  
 TO: W. T. Piper DATE 7/6/56  
 SUBJECT: LAMINAR FLOW WINGS

WRITE IT

In a meeting on July 1, 1954 at Langley Field, NACA aerodynamicists discussed with Fred Strickland and me the advisability of using the so-called low drag airfoil sections on new developments like our Model PA-24.

They are quite positive in their statements that these laminar sections should be used on any new models, and that they would specify the NACA 63 Series on any new light planes if they were to design them.

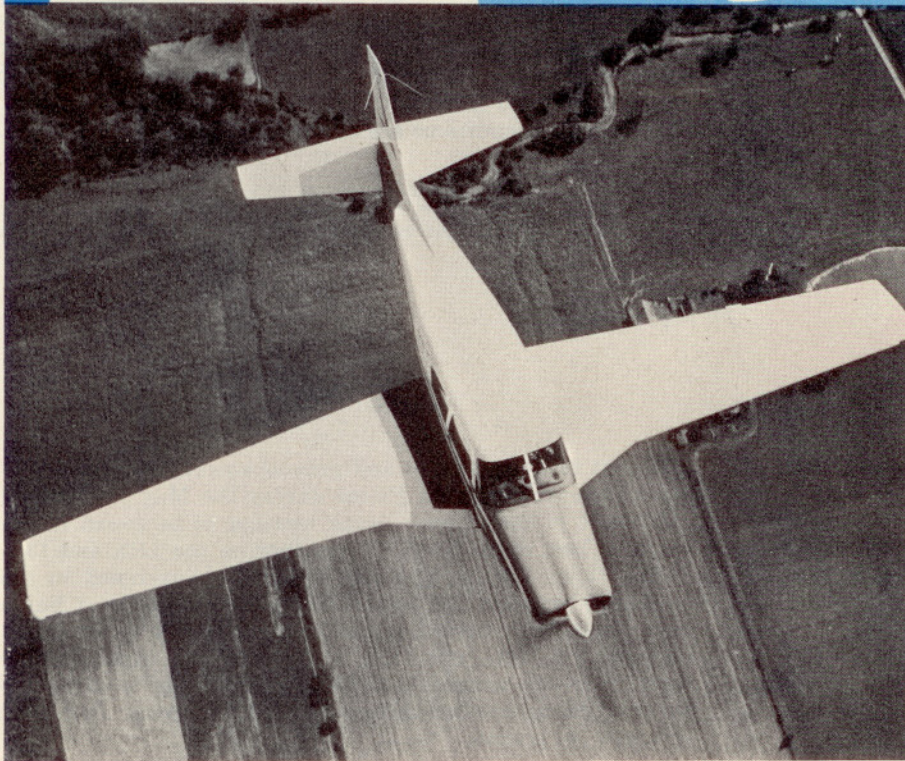
They stated that although there was no appreciable gain that could be counted on in speed, with the newer airfoils, nothing would be lost in the way of stalling characteristics, stability, lift or otherwise, with or without rough leading edges. Therefore, there is no reason for not using the laminar sections, and there are a number of reasons for using them, such as location of maximum thickness (spar location), sales appeal, etc. Also, if laminar flow can be accomplished, by keeping the forward part of the wing smooth enough, a speed gain of about 1% over a section such as used on the Bonanza is possible.

On the strength of this information we will plan on trying a laminar flow section on the PA-24. These NACA members are authors of various reports on this particular subject and appear to be recognized experts on it. They gave us enough data on which to make the sections to use, exact thickness, taper ratio, etc., to enable us to start on the wing design any time. The only point which they didn't make quite clear was whether or not to put twist in the wing and after we have more specific design data on the wing to present we will ask them for their suggestions on the twist.

These men seemed to be well informed on a lot of subjects related to the main topic, for example on the type of flaps and tail surfaces which were most suitable. They stated that for this type airplane, the only type flap that they would recommend would be a simple slotted plain flap, similar to that used on our present planes.

W. T. Piper/ab  
 Vice President

Copies to: Walter Janssens  
 Fred Strickland  
 File

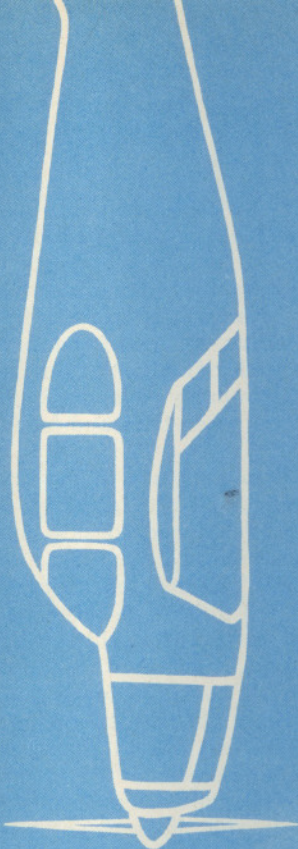


# Birth of

**H**ow is a new private plane designed these days?

Is it the result of some special stroke of genius on the part of one man? Did this outstanding individual—the chief engineer, for example—have a sudden flash of inspiration in the middle of the night, waken suddenly from a sound sleep, and hastily sketch the new airplane idea on the back of that proverbial envelope which apparently has been responsible for the recording of more such strokes of genius than all the world's drawing boards . . . ?





MODEL	PER PLANE	NEXT ASSEMBLY	SUPERSEDES	SUP. BY

THIS DRAWING IS THE PROPERTY OF THE PIPER AIRCRAFT CORP. AND ITS POSSESSION BY UNAUTHORIZED PERSONS SHALL NOT BE CONSIDERED AS PERMISSION TO REPRODUCE FOR SALE IN WHOLE OR IN PART ANY DEVICES SHOWN THEREON.

**PIPER AIRCRAFT CORP.**  
LOCK HAVEN, PENNA.

### Comanche History

Some historical Comanche documents include (far top left) January, 1952, specification on which design was to be based. Directly below it is Piper memo on decision to use laminar flow wing, following NACA conference. Far left bottom is present completed Comanche. Drawing in center shows one 1954 version of proposed Comanche; it had lines similar to Apache. Landing gear test rig (directly at left) helped select final gear configuration. Piper officials, directors, distributors studied cabin mockup (center left), made suggestions for final design. Flying tail (bottom left) saves 30% of conventional tail's area, also saves on overall drag, weight, construction costs.

was flashy or dramatic about the birth of the *Comanche*, Pug and Walt insist, was the first flight of the first completed prototype. Apparently, even the cold realities of big business can't eliminate that small amount of glamor. The fact that the first flight was itself pretty commonplace and routine didn't detract from the excitement and high spirits of the Piper people who had swarmed out onto the Lock Haven airport to watch the big event.

The *Comanche* was first conceived sometime during World War II, Pug says. No one around Piper remembers just when, because it was more an idea than anything else. The airplane we know as the *Comanche* today didn't actually begin to take physical form until 1954. But long before that, the policy committee of the Piper company had agreed on some basic fundamentals: the airplane had to carry four people, be all-metal, low-winged, tricycle-gear, and generally in the price class presently filled by the Cessna 180-182 type of private plane. Most of these basic points had been churning around in company officials' minds during the war, and shortly thereafter.

"There was never any question about the basic concept of the plane," Pug says, "because all of us in management had agreed to those points back in the earliest days of the *Comanche's* history. During these last few years, all we did was await the right time for the actual work to start on the *Comanche*, then give the boys the go-ahead."

How was the decision reached to make this new airplane (it wasn't named *Comanche* until quite late in its conception) all-metal, low-winged and tricycle-gear?

"That was decided in our earliest management meetings that dealt with the new project. The first decision we had to make, of course, was to determine what part of the market we

# a Plane

*Years of research went into the creation of Piper Aircraft's new Comanche*

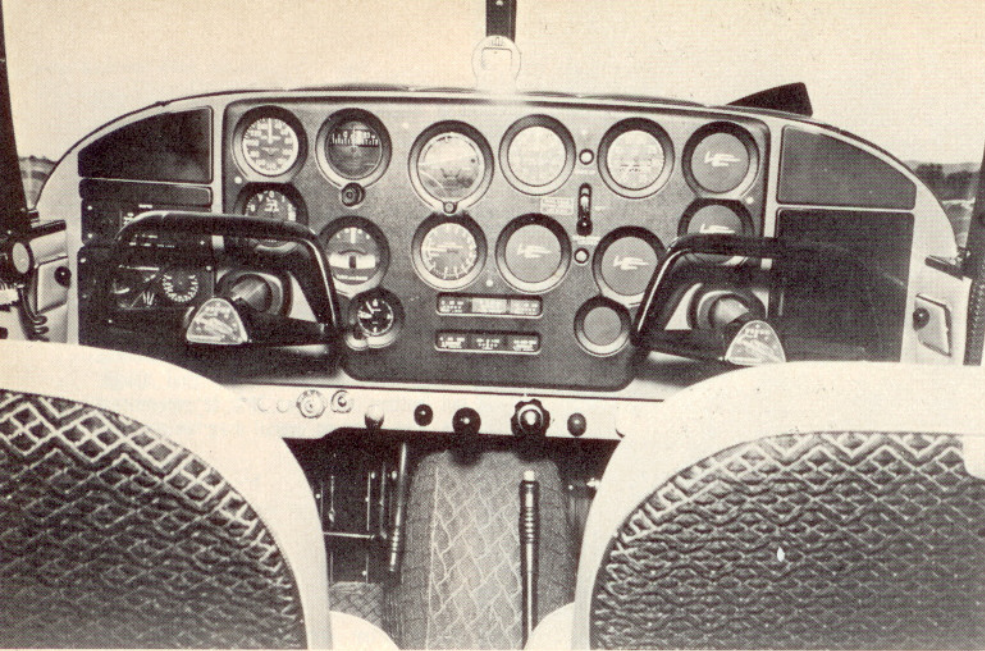
by MAX KARANT • AOPA 18

We decided to go after the answers to these and similar questions about a newly-introduced plane, and picked the Piper *Comanche* as the likeliest candidate for our purposes. The two men who were largely responsible for the birth of the *Comanche* are Howard "Pug" Piper (AOPA 97315), research and development vice president; and Walter C. Jamouneau, chief engineer of the company. Both were interested in helping AOPA explore the actual lineage of the *Comanche*, and did a lot of rummaging through the company files for charts

and notes in advance of our visit to Lock Haven.

If the history of the *Comanche's* development is typical, there are no strokes of sudden genius around Piper these days. No one jumped suddenly from his bed in the middle of the night to scrawl on an envelope. Quite the opposite. If you compare the birth of the *Comanche* to the way Hollywood might depict it, Piper's new four-place private and business design was conceived in a dull, somewhat monotonous, manner. Strictly business. About the only thing that





The Comanche's instrument panel has room for full flight instrumentation required for IFR flying

come figures that a bush airplane can't."

But Piper hasn't abandoned the bush plane idea by any means. It's being kept active, as one of the company's lower-priority projects for the future, and probably will be built some time later when time and facilities permit.

Walt cautioned us not to get the idea that imagination, originality — just plain old-fashioned ideas — are dead at Piper.

"Far from it," he insisted. "Piper's carried through quite a few new designs, right up to the flight-testing of a prototype, and then dropped them. And we'll continue to do this, at least within the limits of our budget. We haven't stifled ourselves by any means. Remember the four-place, low-winged, conventional-gear PA-6, the *Skysedan*? And that little single-seater we had flying around here for a while? We've taken a crack at just about anything you can suggest: amphibians, pushers, twins. Matter of fact, if you'll remember the history of the *Apache*, you'll see a much better example than the *Comanche* of how we design, test, change, then start over again. You'll probably recall that the *Apache* didn't look much like its present self when we first flew it. We ended up changing fuselage, tail—most of the major features were redesigned. No, this airplane business is not nearly so cut and dried as the *Comanche* might have you believe."

Once management gave the go-ahead order on the *Comanche* project, how did the actual design get into the works? Until its latter stages, incidentally, the *Comanche* was known as the PA-24 (Piper Aircraft design No. 24).

"The engineering people took over and started preliminary sketches of a design that would meet the criteria we'd all agreed to some years earlier," Pug said. "As I've said, we'd already agreed that it was to be metal, four-place, tricycle and so on. Then we got together a sort of master-list of all the specifications and measurements of all four-place airplanes on the market. Analyzing this information, along with our own wishes, we gave the engineering people the 'package limits' within which to work. First they started writing preliminary specifications. Then they started sketching designs. [One of the first preliminary specifications

(Continued on page 56)

could best design for. In the beginning, we were actually thinking about a successor for the *Tri-Pacer*. But as the design evolved, and the complexion of the industry and the habits of aircraft owners changed, we decided the most logical place in the market would be for the airplane we now know as the *Comanche*, and in its price class.

"Don't get the idea that any one or two of us made these decisions on our own," Pug warned. "Far from it. The sales department for example, played a very vital role in all the decisions that ultimately got us to where we are today with the *Comanche*. Jake Miller [J. W. Miller (AOPA 20139), Piper sales man-

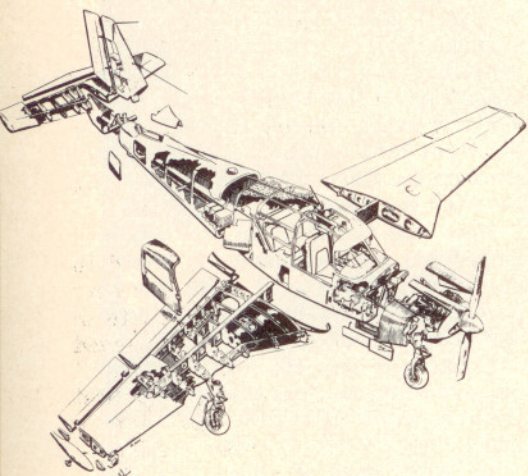
ager] and his people, both in Lock Haven and around the country, have a vitally important part in any such decision. Imagine what could happen to this business of ours if we just arbitrarily decided to design and build the *Comanche*—despite warnings from our sales officials who might feel that that particular design would not sell well!"

Decisions to accept or reject proposed new designs are made fairly often, Pug says. "We're forever being asked by dealers and others to design and build a true bush plane, for example. We are always especially alert to any such ideas from anyone, and this particular idea has cropped up so many times in recent years that we've taken a hard look at it—just as we took those first hard looks at what now is the *Comanche*. After a pretty careful design study we decided we actually could come up with quite a good bush plane, one that should be able to do everything all these people have been asking for in the wilderness areas, and more."

Pug and Walt both grinned at this point. "Then we asked Sales," Pug added. "They analyzed the project, and finally told us they thought they might be able to sell between 100 and 200 a year. That was the end of that project right there—for the time being, at least. Look at it this way: it would cost us a small fortune these days to come up with such a brand new design. But the only reason we'd do such a thing would be to sell enough of them to make a profit. You can quickly understand why we shelved that project when I tell you that we plan to sell between 1,000 and 1,500 *Comanches* a year.

"Needless to say, the *Comanche* can do a lot for our annual gross in-

This cutaway drawing of the Comanche shows the aerodynamic refinements that contribute to the low-wing, all-metal plane's high performance





## Birth of A Plane

(Continued from page 28)

sheets, and one of the first engineers' designs accompany this article as illustrations.—Ed.]

"These then are sent to the key people in the company for comments, suggestions and discussion. We meet every Monday morning to discuss any and all company business, and this kind of preliminary work also is discussed at these meetings. We keep careful notes, and all agreed-to suggestions are then incorporated into the next preliminary step on the design.

"We went through several of these stages," Pug continued, showing us sheaves of memos from the files. "But it wasn't too long before the finished airplane took shape. Finally, there was a last set of preliminary specifications dated May 27, 1954, and a last drawing

of the airplane dated July 6, 1954. These incorporated all the best ideas that any of us had to offer. Once we okayed those two pieces of paper, I guess you'd say the *Comanche* as we know it today was born."

We recalled that Piper at one time had considered buying the Mooney Mark 20 program. "That's right," Pug agreed, "and we did that only with the hope that we could save ourselves some precious time in developing what now is the *Comanche*, by actually buying a finished, flying prototype on which we could start our own development work. We would not have built an airplane of wood, which is the Mooney type of construction. Nor would we have used many of the other Mooney features—although we did experiment with their rubber doughnut landing gear shock absorbers and manually-operated gear retraction, and finally decided not to use them. We just wanted to save time by buying a

flying prototype, but the whole idea fell through because we couldn't come to terms."

But there's still some strong resemblance to the Mooney, we pointed out.

"I don't think it's so much a resemblance to the Mooney," Walt pointed out, "as it is to the present state of the aeronautical art. Our wing shape is similar, and it's laminar flow. But one reason the *Comanche* wing looks like that of the Mooney—and the *Bonanza* too—is that we adopted the idea they both use of having that pronounced leading-edge fillet at the wing root. But that's not there just for appearance; we use it for the same reasons many others are using it and will use it more. In addition to aerodynamic advantages in smoothing airflow over inboard port wing, it's one excellent way of getting more gasoline tank space in the wing—especially in a wing that has to house a retractable landing gear."

"How come the laminar flow wing?" we asked. We were particularly interested in this, Piper's first departure from that tired and true "*Cub* airfoil."

Pug laughed. "To be quite honest," he admitted, "we did instinctively look first at the good old USA 35B wing section, which you call a *Cub* wing. Then we decided to go down to NACA [National Advisory Committee for Aeronautics] at Langley Field, Va., and talk with the airfoil experts there. When we finished these discussions, well, the old *Cub* wing was not for the *Comanche*. Here's the memo I wrote when we got back. We discussed it in our next staff meeting and the decision was made to use the laminar flow."

That memo is reproduced on page 26.

How did they ever decide on something as "un-Piperish" as the *Comanche's* "flying tail"?

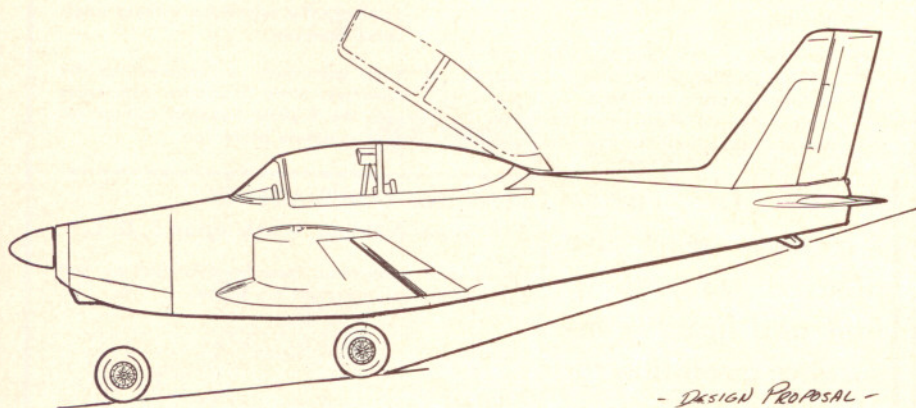
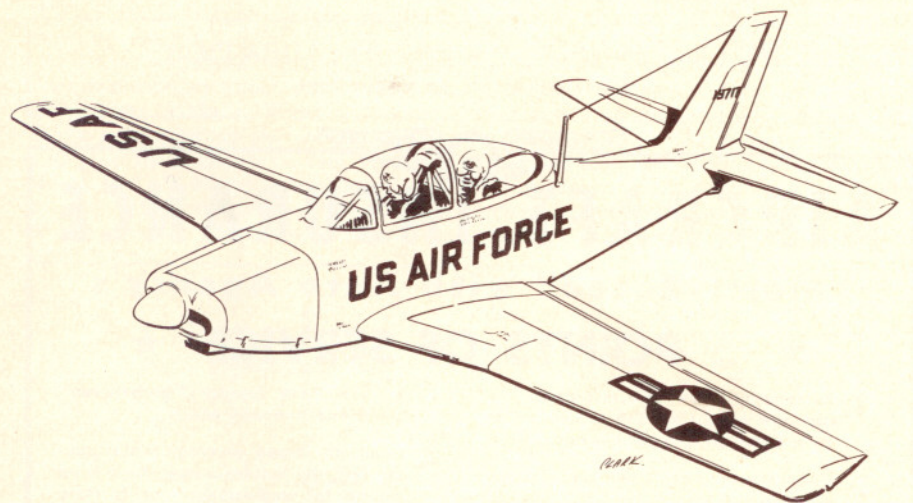
"The flying tail is not nearly as radical as you think," Walt chimed in. "It's been used for years on our jet fighters, the aerodynamics are well known, and there are some decided advantages. We get all the control we need with 30% less area. Obviously, we save weight and cost. We also have less drag.

"John Thorp (AOPA 22461) has used the flying tail on his '*Sky Scooter*' since 1946. He also designed the Lockheed '*Little Dipper*', which used this kind of tail, back in 1943. And as you yourself have just recalled, an airplane called the Mercury '*Chick*' had a flying tail back in the early '30's. No, the *Comanche's* tail had no mysteries for us right from the beginning. Matter of fact, it was in the first *Comanche* design right in the beginning, and it's been there ever since. We've had no trouble whatever with it, and we consider it a solid success."

During the course of our round table discussion it became apparent that the Piper people have no qualms about comparing notes with engineers in other companies.

"None at all," Pug said. "We all compare notes quite freely. If we have some idea Beech or Cessna can use, they're welcome to it. There were sev-

Military Trainer version of Comanche will have tandem seats, powered cockpit canopy hinged at rear. Both Air Force and Navy got similar proposals.



- DESIGN PROPOSAL -

PA-24 TRAINER  
PIPER AIRCRAFT CORP  
LOCK HAVEN, PA



eral times during the *Comanche's* development that we talked over various matters with the boys at Beech, Cessna, Thorp and Mooney."

Did Piper's new engineering and development division at Vero Beach, Fla., under Fred Weick (AOPA 9893), play any part in the *Comanche* development?

"Nope," Pug answered. "The *Comanche* was virtually finished by the time that division had been established. You see, they only started down there last year, and the *Comanche* was already flying by then. In the future, of course, they will share with our engineering department here in Lock Haven whatever new projects the schedule permits us to assign them. Fred and his boys down there are working on that agricultural plane development at the moment. As we see it at the moment, our Lock Haven engineering department will concentrate for a while on improving the *Comanche* and *Apache*."

Who finally named the PA-24 the *Comanche*?

"Frankly, I don't know," Pug said. "That name popped up not long after we decided to use the family of Indian names. I believe that was Jake's idea. Once we decided on Indian names, they just poured out: *Apache*, *Comanche*, *Cheyenne*, *Aztec*, *Cherokee*, *Sioux*, *Iroquois*, and so on. I just don't remember how the name *Apache* got assigned to the PA-23, or *Comanche* to the PA-24."

Did you make any mistakes in the basic design of the *Comanche* that you had to change after the prototype had been built and flown?

"No, the *Comanche* design as you see it today is the *Comanche* we designed on that final drawing we discussed earlier,"

Walt said. "Actually, the *Comanche* design is relatively clean, simple and straightforward. We stayed well within the bounds of the general practice, or state of the art, as it is today. That's actually the kind of airplane we set out to design in the first place: a simple, reliable, modern airplane. Nothing radical, no gimmicks. If you stay within such limits, you should have little or no trouble. Matter of fact, we even started making production tools early in the *Comanche's* development. We've had no major problems at all. We're quite pleased. So are our pilots. And—most important of all, because they're by far our severest critics—so are our distributors and dealers who now have the first production *Comanches*."

Pug added, "In all fairness, I suppose I should say that we did change a few items that we didn't happen to like ourselves. For example, we found the rudder forces were a little too light, and the horizontal control forces on the tail too heavy. We also changed the flaps because they were too heavy too. But, as Walt has said, none of these were major items."

Any new ideas in the works for the *Comanche*?

"A few," Pug said. "We've worked out a preliminary on an agricultural version. And we're still wondering if we can interest the military in a primary-



Constance Wolf in a "free" balloon

## Woman AOPA'er Pilots Navy Blimp

The Naval Aviation News recently paid tribute to one of the country's leading women in aviation, Mrs. Constance Wolf (AOPA 1326), a charter member of AOPA.

Reporting Mrs. Wolf's flight in a Navy airship, Naval Aviation News said:

"One of the grand ladies of aviation helped fly a Navy airship at Lakehurst, culminating 27 years of flying.

"Mrs. Constance Wolf of Blue Bell, Pa., a licensed aviatrix, took the copilot's seat of a K class "blimp" and became one of the very few women ever to fly an airship in this country. [Mrs. Wolf is the wife of Alfred L. Wolf, AOPA general counsel.]

"Mrs. Wolf has now flown most existing types of aircraft: heavier-than-air conventional aircraft, helicopters, lighter-than-air free balloons and airships.

trainer version we've drawn up (sketch accompanying this article). But practically speaking, the new version we're concentrating most on is the 260-h.p. version for the civil market."

Matter of fact, we wouldn't be surprised if they're already working on a turboprop version behind some se-

"Under the supervision of Lieut. (jg) Charles H. Tall III and Andrew Devine, AMC (AP), the actual pilots of the "blimp" which was on a training flight, Mrs. Wolf showed great promise as an airship pilot.

"An addict of ballooning, Mrs. Wolf is the only woman free balloon pilot licensed by the CAA. The lady balloonatic (as she prefers to be called) who first flew in an OX *Challenger* back in 1930, is a founder and vice president of the Balloon Club of America. The club, a band of intrepid adventurers from Philadelphia, meets regularly to fly its cooking-gas-filled balloons.

"Last summer club pilots competed in an international balloon race in Holland. A friend of Mike Todd's, she sailed the balloon used in "Around the World in 80 Days," over London and Paris to advertise the film. It was originally a Navy balloon at Lakehurst."

cluded hangar door. After all—as Walt himself pointed out while discussing what we thought was the *Comanche's* radical flying tail—there's nothing very new about many such developments.

There are quite a few turboprops flying throughout the world, aren't there?

END