Production Model No. 8 of the Yankee, which Author Downie flew on West Coast. Photos by the author

■■ Undoubtedly the newest production item in general aviation today is American Aviation's *Yankee*. When we visited the factory and taxied in at the Cuyahoga County Airport, just east of Cleveland, O., *Yankee* No. 13 was just coming out of the paint shop and No. 14 was being test hopped. Since demand for the new *Yankee* makes them a mighty scarce commodity, we flew the first production plane at the factory in a wet, smoky haze. We tried it again two weeks later on the West Coast in Yankee No. 8.

No matter how you slice it, the *Yankee* is a "fun airplane." It's small but has ample cockpit space. It's mighty fast for the horsepower. It's a dream to fly and, while not aerobatic, it will do just about anything you want with a minimum of persuasion. And, if there's a drop of Scotch (ancestry, that is) in your system, you'll be happy with its thrifty initial cost and operating budget.

Even before we walked through the factory, saw their new state-of-the-art fabrication techniques, and climbed into one of their smooth little birds for the first time, I had one request to make of American Aviation's 36-year-old president, Russell W. Meyer, Jr.

"After some of the snow melts off in the spring, can I arrange to ferry one of these new ships out to the West Coast?"

Meyer nodded and said that this could be set up without much trouble because there'd be plenty of *Yankees* awaiting delivery by then. American Aviation's president has an unusual background for his present position. He's a lawyer by profession, but he worked his way through Harvard's Law School by giving flight instructions and flying for the Marine Air Corps Reserve. He was also an Air Force SAC pilot in KC-97's, F86's and other heavy aircraft for four years. He's logged over 3,500 hours.

The *Yankee* is a new airplane. The company also is new, young, aggressive and eager. They also have a whole new set of problems in various stages of solution. As almost everyone in general aviation already knows, the *Yankee* grew from the basic design developed by Jim Bede (AOPA 181370). We saw one of the original airplanes parked beside the Cleveland paint hangar, and it's a far cry from the production *Yankee*.

The *Yankee* is the first production lightplane to use modern metal-to-metal bonding techniques. With the exception

That New, New Yankee

Two production models flown during appraisal. Our pilot describes Cleveland-built aircraft as a 'fun airplane' . . . 'mighty fast for its h.p.' and 'thrifty in initial cost and operating budget'

by DON DOWNIE / AOPA 188441

of the stabilizer substructure, there is hardly a rivet in the entire bird. Company President Meyer estimates that only 210 man-hours will be required for each airplane when production passes the 1,000 mark.

"Our target of 550 to 600 airplanes in calendar year 1969 is a very reasonable estimate," said Meyer quietly, but with complete confidence. "New production techniques have resulted in at least 30% fewer parts than those needed for so-called 'conventional' construction."

Skeptics have made all the unnecessary remarks about "sticky tape" airplanes. However, the use of heat-sensitive adhesives in aircraft components dates back to and before the original supersonic B-58. While relatively new in years, bonding is a completely proven technique. During FAA certification, a special cycling test was written into the program under a "catch-all" authorization. Engineers required that the wing be cycled to 80% of limit load—in the critical torsion condition—to complete failure. The test went on and on and on, 24 hours a day, for over 11 days. After more than 212,000 cycles, the metal fatigued at a point where it was not bonded. The lap of the bonded joint produces a stronger section than the original metal.

So, it's certainly not going to come "unglued!"

After the pre-cut metal is cleaned and chemically etched, it goes into jigs and fixtures that are wheeled into "the oven" and heated to 250°F for one hour. Test samples are included with each "cooking" and tested in shear and peel as a routine quality control feature.

Unique in basic construction is the 6½-inch-diameter tubular wing spar that "doubles in aluminum" as two 12-gallon fuel tanks. The tube is fabricated in three pieces: one in each wing and one that carries through the fuselage just under the seats. There is a 5° dihedral. Two ⅜-inch bolts slide through the overlap between the center section and the wing panels to carry all flight loads. Ailerons are push-pull activated so that re-rigging is not required after replacing a wing.

Cabin structure is essentially a "box" of ½-inch aluminum honeycomb to form the fire-wall, sides, bottom and sub-section under the baggage compartment. The remainder of the tail cone is 0.032 and 0.025 sheet aluminum with a rounded aluminum "turtle-deck" consisting of four partial bulkheads bonded to a single wrap-around sheet of aluminum. It takes just 30 man-minutes to fabricate the "turtle-deck" and just 15 minutes to assemble a stabilizer for the oven.

Since pilots are prone to be more interested in how an airplane handles than how it's put together, we made a quick tour of the brand new Cleveland fabrication facilities and headed for the flight line located right at the back door of the building. Our walk-around and first flight was with 37-year-old Richard B. Kemper (AOPA 192216), a veteran of 7,000 hours including time in USAF B-26 and B-36 aircraft. Kemper is general manager-operations, and flew much of the certification time on the *Yankee*. He has a Master's degree in Aerodynamics and spent 11 years in flight development (at Cessna) before coming to Cleveland. He's a very savvy guy and a superb pilot.

We made our first flight with Kemper in *N274AA*, the first production airplane. This red bird is the only airplane that the factory has been able to keep around both for demonstrations and various flight tests.

"We've become quite adept at removing test gear for demonstrations," commented Kemper wryly.

Later we flew *Yankee* No. 8, N5606L, on the West Coast with Sam Houston (AOPA 233387), who is chief pilot of Flight Safety, Inc., in Long Beach, Calif. Flight Safety, Inc., will handle *Yankee* dealerships in Long Island, N.Y., and Hayward and Long Beach, Calif.

Just about everything on the *Yankee* is small, except where it counts—and that's cockpit space and flight performance. Wing span is only 24½ feet, and all-up weight is 1,500 pounds, of which 560 pounds is payload. Under the cowling is the well-proven Lycoming 108 h.p. four-banger. The first 15 production airplanes required retrofit carburetors because of a too rich mixture, but all new production units have been modified at the factory. Takeoff with both No. 1 and No. 8 required the mixture control considerably aft of the full-rich position.

Aircraft with sliding canopies have been somewhat less than successful, but the people in Cleveland have come up with the neatest canopy package that these eyes have seen for years. The full-length canopy rails glide on Teflon rollers and slide forward under the cowling, not back as in the original design. Small friction locks hold the canopy in any position. There are two ways to keep cool in the *Yankee*. One involves small, noisy, snap-open vents that will give some air circulation in flight. However, this system is in the process of modification, and the simplest way "to keep your cool" is to open the canopy both on the ground and in flight. The canopy can be opened half way in flight at speeds up to 130 m.p.h. Just make sure that you don't have any spare notes in your shirt pocket. This canopy-open setup is ideal for aerial photography.

When you get into the *Yankee* it's just about like climbing into a sports car. Kemper explained that a flick of your toe pushes up the bottom of the seat and you step on the top of the circular spar. If you happen to be the first pilot aboard, there's an even simpler way; just step from the right wing-walk and put your feet directly on the floor on the left side.

The cabin is deceptively large. I measured the inside at shoulder height; it's 39 inches. Outside width is 41¼ inches. Since pilots come in all shapes and sizes, I found ample cockpit room for my six-foot-two frame. Personally, the seats leaned just a little too far back for me, but that would be easy to adjust to individual preference.

The *Yankee* comes in three factory-equipped packages: the basic airplane with essential instrumentation for $6,495; the *Yankee Trader*, with a Narco Mark III, dual controls and some advanced instrumentation for $7,895; and the *Yankee Clipper*, a full-house arrangement with gyros, a Mark XII with VOA-8 localizer and assorted goodies for $9,495. Naturally, all the initial aircraft to go into the field as demonstrators were of the complete *Clipper* configuration. When I asked Kemper about baggage allowance with full tanks (24 gallons), the *Clipper* package of avionics and instrumentation, and two 170-pound pilots, the factory general manager replied, "You'll be able to carry about 30 pounds of baggage and still be legal."

Just as in concept, design and construction, there are unusual installations inside the cockpit. The most

Downie finished his appraisal of the Yankee on the West Coast in N5606L, which was No. 8 on the production line.

noticeable of these is the fuel gauge system. There's a 12-inch-long, ½-inch-diameter pyrex standpipe that measures the weight of the static fuel at the base of the tank. The red liquid in this standpipe is 80/87 octane fuel. A single fuel selector on the console forward of the console separating the seats is either left, right or off. There is no "both" for fuel.

The console between the seats carries a trim-tab wheel for the elevators, an electric flap switch, the microphone clip, and an ash tray.

Another of the many different features of the *Yankee* becomes immediately apparent just as soon as you ease off the parking brake and begin to taxi. The nose wheel doesn't steer! That wheel up front castors through 90° before reaching the stops. You do "the driving" on the ground with the brakes. Since the nose gear stops at 90° to keep from hitting the prop with the wheel fairing, a tow bar is recommended for all back-up maneuvering on the ground. On our later flight, Sam Houston accomplished the same thing by pushing down on the tail to lift the nose wheel.

This full-swivel nose wheel has some advantages. It's simple and inexpensive to build. It's lightweight and has virtually no maintenance. It'll turn on a dime and give change. However, it does have one potential problem area. As I climbed out of No. 8 at Brackett Field, in Southern California, after my West Coast flight, I waved "good luck" to Sam Houston for his smog-bound flight back to Long Beach. He started to taxi out and made a number of very quick 360° turns to the right. We soon found out that the left brake was out of fluid. Man, was I glad that this situation hadn't happened just three minutes earlier when I'd planted N5606L "on the numbers" and was tempted for a fleeting second to attempt to "make the first turnoff."

If you hit the brakes hard on a landing with a full-swivel nose wheel and one of them isn't there, you're in for an interesting several seconds. I'd add "check brakes for normal pressure" to my personal pre-landing check of the *Yankee*. Actually, this is an item that should be checked before landing any airplane, but pilots tend to ignore it.

After this minor malfunction, I asked *Yankee* President Meyer for more information on the problem. He replied that "landings have been made in all of the crosswind conditions we have encountered, which would be winds up to 20 knots cross, without the necessity of using brakes. The pilot would become quickly aware of the fact that one brake was ineffective due to excessive and very easy brake pedal travel. This would probably occur before the other brake was causing any significant loss of directional control. We have encountered brake failure occasionally during the development program and during testing of early production airplanes, due primarily to foreign material in the brake lines and shuttle valves. These failures have consistently occurred after one or two pedal applications, while ground handling the airplane. We feel that our vendor's manufacturing problems and our own installation problems have been adequately resolved and that brake failures should be at a minimum from this point . . . As you know, controllability by use of the rudder alone is effective at relatively low airspeeds."

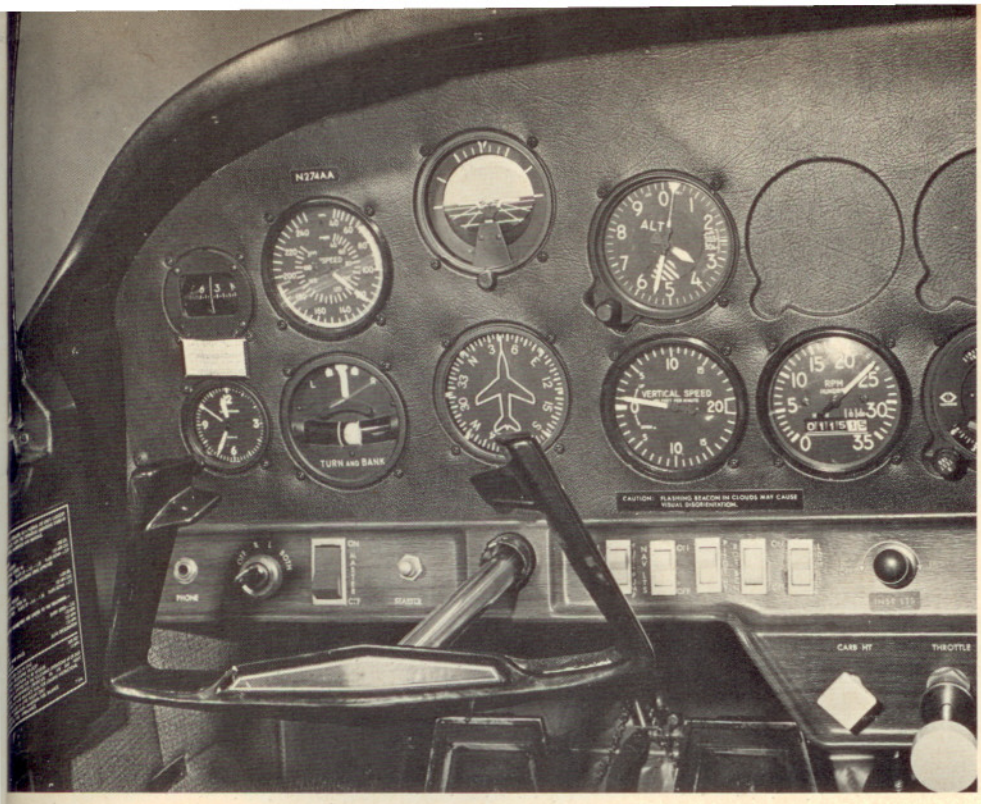
Actually, it takes only a few turns on the ground to get the feel of the castoring nose gear and then you tend to forget all about it. And those tight radius turns in parking are most convenient.

Ground roll on takeoff is listed at 790 feet and rate-of-climb is listed at 900 f.p.m. No pilot making his first couple of flights in any new airplane is going to obtain optimum performance, and I'm no exception. Full throttle and 85 m.p.h. is recommended for best r/c, but this setting puts the nose up just a little high for best forward visibility. I settled for an extra 10 m.p.h. in airspeed and a better view.

I'd consider the silky-smooth control touch of the *Yankee* just about as good as they come. There's a fine balance between rudder and wheel forces, and the elevator trim tab is located conveniently between the seats. During full-throttle climb, it's immediately evident that the engine thrust line is not "canted" down and to the right to compensate for torque. It takes just a bit of a heavy right foot for a coordinated climbout, since there's no manual rudder trim. Yet both *Yankees* I flew were set up correctly for hands-and-feet-off in cruising flight.

I'd like to take credit for this idea, but it came out of an aeronautical discussion with Irv Culver (AOPA 117226), veteran designer of the Lockheed rigid rotor helicopter and many other craft. We were discussing trim tabs and torque correction when Culver made the off-the-cuff comment, "That's easy to handle. Just use two trim tabs. Mount one low on the rudder in the slipstream with its trailing edge turned left to take care of the left turn caused by high power settings. Then have a second tab at the top of the rudder, out of the slipstream, turned in the opposite direction. As you reduce to cruising power and your speed picks up, the top tab begins to take over."

We passed along this simple idea in



Instrument panel of N274AA taken in flight near the Yankee factory at Cleveland, O. American Aviation's Kemper was flying the plane from the right seat when the author took this picture from the plane's baggage compartment.

debriefing correspondence and Meyer commented, "The idea of two rudder tabs such as those described in your letter had not occurred to us but we will give that suggestion some thought."

Like just about everything else in this world, aircraft design is a matter of compromise. The *Yankee* gets its delightfully high 144 m.p.h. top speed and 135 m.p.h. cruising speed out of a miserly 108 h.p., but at the expense of somewhat higher stalling and landing speeds. The wing loading is higher than on most light two-placers: 15.3 pounds per square foot. Stalling speed is 64 m.p.h. and there's just one mile per hour difference in full-flap stalls.

The small 5.44-square-foot (each) flaps on the present model are singularly ineffective, but the factory reports that one of the top priority modifications now in engineering is a more efficient flap system. I gobbled up considerably more runway than was required at Cuyahoga County, but was able to make respectably short approaches into Brackett and Cable Airports on a second flight. Actually, the *Yankee* is such a clean bird that the only way you're going to land in the 445-foot area listed in the "specs" is to get well slowed down on final approach; 85 m.p.h. down final approach seemed adequate, with an extra 5 m.p.h. dropped off coming across the end of the runway.

Listed among the several design developments now underway in Cleveland is the development of a child's seat for the baggage compartment.

Part of the "fun flying" in the *Yankee* comes from its light, responsive controls and unexcelled visibility. A considerable effort has gone into keeping the *Yankee's* appearance clean and like a classic sports car. Thus, the compass has been mounted at the far left of the instrument panel rather than protruding from the top of the panel or the bottom of the windshield. Here again, life is a compromise, and there are rather high deviation corrections.

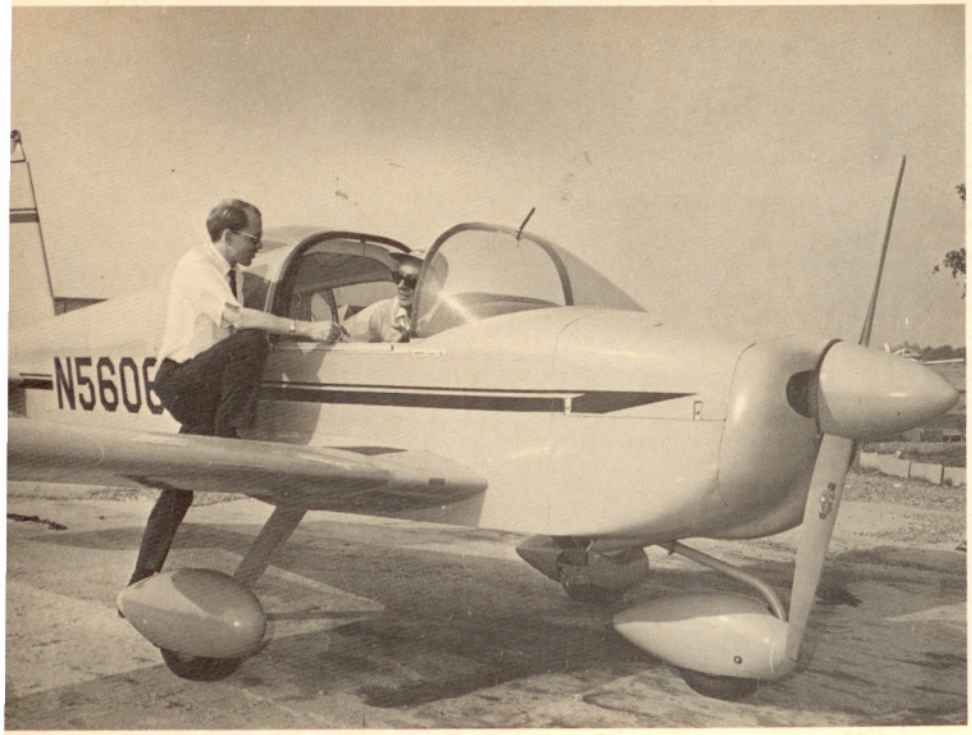
Meyer said frankly that "at the present time we do have rather high deviation corrections, ranging up to 7° or 8°, depending upon the airplane. This deviation is caused by the location of the compass in the instrument panel and the associated steel structure in the same general area. We have located some of this steel structure and, by compensation or demagnetization, have managed to cut the compass deviations down. We are still looking for other areas to improve the installation. We did have the compass mounted in the windshield by the canopy bow, but felt that it was an unnecessary eyesore and restricted the otherwise excellent visibility."

We rolled around the Cleveland sky as much as weather would permit. It was fun! Stalls proved to be completely straightforward, with plenty of aerodynamic buffeting before payoff. Because of the higher wing loading, stalls are somewhat faster than in most other two placers. Secondary stalls can develop if you don't generate a little airspeed before bringing the nose back up. Stalls out of turns are predictably a bit fast but completely conventional.

It's to be expected that pilots attracted to the *Yankee* will also be attracted to other types of fun flying. Anticipating such antics, Meyer pointed out that "the possibility of an aerobatic *Yankee* has been overstressed.

"Even if such an aerobatic option is available in the future, it will most definitely not be a retrofit item. The earliest possible date such a version could be available would be the latter part of 1969, and I am frankly quite dubious at this point as to the merits of such an airplane. It would require additional power, structure, and a completely revised loads analysis and structural testing program. I am not sure that the aerobatic market is large

First production model of the new Yankee. Standing at the cockpit is Richard B. Kemper, American Aviation's general manager-operations. Note comparative size of the Yankee to the Piper Cherokee 140 B in the background.



Sam Houston, chief pilot of Flight Safety, Inc., Long Beach, Calif., with the author (seated in the cockpit) at the Cable Claremont Airport.

enough at the present time to justify the substantial cost of developing and tooling such an airplane."

Our Cleveland check pilot advised that the present *Yankee* will spin, "but only if you really work at it." However, spins are not on the list of approved maneuvers, so we didn't do any.

When you take a close look at the smooth leading edge of the wing, you'll find a little 9-inch-long, "V"-shaped stall strip mounted two feet outboard of the panel root. This assures that the inboard section of the wing will stall while the tips are still flying. Kemper explained that there is a ⅛-inch vertical adjustment available on the strip to correct for those subtle inconsistencies that show up in any production airplane.

Since the *Yankee* is obviously suited to be both a speedy sport plane and a trainer, particularly for those who want to "step up" rapidly to more sophisticated, heavier aircraft, it was logical for the factory to run an accelerated student training program. More than 800 hours and 5,000 takeoffs and landings were crammed into the No. 2 *Yankee* by 33 employees who were checked out in the ship. Two zero-time employees were taken to solo stage. During our visit to Cleveland, there were 170 people on the payroll—53 were licensed pilots. The employee flying club had 45 members.

Cleveland has a superior labor market with tooling capabilities available nowhere else because of nearby automotive construction, according to *Yankee* officials. Many new employees are attracted to the expanding factory because of its location in the suburbs away from "heavy industry" and its proximity to a large county airport.

"Our goal in life right now is to turn out 1,000 of these ships with a variety of gradual improvements," explained company President Meyer. "At the same time, our engineers are working on a four-placer (already under construction) but the airframe will not be identical in size, nor in general appearance, with the Yankee. It will be a totally different design, though it will be a low-wing airplane, and will incorporate many of the bonding techniques we have developed with the Yankee. We feel that the Yankee is an excellent two-place airplane. It will not be stretched, nor will we consider the installation of a larger engine in the near future . . ."

Since bonded structure is brand new to general aviation, and since a factory tour stresses meticulous quality control and complex material preparation before bonding, the question obviously arises: "How do you repair it in the field?"

"With respect to field repair of the Yankee, we have the advantage of using either localized bonding repairs or conventional riveting repairs," Meyer explained. "Bonding repairs can be effected in the field in non-structural areas using room temperature adhesive. Specific instructions and bonding repair kits were given to maintenance representatives of each of our first dealers, though we require approval of each particular field repair from our engineering department here at the plant.

"In structural areas contact pressure during adhesive cure must be maintained by using blind rivets of the cherry lock or huck lock spindle type, or by using a suitable clamping device which will give intimate contact and maintain the relationship of the parts during cure. This type of repair can be accomplished in the field by a qualified regional shop. We have several of these in mind, though all current repair procedures are being handled through our dealers or contract maintenance through the dealer. When we produce a sufficient number of aircraft, we plan to appoint regional repair shops. Bonded structures may also be repaired through conventional means by the addition of splices, ribs and skins with blind rivets as necessary. This would not result in quite as good a final appearance, but would be more than adequate structurally. Each such major repair will have to be approved by the factory. However, as you know, this is conventional with all aircraft manufacturers."

The *Yankee* design has protected itself as far as possible from normal "hangar rash" and minor damage by the use of Fiberglas wing tips, wing root fairings and nose cap, and plastic Royalite elevator and rudder control tips. The wing tips are 18 inches long and contain the recessed cap for the tubular fuel tank. All tips and fairings can be removed quickly for inspections. The factory estimates that a periodic or 100-hour inspection can be completed in only eight man-hours.

It would be difficult to really appreciate the development and production effort of the *Yankee* without having made a visit to the factory and talked with the key management team. They're all young enough to be aggressive and enthusiastic, yet seasoned enough to work carefully. Five of the six key men at the top of the *Yankee* list are pilots and they're probably "leaning" on Controller Richard A. Krajec to learn. All are under 40 except 43-year-old Paul A. Macauley, director of manufacturing. Larry K. Kelly, 36, is director of marketing and a former U.S.N. and American Airlines pilot. Chief Engineer William C. Seidel, 35, supervised 40 engineers on new light-twin projects at Cessna before joining the *Yankee* team.

While the *Yankee* is still the newest airplane to reach certification and substantial production, a number of basic refinements are already under way to improve the finished product. Some will be available in the next several months and some at a later date. These include a sun curtain, winterization kit, installation of shoulder harness attachments, collapsible arm rests, development of a throttle quadrant, jack points for the main gear forgings, split center console for easier flap motor access, deepened glove compartment and better latch, plus developments mentioned earlier in this report.

So the new, new *Yankee* is here to stay. It looks good now, and it's obviously going to look even better. I'm looking forward to spring when a Californian can comfortably revisit the shores of Lake Erie, because that ferry flight back should be lots of fun. □