By AUTHOR OF "STICK AND RUDDER"

Things you'd learn in flying a Seabee from New York to Key West and back.

HOW THE SEABEE WORKS

By
WOLFGANG LANGEWIESCHE

IT so happened that our "service trial" for the Seabee was a run from New York to Key West and back. This might seem too easy a test—what with a whole ocean under one wing, and Florida weather. Naturally, you might think, a Florida trip is where a Seabee would shine.

Shine she did. But actually the route was probably no easier than, say, New York to Wichita would have been, or Minneapolis to New Orleans, or Chicago to Miami. Tidal waters are difficult to use—unless established seaplane bases are available. Large bodies of water, which show up most convincingly on the map, tend to be rough. Salt water is tough. The experienced seaplane pilot prefers the rivers, small lakes, and reservoirs, and soon learns that there are plenty of those, even in supposedly dry regions. As for weather, somewhere between New York and Jacksonville you almost always have to cross the Polar Front; and our trip was no exception. Besides, one wants to try an airplane in warm air, too. All things considered, we think it was a fair test.

To answer your first question first—what does she cruise? It is hard to measure speed exactly in the East, where no section lines offer ready-measured speed courses. But we are satisfied that at the power setting recommended by the manufacturer she cruises the advertised 104—even with four, even in warm air. This power setting—25 inches of manifold pressure, 2250 RPM—is 75% of rated power. Being the timid sort, we cruised at 23 inches and about 2200 RPM, with the propeller in flatter pitch than recommended. With this setting we seemed to make a True Airspeed of about 90, the exact figure varying of course with air temperature and altitude and also fuel loads. We thought the lower power was easier on the engine and that the lower airspeed would give us better miles per gallon—especially because at the lower power you also felt more confident about leaning your mixture. So long as the instrument people leave us without a mixture-indicator or knock-meter, one naturally uses one's mixture control with some trepidation and thus wastes much of the performance which is actually

latent in our small airplanes.

Equivalent Cruising Speed

You may think that the Seabee is mighty slow, considering those 215 horses. But wait.

After a stretch of flying any airplane you come away with an overall impression of that airplane's personality, as it were, which is just as definite as the personality of a human being—and just as hard to put down in black and white. In the case of the Seabee, the dominant impression is neither speed nor slowness. It is comfort. Whatever our successes and frustrations on this trip, they were experienced without the physical torture to which the average small airplane subjects its occupants.

Putting the Cart before the Horse

The noise of the Seabee is of course terrific, and may add to our airport's difficulties with their neighbors. But little of it penetrates into the cabin. This is partly due to the careful sound-proofing, including the tightly-fitting doors, partly to the configuration which puts the cart before the horses. The noisiest regions around a propeller are as shown in the accompanying sketch. You can see how this noise pattern favors the single-engined pusher over the conventional configuration. Exhaust noise seemed far away and was merely a pleasant signal of power. We had no rattles and no drumming. Cabin and windshield consist entirely of curved sheets, as they should in any airplane. Wind noise, the most annoying noise of all in the long run, was virtually absent, owing no doubt to the smooth blending of windshield and nose into one streamlined body. There was none of that throbbing of the windshield, due to the pulsating prop wash, which can cause so much fatigue on long flights. Thus the noisiest of our airplanes is probably the quietest to ride in—excepting possibly the Stinson Voyager. The actual decibel count may not be so low, but the noise is of a kind which does not irk you and does not interfere much with conversation.

There was also remarkably little vibration, the engine's power impulses being absorbed by the main mass of the ship without having to travel through the cabin.

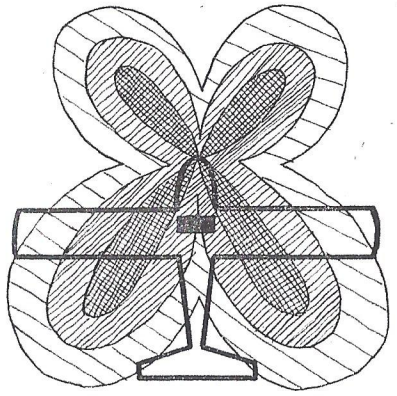
The huge cabin of the Seabee—itself probably possible only in a pusher—gives you the feeling that the airplane has not merely been test-flown in the narrow sense, but that top officials must have taken long, gruelling trips in it. Both seats are plenty wide enough for two; the rear seat even wide enough

to curl up after a fashion and sleep. A short-legged person can stretch his legs in the back seat, and even the longest-legged can do so in the right-hand front seat. Air cushions, which serve also as life preservers, can be inflated or deflated to place you higher or lower, further forward or further back, to suit your build. As your arm gets tired after flying a while and sags down, an arm rest is there to meet it. Ingress and exit are the best since the Hammond Y. You step on the tire, then on the spray-strip which sticks out under the door like a running-board, then into the cabin. Vision is excellent, especially downward-forward, the natural and least fatiguing direction in which to look. The usual problems of side-by-side vision, such as whether the left-hand pilot can inspect a check point which is passing by under the right side, don't even come up. He had a good look at it while it was visible ahead. We had wondered about spray or rain on the windshield: it is plain math that the farther a windshield is away from your eye, the more will each raindrop, each dust-particle, etc., obscure your vision. But somehow it worked fine. No spray ever seems to get on the windshield, probably just *because* it is so far forward; and we flew without difficulties through moderate rain.

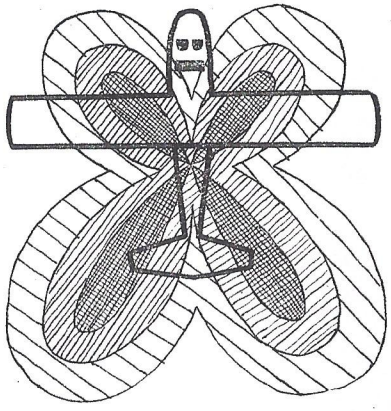
If this is what a pusher does, a pusher is worth having even if it means some sacrifice in performance, and even if it is not amphibious. The amphibian feature of course also contributes to your comfort: you worry so much less about engine failure. Flying the Seabee we had again an experience we had once had in flying a seaplane in supposedly dry parts: not until you have a pontoon on your underside do you see all the water there is. We always pumped the gear up right after becoming airborne. We knew that we could always land in a rough field with the gear retracted, sliding on the enormously strong keel. Thus possible landing places for an amphibian keep coming up with perhaps three times the frequency with which they come up for a landplane; and your chances of success in an emergency landing are probably increased, say, ninefold: it is almost as good as having two engines.

Miles-per-Week

This airline-like comfort of the Seabee actually becomes part of its performance, and must be considered, along with its slow cruise, when evaluating this unusual airplane. Here at last is an airplane in which a man will do an honest day's work of flying, instead of sitting



PROPELLER NOISE PATTERN: note that in a tractor the occupants sit in an area of #2 intensity and close to the area of maximum noise intensity.



PROPELLER NOISE PATTERN. note that in a pusher the occupants are virtually out of the #3 area of propeller noise intensity.

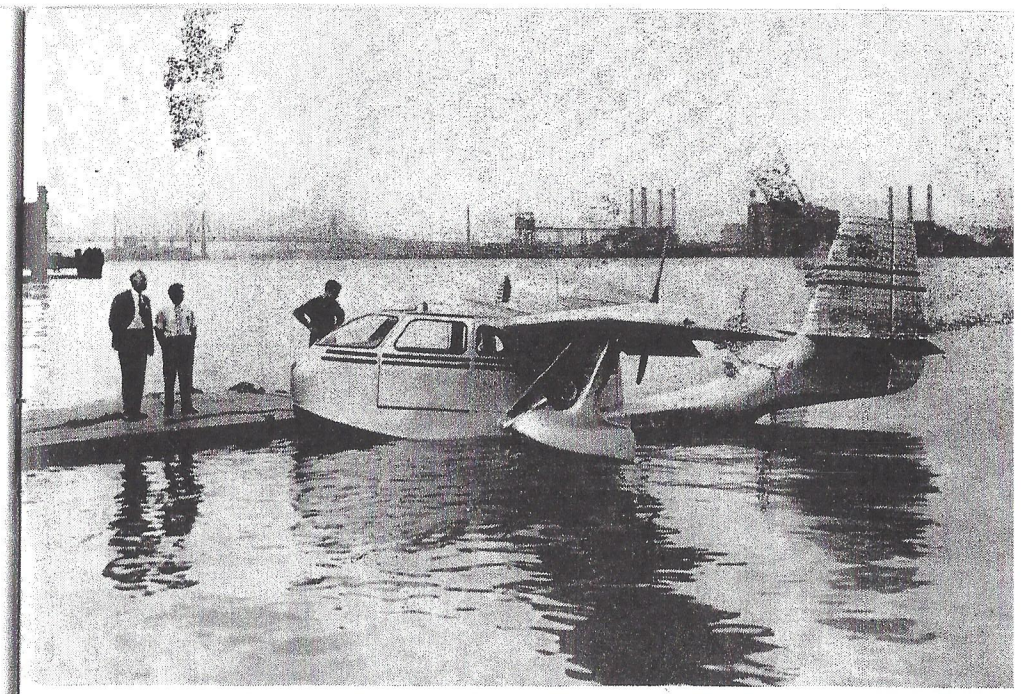
dazedly around the airports, wasting daylight hours, simply from physical reluctance to go on. Fatigue-wise, 8 Seabee hours are probably no harder on you than 5 hours in an ordinary airplane. If two fortyish business men were flying a trip of, say, 3000 miles, one in the Seabee, the other in some faster airplane of merely standard comfort level, I should bet on the Seabee pilot to get there first.

The Seabee's amphibian character also helps you to make miles per *week*, for all the miles per hour it may cost you. It helps especially if you don't actually use it, but keep it in reserve for emergencies. It keeps you going through weather which would stop a contact-flying landplane. On the way south, for example, we hit a Front about midday when south of Norfolk over the dismal swamps and endless forests: low scud beneath a low overcast, light rain, light fog. In any contact-flying landplane we would have turned back to Norfolk. The actual flyability of such weather being so hard to judge from teletype reports, we would probably have wasted the entire afternoon at Norfolk. Next morning we would have lost additional hours through local ground fog. Not so in the Seabee: we moseyed on, winding around a low spot here, poking through a hole there. We knew that

on our left were all sorts of bays and sounds which we could always reach and land on. Almost always we could see at least one body of water showing up light in the grey-green murk, and thus knew that we were free to stop flying within a few minutes. Bad weather is much easier to take in this voluntary fashion than when you are caught in it and forced to go on. We made good 500 miles on that short day in late November, when with a much faster landplane we would probably have been stopped at 300. Distributed evenly over the entire trip, this gain alone is equivalent to having cruised some 5 mph faster through-out.

We wasted some 24 hours on the Georgia coast, experimenting with water work, about which more later. At noon of the third day, while flying the beam across the forests south of Jacksonville, we ran again into low scud with light fog and lowering ceilings. We simply let go of the beam, scurried for the Inland Waterway and stuck to it, flying at 400, then at 300 feet. Finally the weather became a little too risky. The risk, however, was not of life and limb, as it would have been in pushing a contact-flying landplane any further: it was merely of being forced down on a deserted stretch of the canal, with no way to get ashore and indeed no proper shore but only marsh. So we turned back. In a landplane our only recourse would have been to return to Jacksonville. Since this is a Control Zone, we would probably have been stuck there, not only all afternoon, but the next morning as well, until toward noon of the next day the usual morning scud would have burned off! With the Seabee, we merely followed the canal back to a marine service station, landed, tied up, and consulted our maps at leisure. We then ran south through central Florida, up the St. Johns River and across lonely forest and lakes, flying all afternoon with perfect peace of mind through weather and terrain which would have been definitely unsafe in a contact-flying landplane. That afternoon we made good 200 miles—as against zero miles probable landplane travel. Distributed over the entire trip, this adds another 5 mph to the Seabee's "equivalent cruising speed."

In thus pushing through bad weather by being willing and able to sit down on water, we had the same experience which you so often have if pushing weather by being willing and able to fly a bit of instruments: a little push is good for a big gain. Usually the weather is really bad only for a 10 or 20 mile stretch. Once you have pushed



THE SEABEE, like any new machine, will have to have a little time before people grasp fully where they can go and what they can do with it.

through the bad place, you may have quite reasonable going for long stretches.

Direct

A few days later we wanted to fly from Fort Myers to Key West. A fairly direct route would be along the west coast of South Florida, intercepting the string of Keys about half-way out. But that part of the Everglades is swampy, uninhabited and supposedly almost unliveable. In a landplane we would have had to go the long way 'round, zig along the Tamiami Trail across to Miami, then zag along the highway to Key West—a total distance of 300 miles. With the Seabee, we simply filed a CFR flight plan, giving our route in great detail, and went direct. Should we meet one of those Florida squalls, we were resolved simply to sit down on one of the swampy rivers and let it blow over, rather than let it force us from our route. Thus the Seabee not only gave us a chance to see one of the least visited regions of the country, but also cut our route from 300 to

180 miles: another gain which adds yet another 5 mph to our effective cruising speed.

On the way back north we ran into winds up to 40 mph, dead on the nose. That sort of thing is tough on a slow airplane; cars on the highway were gaining on us. In addition, the fresh polar air was viciously rough. But even so, the Seabee didn't do so badly. We simply went down to within 50 feet of the Indian River and ground out the miles with comfort and safety, if not with dispatch. An 8½ hour day put us from Key West into Jacksonville; another 7½ day, into Norfolk. In a landplane we could not have flown so low, nor in the smooth air over the water, nor so long. The rough air would have given our passengers such a beating that we would have been forced to quit quite early.

And in still another way the Seabee saved us time. To get back with certainty on schedule in a contact-flying landplane, we would have had to allow an extra day for possible weather troubles. With the Seabee, we spent that extra day in Florida, because we knew we could push through almost any weather along the Inland Waterway. (On some other trip, a weather-proof water route might have been offered by the Mississippi or the Tennessee or the Ohio, or by the Erie Canal and Lake Erie.) As it turned out, the weather was good, and we flew landplane style, bee-lines from airport to airport. But the time saving remained. Altogether, I think that the Seabee, cruised at 90, gave us travel equivalent to that of a 115 mph landplane.

Peaceful Penetration

This gain in travelling speed came from keeping the water possibilities in reserve, rather than from actually using them. Actual water work is likely to be slow, or at any rate contribute but little to your travelling speed. But it does something else, and equally important: The Seabee did take us a few times to where we really wanted to be—and thus delivered the one service which the airplane ordinarily cannot deliver.

We picked a hotel in central Florida one evening from the air—after first inspecting several towns and lakes from the air. We ran the Seabee's nose right up on the beach and handed our luggage directly to the bell-boy. At Fort Myers, the place where we really wanted to be was a certain cottage on a barrier-beach type of island in the Gulf. We landed on the protected water behind the island, taxied around to the open Gulf side, pumped down

our wheels, waddled up the sandy beach through the gently-heaving surf and parked right on the spot, beneath a palm tree.

We had never used an amphibian before and had to learn a few things. During our check-out flying before departure we had the same landing gear trouble which others also have had: breaking a linkage in the landing gear hydraulic system while trying to taxy out of the water. Republic said that we must have hit bottom before the gear was down all the way and locked. We think, however, that we overstrained the linkage by pumping the gear down against too much water-drag while taxying rather fast downwind; and we resolved to perform this operation at idling speed in the future. At any rate it was easily fixed.

Wheels in the Water

We learned—but are ready to unlearn by further experience—that it should not be considered one of the main ideas of an amphibian to taxy out of the water up on the nearest beach—except of course where a prepared seaplane ramp is available. Many times we did not even try, after probing the bottom with our boat hook. At least once we tried and got badly stuck in the soft sand under-water, and when the full allowable reverse-thrust of the Seabee did not float us again, had to resort to the old Armstrong method of seaplane operation—take off your shoes, roll up your pants, get out and heave. This happened—much as we hate to mention it—just before we handed our luggage to the bell-boy at that hotel, and it spoiled considerably the casual elegance of our arrival, if you know what I mean.

We decided that as a rule the bottom is smooth, hard and sloping only where it is often pounded by a surf which makes it unsuitable. Where there is no surf, the shore is

likely to be soft—very soft on tidal waters. Conditions may be different on inland lakes in some regions however. Also, this statement applies to Seabee-touring, not to the use of a Seabee on repeated trips to the same locations. Somewhere in the desired vicinity you will no doubt be able to find a suitable hard and sloping beach; or you could keep a couple of boards to use as tracks. One Long Island commuter has reinforced his own shore by laying war-surplus landing mats under-water. But for touring, we resolved that once down on the water, we would plan to keep our gear up and remain a seaplane until airborne again.

From this there followed that one should carry a pump. Our hull did not leak, as we had feared it would, more than some negligible amounts. And we would have been willing to leave our particular Seabee afloat, unwatched, for 24 hours. But you can't trust any seaplane float or hull to remain tight. The normal way to drain a Seabee after water-work is very easy. When you get back on the airport you unscrew a number of drain plugs in the keel, one for each compartment. If there is any water, it will run out. But once on water, you might find yourself with a leak and a water load which you can't take off. This can happen to any seaplane float or flying-boat hull, especially after a hard landing. With no way to taxy up on dry land, and no pump, you might then experience long delays during which the weather might turn bad, and so on and on, until for lack of a pump the ship was lost.

We also learned that present seaplane bases are not particularly fitted to take a Seabee. Docks are difficult to use when you have wing-tip floats. Ramps may be strong enough only for light float-planes, and may not extend far enough under-water to take the Seabee's wheels. Thus you are likely to be grounded 20 feet from the shore (the Seabee draws a foot and a half of water), and have to refuel by wading back and forth with a 5-gallon can. This is slow, and leads to such complications as mud in the cabin, or cutting your foot on a piece of glass under-water, and wet pants. As more dealers and operators get delivery on their Seabees and fit their facilities to the airplane, this complication will disappear. Meanwhile, we found it easiest to refuel at airports, just before going on the water. In a way that is the main virtue of an amphibian anyway—combining the penetrative power of the seaplane with the landplane's ease of servicing and storage.

Seaplane Sense

In all this you may read a dark hint that water-operation is a long series of headaches and wet shoes, risks and delays. It would be stupid to say that it is; it would be unrealistic to say that it isn't. It is one of those things about which it is hard to tell the truth because the truth is neither black nor white nor even grey, but a complicated pattern of white spots and dark spots. Water flying is completely smooth, effo t-less and un-demanding only when it is done on specially designated areas of protected water with prepared facilities for mooring, docking and hangaring or over-n'ght watching. Take away the prepared facilities and right away you have the problem first of intelligently picking a suitable landing area, then of getting ashore, then of making the airplane secure. Add rough water, currents, winds, pilings, marshy beaches and sea-walls, and your problems multiply. Add harbor traffic, and the demands upon your wits increase. Add salt water, tides, surf, and you can see that there are some situations in which even the most seasoned seaplane pilot simply can't operate. It's all a question of degree and judgement, experience and "angles."

For failure to appreciate the angles of water flying, many a Sea-

bee owner will lose his ship. But this does not mean that the water side of the Seabee is not worth having. In the first place, you would want it simply for a standby, as explained above. Secondly, operating away from established facilities with some effort and some exercise of wits is still vastly better than being tied completely to prepared facilities as you are in a landplane. In the third place, seaplane handling can be learned. The CAA Water Rating does not mean you have learned it. Normal takeoffs and landings on water are so easy that they are hardly worth practicing, much less worth testing. Pylon 8's and "number 2 stalls" are the same with a pontoon under you as with a landing gear. Spot landings are less important on water than on land. What the seaplane novice needs are 5 solid hours or so of taxying, docking, sailing, etc., under various conditions of wind, water and shore. Unfortunately this is hard to buy, since most commercial seaplane operations naturally have nearly-ideal setups of protected water with prepared ramps, so that their routine flying does not materially differ from airport flying, except that you can make sloppy landings. Fortunately the handling of a seaplane, quite unlike our contrary and elusive art of flying, is largely a question of common sense —informed common sense. It can therefore be learned largely from a book—namely, Dan Brimm's "Seaplanes." It explains all about the various gaits at which a seaplane taxys, about porpoising, the up-wind turn, the down-wind turn, weather-cocking and sailing; also about hangaring, mooring and beaching: the whole strategy, as it were, which the water pilot must use between one evening's landing and the next morning's takeoff. With this book and some gently pushing experimentation, any pilot should be able to check himself out on the water-work in a Seabee.

Keep Cool

In handling the Seabee on the water, two novel features give you an advantage over the ordinary airplane: the reversible-pitch propeller, and the blower-cooling. Both worked exceedingly well for us. The blower-cooling did away with one of the worst headaches of water operation. An ordinary seaplane tends to overheat unless you taxy it either on the step or at idling throttle, which means an impracticably slow pace. On this trip we once had occasion to taxy the Seabee on the open Gulf. The distance, 3 miles, was too long to taxy at an idle. The water was too rough to taxy on the step. So

we just motored at perhaps 15 mph as a regular displacement vessel, pitching and rolling and throwing a bow wave just like a steamer. It would have burned up any ordinary air-cooled engine in no time, but the Seabee engine kept cool. Incidentally, in a twin-float seaplane, so much spray would have been thrown into the propeller that the procedure would have been impossible on that count alone. But the Seabee's propeller rode high and dry.

Back her up

Your other big help on the water is the Seabee's reversible-pitch propeller. An ordinary seaplane on the water keeps going forward (unless headed into a strong wind or current) even with the engine idling. Its progress is gentle, but relentless. The only way to stop is to cut your power, and then you drift back with the wind, and sooner or later drift into sea walls, anchored boats and the like: and then you *hope* that she will start promptly. But the Seabee's propeller allows you to have your cake and eat it too: you have your engine running, and yet have the seaplane standing still, or even going backward.

It works through a separate control, located on the cabin roof, and the best way to work it is to leave your throttle set for, say, 1200 RPM, and then work the reverse lever to put the propeller into neutral, forward or reverse as needed. Mechanically, this trick-sounding gadget worked almost perfectly. Our only trouble with it was a slight tendency for the pitch-changing mechanism to stick, and to follow the control only when you gave it a slight extra blast on the throttle. This was largely remedied by more careful greasing (with a special grease-gun which comes with the airplane). Partly it could have been remedied by raising the unusually low oil pressure which our engine carried.

In actual use, the reverse propeller does not give you, of course, the complete freedom to maneuver which the reverse gear gives you in your automobile or in a motorboat. A seaplane on the water tends to weather-cock into the wind, especially so at very slow speeds when you have no steerage-way for your

rudder and no prop-blast on your air rudder. Hence, while you can always back, the direction in which you will back is more-or-less prescribed for you by the nautical circumstances. In other words, you cannot easily back cross-wind, and even less easily up-wind. For example, on one occasion we had taxied up a fairly steep gravelly beach, wheels down, and wanted to get back in the water. The wind was blowing parallel to the shore line. Our seaplane sense being atrophied by long disuse, we did not turn the airplane around, by hand if necessary, so we could go nose-first into the water: we tried to back into the water. As soon as our tail came afloat, the wind of course took over (while the main wheels were still grounded) and began to weather-cock us. Instead of backing into the water, we were thus backing parallel to the beach. That time, we simply put the propeller into forward pitch and went forward, turning into the water, with no harm done. But harm might have been done by the unexpected outcome of the maneuver, had there been stakes around or a sea-wall; or an annoying delay might have been caused had we thus inadvertantly taxied into a soft spot.

Thus even the reversible propeller does not excuse you from using some seaplane sense, and always striking a mental balance of wind-drift, water-drift, weather-cocking tendencies, the probable effect of water rudder and air rudder, etc., so as to guess the airplane's behavior beforehand. But given some seaplane sense, the prop helps a lot.

For example, as you approach a dock or buoy from the correct angle, with respect to wind and current, you can work your reverse controls so as to keep the Seabee stationay, literally within inches of the mark. Your right-hand man can then step forward, open the ingenious nose-door and leisurely tie up. Without such a propeller this leisurely procedure is impossible except in a very strong wind, because the propeller keeps pulling you forward. Hence you have to cut your engine and coast up to the dock. Unless your timing is good, you either bump the dock, or else you miss, and then you sit there with your engine dead (and perhaps too hot to start again readily) and you start drifting. It is in such situations that seaplanes are slowly and expensively damaged, and the reversible propeller is good insurance.

Seaplane Trap

We had one experience which may bear description because it illustrates a typical seaplane situation.

At Sea Island, Georgia, we had landed up a narrow tidal creek, going in at high tide, landing against tide and current, and tying up at the upwind end, where a low bridge with a high-line on top cut off all further runway.

Our sight-seeing done, we now wanted to get out—and in a hurry. Down the creek there were some sand bars and low oyster beds which, with the tide receding rapidly, would soon blockade us. Our problem then was to get downwind quickly. To turn downwind and taxy downwind would have been just about impossible in any seaplane. The creek was too narrow to force the downwind turn, and downwind taxying would have been possible only at high speed, which would have meant a risk of running aground on oyster beds or sand bars with too much force. In any seaplane, the only way to get down was to back: headed into the wind, letting wind-drift take you down. But in an ordinary seaplane we would have had an unpleasant choice. Backing with an idling engine, we would have wasted valuable time and probably been trapped by the above mentioned sand bars. This would have meant leaving the seaplane in salt water for some 24 hours, until the next combination of high tide with daylight: typical of the traps which tidal waters lay for seaplanes. With the engine stopped, an ordinary seaplane would have backed fast enough, but sooner or later a wing-tip or the tail would have grazed the banks unless we had got the engine started again just in time. In the Seabee we just put the propeller in neutral or slight reverse, and backed down the creek so fast it almost scared us. Regular bow waves appeared at the heels of our wing-tip floats. Whenever we found ourselves drifting too close to one shore, we would just use a bit of forward pitch, stop our motion relative to the shore, and with a bit of rudder sidle out into mid-stream again. Even at that, we crossed the sand-bar only in the nick of time. On this one occasion alone, by saving our Seabee from 24 hours in salt water with all sorts of mooring problems in addition, the reversible propeller probably paid for itself.

(To be concluded next month)

Part II of some Seabee tips gained in a 3,000 mile flight.

HOW THE SEABEE WORKS

By
WOLFGANG LANGEWIESCHE

THUS, as our trip continued, our respect for the Seabee kept growing; an unusually able seaplane which is also an unusually comfortable, steady-going landplane that travels much faster than its hourly cruising figure suggests. It has a two-way radio, turn-indicator, and enough tank to make 500 mile hops non-stop. Its odd configuration does not seem to handicap it. Considering that its hull and wingtip floats must weigh at least as much as two persons, the Seabee might be called a 215 h.p. landplane which carries six at 100 mph: not bad at all.

How is it done?

How is it done? Is there a catch to it? The Seabee differs from most small airplanes now flying in a few fundamental respects which, we found, profoundly affect its operation.

One difference is that its tank of seventy-five gallons can be carried full only if one seat is left vacant. With four occupants, our Seabee was licensed to carry no luggage and only forty-one gallons of fuel, or three hours' cruising at manufacturer's consumption figure. If you are as reluctant as we are to be in the air with less than forty-five minutes of fuel, you can see that a party of four must proceed by rather short hops.

Now you might call this a catch. But we don't. In the first place, it is not played down in Republic's advertising, but quite clearly stated. In the second place, to be able to carry fuel or passengers interchangeably is an advantage. That most of our small airplanes cannot do so is one of the main reasons why the private airplane shows up so poorly in actual travel performance. Think how you could travel in any standard two-seat lightplane if the second seat were interchangeable with a twenty-five gallon auxiliary tank! Think how a small airport could make money with a Cub Cruiser if it could carry three passengers on short sight-seeing hops. An airplane which can always be flown with a full tank is by definition a wasteful airplane: half the time it is wasting a seat you could well use; half the time it is wasting range which you could well use. Let's call the Seabee, then, a three-and-a-half seat airplane, and hope that there will be more airplanes with half-seats soon.

An Old Gripe

Someday we hope to fly a Seabee with three and take full advantage of its tank, making five hundred mile hops. Meanwhile, flying the Seabee with four, we could legally carry only three hours' fuel, and became rather consumption-conscious. We were never able to determine our fuel consumption exactly. The manufacturer claims 13.5 gallons per hour at his power setting. For the trip as a whole, cruised at lower power, our gasoline receipts show 15. For the best-documented thousand mile stretch of the trip we got at our low cruising power 13.5 g.p.h. But that was before we dared lean out our mixture. We believe that for our best hops we finally got our consumption down to perhaps 11.5 g.p.h. The question was always on our mind because there is only one huge tank, and with four persons you do almost all your flying with the gas gauge between ½ and "E". The psychological effect is bad. Like all our airplanes, especially the single-tank ones, the Seabee badly needs a standpipe reserve of, say, six gallons.

A new law

Another way in which the Seabee differs from most other small airplanes now flying is the degree to which you are allowed to load it up. The Seabee is the first airplane we had handled which has been licensed under certain new CAA regulations regarding airworthiness. They now will license an airplane in any or all of three "categories": "acrobatic", which must mainly be strong enough for snap maneuvers, etc., "utility", which closely resembles our traditional small airplanes as to structural strength and performance, and "normal", which is something new under the sun. The Seabee is licensed as a "utility" airplane *and* as a "normal" airplane. Let's see what it means.

When you want to fly the Seabee as a "utility" airplane, it must not carry more than two persons, including pilot, and about three hours of fuel, to a total gross weight of 2810 pounds. In this condition the Seabee performs much like any standard airplane you might mention. She takes off very nicely, climbs at a good angle, is docile enough to be spun and strong enough to take 4.4 g's in lazy eights, loops and other gentle acrobatics. Stalling speed is forty-seven. Cross-wind landings, which we had expected to be critical, seemed normal. In cross-wind taxying (on land) the weather-cocking tendency sometimes overpowers both rudder and brake. The remedy is to taxy a little

faster. The only thing which the Seabee sometimes won't do is a slow-speed downwind turn while taxying; when forced, she likes to go up on her nose, which is not serious because no propeller is there to be broken and the nose, or rather the bow, is so low that the ship can't over-balance, but plunks right back on its tail wheel. But it is embarrassing. Old time tricks of taxying, familiar to those who used to fly brakeless airplanes with tail skids, are out of place on modern airports and not appreciated by modern tower girls. The Seabee badly needs a steerable tail wheel.

But stability in flight is excellent, according to our personal standards, thanks partly to a fifty pound hunk of lead in the nose, partly probably to the high propeller location. The ship is distinctly easy to fly once you have learned (1) its gadgets, (2) the heavy forces required on its elevator, (3) its somewhat slow aileron response, (4) its steep glide and consequent quick flare-out. All of these things are not difficult, but merely different.

"Normal"

But if you want to refrain from all acrobatics and accept a load factor of 3.8 g's, then you can load the Seabee up to a gross weight of 3150 pounds, (four people and about three hour's fuel, or three people, five and one-half hours fuel and some luggage and then the Seabee is a different airplane. It then has all the characteristics of an airplane carrying an overload. The stalling speed is 58 flaps down, 61 flaps up. The take-off run is long—800 feet according to Republic—the climb shallow and at high airspeed. The ship's CAA papers say that the distance required in standard air to clear a fifty foot obstruction is 2080 feet. In this condition the Seabee is *still* easy to fly. You may have a little trouble at first getting the flare-out and ground contact just right, but if you don't you merely gallop a bit on the very good gear.

But in this heavy or "normal" condition you'll have to keep in mind those 2080 feet required to clear a fifty foot obstacle—in standard air. Telephone poles, trees and houses are often higher than fifty feet, and you want to do more than *just* clear them. Also, some runways are uphill and don't show it. Furthermore, the tests were presumably run from concrete and in smooth air, while in practical flying you might run on sand or grass and take off into turbulent air also. Such tests are run with faultless technique; can you trust yours? Obstructions, if approached too closely, have a way of throwing nasty turbulence at you. Turbulence enormously decreases an airplane's performance. The more wind there is, the more turbulence you get. Hence a brisk wind on take-off does not always furnish the help you might expect. Finally, and most important, the air is very often sub-"standard," about which more later. According to our experience, if you want to fly a Seabee in its heavy condition with a comfortable margin of safety you want an unobstructed field or else an airline-type airport with not much less than 3,000 feet of runway.

Use your airplane

Is that a "catch?" Here again, we don't think so. Unless you are permitted to load your airplane up until it needs a big airport to get off, you are wasting some of the performance you might have. All of our small airplanes ought to be permitted to take substantial overloads out of large fields for cross country flights. Consider what you could do with any of our standard two-seat lightplanes if you could take them off with a passenger plus a 10% overload of fuel! It would mean about fifteen gallons of gas, or about three hours' extra cruising! There is, of course, a limit to the overload which can be safely carried. An airplane might sag back to the ground in a downdraft, even if it cleared obstructions. But the new "normal category" regulations require a reasonable climb. The fully-loaded Seabee, while its run is long and its climb shallow, (about 1:12½, as calculated from CAA figures for airspeed and rate of climb) walks upstairs faithfully and steadily, largely with the help, of course, of its controllable pitch propeller which allows you to get full RPM and thus full power when you need it most. The rather high airspeed at which you climb of 79 mph also helps in making the climb steady: if you do fly into a downdraft, you don't stay in it so long.

Good sense

Fortunately, moreover, good-sized airports are now abundant and there is always the water feature of the Seabee to allow you to penetrate to the small communities, the hunting and fishing places and other spots which an airplane ought to be able to reach in order to be useful. Fortunately, also, the approach glide of the Seabee is so steep and its landing flare-out so short, that you can land a Seabee probably in just about any regularly used flying field. The CAA manual gives about 1,000 feet as the distance required to land over a fifty foot obstacle and stop, and even under extreme conditions of hot air and high airport elevation, the distance given is only 1300 feet. (These distances, of course,

again assume faultless technique and very close shaving of obstructions. Add margin to suit your own skill and daring.) Once down in a small field you can always fly out again light, ferry your passengers to a nearby lake or large airport one by one, and then pick up your whole load from there. In this connection it must be stressed that the water take-off of the Seabee is very good. From float-plane experience we expect a given airplane's water take-off to be greatly inferior to its land take-off. With the Seabee this is not so at average elevation and air temperatures. The water distances to clear a fifty foot obstacle is given by the CAA variously as 2480 and 2643. Considering the amount of runway usually available on water, this is practically better than the land take-off! Altogether, then, we came to the conclusion here again that the Seabee people have done some powerful thinking upon the practical use of the small airplane and have come up with a clever compromise of desirable features. We also felt that the new airworthiness regulations which make this possible are a distinct step forward and another step in the CAA's gradual return to good sense.

Call for Public Relations

But the whole take-off, load and fuel situation in one of the new "normal" airplanes can set a few traps for the pilot unless he thinks ahead with respect to factors of load, airport, air temperature, and range. In another year or so these things will have become common airport knowledge, but meanwhile they seem likely to cause an initial wave of accidents, unless the necessary information is more clearly presented to pilots. There is a public information job here which threatens to remain undone.

In the first place the pilot must be made to realize that there *is* this new classification of airplanes, and that the full licensed load of such an airplane is plenty. It may not be polite to say so, but it is common knowledge that many pilots quite often overload their airplanes, largely because the licensed gross weight of airplanes licensed under the old rules leaves a margin of safety which is excessive when you have a large airport and cool air. The pilot must realize that the new "Normal Airplane" allows him all the load which he would carry in his more lawless moments in his present ship. If he exceeds these *new* limits on a warm day he may get into trouble, not only with the laws of man but with the laws of nature.

Now it is true, in the case of the Seabee, that the ship's papers contain a CAA manual which gives all the pertinent performance facts, including take-off distances at various altitudes and air temperatures. But since for most small airplanes the ship's papers contain nothing of interest to the pilot, this manual is likely to go unread. How about a placard on the instrument board: "Pilot must study Operations Manual before flying this airplane with more than one passenger." The same kind of mentality which is deemed to need a placard prohibiting the reversing of the propeller in flight certainly needs such a reminder.

Words

Besides, the CAA manual and ship's placards could well be clearer. Perhaps CAA's public relations section should be consulted when composing matter meant to click with non-lawyer, non-engineer pilots. The manual fails to state, but merely implies, the basic fact—that there are different categories of airplanes, and that the Seabee can be flown under two different sets of rules. In our personal opinion, it is awkward that the word "Utility" should have been chosen to apply to the lightly loaded airplane, which has little utility except as a trainer, and the word "Normal" to the heavily loaded airplane, which has so much utility but is by present piloting standards anything but normal. A pilot trained on the airplanes now flying and flying from the airports now available, has a fairly definite picture of normal airplane performance which applies to most airplanes alike. In this picture, stalling speed and cruising speed, take-off distance and climb angle, size, weight and power are all mutually tied up with one another, so that while the actual figures vary, the total pattern of airplane behavior is pretty consistent and fairly predictable by the pilot without consulting any manuals. As the saying goes — "it flies like a Cub." The new so-called "Normal" airplane does not take off and climb like a normal ariplane but like a normal airplane with an overload. It might have been more effective to follow military usage and call the heavy condition bluntly the "Overload Condition." That one word implies all the pilot needs to know, both as to structural safety and as to performance.

"Overload Condition" may seem ugly words, since they seem to imply that something is not as it should be, while actually the overload condition increases the airplane's safety as well as its utility. In that case, why not put a placard on the instrument board which would say plainly in the case of the Seabee: "When four persons are carried,

including pilot, the fuel tank must not contain more than forty one gallons. Fuel gauge must not show above red line." And another: "For acrobatics, no more than two persons, including pilot, must be carried. Fuel must not exceed forty one gallons. Snap maneuvers and inverted flight prohibited at all times."

A time to say No

Safety, however, should come from our own efforts, not from those of a Government bureau. The Seabee pilot himself must learn to use this new class of airplane intelligently by thinking ahead more than now usual with respect to weight, range, airport size and air temperature. This means, for one thing, that when carrying a full load he should avoid making fueling stops at small, obstructed fields. Because the Seabee, when flown with four has only limited range, this takes a little planning. In this connection he should keep in mind that protracted water maneuvering uses quite a bit of fuel, and that take-off and climb on the Seabee cause noticeable consumption because the propeller permits full-power operation. A typical Seabee situation might be that after a visit to the lake, airborne again, you find yourself shorter of fuel than you had planned, and compelled to go into a small airport after all. This situation is likely to grow into an accident unless the pilot resists the temptation to force a take-off anyway with his full load, even though a piece-meal ferry-out of his passengers may mean a large loss of time.

Sin in Winter

Most of all, the pilot of a new-fangled "normal" airplane *must* study up on the meaning of the expression "in standard air." Now that we are free to load our airplane up enough to take full advantage of its carrying capacity, we can no longer afford to neglect the effects of air temperature and airport elevation on take-off and climb. The more you load an airplane up, the more sensitive it becomes to air conditions. Fortunately, the Seabee manual furnishes complete tables of take-off and climb performance so that no "theory" is required, but the results can be directly taken to heart. The tables run in terms of "distance required to clear a fifty foot obstacle". Here are some key figures: At sea level with 20° F (a cold winter day) the distance as above defined is 1657 feet. At sea level and 100° F (a hot summer day) it is 2785 feet. Keep those additional 1100 feet in mind next summer when you are in a dubious field and some fool gives you the

usual advice: "You won't have any trouble. A fellow was in here with one of these and he got out *good.*" Strictly speaking, to allow an airplane to be loaded to the same gross weight in winter and summer is really undesirable. The same loading which in summer may make performance positively marginal will give you very nice performance in winter. If you want to do any sinning—as we did when through a misunderstanding we flew a while with four plus full tank plus some luggage—sin in winter. But behave in summer.

That airport elevation affects airplane performance—particularly in take-off and climb – is common knowledge. Fortunately, Western fields make allowance for that by extra length. But here again, remember air temperature. At 2,000 feet elevation you need 2150 feet on a cold winter morning, 3825 on a hot summer noon. The CAA climb figures for the two days are 641 ft/min and 473 ft/min. At 4,000 feet, you need 3,000 feet of runway on a cold winter day, 6,000 feet on a hot summer noon. The climb figures for the two days are 520 ft/min and 354 ft/min respectively. At 6,000 feet you need 4085 feet in the winter, while for a 100 degree summer day no figure is given, the rate of climb at that elevation in such air being down to 234 ft/min.

Remember exactly what these figures mean. They are not take-off runs, but take-off plus climb to fifty feet. On the other hand, they should probably not be labeled "Distance required to clear a fifty foot obstacle," but simply "Distance from standing start at which airplane was observed (or is calculated) to have reached fifty feet when flown faultlessly in smooth air." Also, many a tall pine beats fifty feet. For practical use, it would seem wise to add, say, 25% to the figures given. But remember also, as you read this, that the Seabee loaded in accordance with "utility" standards—much like most present-day airplanes – flies substantially like a Cub and can use small, high and hot fields with the best of them.

That is another thing to keep in mind: just as take-off and climb of the heavily loaded airplane becomes extremely sensitive to air conditions, so it also becomes extremely sensitive to load; even a slight lightening of the load will produce disproportionate improvement. Likewise, climb becomes very sensitive to variations of power, due perhaps to your management of your mixture and your propeller pitch, or to maintenance and engine condition. *Sapienti sat.*

Conquest of the Air

In the campaign for the ultimate conquest of the air, where does the Seabee stand?

It is not the kind of airplane which opens flying to new sorts of people, by being cheaper or simpler to fly than previous ones. If it is safer, it is so only in the hands of a competent pilot. It is a grown-up airplane, to be intelligently flown by a person of judgement. Just because it gives a wide choice of possible actions as to range or payload, water or land, gear up, gear down, high or low propeller pitch, it also gives you many chances for pilot error. This does not mean that it is a professional's airplane. A pilot who has a private license and, say, 100 hours of solo can well learn to handle it, but he will have to keep learning even after his initial check-out. He should not simply jump in and fly away. Particularly, he shou'd beware of that impulse in a brand new owner: "Come on, folks. Pile in, let's go for a ride."

Take it easy, fly it light

Let him imitate the practice of the airlines in operating new ships, and set himself some voluntary operation limits for, say, the first fifty hours. For example, it might be wise to resolve that he will fly it in the "light" condition for the first twenty-five hours, and then, in the "heavy" condition, avoid all difficult situations for another twenty-five hours, and never be in the air with less than an hour's fuel. He should simply close his mind to any temptation to break this self-made law. Far beyond the requirements of a "Water Rating," he should study up on water-work, and practice systematically the tricks of sailing, backing, turning, glass-water landings which he will need. Innocence as to water-work will be expensive. Even before he buys a transmitter, he should by all means buy a range-voice filter for his receiver. Our ship lacked this, and hence our radio failed to deliver the one thing which radio really has to offer to the contact-flying small airplane: the weather reports were unintelligible. The Seabee is enough of a traveller to have bad weather somewhere in a day's run. And he should learn proper technique in making power-approaches and landings.

Don't push

He should not push experience too hard by seeking difficult situations on purpose: flying has a way of suddenly pushing you a little harder than you had intended to push yourself. With a little practice, none of the problems which the Seabee poses is at all difficult when

met alone. But you want to avoid the simultaneous onslaught of several difficulties, all unfamiliar—say a rough-water landing when you are in a heavy condition; a cross-wind take-off from an obstructed field with an overload, when the trim tab is perhaps improperly set and very strong stick forces are required; a water-maneuvering problem in which you are short of fuel and can't take your time. Quite particularly, the heavy condition will aggravate just about any difficulty you may meet.

In another respect, the Seabee seemed to us the most impressive contribution to private flying since the Ercoupe. It surely is the most versatile airplane ever offered—at a price one can hope to afford. It is at least an attempt to do to the personal airplane what was done twenty years ago to the common carrier—design it radically for its own purpose.

Let yourself go

It is a good tool, but you have to learn to use it, not only in the sense of piloting, but also in the sense of re-thinking all your ideas about the use of an airplane. Only gradually, as you fly the Seabee, your mind, which has been frozen into the rigid pattern of airport-to-airport hopping, thaws out. As you fly over a pretty stretch of river and have the usual fleeting thought of how nice it would be to be there, you have to keep poking yourself in the ribs and tell yourself, "Go ahead and land. It's all free." As you look at a map and project a trip, you keep looking for airports and seaplane bases, and where the little red symbols are missing your mind remains blank. But you don't need airports, except perhaps twice a day for refueling. And you didn't need Seaplane bases. You don't need to know in advance where you are going to tie her up or beach her. Just go where you want to go, look over the local shore line and pick your spot. Thus gradually you begin to perceive the immense variety of places to go and things to do with such an airplane. It can take you (as it took us) to the most desolate and inaccessible places: it can take you to the front door of a fancy hotel, to downtown waterfronts, to foreign islands, clear to the Arctic Circle. It can take you on a fishing trip or on a sight-seeing trip or to the office in the morning. Properly handled, it can do these things with more safety and peace of mind and more reliability than has ever been available in the small airplane.