



WaterFlying

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DIRECTORY SPECIAL!
Flight Training and Floats

EFIS and GPS on Floats
Bush Pilot Schooling
Downwind Docking Has Its Place

BERIEV Be-103
Think Outside the Box

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ON THE COVER

The Beriev Be-103 will make you forget much that you take for granted about seaplane design.



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Photo courtesy of Mike Fizer, AOPA PILOT

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By Burke Mees

As big and diverse as the aviation scene is in the Western world, we sometimes are reminded that good ideas can come from anyone and any where. The Russian Beriev Be-103 is a good example. It turns conventional thinking about seaplane design on its ear, and the results are worth considering.

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By Robert S. Grant

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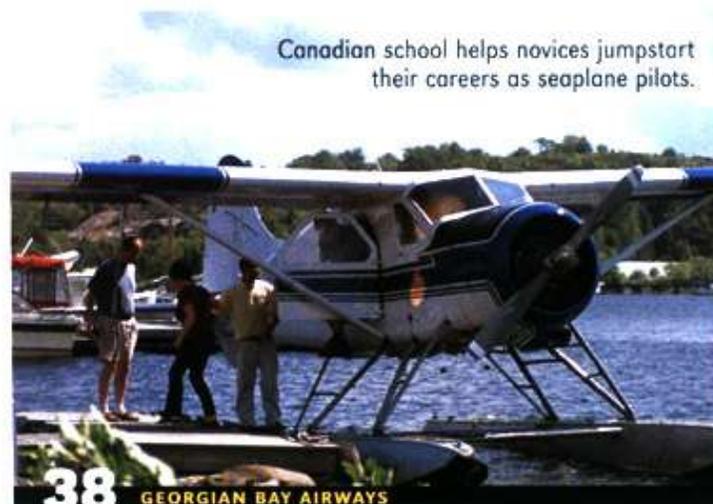
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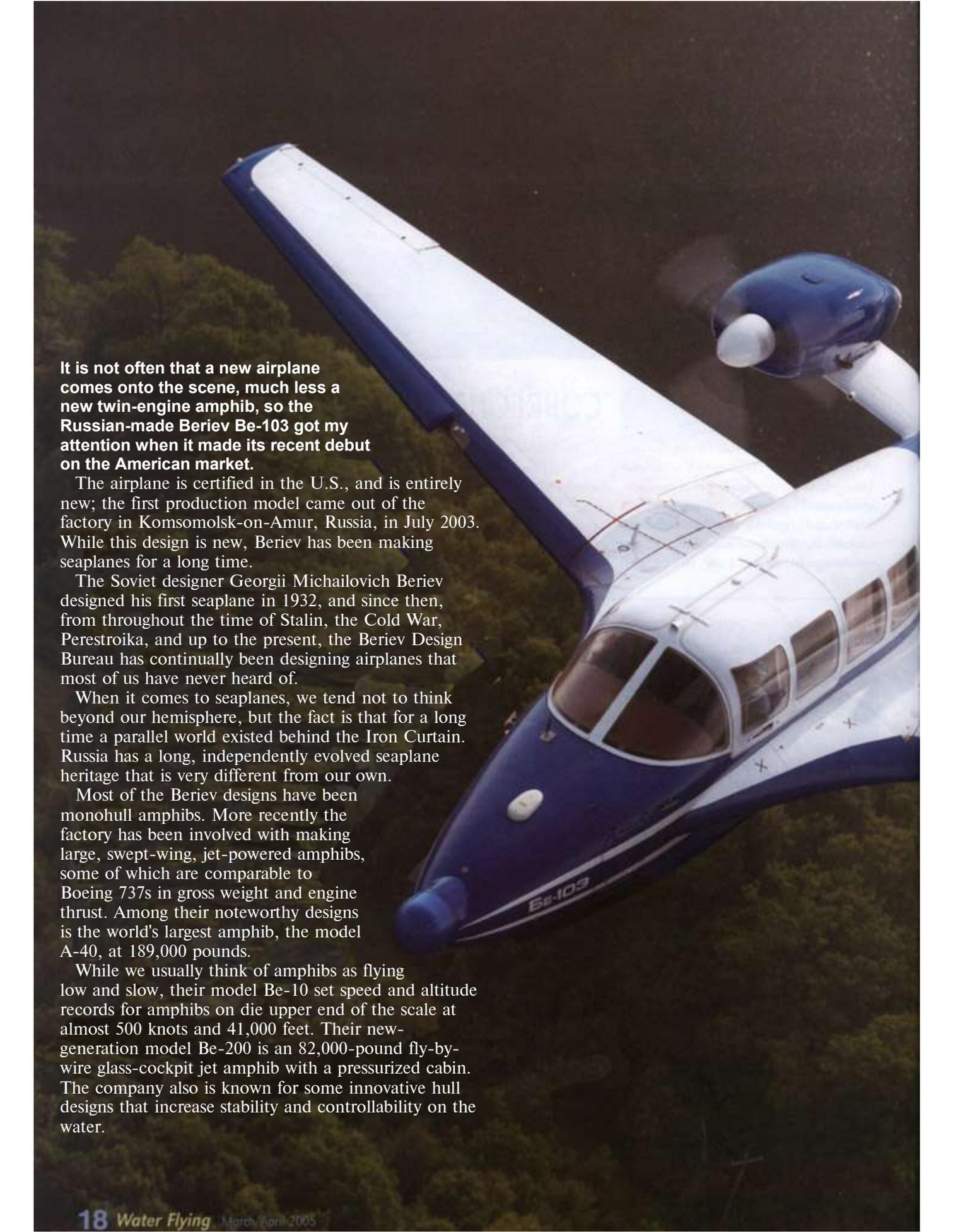
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GEORGIAN BAY AIRWAYS

A high-angle, close-up photograph of a Beriev Be-103 amphibious aircraft in flight. The aircraft is white with blue accents on the nose, tail, and wingtips. It is flying over a dense green forest. The aircraft's unique design, featuring a long, narrow fuselage and a high-wing configuration, is clearly visible. The cockpit is prominent, and the aircraft's registration number, "E-103", is visible on the nose. The background is a dark, blurred forest, suggesting a high-altitude or high-speed flight.

It is not often that a new airplane comes onto the scene, much less a new twin-engine amphib, so the Russian-made Beriev Be-103 got my attention when it made its recent debut on the American market.

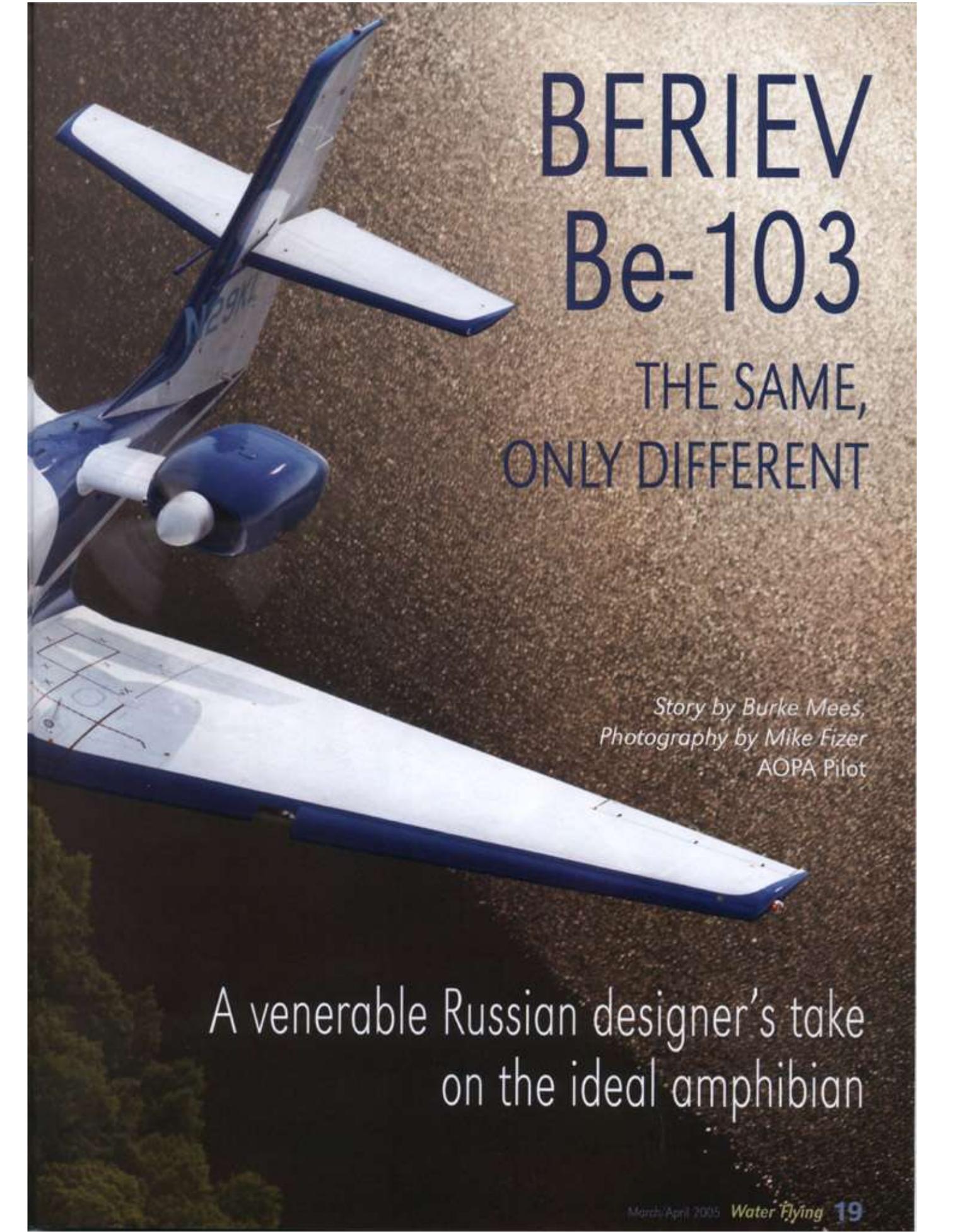
The airplane is certified in the U.S., and is entirely new; the first production model came out of the factory in Komsomolsk-on-Amur, Russia, in July 2003. While this design is new, Beriev has been making seaplanes for a long time.

The Soviet designer Georgii Michailovich Beriev designed his first seaplane in 1932, and since then, from throughout the time of Stalin, the Cold War, Perestroika, and up to the present, the Beriev Design Bureau has continually been designing airplanes that most of us have never heard of.

When it comes to seaplanes, we tend not to think beyond our hemisphere, but the fact is that for a long time a parallel world existed behind the Iron Curtain. Russia has a long, independently evolved seaplane heritage that is very different from our own.

Most of the Beriev designs have been monohull amphib. More recently the factory has been involved with making large, swept-wing, jet-powered amphib, some of which are comparable to Boeing 737s in gross weight and engine thrust. Among their noteworthy designs is the world's largest amphib, the model A-40, at 189,000 pounds.

While we usually think of amphib as flying low and slow, their model Be-10 set speed and altitude records for amphib on the upper end of the scale at almost 500 knots and 41,000 feet. Their new-generation model Be-200 is an 82,000-pound fly-by-wire glass-cockpit jet amphib with a pressurized cabin. The company also is known for some innovative hull designs that increase stability and controllability on the water.



BERIEV Be-103

THE SAME,
ONLY DIFFERENT

*Story by Burke Mees,
Photography by Mike Fizer
AOPA Pilot*

A venerable Russian designer's take
on the ideal amphibian





A DIFFERENT PATH

In short, Beriev has shown some ability and creativity in designing seaplanes, and has definitely taken a different path than the Western world. This distinctly non-western heritage is reflected in the Be-103. It is a 5000-pound, six-place airplane powered by two Teledyne Continental IO-360s (210 hp a side). Its basic design is unlike anything I have ever seen. It is a mid-wing monohull that floats on the inboard wing roots when not on the step. I am told that this design reduces the amount of power required to get on the step, and makes maximum use of ground effect during the takeoff.

There are no wing flaps. The wing does have non-retractable slats on the outboard leading edges, but their sole function is to increase the effectiveness of the small ailerons. The wings have a 22-degree sweep, which is almost as much as the 25 degrees found on a Boeing 737, but it does not really exhibit any swept-wing flying characteristics.

Inside, it has a fighter-plane style stick and a clean, well laid out panel. Like most Russian airplanes, it has a lot of titanium components and there is not much plastic to be found anywhere. It has a large airplane feel and some complex systems and features that you don't usually find on general aviation airplanes, a fact that reflects Beriev's history of making larger airplanes.

Currently, the only Be-103 examples in existence are five prototypes in Russia and three production airplanes that are parked at the Sky Manor airport in Pittstown, New Jersey. The American distributor is Kent Linn, and I had the opportunity to spend two full days there flying the airplane with instructor Jerry Innella.

BRAND NEW DEAL

The plane I flew, serial number 1, had 200 hours on it, which makes it the highest time Be-103 in existence. Jerry has more than 100 hours in type, which makes him one of the highest-time Be-103 pilots around. In short, this is a brand new deal and it is exciting to see it at the beginning, especially since the amphibians I usually fly were made back when Stalin was in power.

My first takeoff was from the Sky Manor airport. On the runway, the airplane's behavior is typical for a tricycle-gear landplane. It has a castoring nose wheel, so you use differential power and brakes to steer on the ground. This is also how you keep it pointed down the runway at the beginning of the takeoff until the air rudder develops adequate steering authority.

One thing to be aware of on this airplane is that it has powered hydraulic brakes, and it is up to you to turn on the hydraulic pump. If you forget to do this, you will have a few applications on the accumulator, after which your ability to steer or stop completely disappears. The only reason I can think of to have powered brakes on a 5000-pound airplane is that Beriev is just in the habit of building large airplanes.

Before landing, an electric-powered hydraulic pump extends the gear and pressurizes the brakes. An item that is conspicuously absent from the Before Landing checklist is flaps. It seems out-of-place for this complex twin not to have a flap lever. Whether or not you are naturally inclined towards smooth landings, it has trailing link gear that will make you look good.

Although there are plenty of lakes near the airport, we had to fly 20 minutes to get to some water that we could land on. That is because in New Jersey you can only land at designated seaplane bases, which made me feel like I was in communist Russia. This en route time provided an opportunity to do all the standard air work, which didn't provide any surprises. For going places, I noticed a 115-knot cruise speed.

SINGLE-ENGINE HANDLING

When I shut an engine down at max-gross weight, it didn't take long to realize that one of the Beriev's real strong points is its single-engine handling characteristics. Due to the inboard location of the engines the yaw is modest, and at max gross it maintained a modest climb. Performance and handling were good by light piston twin standards, and exceptional by twin-engine amphib standards. Unlike most twin seaplanes, this is a genuine multi-engine airplane, capable of holding altitude on one.

To complement its multiengine capabilities, the Beriev also makes a decent instrument airplane. It has stable flying characteristics and comes with a full set of gyro instruments and a good avionics package. While it's not quite certified for known icing, it does have heated propellers, and a heated pitot tube and stall vane. This broad set of multiengine and instrument capabilities is one of the things that sets the Beriev apart from the typical light twin amphib.

Another thing that distinguishes this airplane is how it flies on the water. It is not quite like anything I have ever flown. To start with, it gets on the step without any pitch changes. There is no need to pitch up in the plow and then pitch over onto the step. With all the wing area in the water, it begins planing at a low speed and just levitates onto the step, maintaining a flat attitude throughout the transition.



THE FLOATING WING ADVANTAGE

The Beriev's very new design has something in common with a very old design. Its floating inboard wing root seems to serve the same purpose as the short, stubby, mid-fuselage sponsons on the old Dornier and Boeing monohulls.

These sponsons eliminated the need for wing floats, and assisted the transition to the step. My understanding is that the added surface area of the sponsons would cause them to begin planing at a lower speed than the hull, and they would help lift the airplane onto the step, reducing the amount of horsepower required to make that transition. Once on the step, the sponsons would lift out of the water and no longer produce much drag.

The greatest demand for horsepower occurs when getting on the step, and these sponsons allowed the otherwise underpowered flying boats to get on the step despite being heavily loaded for a trans-oceanic voyage.

The Beriev's floating wing serves the same purpose. The assist that the wing provides allows this 5000-pound monohull to be comfortably powered by 420 horsepower.

Once on the step, the low wing makes maximum use of ground effect to reduce the liftoff speed, minimizing the airplane's exposure to water drag. Conventional seaplanes use flaps to achieve this same result.

There is a certain elegance of simplicity in the Beriev's use of a one-piece wing to achieve what is usually done with the complexity of a wing flap system. Through shrewdness of design, the Beriev designers have eliminated an entire system that entails moving parts and maintenance, as well as management on the part of the pilot.

—Burke Mees

The best technique seems to be to use neutral elevator and not really do anything as the airplane gets on the step by itself. It begins planing on the wing, but as it accelerates, the wing comes up out of the water and planing is shifted to the hull. As this happens, drag diminishes. When the airplane reaches its advertised stall speed, it lifts off by itself.

NO SWEET SPOT

On the step there is no real sweet spot, and the airplane remains fairly indifferent to stick position. Moving the stick forward or aft does not seem to impede acceleration, or have much affect at all. Nor does moving the stick side-to-side do anything since about five feet of the wing on either side is skimming across the top of the water. Despite my best efforts, I could not get the airplane to exhibit any porpoising behavior.

As for takeoff performance, it is not really a STOL airplane, but neither does it have long or laborious takeoff runs.

I spent a lot of time step taxiing, and found it to handle very well in step turns. It has the feel of driving across the water in a saucer. There are no concerns about tipping over or catching a wing float, and the precarious feeling that usually accompanies tight step turns is conspicuously absent. I even did some fairly tight downwind-to-upwind step turns that would have been positively dangerous in a conventional monohull but were comfortable in the Beriev.

For maximum maneuverability, I tried to identify the slowest speed at which it remains solidly on the step and found that, unlike most seaplanes, this is not easy to identify. As the Beriev decelerates, it continues to exhibit step behavior at very slow speeds. When it slows below about 40 knots on the airspeed indicator, there is a noticeable increase in drag, presumably as more wing area enters the water, but by all indications the airplane is still on the step.

Slowing down below 30, the airplane bogs down with even more drag, but it is hard to tell exactly where it can no longer be said to be planing. This indistinct transition to and from the step with no pitch changes is a defining characteristic of the Beriev's water personality. The airspeed I settled on for maneuvering on the step was 40 knots, where much of the wing seems to be out of the water. For especially tight turns, it can be slowed to 30 with good results.

CROSSWIND CORRECTION

While it is extremely stable in pitch and roll when on the step, it is less stable in yaw. During step turns the air rudder does not have a lot of authority, and once in a while I would have to resort to differential power. When getting on the step, if there is any crosswind the airplane abruptly becomes susceptible to weathervaning when it accelerates through the 30- to 40-knot range. I learned to anticipate this during crosswind takeoffs, and to be ready with a little differential power to keep it straight. This speed range seems to be a transition zone on the water when the wing is no longer the defining element in its water handling.

While the airplane is fairly indifferent to technique on takeoff, it is a little more sensitive to technique on landing. It likes to be flown onto the water in the step attitude, which occurs pretty close to the advertised stall speed.

The approach is made at blue line (best single-engine rate of climb speed, 81 KIAS). If you get any slower there is a noticeable increase in drag that will convert to a high sink rate if you let it. For that reason, drive it into ground effect at blue line and then start to hold it off to touchdown in the step attitude.

Touching down faster than blue line speed results in the usual bow drag; slower results in touching down on the aft end and slapping forward onto the water. In the after-landing slideout, it decelerates at a constant flat attitude, regardless of what you do with the stick.

ROUGH WATER READY

One of the pre-conceived notions I arrived with was that the airplane probably isn't any good in rough water or crosswinds. I had a chance to find out that this is not the case. One of the days I flew had gusty winds and crowds of weekend powerboats that were whipping the surface into a confused sea of random chop that made for some genuinely rough water. I flew it in water that well exceeded the 1/2 meter (19 inch) waves that had been demonstrated in certification, and found it to handle them at least as well as a comparably sized floatplane.



In some ways it handled them better, since it slides across the water on its broad platform with no pitching or heaving tendencies. Again, I found no porpoising tendencies, even when slamming into the occasional extra large wave.

Also, I was able to verify the extent of its roll stability on the water by falling in on the step behind a large powerboat and riding parallel on top of his wake. Doing this would have been hazardous in a floatplane and precarious in a conventional monohull, but with five feet of wing skimming the water on either side to provide stability, it was a non-event in the Beriev. It continued steady, with no rocking of the wings at all. The airplane's construction seems sturdy enough to withstand the abuse of rough water.

When it comes to rough water, one of this airplane's strong points is the German-made MT propellers. Their location above and behind the broad wing practically eliminates spray exposure, and any spray they do encounter is not likely to do much damage since the props are composite with a nickel leading edge.

Our rough water session left the props unaffected, where the same session in a Grumman would have required dressing the blades afterward. The props on the airplane have 200 hours and 400 water landings on them, and they have never been dressed and do not need to be. I found that very impressive.

REVERSING PROPS

Another good feature of the propellers is that they have a reverse range, although that had not yet been activated when I flew it. Twin reversing propellers are a powerful tool since having any combination of right and left, forward and reverse thrust creates unparalleled maneuverability, even when the wind is blowing.

This is particularly important in the Beriev because otherwise it would be difficult to dock. Like most mono-hull amphibians, you can neither pull up parallel nor perpendicular to a dock. With the Beriev, however, docking can be achieved by using the airplane's maneuverability to position the forward fuselage onto a corner of the dock. During this operation the placement of the propellers poses no hazard to people on the dock.

I did not have a chance to beach or ramp the airplane. Having a nose wheel is usually a disadvantage for beaching and ramping, but I have been told that the trailing link gear partially makes up for this and makes for a smooth transition to driving out of the water. The main gear track is narrow, with the wheels just 7.5 feet apart.

This is an advantage for beaching since a narrow gear keeps the hull from high centering on rough beaches and makes the airplane well suited for steep beaches.

Some of the roles that Beriev had in mind for this airplane are general passenger/cargo, air ambulance, and maritime patrol. Probably the airplane's biggest weakness is a low useful load, but to keep that in perspective, even workhorses like the Beaver or C-206 have low useful loads when you put them on amphibious floats.

LOSE THE WEIGHT, GAIN THE USEFUL LOAD

In the case of the Beriev, there are some extraneous features that could be eliminated in favor of reducing the empty weight. For example, standard equipment includes a backup altimeter, a backup horizon gyro, a flight data recorder that registers 30 parameters, an airframe icing indicator, engine overheat detection, and the powered hydraulic brakes. Those are a few of the items that seem extravagant on a 5000-pound airplane.

The extra equipment is an indication that Beriev has not completely transitioned from its mindset of making large military and commercial airplanes. Currently, the marketing people are discussing how they can modify the design to make the airplane better meet the needs of the American general aviation market, starting with increasing the useful load.

It is not surprising that the Russians are not quite on the same page as we are when it comes to general aviation because, historically, general aviation has not existed in Russia. That was made clear to me by another Soviet bloc airplane I have flown, a Czechoslovakian Zlin. It had a kill switch hidden in the aft fuselage so the mechanics could disable the airplanes at night to prevent defections.

In spite of their lack of experience in this area, Beriev seems to have come up with an ideal personal airplane.

THE SAME, ONLY DIFFERENT

As for the price, like all new airplanes it is expensive, but to put it in perspective, the price exactly matches what was most recently being asked for a brand new Lake Amphibian. The similarity ends there, however. The Beriev is a whole different class of airplane than the Lake, distinguished not only by a second engine but by a very different set of capabilities and limitations.

When I got back home, people asked if it would make a good Alaska airplane, and the answer depends on how you would use it. While it has roughly the same gross weight and horsepower as a Beaver, the Beriev can't do what a Beaver can when it comes to carrying heavy loads out of short lakes. On the other hand, it can do things that a Beaver can't do, such as get to the other side of Shelikof Strait after having an engine failure. And after that, it could go on to do a single-engine ILS into Kodiak.

If what you are looking for is amphibious versatility with true multiengine reliability for carrying modest loads, this appears to be a good airplane. I have seen the full spectrum of what the Western world has to offer when it comes to seaplanes, and I was favorably impressed with this one.

Beyond the mere practicalities, it has an exotic look and is just enjoyable to fly.

More information, along with the specifications for the Be-103, can be found at the website www.beriev-usa.com. The factory's website www.beriev.com has information about other past and present Beriev airplanes. The American distributor for the Be-103, Kent Linn, can be reached at 908/996-4200.

Burke Mees is a commercial seaplane pilot in Alaska and the author of Notes of a Seaplane Instructor (ASA, 1998; available from SPA).