Beriev Be–103

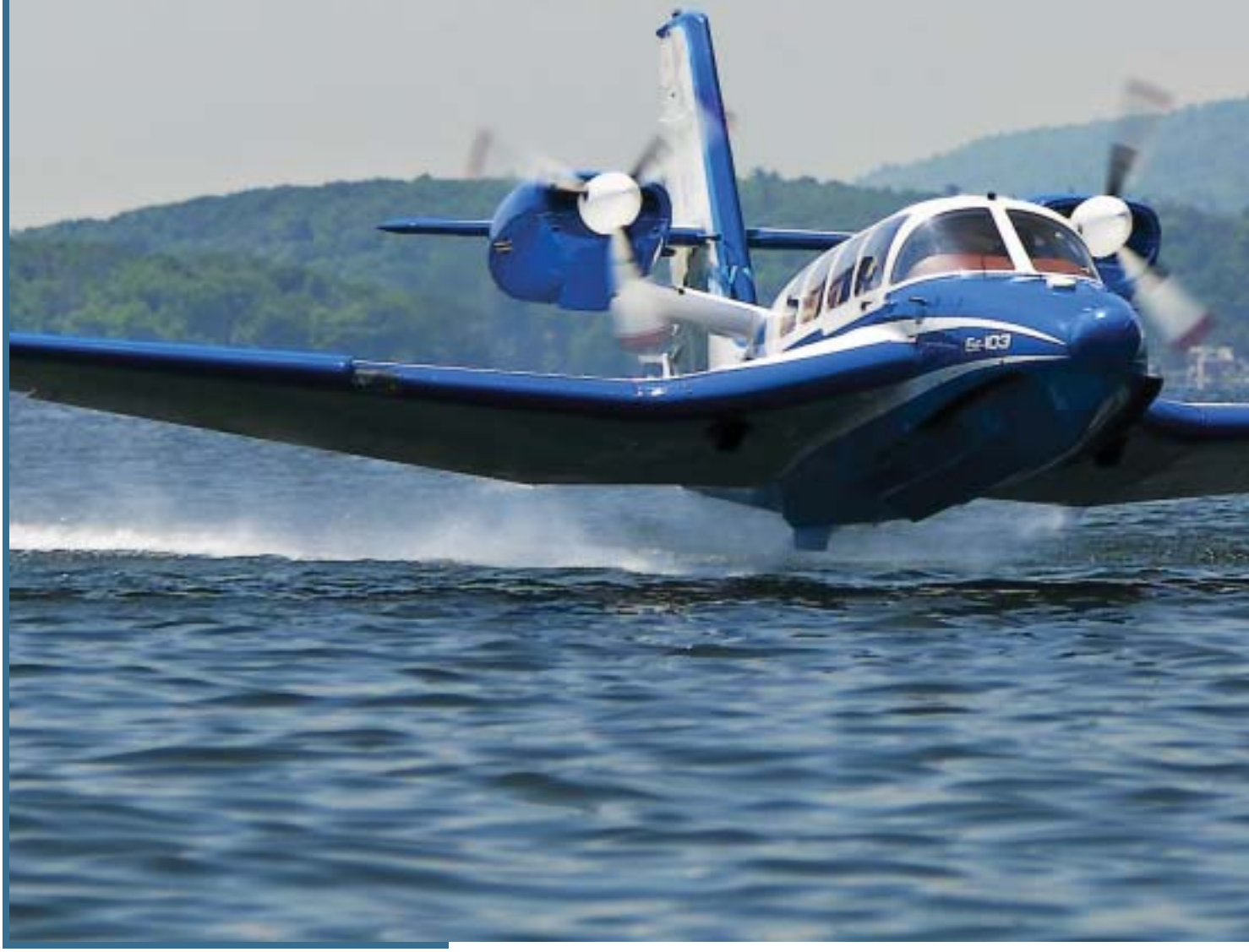
From Russia with

Seaplane pilots looking at the Beriev Be–103 light amphibian for the first time express skepticism about its unusual low- to mid-wing configuration and are curious to know how such an airplane performs on water. After all, other seaplanes have wings intended to be kept well clear of the water. These pilots usually are surprised to learn that the Be–103 performs and handles extraordinarily well on water.

The airplane was developed by the Beriev Design Bureau in western Russia, a company that has been designing seaplanes for more than 70 years and seems to have unrivaled expertise. (Beriev recently introduced the Be–200, a 90,000-pound twin-jet amphibian used as a water-drop firefighter.)

The airplane is manufactured by KnAAPO (you don't want to know what Russian words these letters represent) in Komsomolsk-on-Amur in eastern Russia. KnAAPO also builds the Sukhoi Su–27 Flanker, an impressive twin-jet fighter.

Enter Kent Linn, owner of the public use Sky Manor Airport in Pittstown, New Jersey. Seventy-one years young, Linn learned to fly in Alaska where he became enamored with seaplanes. Now a retired flight-test engineer for Douglas Aircraft at Edwards Air Force Base, he read about the history of the Beriev Design Bureau and the Be–103 in the 2000 *Water Flying* annual. The airplane so intrigued him

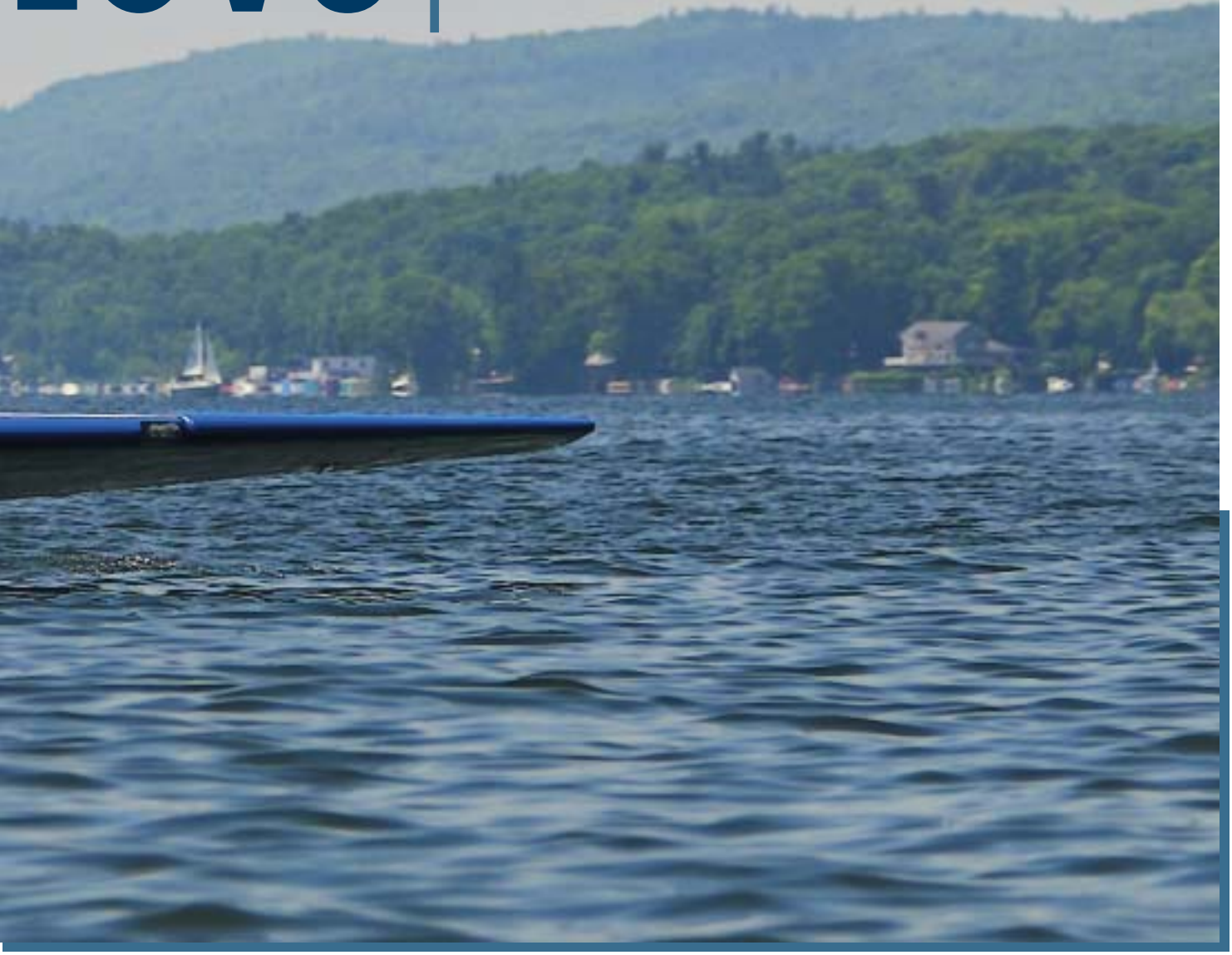


love

Now landing in water country, U.S.A.

BY BARRY SCHIFF

PHOTOGRAPHY BY MIKE FIZER



that he ultimately became its North American distributor. He accepted delivery of three aircraft when they were disgorged from a mammoth Antonov An–124 during EAA AirVenture 2003.

Linn explains that the Beriev's wing displaces water to help keep the amphibian afloat and contributes to superior seaworthiness.

The low-set wing also takes maximum advantage of ground effect during takeoff and landing. No other airplane operates with its wings so close to the water. Because of this, the Be–103 does not need flaps and can skim the water on its trailing edges.

The aircraft has slightly inverted gull wings so that the inboard sections prevent the airplane from rolling when on water. Gone is the weight and drag caused by wingtip floats common to other flying boats. Gone also is the undesirable yaw that can occur when a float digs into the water during a wing-low water landing.

The wing is swept 22 degrees and from certain viewing angles gives the illusion of being a delta or bat wing.

The 210-horsepower Continental IO-360-ES4 engines are mounted high to prevent the German MT-Propeller MTV-12 three-blade composite, reversible-pitch propellers from being damaged by water spray. Checking oil requires climbing on the wing, unfastening and lifting the upper half of a nacelle with one hand, and pouring oil with the other. (There are no oil-

access doors; in Russia, airplanes are serviced only by ground personnel; the pilot just flies.) The fuel system consists of four tanks, two in the wings and two header tanks in the engine pylons for a total capacity of 90 gallons. Refueling requires filling the wing tanks, turning on transfer pumps to fill the pylons, and then refilling the wing tanks as necessary. During flight, the header tanks are automatically kept full as long as there is fuel in the wings.

The airframe is primarily lithium-aluminum, an alloy reportedly lighter, stronger, and more corrosion-resistant than conventional aluminum. Stress areas utilize titanium, while the wing tips and nacelles are fiberglass.

The airplane appears overbuilt, reminiscent of Grumman-built seaplanes. Jerry Inella, a United Airlines' captain who checked me out in the Beriev, says, "A seaplane really takes a pounding on the water. I want it built like a battleship, and this airplane fits the bill perfectly."

The workmanship is not always pretty, but it appears durable. There is nothing flimsy or fragile about a Be–103.

Circuit breakers are accessible only when on the ground through an exterior hatch on the right side of the bow. They are inaccessible during flight because Beriev does not want popped breakers to be reset in the air.

The Be–103 is the first Russian design to be FAA certified in the Normal category and marketed in the United States. The Russians, however, do not seem to have a firm grasp of general aviation operations, probably because there is so little of it in their homeland.

Instead, they build small airplanes as if intended for the airlines or military, which explains some of the Be–103's oddities.

The original three aircraft were delivered, for example, with only one control stick. The Russians consider the right front seat to be for a passenger, and passengers in Russia are not allowed access to the controls. (Second sets of controls have since been installed in all three aircraft.)

The Russians favor a stick over a wheel perhaps because a stick does not interfere with a pilot's view of the instrument panel. I prefer a stick to a wheel and found the flight controls nicely balanced and harmonized. The ailerons and stabilator are operated with pushrods; the rudder is cable controlled.

The stick contains the pitch-trim and push-to-talk switches. The rudder trim tab also is operated through an electric actuator.

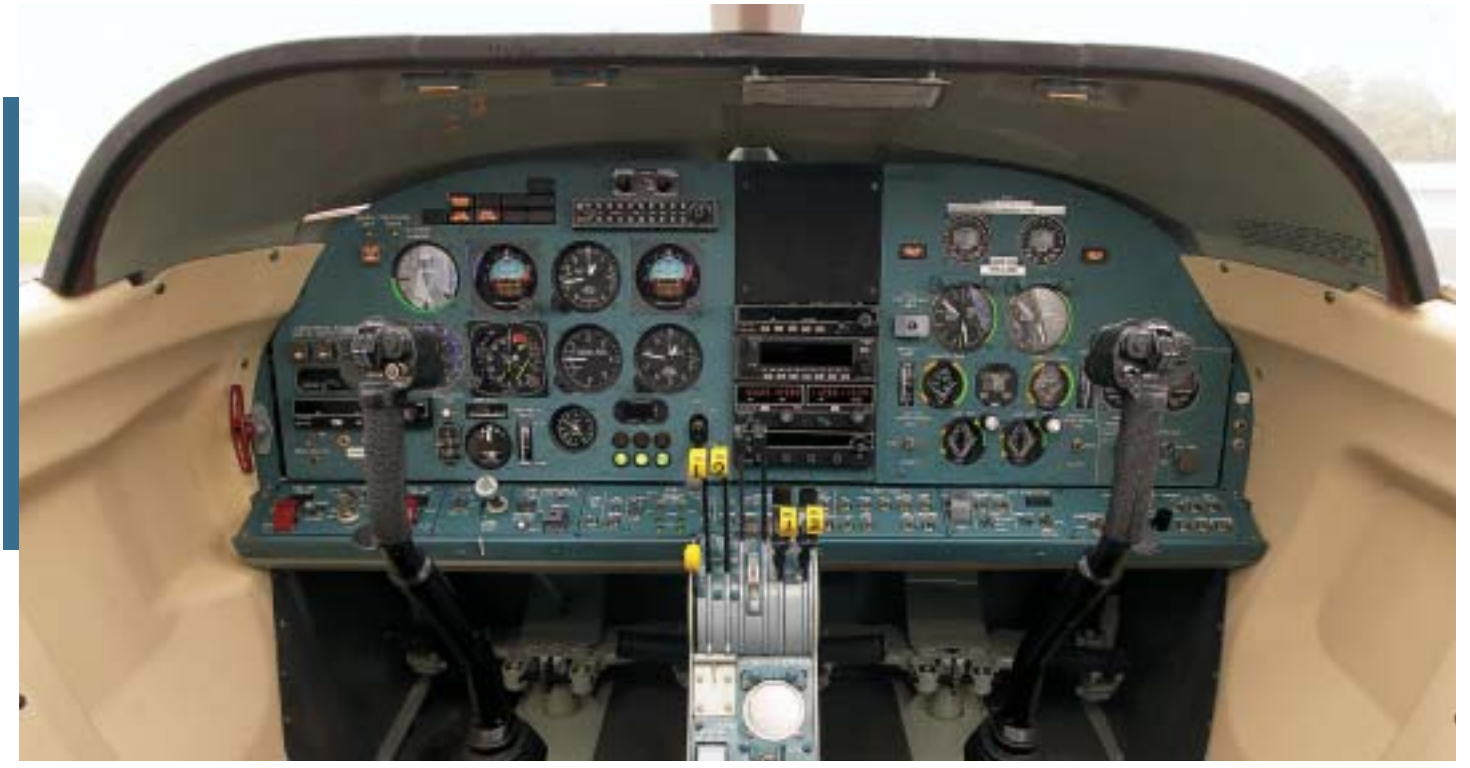
Solo flight requires that ballast be placed near the right front seat to keep the center of gravity within limits.

Because of the builder's airline and military mentality, the airplane has sophistication rarely seen in light twins. This includes a 30-parameter, five-hour flight-data recorder, an angle-of-attack system, engine fire-detection systems, a second attitude indictor (in addition to a turn-and-bank indicator), a second altimeter, a radome, an ice detector, and so forth.

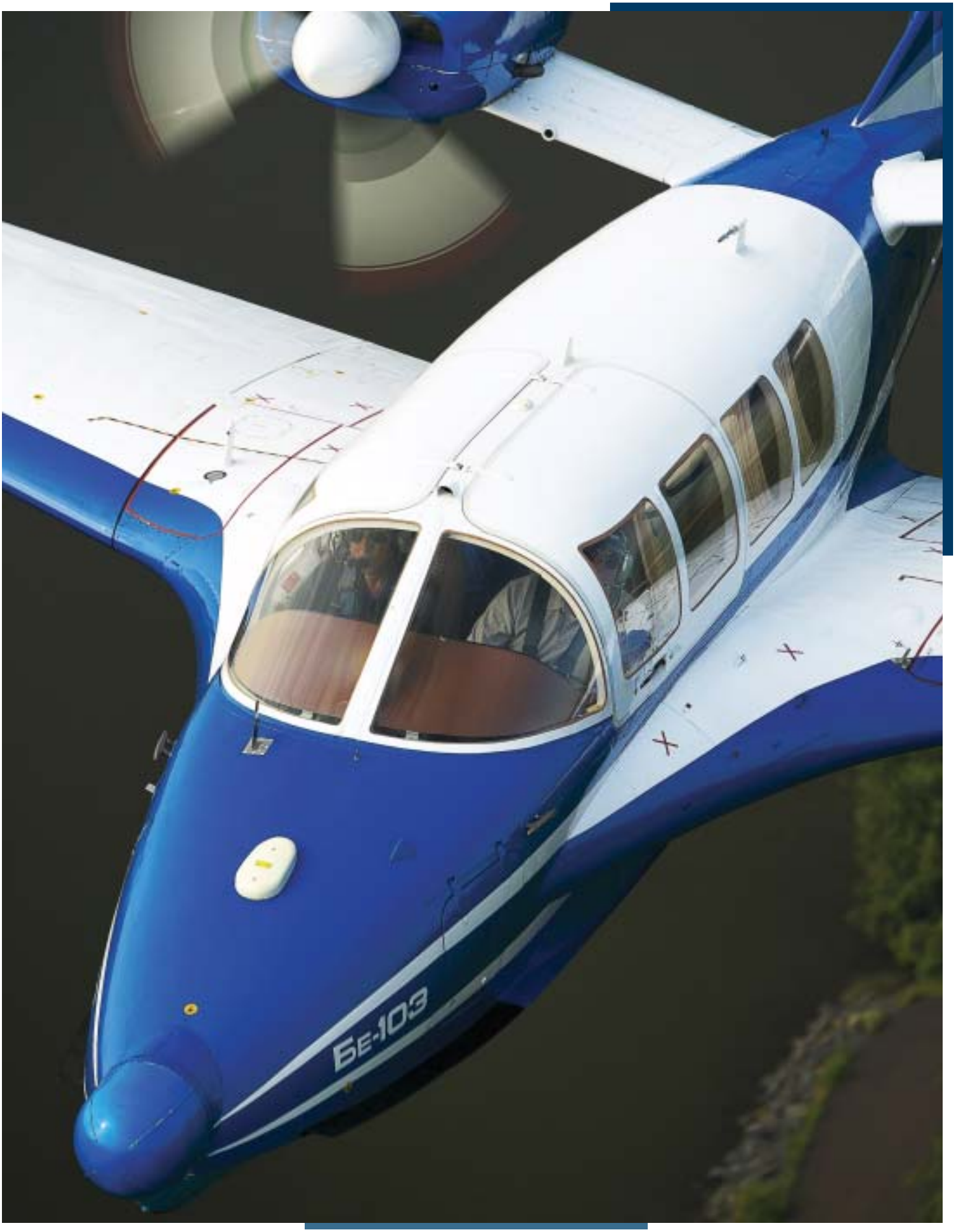
This partially explains the heavy empty weight. The aircraft I flew, N29KL, has an empty weight of 3,810 pounds. Linn is hoping to have KnAAPO remove some of the unnecessary equipment to increase useful load, which in the test aircraft is 1,201 pounds.

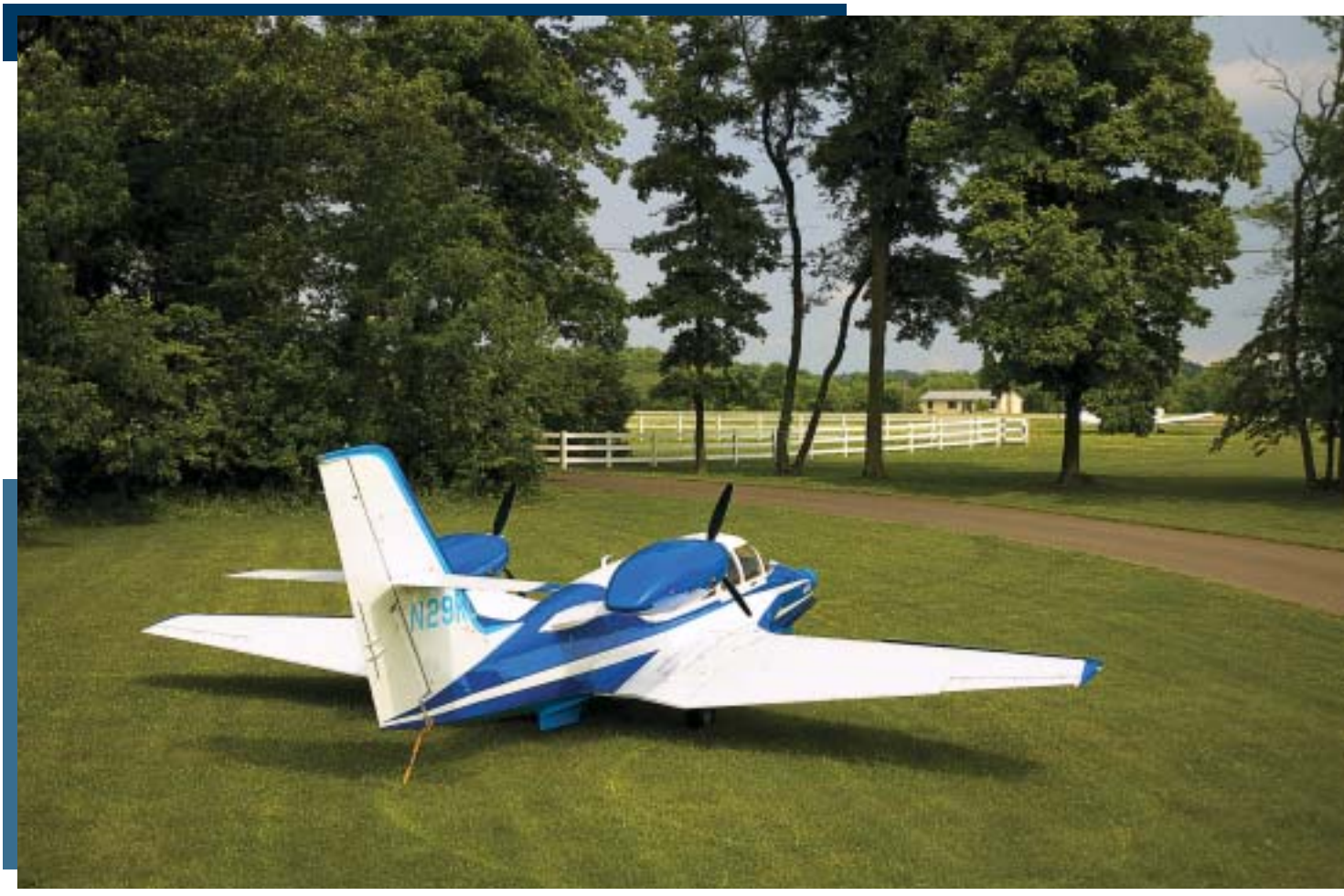
Linn also would prefer the airplanes to be delivered green so that a sexier paint scheme can be applied stateside.

A ladder stowed in the wing root is used to climb into the cabin through the left gull-wing door. An identical starboard door is for emergency egress. The cabin is capacious and comfortable for all six occupants. The rudder pedals adjust fore and aft to accommodate the tall and the short. This is the only light airplane I can recall having flown in which I could not reach the pedals with my seat fully aft.



Russian designers favor control sticks (even in twins) to provide pilots with an unobstructed view of the instrument panel. Dual attitude indicators and altimeters offer added safety and redundancy.


BE-103



The airplane is functionally beautiful but not aesthetically so. All placards and instrument labeling are in English, but the lettering is distinctively Russian.

There is a life jacket under each seat, and sea equipment (such as titanium anchor, grapple hook, and waterproof gloves) is stowed in sidewall compartments next to each pilot seat.

The brakes and landing gear have their own hydraulic systems. One must not forget to turn on the electric brake pump before taxiing. This is a mistake you make only once. Differential braking steers the castoring nosewheel.

During flight the Be–103 tends to hunt slightly in turbulence, not unusual for a flying boat because of the destabilizing effect of a long bow.

With the wing behind the pilot, cockpit visibility is excellent.

The wing-in-water concept precludes the possibility of flaps. An 11-foot-long fixed slat on the outboard leading edge of each wing enhances slow flight (and costs only one knot of cruise speed). The resultant high-lift wing has benign stall characteristics, but the stall-warning indicator sounds like a ringing telephone. You might be more likely to respond by saying, "Hello?" than lowering the nose.

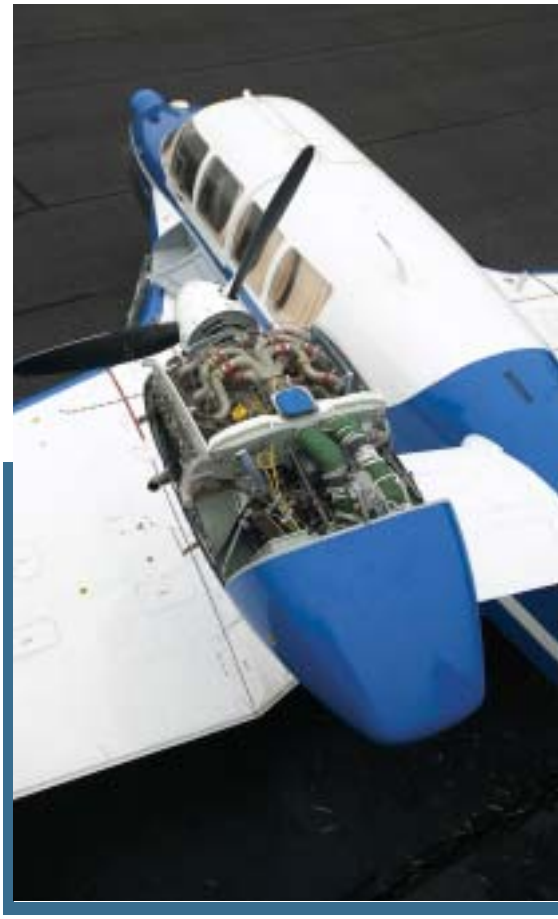
The large, tall vertical stabilizer and closely coupled engines make handling an engine failure relatively easy. Little rudder pressure is required to keep the aircraft on an even keel.

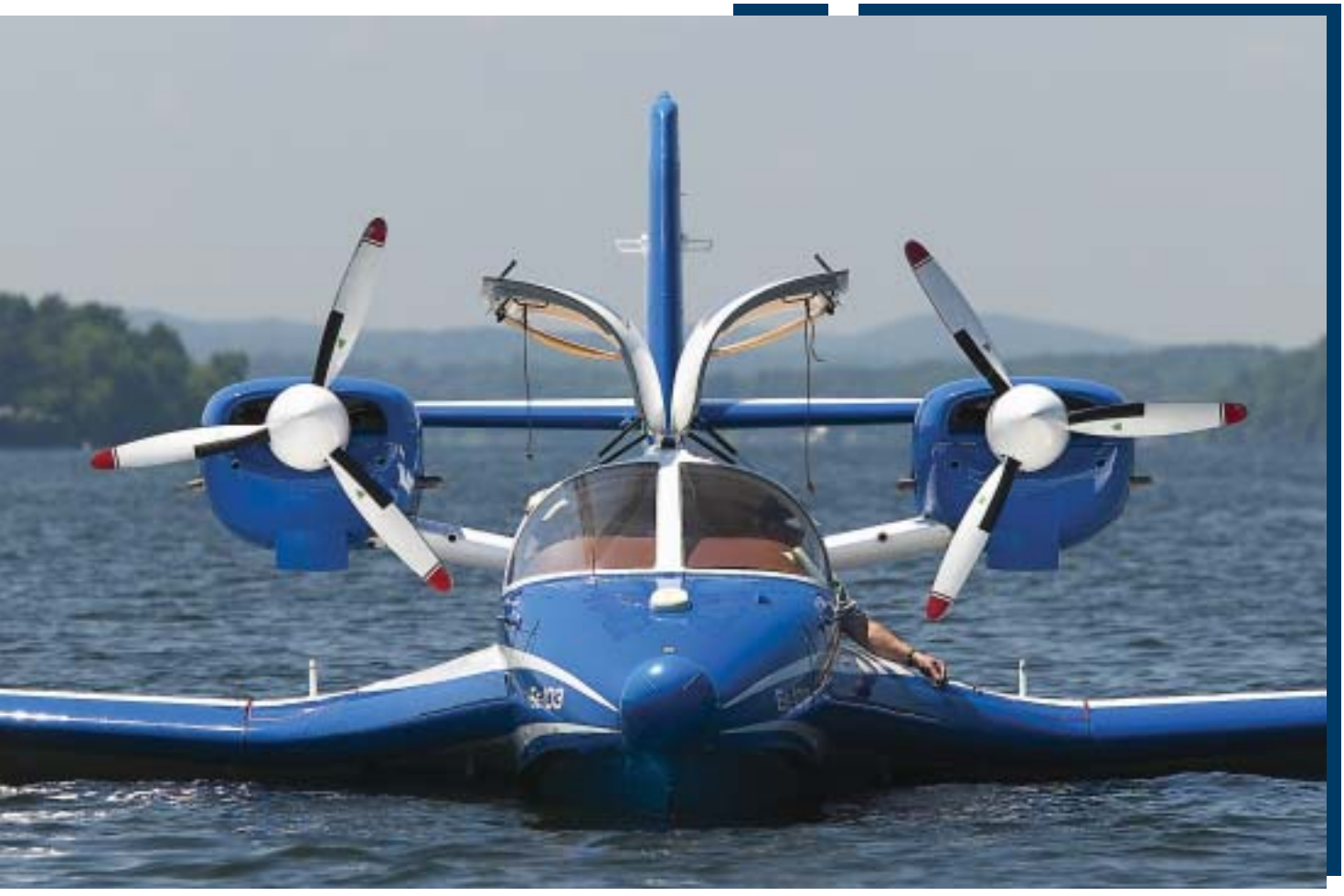
If an engine-driven fuel pump fails, an electric boost pump automatically takes over and delivers the correct amount of fuel pressure as dictated by throttle position.

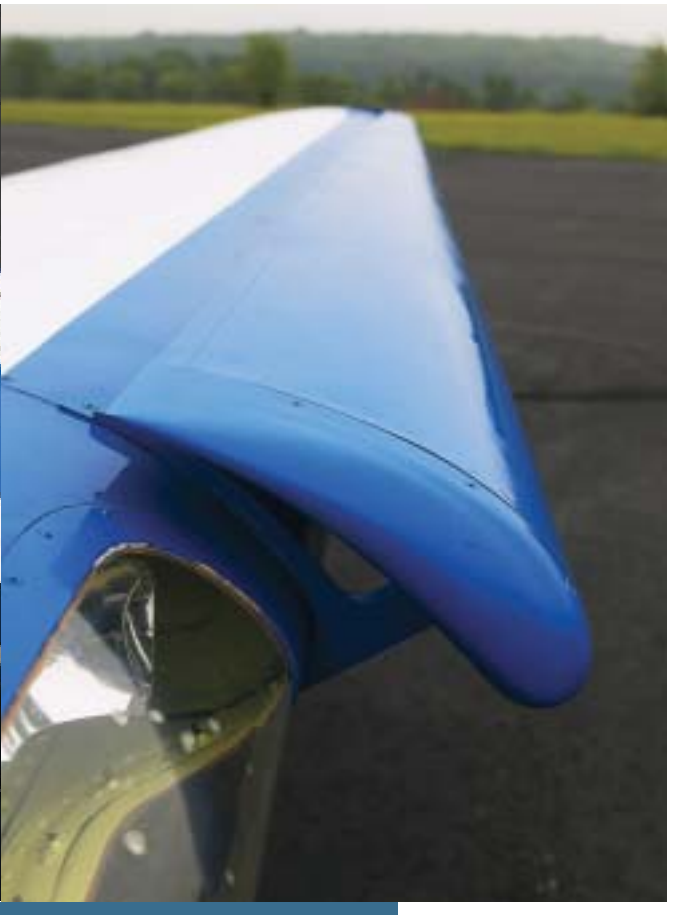
If the pilot should respond to an engine failure by pulling the incorrect mixture control to idle cutoff (before identifying and confirming the dead engine by retarding its throttle), the boost pump will automatically activate and keep the good engine running. It is difficult to shut down the operating engine by mistake.

Water landings are easy, but landing in a significant crosswind with such a low wing could be problematical. The good news is that seaplane pilots almost always have the option of landing directly into the wind.

Attitude remains stable and flat in step turns from downwind to upwind, a time when conventional seaplanes tend to tip outboard.







The wings-in-water design (above) increases lateral stability on the water and maximizes the benefits of ground effect during takeoff and landing. An 11-foot-long fixed slat (left) on each wing reduces stall speed and compensates for the absence of wing flaps.

The propellers are moved into reverse pitch by pulling the throttles aft of idle. There is no independent water rudder, but the air rudder partially extends into the water and has the effect of a water rudder.

Docking is not quite as easy with a Be–103 as with high-wing airplanes. Instead of pulling alongside a dock, you must maneuver the airplane to a corner of a dock so that one edge is alongside the forward fuselage and the other is near the wing. It is not ideal, but it works.

Water takeoffs are initiated with the stick held fully forward or aft. Elevator input matters not. The wing in the water forces the airplane to assume the proper attitude and rise onto the step unassisted. With the wing roots riding the water, the airplane has remarkable roll stability.

On the step, the forward portions of the wings are out of but extremely close to the water, which maximizes the influence of ground effect and minimizes induced drag. Nose-down elevator is needed to optimize acceleration on the step.

One measure of how well a seaplane is built is the amount of water drained from the hull's watertight compartments after extensive water operations.

After my water work at New York State's Greenwood Lake, I found surprisingly little water in any compartment.

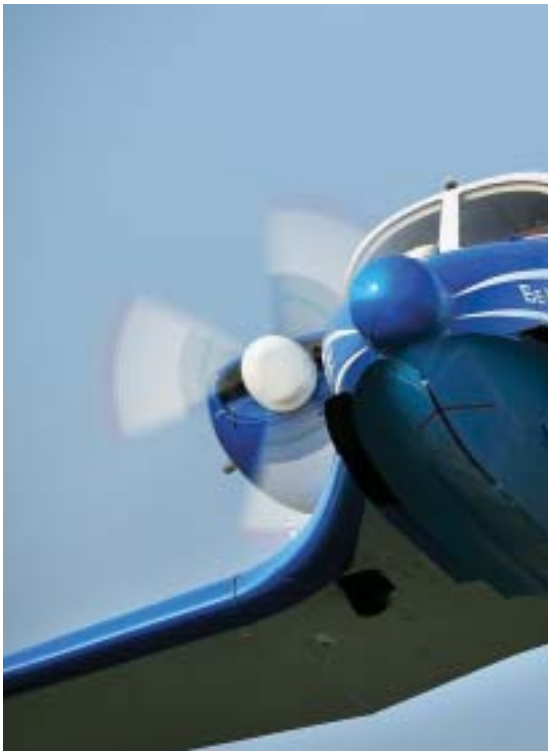
The trailing-link main landing gear makes every pilot seem like a pro when touching down on land. The gear legs retract forward into watertight wells.

The nice thing about an amphibian is that malfunctioning landing gear is not as serious as when flying landplanes. If the gear cannot be made to extend, just land on water.

The pilot's operating handbook reflects the builder's airline and military mentality. On the plus side, it is one of the most complete and elaborate handbooks I have ever encountered for a light airplane.

On the negative side are a host of illogical limitations that clearly need to be removed for general aviation operations. For example, it is unreasonable to ban water takeoffs and landings at night, limit operating altitude to 10,000 feet msl, restrict land operations to a minimum runway length of 3,900 feet, limit takeoffs and landings to elevations below 3,000 feet, and so on.

The Russians also include the weight of a 176-pound pilot in the empty



SPECSHEET

Beriev Be-103

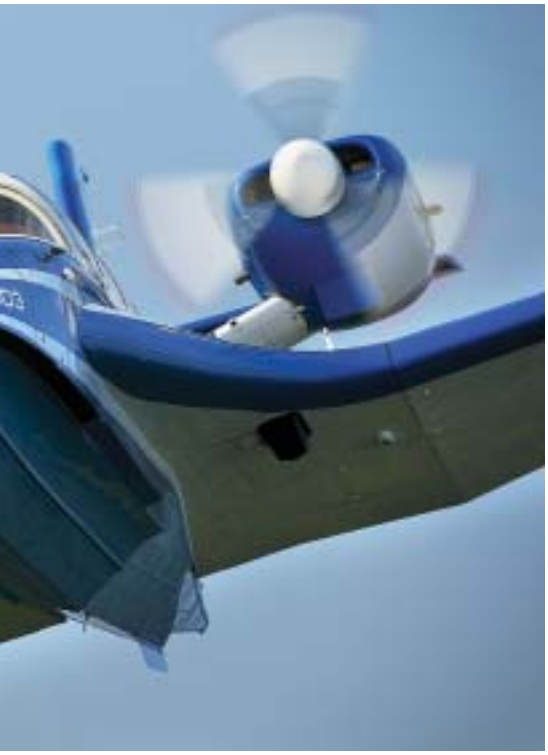
Price as tested: $795,000 (including avionics)

Specifications

Powerplants	Continental IO-360-ES4 210 hp
Recommended TBO	2,000 hr
Propellers	MT-Propeller GmbH, constant-speed full-feathering, reversible-pitch, 72-in dia
Length	34 ft 11 in
Height	12 ft 4 in
Wingspan	41 ft 9 in
Wing area	270.2 sq ft
Wing loading	18.5 lb/sq ft
Power loading	11.9 lb/hp
Seats	6
Cabin length	12 ft 0 in
Cabin width	4 ft 1 in
Cabin height	4 ft 0 in
Empty weight (of test aircraft)	3,810 lb
Max ramp weight	5,033 lb
Max takeoff weight	5,011 lb
Max zero-fuel weight	4,888 lb
Max useful load	1,201 lb
Max payload w/full fuel	661 lb
Max landing weight	5,011 lb
Fuel capacity, std	90 gal
Oil capacity	8 qt/eng
Baggage capacity (volume)	28.3 cu ft

Performance

Takeoff distance, ground roll	1,275 ft
Takeoff distance over 50-ft obstacle	1,921 ft
Accelerate-stop distance (to/from 50-ft height)	4,826 ft
Takeoff distance, water	1,804 ft
Max demonstrated crosswind component	12 kt
Rate of climb, sea level	984 fpm
Single-engine ROC, sea level	73 fpm
Max level speed, sea level (V_{MAX})	130 KIAS



Cruise speed/range w/30-min rsv, (fuel consumption, both engines), 5,000 ft @ 75% power, best power mixture .....127 kt/457 nm (19.5 gph)
Service ceiling.....16,405 ft
Single-engine service ceiling .....3,000 ft
Landing distance over 50-ft obstacle .....2,364 ft
Landing distance, ground roll .....787 ft
Landing distance, water.....1,050 ft

Limiting and Recommended Airspeeds

V_R (rotation) .....70 KIAS
V_X (best angle of climb) .....81 KIAS
V_Y (best rate of climb) .....84 KIAS
V_{XSE} (best single-engine angle of climb) .....78 KIAS
V_{YSE} (best single-engine rate of climb) .....81 KIAS
V_{MC} (min control w/one engine inoperative) .....62 KIAS
V_{NO} (max structural cruising) .....130 KIAS
V_{NE} (never exceed) .....130 KIAS
V_A (design maneuvering) .....116 KIAS
V_{LE} (max gear extended) .....99 KIAS
V_{LO} (max gear operating) .....99 KIAS
V_{S1} (stall, clean) .....60 KIAS
V_{SO} (stall, in landing configuration) .....60 KIAS

For more information, contact Kent Linn, Sky Manor Aircraft Sales, Sky Manor Airport, Pittstown, New Jersey 08867; telephone 908/996-4200; fax 908/996-3410; or visit the Web site (www.beriev-usa.com).

All specifications are based on manufacturer's calculations. All performance figures are based on standard day, standard atmosphere, sea level, gross weight conditions unless otherwise noted.

weight, further reflecting their airline mentality. (Empty weights shown here do not include the pilot.)

The Be–103 truly is a lot of airplane for the money. Where else can you buy a new multiengine amphibian (with a suite of Bendix/King avionics including a KLN 89B GPS) for only $795,000? Be–103s imported in the future, however, are likely to cost more.

It also is a lot of airplane (5,011 pounds) to be pulled by only a pair of 210-hp engines. The twin could use more muscle, and Linn is encouraging the factory to increase power to 250 or 300 hp per side on future models.

i Visit the author's Web site (www.barryschiff.com).

KnAAPO says it is dedicated to the Be–103 for the long haul, but it has yet to establish a support network or satisfy concerns about the ready availability of Russian parts.

One nice thing about KnAAPO's attitude toward general aviation is that in Russia, ground crews are sent in advance to a pilot's destination. Upon his arrival, they tie down the aircraft, service it, and clean the windshields. I could handle that. AOPA