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LAKE'S TURBO RENEGADE

Effective as a personal transport as well as an air taxi and utility hauler, this respected amphibian provides an added dimension of usefulness.

By JOHN W. OLCOTT

Value is measured in units of usefulness. An aircraft has value because it can satisfy a variety of needs, ranging from saving travel time to affording great personal satisfaction and, in some cases, accomplishing tasks that no other vehicle can.

With the ability to use water as well as runways for landings and takeoffs, the Lake Turbo Renegade amphibian measures high on the usefulness scale. Its well designed, proven hull makes the aircraft an able boat for most water conditions associated with inland lakes, rivers and open seas with wave heights of less than three feet. Although only 3.2 percent of the 13,360 landing facilities for airplanes within the United States are established seaplane bases, many states allow the use of their lakes and rivers for *ad hoc* operations, provided that safety and environmental considerations are observed. Others, such as New Jersey, restrict seaplane operations to specific locations, although in an emergency almost any body of water is acceptable.

For our demonstration of the Turbo Renegade's versatility and

Ample panel space for full IFR implementation allows the Lake Turbo Renegade to satisfy serious travel needs. Amphibian capability and easy access to the cockpit area add utility and enjoyment. Note the Q-tip prop.

usefulness, B/CA editors departed Kissimmee Municipal Airport, home for one of Lake's three facilities, and flew low over the Florida countryside until we found a large pond that appeared to be about a mile long and a half-mile wide. Although there were a few houses along its shores, the placid body of water was in a relatively rural location—ideal for seeing how the Renegade, with its turbocharged 270-hp Lycoming TIO-540-AA1AD, could turn water into runway and bring new meaning to the words "freedom of flight."

Checking the ripples on the lake caused by an easterly wind of less than 10 knots, we planned a pattern that presented no crosswind upon touchdown. We lined up on final, heading across the lake rather than along its greatest length since the Turbo Renegade's water-run upon landing is only about 600 feet. Power was used to establish a comfortable rate of descent and gentle touchdown, and the aircraft quickly slowed as the hull settled into the water.

The water touchdown reminded us of the sight you see when landing a sailplane. You're fairly close to the water as the aircraft is established in the touchdown attitude, similar to the action of a sailplane as it seems to hug the ground just prior to landing on its single wheel, which typically is buried within the fuselage. As the keel of the Renegade's V-shaped hull sliced through the tops of gentle ripples, we reduced power and the aircraft quickly became a boat, bobbing gently in the serene Florida lake.

Takeoffs require more water than do landings, but still, we managed liftoff easily, with considerable margin, without requiring the length of the lake. Heading into the light wind, the amphibian responded to its turbocharged Lycoming, mounted high above and behind the cockpit, and quickly became poised on the "step" as it transformed itself from seacraft to aircraft.

At the relatively light weight of 2,600 pounds, the Turbo Renegade requires a run of 800 feet to become airborne in typical water conditions. More than twice that distance is required at the aircraft's certificated gross weight of 3,140 pounds.

GREAT VERSATILITY

Had space or obstacles been a problem, we could have used the Renegade's significant seaplane capabilities, which instructor and demonstration pilot Luis Molina displayed so

Sponsons serve as tip floats and auxiliary fuel tanks. A simple system transfers fuel. (Note: the main gear extends from the fuselage, not the sponson.) The water rudder retracts mechanically for takeoff and landing.

ably. Water-taxiing on the step, with the aircraft's nose out of the water and nearly ready for takeoff, Molina began a series of turns that showed the Renegade's agility as well as its water stability. Banking into the turn and placing the inboard-wing sponson on the water, Molina was able to complete tight circles while maintaining adequate margins of control. There was no apparent tendency to porpoise as the hull sliced through the water with the aircraft turning sharply and gaining speed. With such a turning technique, the aircraft can build up knots before heading into the wind for takeoff.

Stall speed with flaps down is a relatively slow 49 knots, which facilitates a short water run before liftoff, and speed for maximum climb angle (V_X) is 66 knots. Thus, the Renegade demonstrates an impressive ability to depart from short fields and waterways. Flaps, which have only full-up and full-down positions, are used for all takeoffs and touchdowns. Once obstacles have been cleared, the best rate-of-climb speed (V_Y), 76 knots, can be used to achieve a maximum climb rate of 780 fpm at the aircraft's maximum weight of 3,140 pounds.

Returning for another water landing, Molina brought the Renegade to a smooth touchdown, slowing to a normal taxi speed before positioning the aircraft's water rudder, which extends from the normal rudder to provide an enlarged surface area below the water line.

For takeoff and landing, the aircraft's conventional rudder draws sufficient water to serve as an adequate directional control until it becomes aerodynamically effective. But at low speeds, the larger wetted surface of the water rudder is necessary to provide the desired amount of directional control from hydrodynamics instead of aerodynamics.

We motored toward the shore of the small lake as if the Renegade were a typical power boat, snuggling one wing almost onto the sandy beach. With the aircraft's sponson about to touch bottom but still in the water, we were able to use the wing as a walkway.

There is no probation walking on the Renedage's wing, provided you stay near the main spar. Seaplanes, which have boat hulls, do not have the ability to float alongside a dock and place a pontoon in position where the pilot or passengers can simply step from the aircraft. Nor can hulled seaplanes carry items strapped externally, as can floatplanes. Then again, no aircraft perched high on pontoons can make the sharp, high-speed turns we had accomplished just prior to docking.

But the Renegade has another capability that makes the interface between water and land easy to accomplish. After demonstrating the ease with which a wing could be used as a walkway to a dock or dry land, Molina powered the amphibian away from the shore and went into deeper water. There he lowered the landing gear—seaplanes *must* have their wheels up for a water landing—raised the water rudder and headed back to shore, this time proceeding straight toward the beach.

As we reached shallower water, the wheels made ground contact and the Renegade rolled onto land as though merely taxiing up a slight incline at the local airport. Once on land, we departed the aircraft to review its structural details.

STRONG HERITAGE

The Lake Renegade design has its roots in the Colonial C-2 Skimmer, a two-place amphibian that was powered by a 125-hp Lycoming and first flew in 1948. Lake Aircraft purchased the manufacturing rights to the Skimmer in 1959, but retained the basic structural and aerodynamic design created by noted engineer David Thurston and his Colonial team of four other Grumman alumni just after World War II. Subsequent modifications and refinements added more than six feet to the aircraft's length and more than four feet to its wingspan, increased seating capacity from two to as many as six and more than doubled its power in a 250-hp, non-turbocharged version. Nonetheless, today's Lake still possesses the strength and functionality of the Grumman-inspired engineering.

Seaplanes must survive in both nautical and aeronautical environments. The fuselage needs the strength and tightness of a fast motorboat yet must be sufficiently light and sleek to achieve flight. To help meet these stringent design requirements, the Renegade employs a simple hydraulic system for gear retraction and has nosewheel castering, so that no cables or electrical lines penetrate the hull below the water line. Lake also uses hydraulics for trim and flap deflection.

The Lake airframe has been used for several government-sponsored research programs involving novel landing systems including hydrofoils for water applications and air cushions for landing on unprepared fields, thus attesting to the basic strength of the hull.

Renegade hull design involves more than strength and flotation, however. Boats have static and dynamic stability requirements for successful water handling that in some ways are just as challenging as the stability and handling considerations of aircraft in flight.

A seaplane that rides the waves poorly or bobs longitudinally can cause a pilot to get out of phase with water-caused oscillations, potentially leading to a dangerous condition known as porpoising. Such adverse tendencies limit a seaplane's usefulness to calm water and experienced pilots. Also, the effectiveness with which a seaplane's hull disrupts the natural suction that exists between it and the water, particularly in calm conditions, significantly affects takeoff performance and thus the seaplane's usefulness.

The Renegade's V-hull, with its vented longitudinal stiffeners and spray dams, reflects the considerable detail that went into designing a flying boat that is not overly challenging as a water craft and exhibits good takeoff performance. Experienced seaplane pilots are complimentary of the Renegade's water handling. Renegade aircraft performance numbers speak for themselves.

Besides hull strength and shape, other elements of the Renegade design stem from seaplane considerations. Its engine is mounted in a pusher arrangement high above the fuselage to keep it and its propeller out of potentially harmful water spray. While that position results in trim changes with throttle movement and causes vibration and sound near the stall, as air from the wing and fuselage at high angles of attack impinges on the propeller, it also keeps the aircraft's propulsion system relatively free from the challenges of operating in a nautical environment. Also, cabin noise is somewhat lower than that of other aircraft with similar horsepower, in part due to engine location and partly due to the lower indicated airspeeds that result from the weight and drag inherent in all seaplane configurations.

No special ramps are required for beaching if the shoreline is fairly smooth. Lower the gear and forge on.

UTILITY AND FUN

After inspecting the aircraft and stretching our limbs, we re-entered the comfortable cabin and prepared for departure. The amphibian transitioned from landcraft to boat as we taxied into the lake and raised the landing gear after buoyancy was achieved. Clearing the area for other vehicles, waterborne and other, we began our takeoff run and were quickly on our way back to the conventional world of airports and runways.

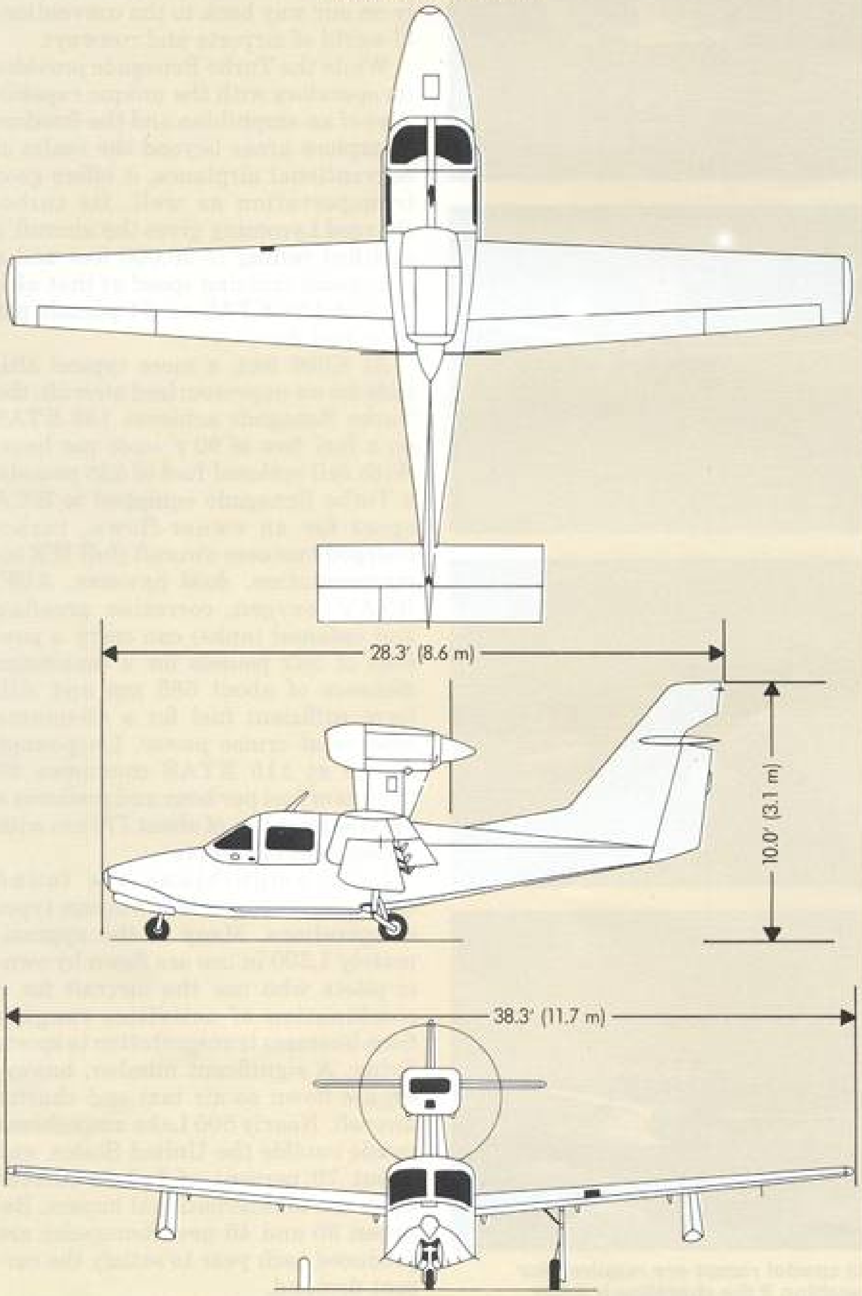
While the Turbo Renegade provides its operators with the unique capabilities of an amphibian and the freedom to explore areas beyond the realm of conventional airplanes, it offers good transportation as well. Its turbocharged Lycoming gives the aircraft a certified ceiling of 20,000 feet and a maximum cruising speed at that altitude of 155 KTAS on 94 pounds per hour fuel flow.

At 8,000 feet, a more typical altitude for an unpressurized aircraft, the Turbo Renegade achieves 138 KTAS on a fuel flow of 90 pounds per hour. With full optional fuel of 528 pounds, a Turbo Renegade equipped to B/CA specs for an owner-flown, turbocharged business aircraft (full IFR instrumentation, dual nav/com, ADF, RNAV, oxygen, corrosion proofing and optional tanks) can carry a payload of 332 pounds for a maximum distance of about 685 nm and still have sufficient fuel for a 45-minute reserve at cruise power. Long-range cruise at 115 KTAS consumes 69 pounds of fuel per hour and produces a maximum range of about 770 nm with 45 minutes of reserve.

Lake amphibians are found throughout the world in various types of operations. Many of the approximately 1,300 in use are flown by owner-pilots who use the aircraft for a combination of activities ranging from business transportation to sports flying. A significant number, however, are flown as air taxi and charter aircraft. Nearly 500 Lake amphibians reside outside the United States, and about 70 percent of Lake's current sales are to international buyers. Between 30 and 40 new Renegades are produced each year to satisfy the current demand.

Servicing of the Turbo Renegade is

LAKE RENEGADE



provided by the Lake organization, which has its main sales office in Kissimmee and factory-owned facilities in Laconia, New Hampshire and Renton, Washington. Production is accomplished by a 140-person staff in Sanford, Maine. Renegade parts are supplied worldwide within 24 hours of a request to any of the Lake facilities, according to company officials.

Considering the vast number of landing sites that are within the reach of a Lake amphibian, the aircraft's proven history as a versatile form of transportation and the freedom it provides, the Turbo Renegade should measure high on anyone's scale of usefulness. **B/CA**

SPECIFICATIONS
LAKE TURBO RENEGADE

B/CA Equipped Price	$348,800
Engine	
Model	Lyc TIO-540-AA1AD
Power	270 hp
TBO	1,800 hrs
Seating	1 + 4/5
Dimensions	See three-views
Weights (lb/kg)	
Max ramp	3,140/1,413
Max takeoff	3,140/1,413
Max landing	3,050/1,373
Zero fuel	2,987/1,344
EOW	2,280/1,026
Max payload	707/318
Useful	860/387
Max fuel	528/238
Payload w/max fuel	332/149
Fuel w/max payload	153/69
Limits/Speeds (KCAS)	
V_{NE}	148
V_{NO}	117
V_A	117
V_{SO}	54
V_X	66
V_Y	76
Performance	
Takeoff (ft/m)	
SL, ISA	1,280/390
5,000 ft @ 25°C	1,600/488
Climb	
Rate (fpm/mpm)	780/238
Gradient (ft/m)	503/153
Service ceiling (ft/m)	20,000/6,096
Long-range cruise	
TAS	115
Fuel flow (lb/hr)	69
FL	080
Specific range (nm/lb)	1.67
High-speed cruise	
TAS	138
Fuel flow (lb/hr)	90
FL	080
Specific range (nm/lb)	1.53
Range	
Seats full (nm)	152
Tanks full (nm)	891