The Seawind Flyer

Fall 2010

"The evolution of an intelligent design." ™

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FLIGHT TESTING

The flight testing continues and the pace has been slow. We are still conducting performance stalls.

A stall is defined by the regulations as:

~ A nose-down break that cannot be controlled by the pilot
~ Holding the elevator against the up travel stop for two seconds
~ The action of a device such as a stick pusher

The flight analyst, John Taylor, discovered while reviewing the data that we have not used more than seven degrees of the 30 degrees of up elevator available to us.

The horizontal tail, i.e., stabilizer and elevator, was originally designed for the amphibious requirements of rotating on a land take-off and also for controlling porpoising over the bow wave passing during a water take-off. The elevator has always been more than effective in flight.

John determined that we should reduce the up elevator angle by approximately one-third. Now the Seawind stalls with a gentle nose drop in a wings level stall by the controls hitting the stop. More tests remain to be done. The reduced up elevator angle will be tested for take-off on the runway at full gross forward c.g. and for handling the bow wave during water testing.

The Seawind wing videos have proven that the stall pattern is perfect. It is a text book stall starting at the root of the wing and moving outboard and forward as the stall develops. The stall stops before reaching the aileron, which remains effective. All of the roll and stall tests had to be conducted at maximum unbalanced load. We had to put 48 pounds of lead bars inside the left wing tip.

As previously reported, we know that the Seawind will not spin in a power-on stall. We also know that in a power-off stall, when a spin maneuver is executed, the application of power will stop the incipient spin in less than one turn. We now know that without the application of power a Seawind can be made to spin at full idle power. We also know with the application of power recovery can be made in less than one turn. More tests will continue.

CONTROL TEST REMAINING

An amphibious flying boat aircraft provides an opportunity for a great deal of pleasure. It also provides many challenges to us, and the one remaining is "yaw," directional control.

We have to have the power plant safely above the water and, when we do, the propeller at idle power windmills and reduces and disrupts the airflow across the rudder. In the case of the Seawind the propeller is directly in line with the rudder, so the slightest application of power in flight makes the rudder very effective.

Our efforts are now being concentrated on making the rudder sufficiently effective at full idle setting.

John Taylor has given us a number of enhancement devices and tests are being performed. We hope in the next two weeks that we can demonstrate recovery from an idle power spin entry or a spin entry with the propeller stopped.

For the latter to occur it would require the failure of highly reliable engine equipment and two failures of pilot judgment all at the same time. No pilot should ever fly on the edge of disaster; however we will evaluate it.

The saving grace to these testing delays is that we all know what punishment the airplane can take.

The flight testing is taking place at 300 lbs over gross weight, with a good deal of that being the 48 lbs of unbalanced load to the left side of the aircraft and the 40+ pounds of spin chute, over 200 lbs of data collection equipment, ballast, and ballast mounting plates.

EXHAUSTIVE TESTING

We have passed one lifetime of fatigue testing with about 100 disbonds (one inch wide by one inch long every 12 inches) and 200 inflictions of barely visible damage at the most critical location.

There have been a few weeks of interruption while we inflict an additional 50+ points of visible, more severe damage. In addition, we will be cutting holes in the wings to obtain approval of repair methods should a customer sustain damage to his aircraft. These approximately 360 test points will be part of the second fatigue lifetime equivalent to 12,000 hours of flight.

All of that is in addition to the static load test at 10% over ultimate load, which is equivalent to 6.27 g. The Seawind is surviving it.

Correction

In the summer 2010 Seawind Flyer, I wrongly described one lifetime as 10,000 hours. One lifetime is 12,000 hours.

Last quarter we reported that the main landing doors were vibrating in the down position. We changed the mounting method, and there has not been any recurrence since.

The flight testing program tends to concentrate our focus on flight characteristics. During every flight, all the systems are being tested at the same time.

The FUEL SYSTEM has been working as designed for months.

The ELECTRICAL SYSTEM, including the avionics, antennas, and the lightning are all performing as intended.

The HYDRAULIC SYSTEM has been working flawlessly.

SYSTEMS TESTING

All of the systems are interrelated and dependent on other systems for proper operation of the aircraft.

The LANDING GEAR SYSTEM consists of:

~ Trailing link steerable nose wheel
~ Trailing link main landing gear
~ Oil/nitrogen oleo shock struts
~ Cleveland amphibian brakes
~ Gear position warning system
~ Up and down actuators and lock link over center actuators
~ Position indicator lights and squat switch

The POWER PLANT is being tested during every maneuver being performed. The power plant is being monitored with the J.P. Instruments EDM 930 engine monitor, which is standard equipment. The EDM displays all six cylinder head temperatures and exhaust gas temperatures as well as oil temperature, oil pressure, fuel pressure, voltage, amperage, outside air temperature, fuel flow, and left and right wing fuel quantities.

In addition the EDM displays the engine RPM, manifold pressure, tack time, and any alerts. It not only displays, it also records 50 hours of flight.

After the engine was properly adjusted, it has been running flawlessly with all temperature and parameters in the green.

We are also monitoring alternator temperatures even though Continental has been using the direct drive alternator for probably 30 years.

We have temperature sensors all over the cowling and at each vibration isolator.

Many test flights were performed in 90° F summer heat and, no doubt, will also be made in the cold Canadian winter.

ENGINE BREAK-IN

The engine is still operating on mineral oil until we are certain that the engine is properly broken in. Many people believe that mineral oil should be used for 25 hours, and then it should be switched to detergent oil. Not so. It is recommended that you monitor oil consumption and when the number of hours between adding oil peaks out (approximately 10 hours per quart) then change to multiviscosity detergent oil.

If you change to detergent oil too soon, (i.e., say, six hours per quart), then wherever you are at is where the engine oil consumption will stay. The piston rings will stop wearing in properly to the cylinder walls and consumption will not improve.

During the break-in period, you should try to fly at 75% of power as much as possible.

FUEL SYSTEM

DESIGN CONSIDERATIONS

The fuel system in the Seawind is different than most General Aviation aircraft primarily because it is a cross country amphibian. For normal business and family use, the Seawind has a 40-gallon main tank in each wing, total up to 80 gallons (max. 480# of fuel). The Seawind also has a 15-gallon long-range tank in each wing. Two people can go into the back woods fishing or camping almost 700 miles and have enough fuel to come back. The total of 110 gallons of fuel weighs almost 660 lbs.

Please do not ask if the Seawind can carry full fuel, four adults, and luggage. Like most 4/5 place aircraft, the Seawind can carry 1100 lbs. It makes no difference if it's people, cargo, or fuel.

No pilot would plan an eight-hour non-stop flight with four adults and 110 gallons of fuel.

You can plan a four-hour flight of four 170-lb people (standard FAA man) with 40 lbs of luggage and 64 gallons of fuel for a distance of 700 miles or 610 n.m.

The system is designed to fly on both main tanks all the time without the need for switching back and forth between tanks. A reasonable balance of fuel (within six gallons) between tanks is suitable for landing on water, planned or unplanned emergency.

It is possible to have a greater imbalance. The EDM 930 engine monitor will alert you to any imbalance of four gallons or more. The separate fuel level sensors also give you a digital quantity read-out of the two main tanks.

If any fuel imbalance occurs, you can pump fuel from one wing to the other in flight with the appropriate balance pumps.

The long-range tanks are used only to refill the main tanks by switching on the transfer pumps. When the main tanks are down to half full, you simply turn on the transfer pumps.

VENTING THE TANKS

Venting of the tanks is important in providing adequate air pressure in the tank to assure fuel flow. Amphibians are an attractive home for mud daubers and other bugs to nest in. They like fuel vents. That is why blowing in the vents is on the preflight list.

The Seawind has three fuel tank vents. One in each wing and one on the vertical tail. All three are tied together in a balance line so that if one vent is clogged there are two more to support the system operation.

PREFLIGHT

A calibrated stick is recommended to verify the fuel quantity on the EDM when preflighting the main tanks.

There is a sump drain for each tank to remove any water that might have gotten into the fuel system.

There are Saf Air fuel drains on the left side of the hull: Two drains (one from each gascolator), one from the wing vent system low point, one from the header tank and one from the fuel pump enclosure in the aft hull.

FUEL ENCLOSURE

In the event an aluminum pressure fuel line was to leak, there is a clear plastic over sleeve that carries the leaked fuel into the enclosure.

The header tank and both fuel pumps are located in the fuel enclosure.

If any fuel starts to collect in the enclosure, a warning light illuminates at the console to prompt the pilot to start a drain pump that ejects the leaked fuel outside the aircraft.

FUEL SYSTEM OPERATION

The fuel flows by gravity from both wings through a gascolator/filter to the one-gallon header tank. An emergency fuel valve is operated by a push/pull cable on the console. Pushing it forward opens the valve from the header tank to the pumps supplying the engine.

The fuel is pumped up to the engine from the header tank by a Weldon fuel pump. It continuously supplies fuel at low pressure and high flow to the engine-driven fuel pump. The engine has an extremely reliable centrifugal Romec pump, which requires a return line to keep the system vapor free. The vapor return line goes back to the header tank where the air is separated out and vented overboard.

A standby backup Weldon pump provides fuel in an emergency if the main pump fails.

Richard Silva

Fall is a beautiful time of the year.

A three-Seawind family.