Lazair™

TECHNICAL UPDATE

Distributed as a free service to all Lazair owners

Number 7 March'83

7.1 CHECK YOUR NOSEWHEEL AXLE

While doing some modifications to one of our demonstrators recently we noticed a considerable amount of wear on the nosewheel axle. This particular aircraft had made many beach landings last summer and it is probable that much of the wear was caused by sand in the nosewheel bushings. While a worn nosewheel axle might not seem like a serious problem, it could be serious on a Lazair™ equipped with rudder pedals. If the axle is worn sufficiently, to cause an appreciable stress concentration, applying pressure to both rudder pedals simultaneously could cause the axle to fracture and result in the loss of rudder pedal control. This has not happened, and it is unlikely that it ever will, but your nosewheel axle should be checked for wear at least after every 50 hours of flying time, and replaced if necessary. If you land and take off in sandy areas, the checks should be made more frequently.

7.2 PIONEER CYLINDER HEADS

In an early notice to customers (before we began distributing these "green sheets"), owners of Pioneer powered Lazairs were advised that some of the Pioneer engines had developed cracks in the cylinder head. Since there are a few of the early Lazairs still flying with Pioneer engines, this information is provided again. The earlier Pioneer engines seem to be most susceptible to this problem, although many have flown several hundred hours without difficulty. The second generation of Pioneer heads incorporated a vertical web between the cooling fins directly behind the decompressor boss. While this did not eliminate the problem completely, it certainly reduced it. The people at Pioneer suggested that some of the problems may have been caused by a leaky decompressor which can cause a hot spot in the cylinder head and therefore contribute to the cracking. By replacing the decompressor with a suitable length 5/16UNF bolt and gasket, this potential problem can be eliminated. These engines are small enough to make the decompressor unnecessary for starting. However, the most probable cause of this problem is insufficient lubrication which causes the head to overheat. As with all two-stroke engines, the Pioneer must be run with a rich fuel mixture. A mixture which is too lean can result in serious damage. When adjusting the high speed mixture screw on the carburetor, it should be turned in until the engine just begins to slow down, then the screw should be backed out one quarter to one half a turn.

7.3 "CLEAR THE PROP!"

Propellers are dangerous. Propellers can be lethal! Aside from the obvious discomfort if you should inadvertently stick your finger (or your head) into a spinning propeller, you should be aware that any propeller regardless of its material or method of manufacture could possibly break. While the statistical probability of any particular propeller breaking is very low, it is nonetheless, possible. The tensile stress in a spinning propeller can be very high. The acceleration at the tip of a 30 inch diameter prop turning at 6,000 RPM is over 15,000 g's. No, that's not a misprint, it really is fifteen thousand g's. This means that an imbalance of only one tenth of an ounce at the tip of the prop would produce a force of almost a hundred pounds pulling the prop shaft, first one direction, then, 5 milliseconds later, in the

opposite direction. This type of oscillating force can not only destroy crankshaft or driveshaft bearings, but can result in a fatigue failure of the crankshaft and even the propeller itself. Any tendency to fatigue can be aggravated by nicks or scratches in the prop, overtorquing or undertorquing the prop bolts, foreign material between the propeller and the mounting flange, and discontinuities in the propeller material. Potential problems can be lessened at the design stage by making props from homogeneous materials rather than materials such as wood, by keeping the nominal blade weight to a minimum, especially near the tips where the acceleration is highest, and by using a manufacturing process which makes the propeller as symmetrical as possible. Post manufacturing fixes such as static balancing may help but a statically balanced propeller will not necessarily be balanced at all operating speeds.

The propeller designed for the Lazair™ has been tested at 9,000 RPM (1.5 times the normal maximum operating speed of 5,800 RPM). This creates a tensile force nearly two and one half times the force which would be encountered in normal service, and provides an adequate safety factor for normal operation. However, using these propellers at higher speeds can increase the stresses substantially (since the tensile force is proportional to the square of the RPM). In addition to this, increasing the speed will increase the probability of tip flutter. Tip flutter will increase the temperature of the tips, which reduces the flexural strength and causes even more flutter.

Even if a propeller is not abused there is no absolute guarantee that it will never fail. In the past year, we have had reports of three propellers breaking in flight. Fortunately there were no injuries caused by flying fragments, but had this happened with the aircraft on the ground and a bystander in just the wrong place, it could have been much more serious. While three broken props out of the approximately 2,000 which are now on Lazairs, is not a record of which we are particularly proud, it is probably better than what could be achieved with wooden props under the same operating conditions. There is no reason to expect that one of your props will fail, and we don't wish to cause any paranoia, but the props on your Lazair™ (and the props on every other ultralight) should be treated with respect. Inspect them frequently. Keep them clean, file or sand out any small nicks or scratches, do not do anything which could upset the balance, and, above all, do not allow bystanders to stand in the plane of rotation while you do your engine run-up. When you are around other ultralights, observe the same precautions and stay behind the propeller. At the Oshkosh Fly-In alone last year there were three incidences of propellers flying apart (none of them on a Lazair™) so remember -- it can happen.

Although the probability of losing a propeller in flight is remote, it is a possibility. However, unlike the situation in a larger aircraft, the loss of a prop (or any other problem which initiates a forced landing) should not, under most circumstances, result in damage to the aircraft or injury to the pilot. Ultralight pilots have a very significant advantage over other pilots in this regard because in most areas, it is possible to fly an ultralight so that there is always a safe landing site within gliding distance. This is not the case if you're flying a Lear Jet or even a Cessna 150. While it's almost always possible to keep a landing spot in sight, most of us don't always do so. The next time you're showing your friends how low you can fly, ask yourself "What would I do if an engine quit -- right now?". Maybe you will decide that a bit *more altitude would be prudent.*