



LISA TURNER

COMMENTARY / AIRWORTHY



Airworthy Prop?

It takes more than just a passing glance

BY LISA TURNER

"COME ON," TIM SAID. "We've got to get going."

"Right. Let me finish this preflight," Bob said.

Bob circled the small two-place composite aircraft with a checklist. Passing the wood prop, he ran his hands over the leading edge. Feeling a nick, he looked at the area. He saw a 1/8-inch crack in the edge near the tip.

"Tim, come here and look at this."

Tim came over and examined the blade.

"Not enough to worry about," he said. "When we get back, I'll fill it with something."

Both Bob and Tim failed to look carefully at the faces of the blades. If they had inspected them, they would have seen a small area of delamination stretching out from the crack.

They jumped in the airplane, started up, and taxied to the active runway on the nontowered field. About five minutes after leaving the pattern, Bob noticed a growing vibration.

"What's that vibration, Tim?"

"What vibration? Oh wait — I feel it. I don't know."

The vibration was unnerving and began to grow stronger.

"Something's wrong," Bob said, reducing power slightly.

Without warning, the tip of one blade on the propeller flew off, just missing the windshield. Now the vibration felt like the entire airplane was coming apart. In a panic, Bob reduced power and searched for a landing spot. Farmland stretched for miles, and Bob saw a hard-packed mown field. He shut the engine down as they floated over a ditch, making a hard, bouncy landing.

Lucky to not have flipped, the two men looked out at the now stationary prop. One blade tip was missing. Splintered wood stretched a third of the way down the blade.

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The two men looked at each other.

"I guess that crack was more serious than I thought it was," Bob said.

This story is a composite from NTSB reports of accidents caused by propeller failures. Most of these failures were caused by inadequate inspection, inadequate maintenance, or both. Pilots may not know what to look for on an inspection, especially on experimental airplanes.

When we were student pilots, we were taught how to preflight the airplane. We were told to look for cracks and nicks on the propeller. When we got to the propeller, most of us would run our hand along the leading edges. If they were smooth, we'd move on, not realizing how critical this part of the aircraft was.

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to the prop(s) on our aircraft
ve moved to a controllable
-speed model. But there
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either forgot or didn't know.
e some prop facts that might
e possibility that a prop, an
ent, or the engine itself will
ine after a prop failure.
ll the relatively recent story
T crashed and killed all
orroded propeller blade
s hub. According to the U.S.
News on December 6, 2018:
Corps investigation found
Propeller 2 (P2B4, in the
unattached, struck the port
age, cut straight through
ne passenger area of the
ne lodged in the interior of
de of the plane. This dam-
series of events that led to
ding with the starboard

side of the fuselage and ultimately the
plane breaking into three pieces mid-air.

"According to the JAGMAN [Manual of
the Judge Advocate General], the Navy and
Marine Corps require C-130 propellers to
undergo an overhaul every 5,000 to 6,000
flight hours. Investigators studying the
plane wreckage found not only corrosion in
the Blade 4 Propeller 2, but found anodize
coating inside the corrosion pitting —
which means the corrosion was there
during the 2011 overhaul, and instead of
removing the corrosion and fixing the
blade, the coating was applied over the
damaged blade."

TRUE OR FALSE?

**NEVER ATTEMPT TO REPAIR A PROPELLER.
THIS SHOULD BE LEFT TO A CERTIFIED PRO-
PELLER SHOP.**

False. The truth is, it depends. If your
propeller is driven by a Rotax 447 in a small
aircraft, then there is no reason why you

can't make repairs yourself. On the other
hand, if you're flying a Stearman with a
Sensenich propeller, you will need to deter-
mine how serious the damage is and follow
the directions of the propeller manufacturer.
Certified propellers have their own standards
for airworthiness, just as certified aircraft do.
In both cases, you should read and under-
stand what the manufacturer's advice is.
(See Hints for Homebuilders prop repair videos,
FAA Advisory Circulars 43.13-1B and 20-37E,
and other resources at www.EAA.org/extras.)

**NEVER PUSH OR PULL ON THE PROP TO MOVE
THE AIRPLANE.**

False. Here's another "it depends." With
small aircraft that use a propeller gear reduction
drive, such as Rotax, pulling the aircraft around
the hangar by the prop root may be permitted
(check with the manufacturers of the prop and
the engine). In the case of larger lightplanes and
traditional prop and hub arrangements, you
never want to pull or push on the prop or the
spinner. Use a tow bar to move the aircraft.



With small aircraft that use a propeller gear reduction drive, such as Rotax, pulling the aircraft around the hangar by the prop root may be permitted (check with the manufacturers of the prop and the engine). Traditional prop and hub arrangements should be moved using a tow bar.

CORROSION IS ONE OF THE TOP REASONS FOR METAL BLADE AND HUB FAILURE.

True. This was the case in the KC-130T crash. When you perform your preflight, look for discoloration, pitting, uneven surfaces, and cracking. Corrosion can also occur unseen inside hubs on controllable pitch and constant-speed props.

WHEN YOU'RE BUILDING YOUR OWN AIRPLANE, IT'S ALWAYS BETTER TO GO WITH A CONTROLLABLE PITCH OR CONSTANT-SPEED PROPELLER BECAUSE OF ITS EFFICIENCY.

False. Again, it depends. On small aircraft, a fixed-pitch prop is wonderfully simple. Of course, it's a compromise, but the simplicity and relatively low cost have a lot going for it. Moving up to a controllable pitch or constant-speed prop on a larger homebuilt also makes sense with larger engines and higher speeds.

YOU LAND YOUR AIRPLANE AND ACCIDENTALLY RUN OFF THE RUNWAY INTO SOME TALL WEEDS. YOU SEE AND HEAR THE PROP RUN INTO THE WEEDS, SUDDENLY LOWERING THE ENGINE RPM AND ALMOST STOPPING THE ENGINE. WHEN YOU RETURN TO THE HANGAR, THE PROP ONLY HAS SCRATCHES ON IT WITH SOME LEADING EDGE SCUFFING. THIS IS CONSIDERED A PROP STRIKE — TRUE OR FALSE?

True. This should be considered a prop strike. You should follow the engine and prop instructions for an inspection.

TIPS FOR INSPECTION AND CONTINUED AIRWORTHINESS

STRESS RISERS: High centrifugal forces on a propeller amplify and aggravate any existing damage, like nicks or cracks. A small crack can get bigger fast. This is why you want to determine how serious a crack or dent is in relation to the manufacturer's recommendations. If you're not sure, seek out a professional and do not fly the airplane.

PREFLIGHT INSPECTIONS: Use the manufacturer's checklist if it provides one. If it doesn't, develop your own. In the case of constant-speed props, there will be plenty of airworthiness and maintenance advice. Use it to enhance your preflight propeller inspection. Don't forget to check the security and condition of the spinner and hub. Put a magnifying glass or two in your toolkit for looking at surfaces.

Wood and composite propellers are more susceptible than metal propellers to stone and debris damage. Delamination, debonding, loss of protective coatings, and warping can be the result. Look carefully at all blade faces and edges.

PROP QUIZ

Wood props should be left at the 1 o'clock position so the water runs off.

FALSE. Wood two-bladed props should be stored in the horizontal position, which minimizes water retention in one blade that could cause an imbalance in flight.

Metal props should be left in a horizontal position so oil stays on them.

FALSE. Put a two-bladed metal prop at the 1 o'clock position to minimize debris collection and water retention.

One of the most corrosive substances that should be cleaned off your prop is:

A.) Polish (B.) Water (C.) Bird Poop

CORRECT ANSWER: C

With small nicks and dents less than 7/16 inch, it's okay to fly until you get it repaired.

FALSE. First, a nick or dent almost half an inch is an accident waiting to happen. Second, never fly with a damaged propeller.

Cyanoacrylate and baking soda work well for filling cracks and holes in experimental aircraft wood props.

TRUE. The instructions in Hints for Homebuilders and in AC-43-13 are very specific on materials and techniques for repairs. Follow instructions exactly.

Airworthiness directives (ADs) are optional for owners of experimental aircraft.

FALSE. If you have a certified propeller on your experimental aircraft, you must comply with ADs to stay safe.

The blade face is the surface you see when you are looking at the propeller from the front of the aircraft.

FALSE. The blade face is the surface you see when you are inside the aircraft.

To all but eliminate this accident source, know all about the propeller you have on your airplane. Make sure your preflight checklist includes all of the items that your propeller manufacturer recommends you inspect.

VIBRATION: The ability to balance a lightweight wood or composite prop may be limited. If you encounter excessive vibration in flight, consult the manufacturer for advice. The more vibration induced by an unbalanced prop, the more potential for component damage throughout the aircraft. Don't rule out the spinner as the cause.

WOOD PROPELLERS: Take the spinner off periodically to check torque on the prop mounting bolts and look at their condition. Wood will swell and shrink with temperature and humidity changes, and the bolts can loosen. In general, check torque after the first 25 hours, and then every 50 hours. Look for any crushing (over torqueing), and if the airplane stays outside, consider a prop cover.

ROCKS AND DEBRIS: Check your runup area for loose gravel and other debris. Both can do a lot of damage in a short time.

HUB BOLTS: Check for missing safety wire, cracks, and damage around the bolts. Use a calibrated torque wrench on hub bolts.

CONTROLLABLE PITCH AND CONSTANT-SPEED PROPS: Read and understand the pretakeoff operational checks and in-flight procedures. It can be extensive, but it's critical to avoid a failure. These props are wonderful but complex.

READ ADVISORY CIRCULAR AC-20-37E, *Aircraft Propeller Maintenance*, and keep a copy handy for reference.

The good news is that propeller-related accidents are not common. But, when they do occur, they are serious. To all but eliminate this accident source, know all about the propeller you have on your airplane. Make sure your preflight checklist includes all of the items that your propeller manufacturer recommends you inspect. Pay close attention to hour and calendar limits in the maintenance manual. If there are ADs and/or SBs for your prop, make sure they are complied with promptly. Finally, if there are any unusual vibrations that you sense in the airplane, get them checked out immediately. It might or might not be the prop. You don't want to find out when the prop flies apart. *EAA*

Lisa Turner, EAA 509911, is a manufacturing engineer, A&P mechanic, technical counselor, flight advisor, and former designated airworthiness representative. She built and flew a Pulsar XP and Kolb Mark III. She is currently restoring a Waco UPF-7 with her husband. Lisa is a member of the EAA Homebuilt Aircraft Council and Women in Aviation International.
