MMFC
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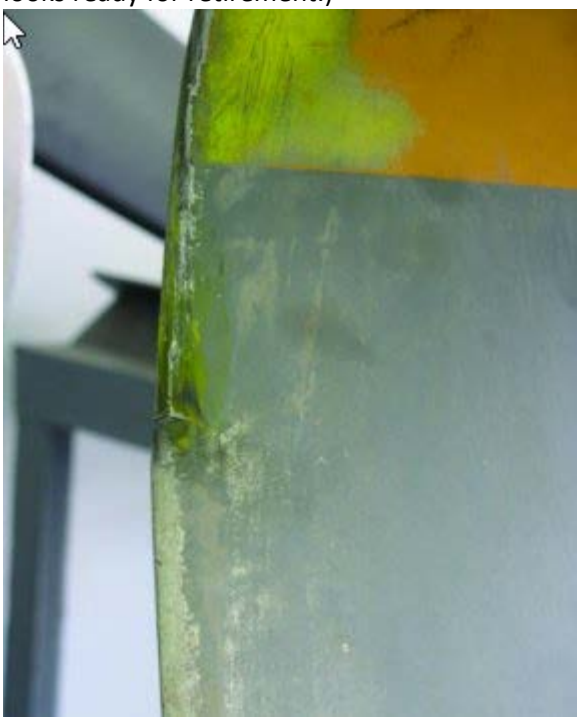
“Watch That Propeller”

When performing preflight inspections on propellers, pilots should be on the lookout for certain conditions they may not expect elsewhere on an airplane. Cracks in the spinner enclosing a propeller hub, like the one below, might be repairable but also can signal undue vibration and/or hidden corrosion.

Below, the hard-to-see crack in this propeller blade also might be repairable, but probably not by your favorite A&P. It likely will need to go to an approved prop shop for evaluation. (Either way, this blade looks ready for retirement.)



Propeller checks

Performing a good preflight involves a thorough check of the propeller and spinner before operating the engine. Corrosion and deferring defects that require maintenance are major causes of propeller failures. Even minor dings in the blades require maintenance and referring to the manufacturer's maintenance instructions to determine if it's still airworthy. Cracks, oil or grease leaks, damaged spinners and missing screws also are reasons to seek out professional input.

Propeller vibration can be another indicator maintenance is needed. A technician familiar with the engine/prop combination will check that propeller blade track is within limits and that the prop is installed in the correct position—it's possible that changing the propeller's position on the crankshaft may correct a vibration problem. Consider the long-term effects of vibration on the complete aircraft and all the installed components such as instruments and avionics, plus powerplant accessories such as the alternator, magnetos or vacuum pump. While a slight vibration can be acceptable, any vibration should be investigated as to the origination if for no other reason than to avoid damage or failures and costly repairs.

Foreign Object Strike. A foreign object strike can include a broad spectrum of damage, from no visible damage, to a small nick, to severe ground impact damage. A conservative approach in evaluating the damage is required because of the possibility that there may be hidden damage that is not readily apparent during a superficial, visual inspection (see Figure 1-13). Refer to the manufacturer's maintenance instructions for damage limitations.

Propeller Blade Struck by a Foreign Object

202. INSPECTION METHODS. The methods used in propeller inspection are versions of methods used in inspecting the entire aircraft. - - - -

a. Visual Inspection. The primary defense against early failure of propellers. When inspecting propellers, it is necessary to use touch and other senses, as well as visual cues. Changes in surface roughness, unusual free play, and odd sounds give hints as to conditions that may affect airworthiness. Feel for roughness and look for small variations in color, texture changes, waviness, and changes in reflection that may signal the removal of protective coatings. Some areas may require the use of a 10x magnifying glass to identify small features or find cracking. Refer to the propeller manufacturer's maintenance documents for specific instructions.

b. Preflight/Walk-Around Inspection. The propeller portion of the walk-around is an important element of the process of airworthiness maintenance. It should not be merely a superficial look, but a studied review of the condition of everything that might give trouble during the forthcoming flight.

(1) Blade. The blade and its surface should be carefully inspected for conditions affecting airworthiness as detailed below.

(a) Surface Damage. Look for surface damage on both sides of the blades such as dents, nicks, scratches, and corrosion. Surface imperfections can also be felt by running your fingernail along the blade leading edge. Damage should be repaired before flight. Whenever a noticeable dent, nick, corrosion pit, or bump is observed, an appropriately rated mechanic should blend it out. The mechanic should remove all corrosion products and determine that the section thickness has not been reduced below allowable limits. Allowable thickness limits should be obtained from the manufacturer's maintenance manual, or other FAA acceptable propeller inspection criteria.

(b) Erosion. Examine the blade for evidence of erosion. If metallic blades appear to show erosion beyond limits, the propeller should be removed from service and evaluated by an appropriately rated repair station. Check the condition of the paint on blades and spinners that have protective paint. Paint protects the surface of the blade from erosion, and the blade should be repaired before the paint wears through and the blade structure begins to erode. Do not apply excessive paint and do not paint propeller components unless it is in accordance with manufacturer's instructions since improper painting may affect propeller balance, operation, static electricity discharge, or have other unintended consequences.

(c) Composite or Wood Delaminations. Although not susceptible to corrosion like metal propellers, wood or composite propellers have special problems that can lead to an unairworthy condition. Wood or composite propellers are susceptible to internal damage from small stone strikes that can create delamination or microcracks and permit intrusion of moisture. Moisture will cause expansion of existing cracks and delaminations. When moisture freezes within the blade, it causes delamination. When inspecting wood or composite propeller blades, look for cracks or delamination on the blade surface and at blade edges. In wooden propellers, check the gluelines for debonding; look for warp and loss of protective coating (paint or varnish). If drain holes are present, it is imperative that they be inspected since they may become clogged with insects and debris. Clogged drain holes can cause moisture retention.

(d) Straightness. Sight down the edges to find any deformation.

(e) Looseness. Feel the blades and move them to find unusual changes in looseness and unusual play. Blade-to-blade differences indicate that an internal problem may exist. Some propeller blades are designed to be loose. In this case, look for blade-to-blade differences to indicate unusual play.

If you spot any dings or dents in the propeller, you need to have those dressed out as soon as possible. Why?
Propeller blades have nodes and the stresses at these nodes are extremely high and generally increase as power is applied or during operation in restricted power ranges. If you get a ding at one of these points and leave it, it creates a stress riser that can initiate a crack in the blade. And depending on the location of the crack and the overall health of the blade, these cracks can progress quite rapidly.

Final thoughts

Propellers and propeller repairs are expensive, so it's important to take care of that hunk of metal hanging off your engine. Do not push or pull on a propeller to move your airplane; use an appropriate tow bar, as even a moderate amount of force on a blade can throw it out of track, or worse. Corrosion is another problem that causes a propeller to become condemned early in its life. Keep your prop clean by removing insect residue, dust, bird droppings, etc., with cleaning chemicals approved for aircraft (aluminum) use. A light coat of oil can help to form a barrier preventing moisture from attacking the metal.

Finally, keep an operating propeller away from the pavement. Maintain the nosewheel's strut on your aircraft at the upper limit and perform engine run-ups away from loose gravel and dirt. Take care of your propeller and it will take care of you.

Credits:
Aviation Safety Magazine.com
FAA Advisory Circular 20-37E (9/09/2015)
Piper Flyer Association (piperflyer.org)

David Key
MMFC Safety