Repl. by 37B

AC NO: 20-37A

DATE: 4/4/69

ADVISORY CIRCULAR

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

SUBJECT: AIRCRAFT METAL PROPELLER BLADE FAILURE

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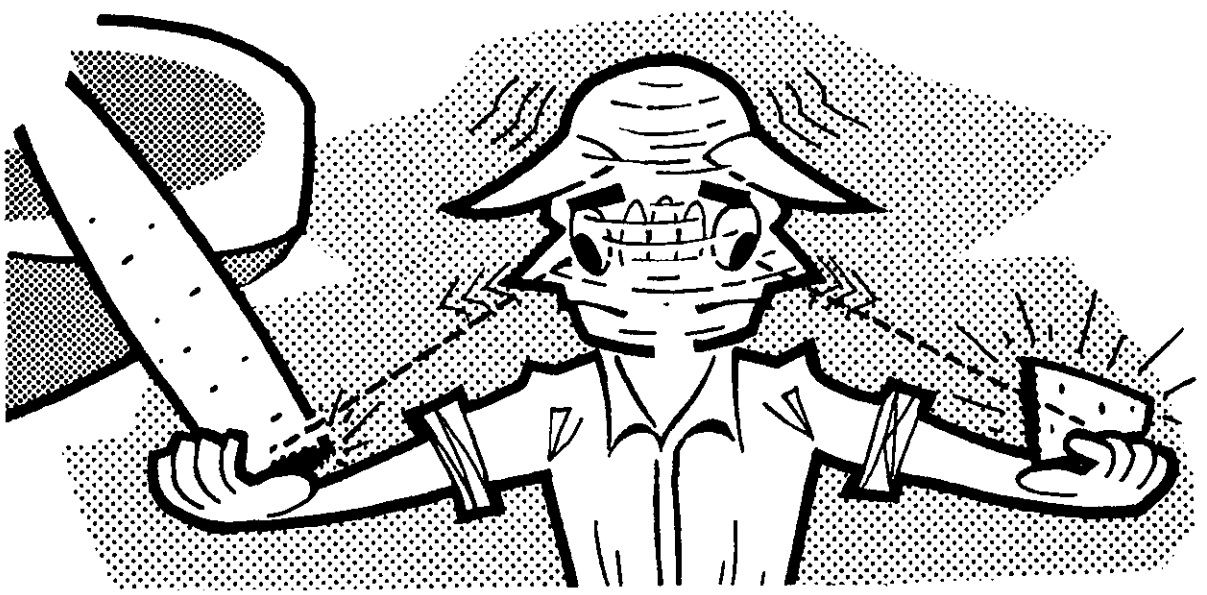
1. PURPOSE. This advisory circular provides information and suggested procedures to increase service life and to minimize blade failures of metal propellers.

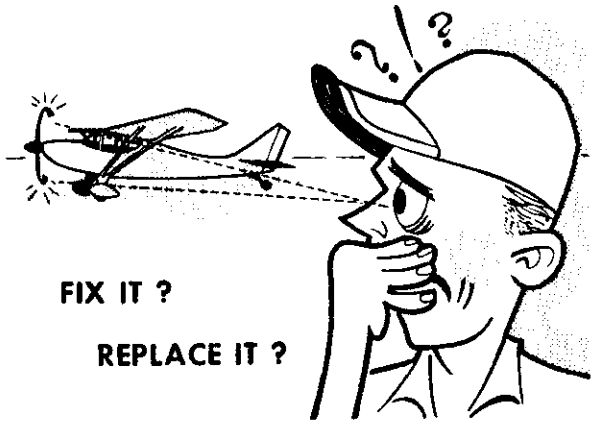
2. CANCELLATION. Advisory Circular AC 20-37, effective 6/7/65, is canceled.

3. GENERAL. A high margin of safety is incorporated in the design of modern metal propeller blades. Even so, failures occur. Reports of propeller blade failures do not show that the failures can be attributed to any particular aircraft/engine/propeller combination.

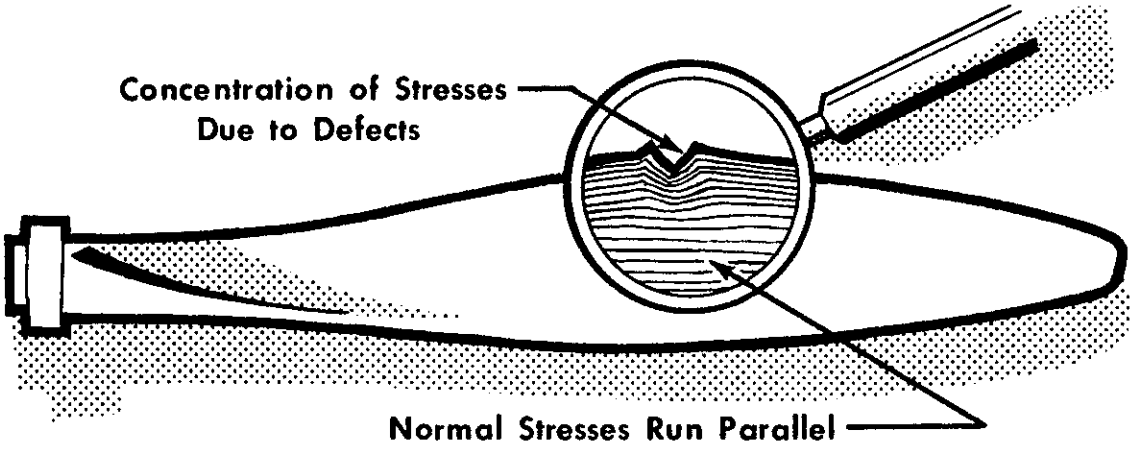


Initiated by: FS-340

4. WHY BLADES FAIL. An investigation of a representative number of propeller blades disclosed that failures occurred because of fatigue cracks which started at mechanically formed dents. Blade material samples analyzed did not reveal evidence of failure caused by material defects or surface discontinuities existing before the blades were placed in service.

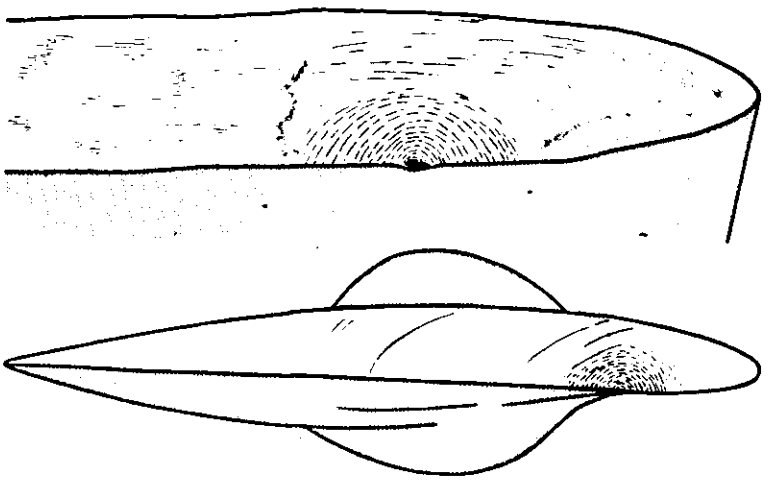


Often fatigue failure occurs at a place where previous damage had been repaired. This may be due to the failure actually having started prior to the repair or the repair may have been improperly performed. Too many blade straightening or blade repitching operations can overstress the metal, causing it to fail. FAA Advisory Circular 43.13-1, Chapter 12 and the propeller manufacturers maintenance instructions contain information concerning the limitations for straightening of deformed blades. Exceeding the limitations for straightening of propeller blades may result in blade failure during operation.



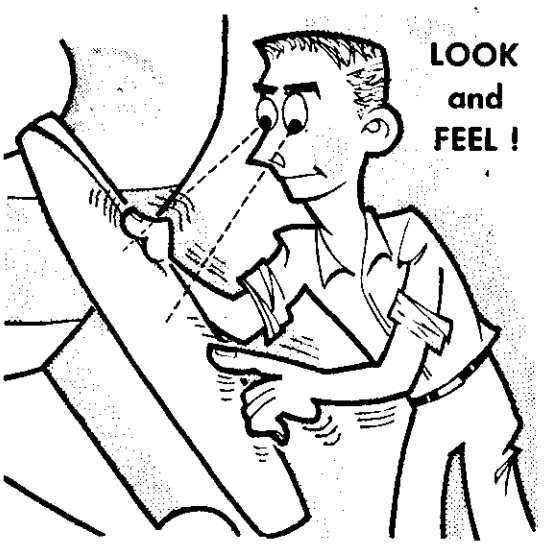
5. HOW BLADES FAIL. The stresses that normally occur in a propeller blade may be envisioned as being produced by lines of force that run within the blade approximately parallel to the surface.

When a defect occurs, it tends to squeeze together the lines of force in the defect area, thereby increasing the stress. This increase in stress may be sufficient to cause a crack to start. Even a small defect such as a nick or dent may develop into a crack. The crack, in turn, results in a greater stress concentration than existed before. The resulting growth of the crack will almost inevitably result in blade failure. This condition is so common, and the results are so serious, that great emphasis should be placed on the daily and preflight inspection of propeller blades for defects. Whenever defects are found, they should be repaired or the propeller replaced before further flight.



6. WHERE BLADES FAIL. Service experience indicates fatigue failures usually occur within a few inches of the blade tip. Failures also occur in the blade near the shank and at the propeller hub well out of the critical areas; therefore, NO DAMAGE SHOULD BE OVERLOOKED OR ALLOWED TO GO WITHOUT CORRECTION!

7. BLADE INSPECTION. When performing an inspection on the propeller, especially during the preflight inspection, inspect blades completely - not just the leading edge - for erosion, scratches, nicks, and cracks. Regardless of how small the surface irregularity, consider it as a stress riser subject to fatigue failure.



Propeller manufacturers' manuals, service letters, and bulletins specify methods and limits for blade maintenance, inspection, service, and repair. Similar information is also available from the Federal Aviation Administration. All propeller repairs should be performed by qualified personnel.

8. "BLADE TIPS." Your conscientious application of these helpful tips will greatly reduce potential and actual propeller blade failures:

   a. Keep blades clean - the crack cannot be seen if covered with scum or other foreign matter.

   b. Avoid engine runup areas containing loose rocks, gravel, etc.

   c. Do not move the aircraft by pushing or pulling on the propeller blades - they were not designed to be used as handles.

9. HELP WANTED. In order to continuously develop improved design data, operational procedures, and maintenance techniques, we should have information relative to all propeller blade failures. We request that owners, pilots, and maintenance personnel cooperate by voluntarily reporting all propeller blade failures. FAA Form 8330-2, Malfunction or Defect Report, (formerly FAA Form 1226) is a convenient means of supplying FAA with the desired information. Forms are available from any FAA General Aviation District Office, and are preaddressed for free mailing to the FAA Maintenance Analysis Center (MAC). Most aviation maintenance shops will have these forms available. FAA Advisory Circular 20-23C, Interchange of Service Experience - Mechanical Difficulties, provides further information about the use of FAA Form 8330-2 and the function of MAC. Information that will be of great value to FAA and the aviation industry include:

a. A brief maintenance and operation history of the airframe and engine including any incident of sudden engine stoppage due to the propeller contacting the ground or other objects.

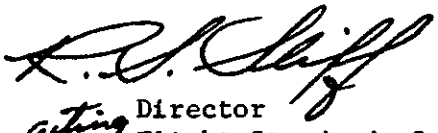
b. A history of the propeller, including any previous damage, all repairs and alterations, operating time in service since any repairs or alterations have been performed, total operating time, and whether or not the propeller has been used on other aircraft.

c. Information relative to any instance of rough engine operation at any time during the life of the installation.

d. Information about the amount of wear present in the engine crankshaft dynamic damper and attaching parts may be significant to why the propeller blade failed.

Fortunately, in most cases of propeller failure, a safe landing is accomplished with little or no other damage. In many cases the propeller manufacturer may wish to install a new propeller on the aircraft on which a blade has failed and conduct tests before any repairs or adjustments are accomplished. Your cooperation with the manufacturers in this respect should prove beneficial to all.

We solicit the cooperation of the aviation community in the investigation of propeller fatigue failures. Our combined efforts and contributions in this regard can materially enhance flying safety.



acting Director
Flight Standards Service