



METAL PROPELLER REPAIR MANUAL

INTRODUCTION

The purpose of this Service Manual is to provide the repair information necessary to maintain a fixed-pitch metal propeller in an airworthy condition.

The types of service-damage which may render a fixed-pitch metal propeller unairworthy are mainly mechanical injuries such as cuts, nicks, and dents caused by the impact of stones, gravel, sand, etc. Usually a displacement of the metal is involved and the void is roughly V-shaped in cross-section with the sharp point of the "V" pointing inward, away from the surface of the metal. There is also a type of chemical damage which involves corrosion at the interfaces of the grain structure of the metal. In this manual it is called corrosion pitting. The mechanical effect of this on the strength of the metal is like that of a "V" notch with the sharpest possible edge. It is the objective of all repair techniques to remove this V-shaped notch and to leave the repair area in a smooth, rounded well-faired condition. It is worthwhile to understand the reasons behind these procedures.

A metal propeller is subjected to two kinds of loads or stresses. A stress is merely the load or force which acts across a unit area of the blade cross-section. The first of these stresses is steady and continuous and due to the combination of the centrifugal forces associated with the rotation of the propeller, and forces which are the reaction of the airload on the blade. These centrifugal forces are very large when a typical light-plane propeller is operating at its rated rotational speed. A particle of metal near the tip of the blade may exert an outward pull roughly 7500 times greater than its own weight. The forces due to the reaction of the blade to the airload tend to bend it out of the plane of rotation and the centrifugal forces tend to straighten the blade and bring it back into the plane of rotation, so that in operation the blade will seek some intermediate or equilibrium position. The sum of the stresses caused by these steady forces constitutes the total steady stress to which a blade is subjected at a given rotational speed, power input, and forward speed of the propeller. It varies, of course, along the radius of the blade in a manner which is determined by the shape of the blade. At rated conditions of power, rotational speed, and forward speed, it is possible, by proper design of the blade, to hold the maximum value of these steady stresses below a value of about 7500 pounds per square inch. This is about one-fourth of the yield strength of aluminum alloy 2025, heat-treated to Specification T6, which is the metal universally used throughout the light-plane propeller industry.

The second type of stress is an alternating or vibratory stress. In this type of stress, the blade is subjected alter-

nately to loads which tend to stretch the metal and then to compress it. The sequence of events which occur as the load on a portion of the blade section varies from the point of maximum tension thru maximum compression and back to maximum tension is called a cycle of vibration. The time which elapses during a cycle is called the period of vibration. The number of cycles per second, or other unit of time, is called the frequency of the vibration. The number of cycles per revolution of the propeller is called the order of the vibration.

The forces which shake a propeller and cause it to vibrate arise mainly in the piston engine which drives it. A piston engine does not produce a smooth and constant torque. The rated torque of a direct-drive engine is merely the mean value of the torque impulses taken over a period of one revolution of the crankshaft. The orders of the torque impulses are determined by the number of engine cylinders and their arrangement. These orders are usually integer multiples of the number of firing impulses per revolution of the engine crankshaft. For example, a four-cylinder engine, with the cylinders in two banks, arranged at an angle of 180° to each other, will produce torque impulses at frequencies which are 2, 4, 6, 8, . . . times the rotational speed of the engine.

A metal propeller, like a tuning fork, has a set of natural frequencies of vibration. These frequencies are determined by the shape of the blade—its length, thickness distribution, and width distribution. When one of the natural frequencies of the propeller coincides with the frequency of a shaking force put out by the engine, a resonance peak occurs. At this condition, depending upon the magnitude of the shaking forces coming from the engine and the damping forces in the propeller, vibratory stresses may become very large. During the design of a metal propeller intended for use on engines of a particular model, an effort is made to tune the propeller so that dangerous resonance peaks will fall outside the operating range of engine rotational speed.

Over the period of many years in which forged aluminum alloy propellers have been in use, service records have shown that a propeller can operate safely, provided the values of steady stress and vibratory stress are held to certain well-established levels. When a combination of steady and vibratory stresses is allowed to exceed these levels, after the accumulation of a sufficient number of vibration cycles, or fatigue cycles as we may call them, the strength of the metal begins to deteriorate and a fatigue crack may develop which can quickly lead to a failure of the propeller. Much test work has been done to determine the number of fatigue cycles required, at a

given level of stress, to produce a fatigue failure. Metal propellers are not type certificated until it has been demonstrated that the steady stresses and vibratory stresses for each propeller-engine combination are at a satisfactory level.

The values of allowable steady and vibratory stress which experience has shown to be satisfactory apply to well-faired undamaged blades. When a propeller blade sustains damage in the form of a sharp-bottomed notch, the stress level at the root of the notch may be increased by an amount many times greater than the stress at the same location in an undamaged blade. The notch effect or stress concentration factor, is dependent upon the depth and the sharpness of the bottom of the notch. This local stress may increase to a level at which very little more flight time is required to initiate a crack which may propagate rapidly and lead to an early blade failure. It is for this reason that frequent inspections and prompt repair of damage of this type are urgently recommended.

There is another way in which, during the service life of the propeller, the vibration characteristics of an engine-propeller combination may be altered so that vibratory stresses rise to dangerous levels. This situation is brought about by a shift of one or more of the resonance peaks into a frequently used range of engine rotational speeds. When the thickness and width of the blade have been reduced by repeated repairs, the stiffness and therefore, the natural frequencies of vibration are also reduced.

The effect of a diameter reduction of the propeller is to increase the natural frequencies of the blades. Any alteration of the original blade dimensions large enough to cause a significant shift, either up or down, away from the set of natural frequencies originally designed into the propeller, may bring an undesirable resonance peak into the cruising range of engine rotational speeds. This is why minimum repair dimensions and diameter limits are established for each engine-propeller combination.

Alternating stresses are the cause of metal fatigue. It is the number of fatigue cycles and the stress level at which they have been accumulated which determines the endurance life of a propeller. Research has shown that the life expectancy of metal specimens, which have been fatigue-cycled to 50% of their endurance life, can be extended by the removal of a thin layer of surface metal. It is good practice then, periodically to remove the layer of fatigued surface metal and the accumulation of small cuts and scratches by reconditioning the entire blade.

In summary then, it may be said that the general policy behind safe blade repairs is to hold reductions from the original blade dimensions to a minimum, and to remove any "V" notch type of damage as promptly as possible by rounding-out, fairing, and polishing the area of damage. It is intended that the methods, techniques, and practices of FAA Advisory Circular 43.13-1A be followed, however minimum blade dimensions after repair shall be governed by the data in this manual.

DEFINITIONS; COMMON TYPES OF SERVICE DAMAGE TO ALUMINUM ALLOY PROPELLERS

CORROSION PITTING - Tiny deep cavities extending inward from the surface of the metal; may tunnel under the surface, re-appear at another location.

CRACK - Physical separation of adjacent portions of the metal, which may extend far below the surface of the blade. Usually initiated by a nick, scratch, or corrosion pits in an area of the blade subjected to continuous vibration.

CUT - Loss of metal over a relatively long and narrow area, sometimes extending to an appreciable depth, caused by a sharp-edged object striking the blade a glancing blow.

DENT - A depression in the blade surface produced by direct impact of a hard object.

EDGE ALIGNMENT - Blades out of edge alignment are bent about an axis nearly perpendicular to the chord so that a line through corresponding stations of the two blades no longer cuts the center of the hub bore.

EROSION - Loss of metal from the surface by mechanical action of small foreign objects such as grit or sand; usually found in the area of the leading edge and flat side of the blade.

FACE ALIGNMENT - Blades out of face alignment are bent about an axis nearly parallel to the chord so that the blades do not "track".

FRETTING - Breakdown or deterioration of a metal surface by a vibratory or chafing type of action.

GOUGE - Deep grooves in a blade caused by contact with a foreign object under heavy pressure.

INCLUSION - Scale or other foreign material embedded in the metal.

NICK - A sharp bottomed notch involving displacement of metal, usually found on the leading and trailing edges of a propeller blade.

SCORE - A tear or break in the metal surface intermediate in size and depth between a gouge and a scratch.

SCRATCH - A small and superficial cut in the metal surface. Usually found on the flat side of the propeller blade.

SURFACE CORROSION - Loss of metal from the surface by chemical or electro-chemical action. The corrosion products can easily be removed by sanding.

REPAIR INSTRUCTIONS

1. **CLEANING:** Before a damaged propeller can be properly examined to determine whether it is repairable, it should be cleaned and the paint removed. Cleaning may be accomplished with soap and water, or with a suitable mineral solvent and a soft bristle brush. The paint must be soaked free with a suitable commercial paint remover and removed with a soft bristle brush or a rag. It should not be scraped off with a steel tool nor brushed off with a wire brush.
2. **PRE-REPAIR INSPECTION:** The purpose of a pre-repair inspection is to avoid investment of labor, only to later discover unrepairable damage had been sustained by the propeller.

When a blade is bent, the bend must be measured by the method shown in Figure 1 of this manual, and compared to the appropriate graph of maximum allowable bend vs. blade radius. Beware of repairing bends which, by the shape of the bend, indicate that the blade may have been pre-straightened to bring it within allowable limits. See A.C. 20-7J (August, 1972).

The depth of a cut or gouge should be measured to determine whether repair is possible within the limits of the appropriate minimum blade dimensions.

A pre-repair examination must include a visual inspection with a magnifying glass of at least three-power for the presence of fatigue cracks. An indispensable aid to visual inspection is either an etching or dye-penetrant process.
3. **STRAIGHTENING A BENT BLADE:** If the bend is within allowable limits, this should be the first repair operation. Using a suitable bending tool or repair bench, the blade should be straightened in small increments proceeding from the portion of the bend nearest the hub, where the blade is thicker, outward along the blade until the fairing and appearance of the blade are reasonably good. At this point, the results can be judged by sighting along the blade. Blade contours should flow smoothly from the tip inward, without apparent waves or curvature reversal. The propeller should then be placed on a propeller checking stand, and its face alignment checked by comparing corresponding stations of the repaired blade with those of the undamaged blade.

It is not feasible, in this manual, to include complete face alignment data for each propeller. However, if both blades of a propeller have been bent, and if an undamaged propeller of the same model and pitch is not available for comparison, the correct elevation of the blade tip from the rear hub face is given with the repair specifications for each propeller model.
4. **BLADE ANGLES CORRECTION:** After the blades have been brought into face alignment, blade angles should be checked. Blade Angle Templates (available from the Sensenich factory) should be used as shown by Figure 4 as indicated by the appropriate repair specifications, which list the proper blade angles and tolerance for each specified pitch. The blades should be twisted to agree with these specifications. Note that bending a blade into face alignment and twisting to obtain the proper blade angles are not independent operations. After blade angles have been corrected, face alignment must be checked, and vice-versa until both are within tolerance.
5. **EDGE ALIGNMENT:** Inspection of edge alignment should not be attempted before face alignment and blade angles are correct. Edge alignment can then be measured on a propeller checking stand by setting height gauges to touch the leading edge of each blade at corresponding stations, then removing the propeller from the stand and rotating it 180 degrees before replacing it on the stand. It is never permissible to straighten a blade which has been bent out of edge alignment. If it is not possible to achieve proper 180 degree index of the blades by removal of metal from the leading edge of one blade and from the trailing edge of the opposite blade within allowable blade dimensions, the propeller must be removed from service.
6. **REPAIR OF BLADE DAMAGE:** Approved techniques for repair of damage to metal propeller blades are shown by Figures 2 and 3 of this manual.

Nicks or cuts into the leading or trailing edge of a blade may be individually repaired as shown by Figure 2, Illustration B. The repair should be accomplished by rounding out and fairing with a file to slightly deeper than the apparent depth of the damage, to ensure that the bottom of the injury is removed, and polishing with a fine abrasive cloth. The chordwise depth of the finished repair must not be greater than 3/16 inch (0.48 cm.) and the final chord must equal or exceed the minimum specified by this manual. The radius of curvature in the area of the repair must be 3/8 inch (0.95 cm.) minimum. The faired length of the repair should not exceed 1 1/2 inches (3.8 cm.). More than one of these repairs is permissible only if the repair areas do not overlap.

Dents or gouges in blade faces may be individually repaired as shown by Figure 2, Illustration A. This repair should be accomplished by rounding out and fairing with suitable abrasive paper or cloth to

a depth sufficient to ensure complete removal of the damaged metal and polishing with a fine abrasive cloth. The finished repair must not exceed 1/16 inch (0.16 cm.) in depth and curvature of the surface in the area of the repair must be 3/8 inch (0.95 cm.) radius minimum. The finished repair should not exceed 3/8 inch (0.95 cm.) chordwise by 1 inch (2.54 cm.) long. More than one of these repairs per blade is permissible only if the repair areas do not overlap a common blade radius.

Longitudinal cuts, as shown by Illustration C of Figure 2, may be repaired in the same manner as repair of a dent or gouge in a blade face.

A transverse (chordwise) crack in a blade face, or at the leading or trailing edge cannot be repaired. The presence of a crack indicates that blade failure is imminent. **The propeller must be immediately removed from service.**

WARNING: Repair of nicks, cuts, or cracks by peening over the adjacent edges is not permissible. This procedure will induce a tensile pre-stress at the bottom of the damage and will almost certainly initiate the development of a fatigue crack. Such a crack will usually progress rapidly and lead to an early fatigue failure.

The use of weld material to fill damaged areas is never permissible. This will result in substitution of low-strength cast material for the original high-strength forged aluminum.

- 7. PROPELLER RECONDITIONING:** It is recommended that the blades of a metal propeller should be reconditioned periodically. Flight-time intervals between reconditioning are recommended in note 5 of the repair specifications. More frequent reconditioning is advisable when minor repairs, and accumulated scratches and nicks, are numerous.

The reconditioning operation includes removal of the anodize coating from the entire surface of the propeller by 20% caustic soda etch, followed by 20% nitric acid rinse and inspection for cracks, and repair of all damage to the blade surface.

Metal removal during blade reconditioning should be at least 0.004 inch (0.01 cm.) per surface over the entire blade. In any case, whether chemical or mechanical, all traces of damage must be removed. Total removal of damage can only be assured by etching or dye-penetrant inspection.

When a propeller has been reworked to minimum chord, thickness, and diameter but does not clean up in the last inch of leading edge adjacent to the tip, it is permissible to round the tip as shown by Figure 3.

8. POST REPAIR INSPECTION: Repaired blades must be visually inspected, using a magnifying glass of at least three-power, to ensure that the bottom of the notch has been removed. If an incipient crack is suspected at the root of the notch, a local etch or dye-penetrant method of inspection should be employed.

- 9. BALANCE:** The maximum allowable Moment of Unbalance for each propeller is shown by the repair specifications. This is the maximum static unbalance which is allowed when the propeller is placed on a leveled propeller balancing stand with hardened and ground cylindrical rails, using a hardened and ground steel mandrel of diameter equal to the diameter of a standard mounting flange pilot stub inserted through the propeller pilot bore. The room in which propeller balance is inspected should be free from air currents. With this type of equipment, a balanced propeller will remain in any position with no tendency to rotate.

Horizontal balance may be corrected by removal of small amounts of metal from the heavy blade at locations where chord and thickness exceed the dimensions of the light blade. Vertical balance may be corrected by removal of metal from the heavy side of the hub.

- 10. REFINISHING:** Repaired propellers should be prepared for painting by chromic-acid anodizing (MIL-A-8625B) or ALODINE chemical conversion coating (MIL-C-5541). U.S. PAINT CO. ALUMI-GRIP or equivalent products may be used in accordance with the manufacturer's instructions.

The following color pattern is recommended: The rear (Thrust) face of each propeller blade should be finished dull black to reduce glare into the cockpit, from about 5 inches (13 cm.) radius to the tip. The remainder of the propeller should be painted gray, except for two 2-inch wide tip-strips added on the camber (front) face of each blade.

A decal showing propeller model, Type Certificate Number, and attaching bolt wrench torque should be applied near the trailing edge on the front face with the inner edge at 6 1/4 inches (16 cm) blade radius.

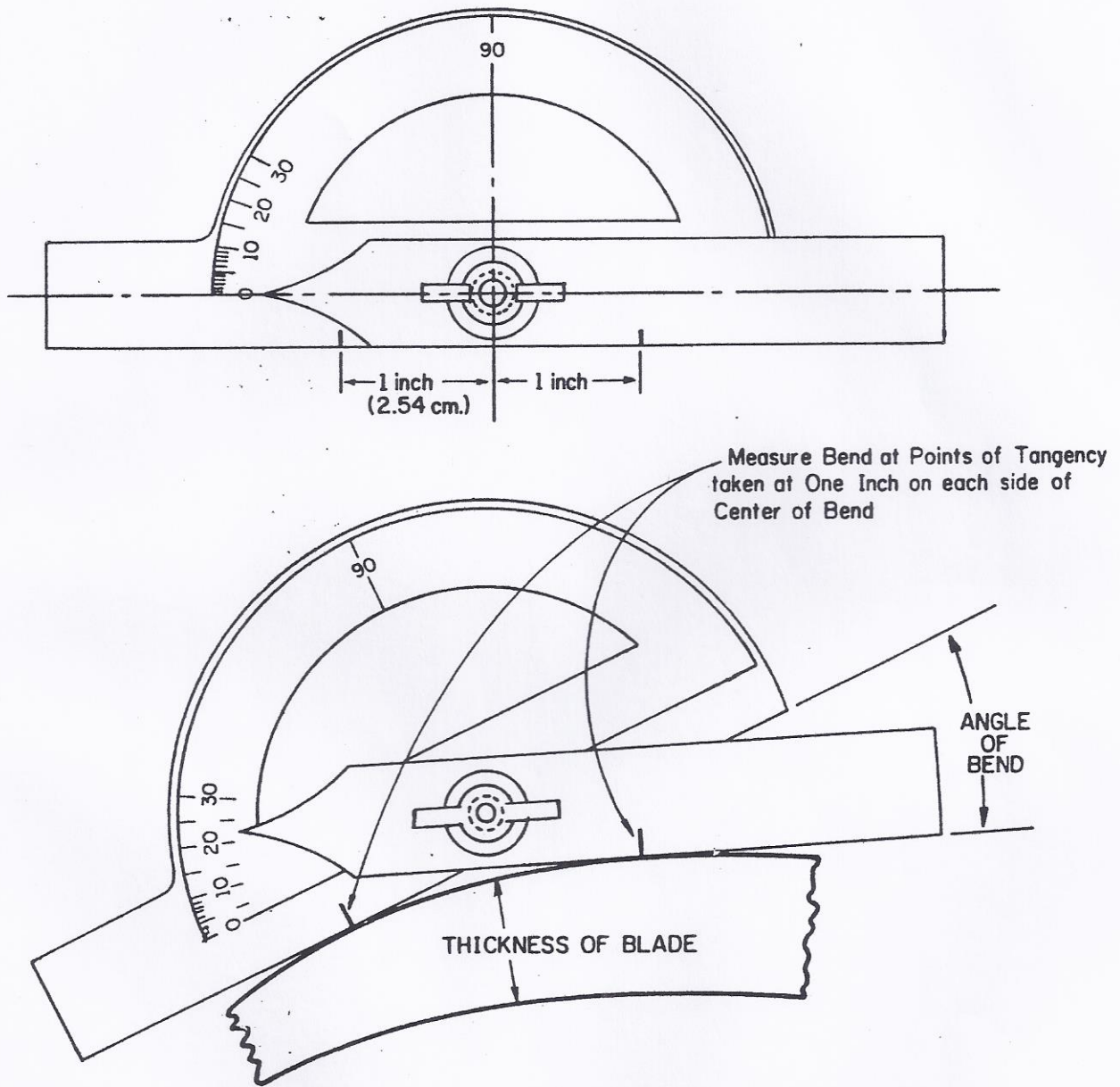
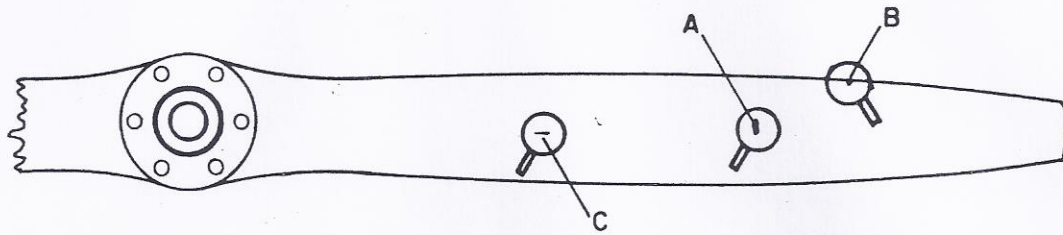


FIGURE 1
MEASUREMENT OF BEND (DEGREES PER 2 INCHES BLADE LENGTH)

Adapted from Fig. 12.6, A.C. 43.13-1A



BEFORE REPAIR

AFTER REPAIR

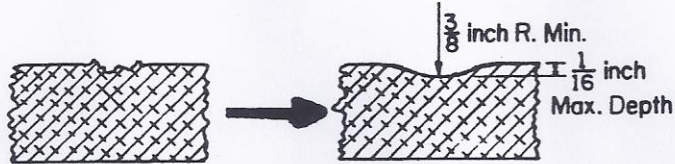


Illustration A
Dent or Gouge in a Blade Face

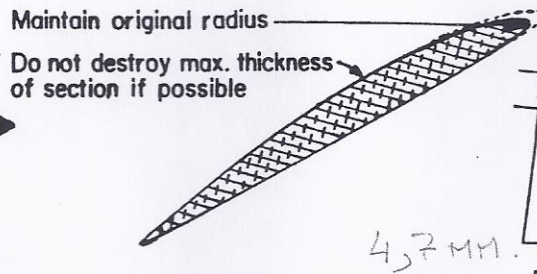
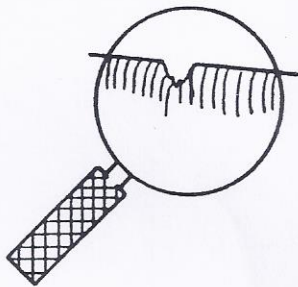
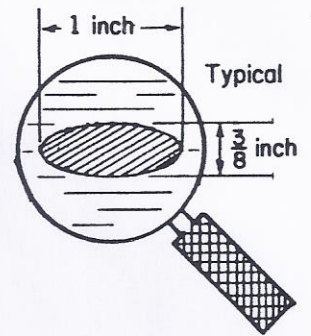


Illustration B
Nick or Cut into Blade Leading Edge

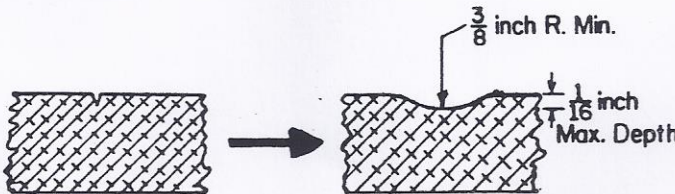
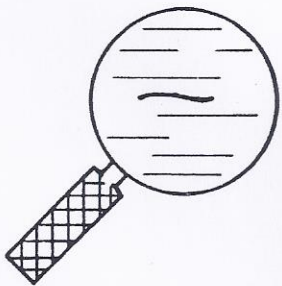
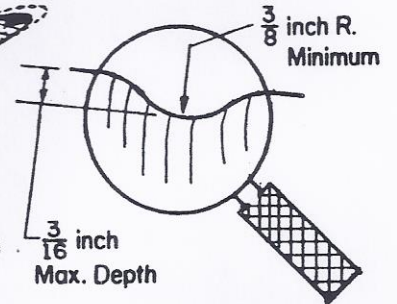
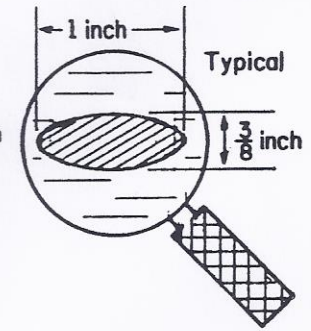


Illustration C
Longitudinal Cut into Blade Face



Note: 1 inch = 2.54 cm.

FIGURE 2
APPROVED TECHNIQUES FOR REPAIR OF BLADE DAMAGE

Adapted from Fig. 12.2, 12.3, A.C. 43.13-1A

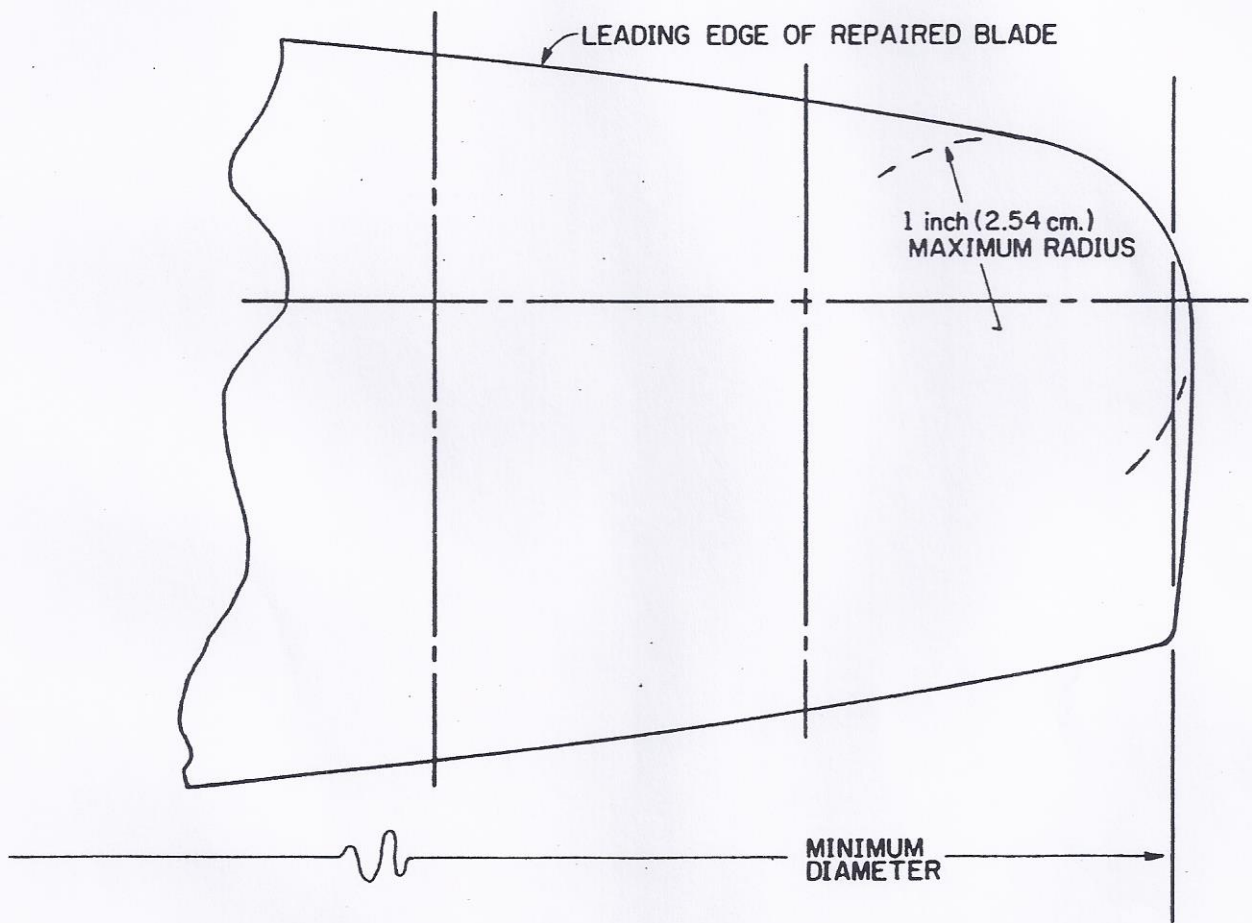


FIGURE 3
ALLOWABLE TIP MODIFICATION
PROPELLER AT MINIMUM CHORD, THICKNESS, AND DIAMETER
(Does not apply to Sensenich 74C, 76A series propellers)

Sensenich Metal Propellers, BLADE ANGLE TEMPLATES

When repairing fixed-pitch metal propellers, the blade angles must be checked to assure conformance to the specifications given by this manual. The purpose of bringing blade angles into conformity is to balance the thrust forces produced by the two blades. Aerodynamic balance of a propeller is just as important to smoothness of operation as is propeller mass balance.

Those propeller models which incorporate the Rose airfoil, with a convex surface on the thrust

face, require the use of BLADE ANGLE TEMPLATES to accurately measure blade angles. These templates (available from the factory) are used as shown by Figure 4.

Propeller performance will be altered if the thrust face of a modern propeller is ground flat to facilitate angle measurement. Repairs should be made to conform as nearly as possible to the original airfoil shape.

BLADE ANGLE TEMPLATES sets are available for the following propellers:

69C Series..... See page 10

72C Series..... See page 14

74DM
74DR Series..... See page 22

74DM
74DC Series..... See page 26

76E Series..... See page 34

Note: Model series 74C, and 76A do not require use of blade angle templates.

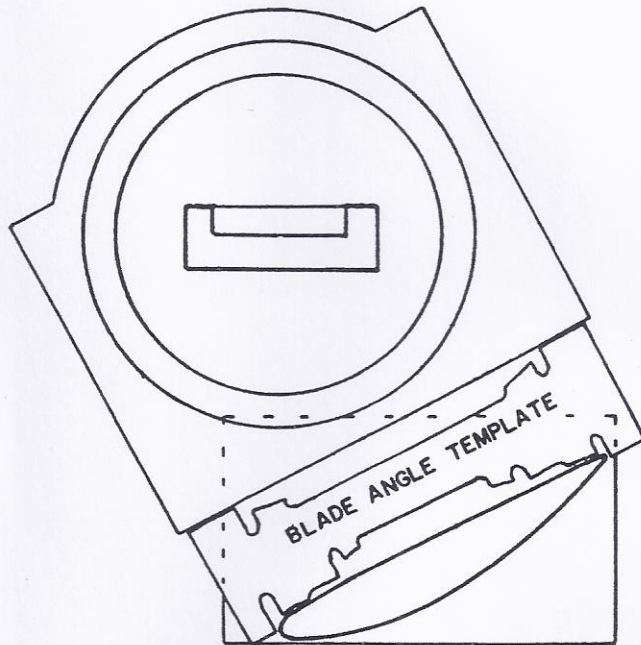


FIGURE 4

SENSENICH
72C KSG-0-54

0235

F-GERO
F-GTZU
F-GUXI

**REPAIR SPECIFICATIONS
72C SERIES PROPELLERS**

Weight
24.8 Pounds (11.2 Kilograms)

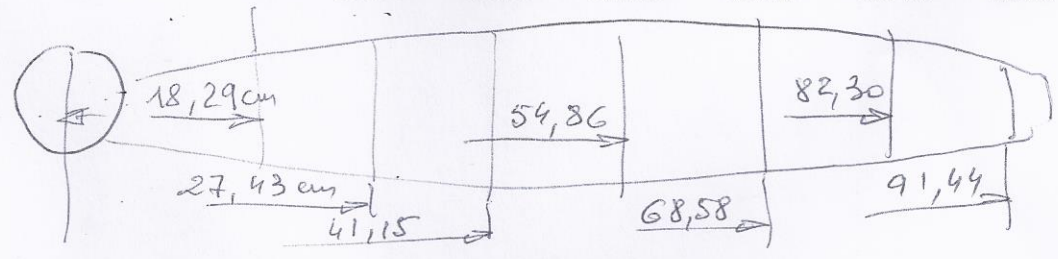
Maximum Out-of-Balance Moment
0.050 Pound-Inches (57 Gram-Centimeters)

72CK attaching kit adds approximately 0.75 pounds to installed weight.
KS8 spacer and 72CKS8 attaching kit adds approximately 4.3 pounds to installed weight.
KS12 spacer and 72CKS12 attaching kit adds approximately 5.9 pounds to installed weight.

| | | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ |
|---------------------|----------|-------|-------|-------|-------|-------|-------|-------|
| BLADE RADIUS | (inches) | 7.20 | 10.80 | 16.20 | 21.60 | 27.00 | 32.40 | 36.00 |
| | (cm.) | 18.29 | 27.43 | 41.15 | 54.86 | 68.58 | 82.30 | 91.44 |

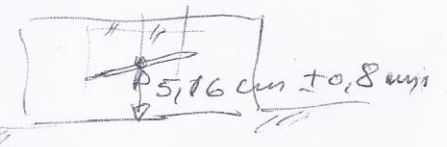
| MINIMUM BLADE DIMENSIONS | | | | | | | | |
|---------------------------------|----------|-------|-------|-------|-------|-------|-------|-------|
| Chord | (inches) | 4.60 | 4.83 | 4.93 | 4.72 | 4.18 | 3.18 | 2.11 |
| | (cm.) | 11.68 | 12.27 | 12.52 | 11.99 | 10.62 | 8.08 | 5.36 |
| Thickness | (inches) | 1.359 | 0.969 | 0.677 | 0.502 | 0.368 | 0.243 | 0.145 |
| | (cm.) | 3.452 | 2.462 | 1.720 | 1.275 | 0.935 | 0.617 | 0.368 |

| PITCH (Inches) | BLADE ANGLES (Degrees) | | | | | | |
|-----------------------|-------------------------------|-------|-------|-------|-------|-------|--|
| 48 | 31.55 | 24.35 | 19.60 | 15.80 | 12.95 | 11.50 | |
| 49 | 31.55 | 24.65 | 19.90 | 16.10 | 13.25 | 11.80 | |
| 50 | 31.55 | 24.95 | 20.20 | 16.40 | 13.55 | 12.10 | |
| 51 | 31.55 | 25.30 | 20.55 | 16.75 | 13.90 | 12.45 | |
| 52 | 31.55 | 25.60 | 20.85 | 17.05 | 14.20 | 12.75 | |
| 53 | 31.55 | 25.90 | 21.15 | 17.35 | 14.50 | 13.05 | |
| XI → 54 | 31.55 | 26.25 | 21.50 | 17.70 | 14.85 | 13.40 | |
| 55 | 31.55 | 26.50 | 21.75 | 17.95 | 15.10 | 13.65 | |
| 56 | 31.55 | 26.80 | 22.05 | 18.25 | 15.40 | 13.95 | |



NOTES:

- (1) Minimum thickness repair dimensions should be approached uniformly over the entire blade length.
- (2) Blade Angles tolerance is ± 0.1 degree. This will permit 0.2 degree maximum variation between blades. Templates are required for blade angle measurement. See page 9.
- (3) Tip elevation, measured from the plane of the rear hub face to the blade tip at the center of the chord, shall be 2.03 (± 0.031) inches equals 5.16 (± 0.08) centimeters.
- (4) Blades shall track each other within 0.063 inch (0.16 cm.), measured at corresponding blade stations from 7.20 inches radius (18.29 cm. radius) to tip.
- (5) Recommended time between reconditioning: 1000 hours.



MINIMUM BLADE DIMENSIONS 72C SERIES PROPELLERS

6.00 INCHES

14.00 CM

5.00

12.00

4.00

10.00

3.00

8.00

CHORD

2.00

6.00

4.00

4.00

1.00

2.00

MINIMUM CHORD

MINIMUM THICKNESS

1.60 INCHES

1.40

- 3.5 CM

1.20

- 3.0

1.00

- 2.5

0.8

- 2.0

0.6

- 1.5

0.40

- 1.0

0.20

- 0.5

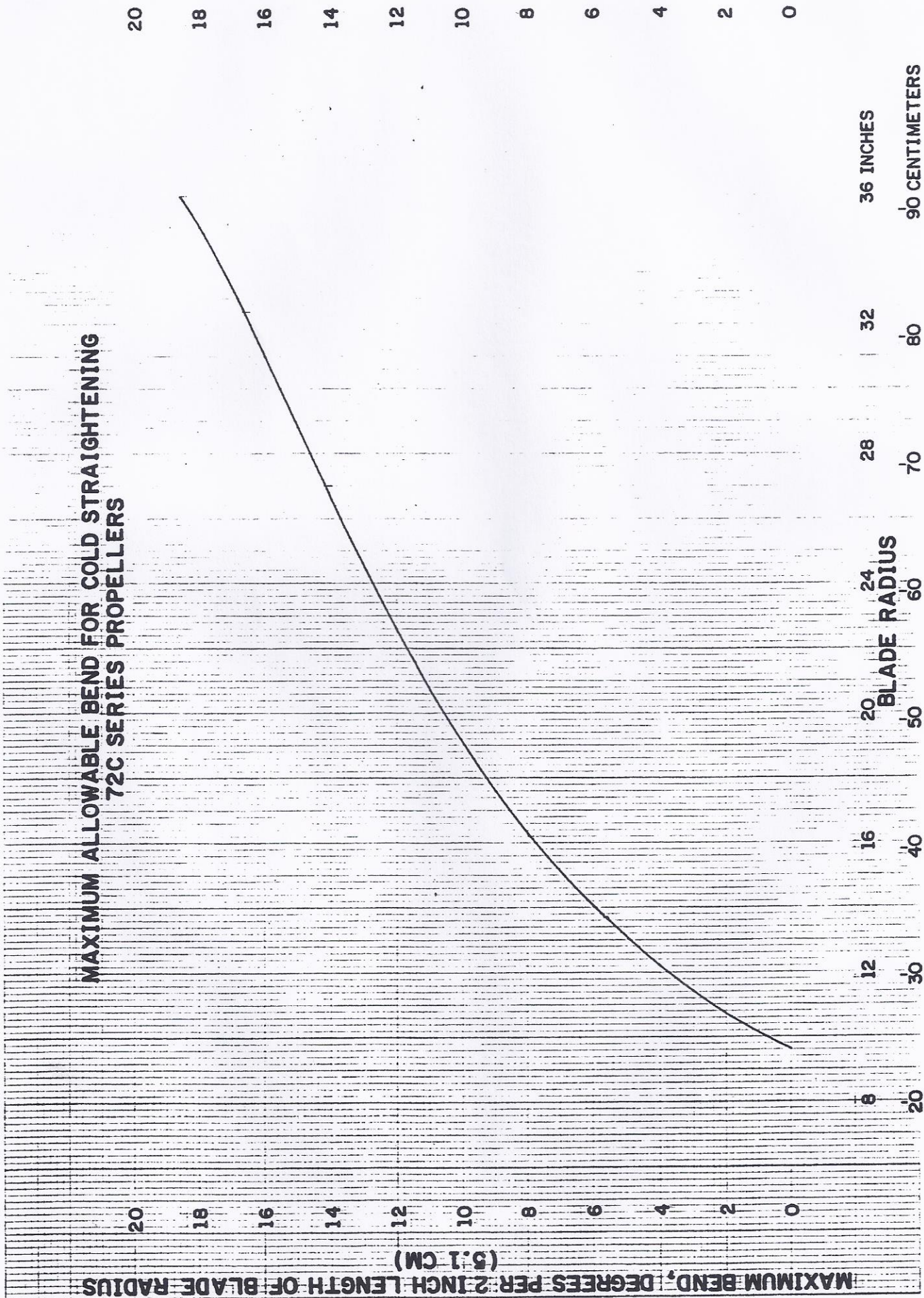
THICKNESS

20 24 28 32 36 INCHES

70 80 90 CENTIMETERS

Circle

**MAXIMUM ALLOWABLE BEND FOR COLD STRAIGHTENING
72C SERIES PROPELLERS**



74DM655-2-66

Helice n° 1
F-6DKL

FORM 350

Rayon $\frac{74'' - 37''}{2} = 18.5''$

**REPAIR SPECIFICATIONS
* 74D SERIES PROPELLERS**

*NOTE: These specifications apply to 74DM and 74DR Series propellers, serial numbers without a letter prefix, and serial numbers with "A" prefix lower than A31177.

Weight 29.5 Pounds (13.4 Kilograms) **Maximum Out-of-Balance Moment** 0.059 Pound-Inches (68 Gram-Centimeters)

74DM6 attaching kit adds approximately 0.9 pounds to installed weight.

Installed weight of 74DR propeller is approximately 30.7 pounds.

| | | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|--------------------------|----------|-------|-------|------------------------|-------|-------|-------|-------|
| BLADE RADIUS | (inches) | 7.40 | 11.10 | 16.65 | 22.20 | 27.75 | 33.30 | 37.00 |
| | (cm.) | 18.80 | 28.19 | 42.29 | 56.39 | 70.49 | 84.58 | 93.98 |
| MINIMUM BLADE DIMENSIONS | | | | | | | | |
| Chord | (inches) | 5.16 | 5.33 | 5.32 | 4.96 | 4.25 | 3.21 | 2.36 |
| | (cm.) | 13.11 | 13.54 | 13.51 | 12.60 | 10.80 | 8.15 | 5.99 |
| Thickness | (inches) | 1.28 | 0.99 | 0.74 | 0.56 | 0.40 | 0.26 | 0.18 |
| | (cm.) | 3.25 | 2.51 | 1.88 | 1.42 | 1.02 | 0.66 | 0.46 |
| PITCH (inches) | | | | BLADE ANGLES (Degrees) | | | | |
| | 50 | 33.55 | 25.30 | 20.10 | 16.05 | 13.10 | 11.60 | |
| | 52 | 33.55 | 25.90 | 20.70 | 16.65 | 13.70 | 12.20 | |
| | 54 | 33.55 | 26.50 | 21.30 | 17.25 | 14.30 | 12.80 | |
| | 56 | 33.55 | 27.10 | 21.90 | 17.85 | 14.90 | 13.40 | |
| | 58 | 33.55 | 27.70 | 22.50 | 18.45 | 15.50 | 14.00 | |
| | 59 | 33.55 | 28.00 | 22.80 | 18.75 | 15.80 | 14.30 | |
| | 60 | 33.55 | 28.30 | 23.10 | 19.05 | 16.10 | 14.60 | |
| | 62 | 33.55 | 28.90 | 23.70 | 19.65 | 16.70 | 15.20 | |
| | 64 | 33.55 | 29.50 | 24.30 | 20.25 | 17.30 | 15.80 | |
| | 66 | 33.55 | 30.10 | 24.90 | 20.85 | 17.90 | 16.40 | |

NOTES:

- (1) Minimum thickness repair dimensions should be approached uniformly over the entire blade length.
- (2) Blade Angles tolerance is ±0.1 degree. This will permit 0.2 degree maximum variation between blades. Templates are required for blade angle measurement. See page 9.
- (3) Tip elevation, measured from the plane of the rear hub face to the blade tip at the center of the chord, shall be 2.17 (±0.031) inches equals 5.51 (±0.08) centimeters.
- (4) Blades shall track each other within 0.063 inch (0.16 cm.), measured at corresponding blade stations from 7.40 inches radius (18.80 cm. radius) to tip.
- (5) Recommended time between reconditioning: 1000 hours.

MINIMUM BLADE DIMENSIONS *74D SERIES PROPELLERS

*74DM and 74DR Series, serial numbers lower than A31177
Serial numbers without a letter prefix.

6.00 INCHES

14.00 CM.

MINIMUM CHORD

5.00

12.00-

4.00

10.00-

3.00

8.00-

CHORD

2.00

6.00-

1.00

4.00-

2.00-

MINIMUM THICKNESS

1.60 INCHES

1.40

1.20

1.00

0.8

0.6

0.40

0.20

THICKNESS

-3.5 CM.

-3.0

-2.5

-2.0

-1.5

-1.0

-0.5

8

12

16

20

24

28

32

36

37 INCHES

20

30

40

50

60

70

80

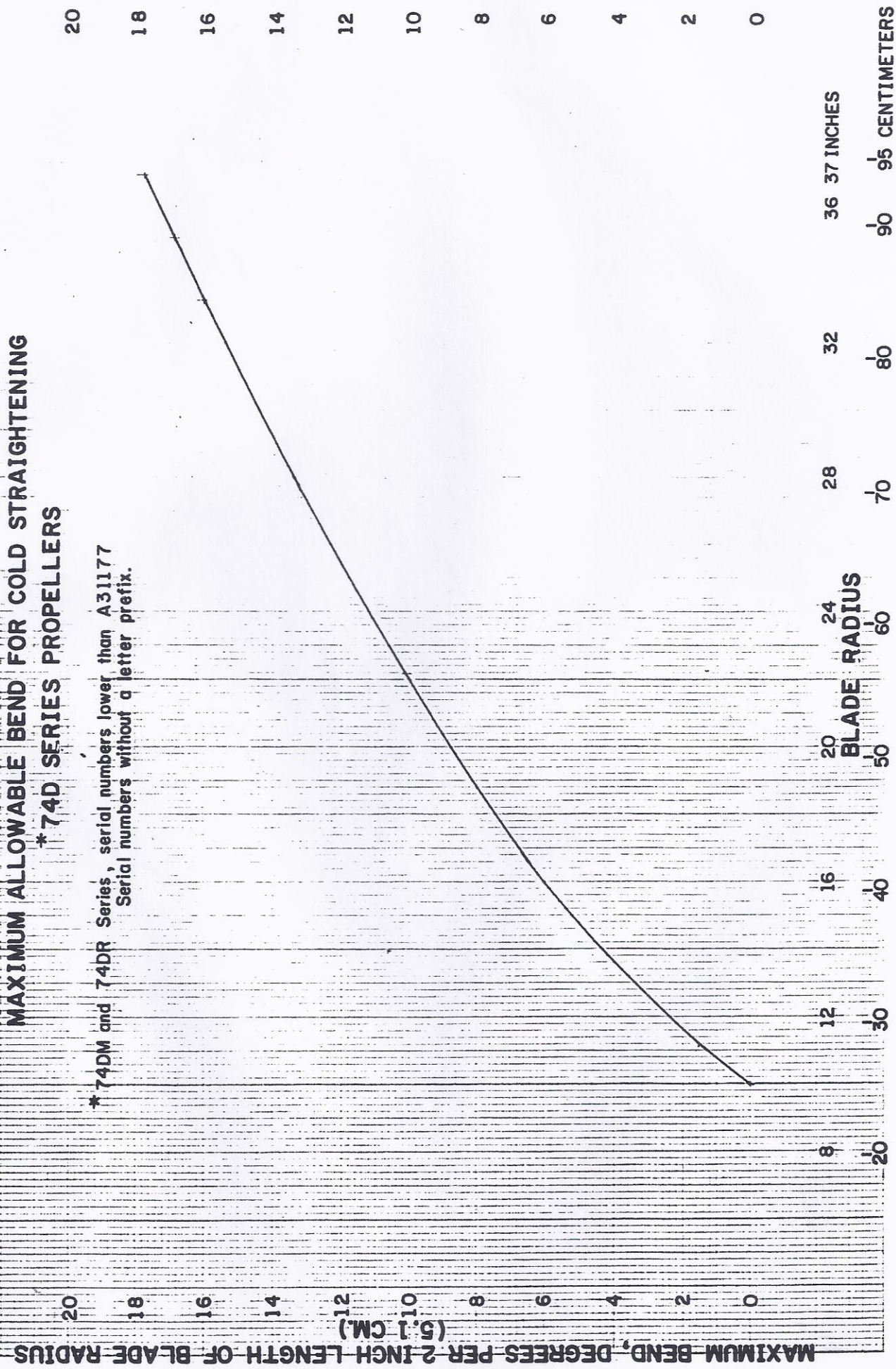
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95 CENTIMETERS

BLADE RADIUS

**MAXIMUM ALLOWABLE BEND FOR COLD STRAIGHTENING
*74D SERIES PROPELLERS**

* 74DM and 74DR Series, serial numbers lower than A31177
Serial numbers without a letter prefix.



REPAIR SPECIFICATIONS * 74D SERIES PROPELLERS

*NOTE: These specifications apply to 74DC propellers and 74DM Series propellers, serial number A31177 and higher, and serial numbers with "K", "B", or "BK" prefix.

| | |
|------------------------------|--|
| Weight | Maximum Out-of-Balance Moment |
| 32.2 Pounds (14.7 Kilograms) | 0.061 Pound-Inches (71 Gram-Centimeters) |

74DM6 attaching kit adds approximately 0.9 pounds to installed weight.

M6S5 spacer and 74DM6S5 attaching kit adds approximately 4.0 pounds to installed weight.

M6S8 spacer and 74DM6S8 attaching kit adds approximately 5.3 pounds to installed weight.

Installed weight of 74DC propeller is approximately 33.3 pounds.

| | | | | | | | | |
|---------------------|--|---------------|-------|-------|-------|-------|-------|-------|
| BLADE RADIUS | | (inches) 7.40 | 11.10 | 16.65 | 22.20 | 27.75 | 33.30 | 37.00 |
| | | (cm.) 18.80 | 28.19 | 42.29 | 56.39 | 70.49 | 84.58 | 93.98 |

MINIMUM BLADE DIMENSIONS

| | | | | | | | | |
|------------------|--|---------------|-------|-------|-------|-------|-------|-------|
| Chord | | (inches) 5.02 | 5.27 | 5.38 | 5.16 | 4.56 | 3.48 | 2.31 |
| | | (cm.) 12.75 | 13.39 | 13.67 | 13.11 | 11.59 | 8.84 | 5.87 |
| Thickness | | (inches) 1.49 | 1.07 | 0.75 | 0.55 | 0.40 | 0.26 | 0.16 |
| | | (cm.) 3.785 | 2.718 | 1.905 | 1.397 | 1.016 | 0.661 | 0.406 |

PITCH (Inches)

BLADE ANGLES (Degrees)

| | | | | | | |
|----|-------|-------|-------|-------|-------|-------|
| 50 | 33.50 | 25.10 | 20.10 | 16.00 | 13.00 | 11.45 |
| 52 | 33.50 | 25.70 | 20.70 | 16.60 | 13.60 | 12.05 |
| 54 | 33.50 | 26.30 | 21.30 | 17.20 | 14.20 | 12.65 |
| 56 | 33.50 | 26.90 | 21.90 | 17.80 | 14.80 | 13.25 |
| 58 | 33.50 | 27.50 | 22.50 | 18.40 | 15.40 | 13.85 |
| 60 | 33.50 | 28.10 | 23.10 | 19.00 | 16.00 | 14.45 |
| 62 | 33.50 | 28.70 | 23.70 | 19.60 | 16.60 | 15.05 |
| 64 | 33.50 | 29.30 | 24.30 | 20.20 | 17.20 | 15.65 |
| 66 | 33.50 | 29.90 | 24.90 | 20.80 | 17.80 | 16.25 |

NOTES:

- (1) Minimum thickness repair dimensions should be approached uniformly over the entire blade length.
- (2) Blade Angles tolerance is ± 0.1 degree. This will permit 0.2 degrees maximum variation between blades. Templates are required for blade angle measurement. See page 9.
- (3) Tip elevation, measured from the plane of the rear hub face to the blade tip at the center of the chord, shall be 2.22 (± 0.031) inches equals 5.64 (± 0.08) centimeters.
- (4) Blades shall track each other within 0.063 inch (0.16 cm.), measured at corresponding blade stations from 7.40 inches radius (18.80 cm. radius) to tip.
- (5) Recommended time between reconditioning: 1000 hours.

MINIMUM BLADE DIMENSIONS *74D SERIES PROPELLERS

*74DC and 74DM Series, serial number A31177 and higher,
Serial numbers with "K", "B", or "BK" prefix.

6.00 INCHES

14.00 CM

MINIMUM CHORD

5.00

12.00

4.00

10.00

8.00

26

CHORD

27

MINIMUM THICKNESS

2.00

4.00

1.00

2.00

THICKNESS

1.60 INCHES

1.40 - 3.5CM

1.20 - 3.0

1.00 - 2.5

0.8 - 2.0

0.6 - 1.5

0.40 - 1.0

0.20 - 0.5

36 37 INCHES

32

28

24

20

16

12

8

BLADE RADIUS

60

50

40

30

20

90

80

70

60

50

40

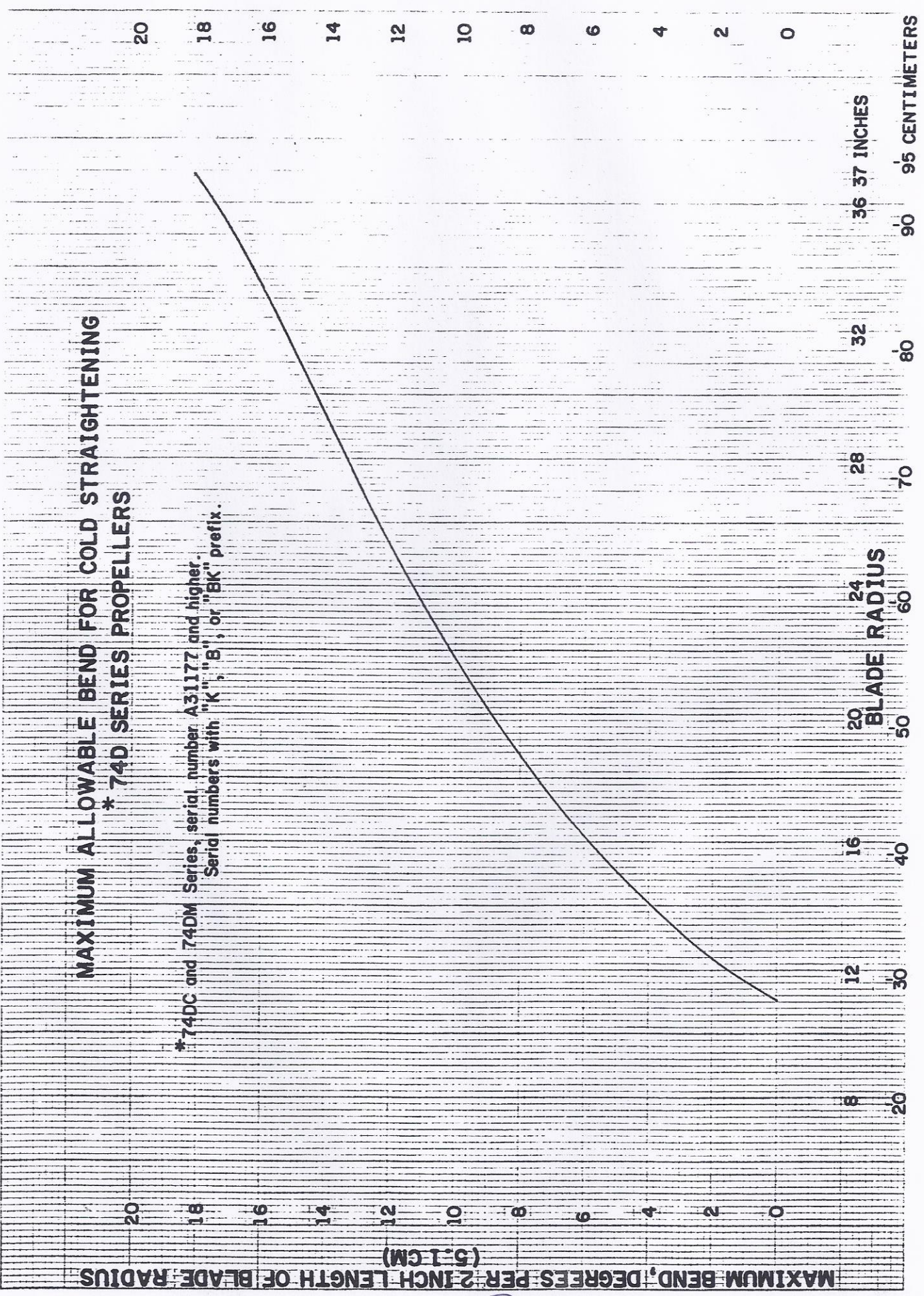
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20

95 CENTIMETERS

**MAXIMUM ALLOWABLE BEND FOR COLD STRAIGHTENING
* 74D SERIES PROPELLERS**

*74DC and 74DM Series, serial number A31177 and higher.
Serial numbers with "K", "B", or "BK" prefix.



entire
76EM855-0-64

0360

**REPAIR SPECIFICATIONS
 76E SERIES PROPELLERS**

BVMC

Weight
 34.5 Pounds (15.6 Kilograms)

Maximum Out-of-Balance Moment
 0.069 Pound-Inches (79 Gram-Centimeters)

76EM8 attaching kit adds approximately 1.75 pounds to installed weight.
 M855 spacer and 76EM855 attaching kit adds approximately 5.2 pounds to installed weight.

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|--------------|----------|-------|-------|-------|-------|-------|-------|-------|
| BLADE RADIUS | (inches) | 7.60 | 11.40 | 17.10 | 22.80 | 28.50 | 34.20 | 38.00 |
| | (cm.) | 19.30 | 28.96 | 43.43 | 57.91 | 72.39 | 86.87 | 96.52 |

MINIMUM BLADE DIMENSIONS

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-----------|----------|-------|-------|-------|-------|-------|-------|-------|
| Chord | (inches) | 5.27 | 5.54 | 5.64 | 5.41 | 4.79 | 3.65 | 2.43 |
| | (cm.) | 13.39 | 14.07 | 14.33 | 13.74 | 12.17 | 9.27 | 6.17 |
| Thickness | (inches) | 1.542 | 1.100 | 0.770 | 0.572 | 0.420 | 0.278 | 0.168 |
| | (cm.) | 3.917 | 2.794 | 1.956 | 1.453 | 1.067 | 0.706 | 0.427 |

PITCH (inches)

BLADE ANGLES (Degrees)

| | | | | | | |
|----|-------|-------|-------|-------|-------|-------|
| 54 | 33.60 | 26.00 | 20.75 | 16.80 | 13.95 | 12.45 |
| 56 | 33.60 | 26.55 | 21.30 | 17.35 | 14.50 | 13.00 |
| 58 | 33.60 | 27.15 | 21.90 | 17.95 | 15.10 | 13.60 |
| 60 | 33.60 | 27.70 | 22.45 | 18.50 | 15.65 | 14.15 |
| 61 | 33.60 | 28.00 | 22.75 | 18.80 | 15.95 | 14.45 |
| 62 | 33.60 | 28.30 | 23.05 | 19.10 | 16.25 | 14.75 |
| 63 | 33.60 | 28.60 | 23.35 | 19.40 | 16.55 | 15.05 |
| 64 | 33.60 | 28.85 | 23.60 | 19.65 | 16.80 | 15.30 |
| 65 | 33.60 | 29.15 | 23.90 | 19.95 | 17.10 | 15.60 |
| 66 | 33.60 | 29.45 | 24.20 | 20.25 | 17.40 | 15.90 |

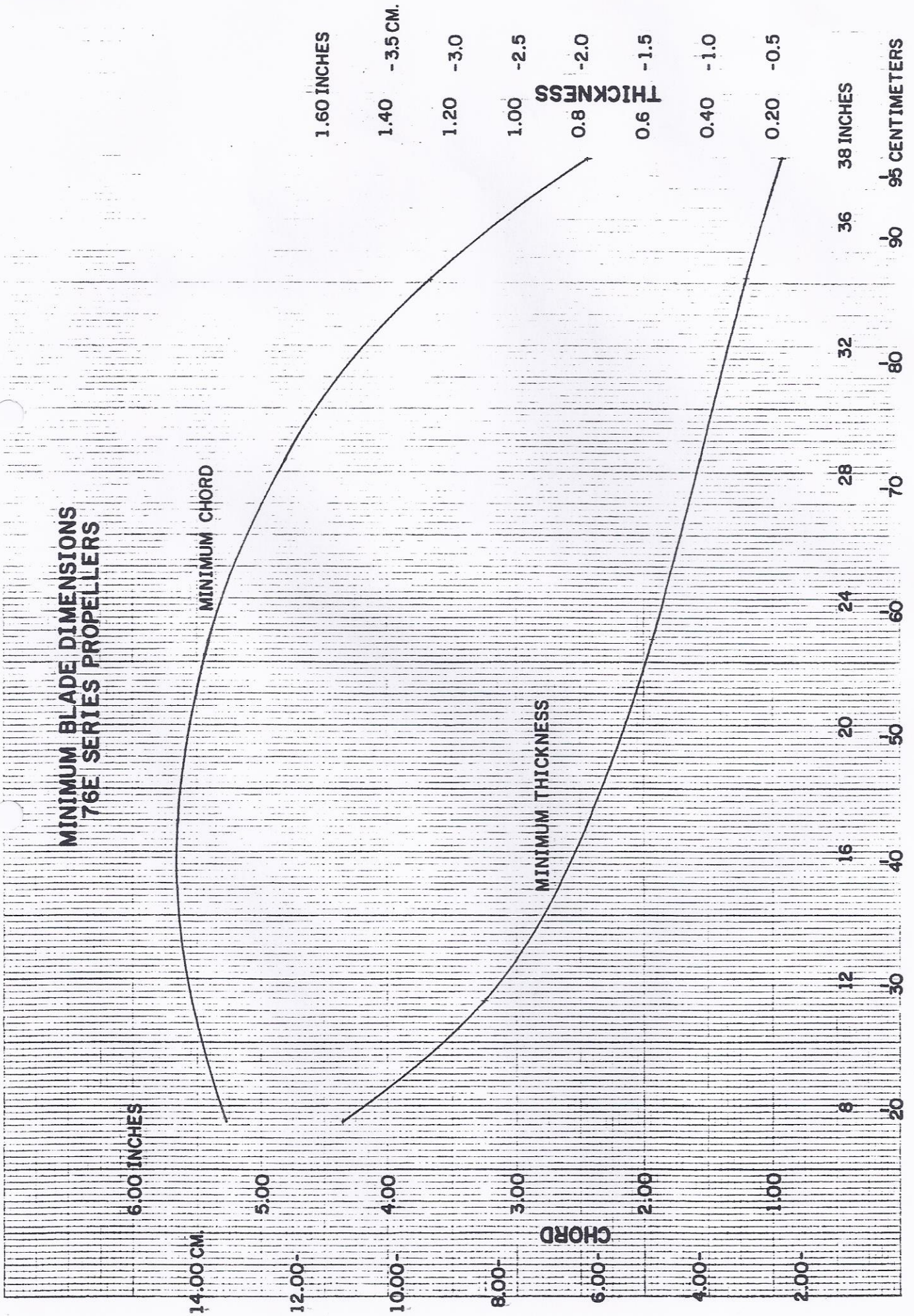
BVMC

*pass max
 Tolere*

NOTES:

- (1) Minimum thickness repair dimensions should be approached uniformly over the entire blade length.
- (2) Blade Angles tolerance is ± 0.1 degree. This will permit 0.2 degree maximum variation between blades. Templates are required for blade angle measurement. See page 9.
- (3) Tip elevation, measured from the plane of the rear hub face to the blade tip at the center of the chord, shall be 2.30 (± 0.031) inches equals 5.84 (± 0.08) centimeters.
- (4) Blades shall track each other within 0.063 inch (0.16 cm.), measured at corresponding blade stations from 7.60 inches radius (19.30 cm. radius) to tip.
- (5) Recommended time between reconditioning: 1000 hours. It is recommended that early 76E Series propellers (without "K" suffix serial number) be modernized when blades are reconditioned. See page 37.

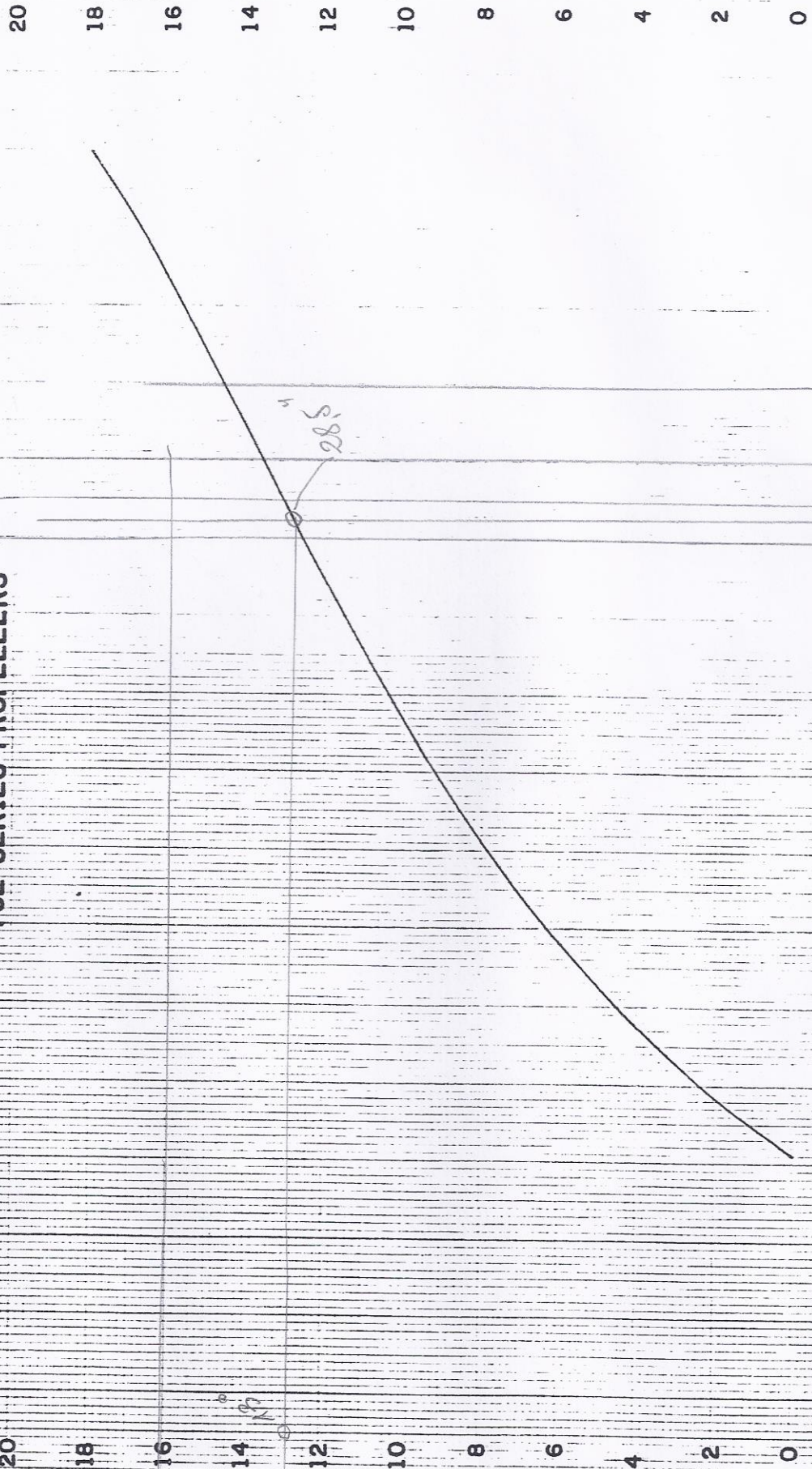
**MINIMUM BLADE DIMENSIONS
76E SERIES PROPELLERS**



MAXIMUM BEND, DEGREES PER 2 INCH LENGTH OF BLADE RADIUS

(5.1 CM)

MAXIMUM ALLOWABLE BEND FOR COLD STRAIGHTENING
76E SERIES PROPELLERS



Les maxi pour 2" de longueur de rayon de pale

**PROPELLER REPAIR FACILITIES AUTHORIZED TO MODIFY
76E SERIES IN CONFORMANCE TO "K" REVISION**

SENENICH PROPELLER CO.
P.O. BOX 5100, East Airport Road
Lancaster,
Pennsylvania, U.S.A.

HAWKER DEHAVILLAND PTY. LTD.
P.O. Box 78
Lidcomb, N.S.W.
Australia 2141

PROPELLERWERK HOFFMANN
Hoffmann GmbH & Co. KG
Postfach 265
Kupferlingstrabe 9
D-8200 Rosenheim 2
West Germany

AIRWORTHINESS DIRECTIVES SENENICH CORPORATION

54-05-02 SENSENICH: Applies to All Model M76AM-2 Propellers Installed on Lycoming Models O-290-D and O-290-D2 Engines.

Compliance required by March 15, 1954, and at intervals not to exceed each 25 hours operation thereafter.

To eliminate the possibility of blade tip failures on Model M76AM-2 propellers installed on the above Lycoming engines, all nicks, gouges and scratches within 8 inches of the blade tip should be removed. Care should be taken to be sure all trace of the damage is removed. Minor damaged areas may be removed by using coarse emery cloth. The repaired area should then be polished with fine emery cloth. Rebalancing is not necessary when repairing minor damage areas as defined in Civil Aeronautics Manual 18 (18.30-15)

(Sensenich Service Bulletin No. R-2 covers this same subject)

60-11-08 SENSENICH: Amdt. 166 Part 507 Federal Register May 28, 1960. Applies to M74DM Propellers Installed on Lycoming O-320-B Series Engines Except Propellers With An "A" or "K" prefix to the Serial Number.

Compliance required within the next 100 hours of flight time or by August 1, 1960, whichever comes first, and at each periodic inspection thereafter.

As a result of three incidents of cracked hubs, the following shall be accomplished:

(a) Remove the propeller and visually inspect for cracks originating in the pilot bore. In case of doubt, any of the approved methods for aluminum alloy inspections should be used. If cracks are found, the propeller shall be retired immediately from service.

(b) If no cracks are found, polish out any scratches in the bore and break and polish any sharp edges at the front and rear chamfer of the pilot bore.

(c) When the propeller is reinstalled, torque retaining bolts to 300 inch-pounds.

(Sensenich Service Bulletin No. R-8-1 covers the same subject)

Revised November 14, 1961.

66-23-02 SENSENICH: Amdt. 39-289 Part 39 Federal Register September 22, 1966. Applies to All Fixed-Pitch Metal Propeller Models with Water-Soluble Mid-Blade Decals.

Compliance required within the next 20 hours' time in service after the effective date of this AD, unless already accomplished.

To prevent further mid-blade propeller failures resulting from corrosion pits that initiate fatigue cracks under the water-soluble mid-blade decal, accomplish the following:

(a) Soak water-soluble mid-blade decals (Sensenich

Propeller Bulletin No. R-12 describes decals) with paint remover and rub off with a rag. (Scraping or sanding of decals may inadvertently obscure evidence of possible corrosion.)

(b) Apply dye penetrant to the mid-blade area and inspect for corrosion and cracks with a glass of at least three power.

(c) Remove corrosive pits 0.015 inch deep or less by sanding with a 220 grit wet or dry abrasive paper and polishing with a paper of 320 grit or finer.

(d) Clean area thoroughly and reinspect in accordance with (b) to insure that the removal of all corrosive pits has been accomplished. Clean and spray repaired area with a clear lacquer.

(e) Replace before further flight any propeller having corrosive pits 0.015 inch deep or greater or having cracks with a propeller of the same model number that has been inspected and repaired as necessary in accordance with this AD.

(Sensenich Propeller Bulletins Nos. R-11, dated March 1, 1966; R-12 dated February 6, 1967, pertain to this subject.)

This supersedes AD 66-11-03.

This directive becomes effective October 1, 1966.

Revised May 16, 1967.

69-09-03 SENSENICH: Amdt. 39-761 as amended by Amdt. 39-808 is further amended by Amdt. 39-1102. Applies to Sensenich type M76EMM, M76EMMS, 76EM8, and 76EM8S5 model Propellers installed on Lycoming O-360 type engines, except the O-360-A4A, and O-360-A4G solid crankshaft engines.

Compliance required as indicated.

(a) To prevent propeller blade tip failures avoid continuous operation between 2150 and 2350 rpm.

(b) Mark engine tachometer with a red arc from 2150 to 2350 rpm within the next 25 hours time in service after the effective date of this AD.

(c) Propellers with 500 or more total hours in service, inspect, rework or replace in accordance with paragraph (f) within the next 50 hours time in service after the effective date of this AD.

(d) Propellers with less than 500 total hours in service, inspect, rework or replace in accordance with paragraph (f) prior to the accumulation of 550 hours time in service.

(e) Propellers whose prior service history is unknown, inspect, rework or replace in accordance with paragraph (f) within the next 50 hours time in service after the effective date of this AD.

(f) Remove propeller and return to manufacturer for inspection and reconditioning in accordance with "Recommended Action" in Sensenich Service Bulletin No. R-14 dated March 23, 1970, or an equivalent method approved by

the Chief, Engineering and Manufacturing Branch, FAA, Eastern Region.

(g) Propellers which have been inspected, reworked or replaced in accordance with this AD and found satisfactory will be identified with a suffix letter "K" after the serial number. New production propellers which are in accordance with this AD and considered satisfactory include change "K" or subsequent changes.

(h) Subsequent repair or reconditioning of "K" propellers may be performed as required by any FAA certificated propeller repair station.

(Sensenich Propeller Bulletin No. R-13 dated April 11, 1969 and R-14 dated March 23, 1970, pertains to this subject.)

Amendment 39-761 effective May 9, 1969.

Amendment 39-808 effective August 7, 1969.

This Amendment 39-1102 is effective November 10, 1970.

February 10, 1954

SERVICE BULLETIN # R-2

TO: C.A.A. Regional Offices, Propeller Repair Stations,
Sensenich Distributors and Piper Wholesalers.

SUBJECT: FIXED PITCH METAL PROPELLERS
MODEL M76AM-2 INSTALLED ON LYCOMING
ENGINES, MODEL O-290-D AND O-290-D2

Due to service experience, it is known that there is a possibility of a propeller blade tip failure in flight of the subject combination. Such failures result from fatigue originating at a nick in the blade, indicating that such nicks have not been promptly removed in compliance with CAM-18.

The most critical area on the subject propeller-engine combination is known to be in an area between three and five inches inboard from the tips.

To minimize the likelihood of blade tip failures, all nicks, gouges, and scratches within eight inches of the blade tip should be removed immediately. Care should be taken to be sure all trace of the damage is removed. Minor damaged areas may be removed by using coarse emery cloth. The repaired area shall then be polished with fine emery cloth. Rebalancing is not necessary when repairing minor damage areas.

Propellers having severe nicks, gouges or scratches should be forwarded to the propeller manufacturer, or approved propeller repair station for inspection and repair.

November, 1956

SERVICE BULLETIN # R-3

TO: ALL OWNERS, SENSENICH AND PIPER DISTRIBUTORS, PROPELLER REPAIR STATIONS

SUBJECT: REPLACEMENT OF SENSENICH M76AM-2
PROPELLERS INSTALLED ON 135 H.P. LYCOMING
O-290-D2 ENGINES WITH THE MODEL M74DM

In view of recurring blade tip failures, it has become necessary to retire from service, as soon as possible, all M76AM-2 propellers which have been operated in a cut or nicked condition on the Lycoming O-290-D2 engine. Propellers which are undamaged and nick-free may be left in service for not more than 500 hours total flight time, provided continuous operation between 2450 and 2500 R.P.M. is avoided. A placard is being forwarded to each owner on record.

The M76AM-2 propeller should be replaced by a Model M74DM of the same pitch. It will be necessary also to replace the spinner with one of the type currently used on Piper 150 H.P. Tri-Pacers and Super Cubs.

PROPELLER BULLETIN

Sensenich Corp.



Lancaster, Pa.

SERVICE BULLETIN #R-8-1

SEPTEMBER 22, 1961

FAA APPROVED

TO: SENSENICH AND PIPER DISTRIBUTORS, FAA APPROVED PROPELLER REPAIR STATIONS, AND FAA REGIONAL OFFICES.

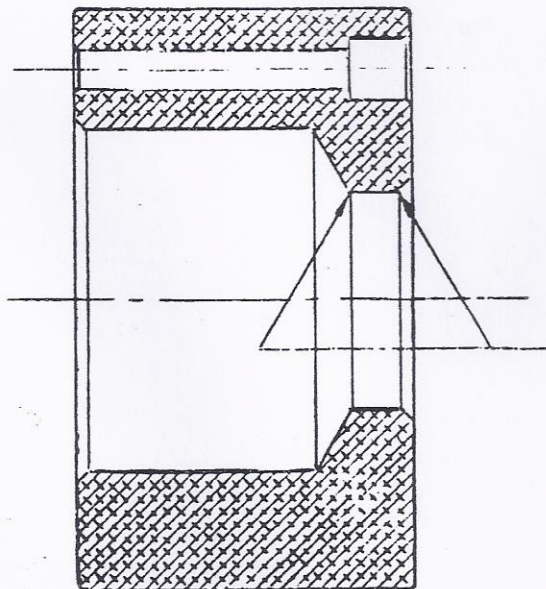
SUBJECT: INSPECTION OF SENSENICH PROPELLERS; APPLIES TO M74DM PROPELLERS, EXCEPT THOSE WITH SERIAL NUMBERS PRECEDED BY THE LETTERS "A" OR "K", INSTALLED ON LYCOMING O-320-B SERIES (160 H.P.) ENGINES.

COMPLIANCE REQUIRED WITHIN THE NEXT (10) HOURS OF FLIGHT TIME.

REMOVE PROPELLER AND VISUALLY INSPECT FOR CRACKS ORIGINATING IN PILOT BORE. IN CASE OF DOUBT, ANY OF THE APPROVED METHODS FOR ALUMINUM ALLOY INSPECTIONS MAY BE USED. IF CRACKS ARE FOUND, THE PROPELLER MUST BE RETIRED IMMEDIATELY FROM SERVICE. IF NO CRACKS ARE FOUND, POLISH OUT ANY SCRATCHES IN THE BORE AND BREAK AND POLISH ANY SHARP EDGES APPEARING AT THE FRONT AND REAR CHAMFER OF PILOT BORE. (SEE DRAWING)

WHEN PROPELLER IS REINSTALLED, TORQUE RETENTION BOLTS TO 300 INCH POUNDS.

AFTER COMPLIANCE, PROPELLER SHALL BE REMOVED AND INSPECTED AT EACH ANNUAL INSPECTION OR EACH 100 HOUR INSPECTION, WHICHEVER OCCURS FIRST. PROPELLERS WITH CRACKS MAY BE RETURNED TO THE MANUFACTURER FOR POSSIBLE REPLACEMENT ON A WARRANTY BASIS.



PROPELLER BULLETIN

Sensenich Corp.



Lancaster, Pa.

NUMBER R-11

MARCH 1, 1966

TO: SENSENICH DISTRIBUTORS, FAA APPROVED REPAIR STATIONS, PIPER CHEROKEE OWNERS

AIRCRAFT MODELS AFFECTED: PIPER CHEROKEE PA-28-180 ONLY WITH S/N 28-671 TO 28-2336 INCL.

COMPLIANCE DATE: PRIOR TO BUT NOT LATER THAN NEXT 20 HOURS OF OPERATION

SUBJECT: INSPECTION OF MID-BLADE AREA OF M76EMM AND M76EMMS PROPELLERS

Sensenich Propeller Bulletin No. R-10 dated 4 January 1965, required the removal of the mid-blade decal so that the area under and adjacent to the decal could be examined for corrosion pits. These corrosion pits had, in some cases, initiated a fatigue crack which resulted in a failure of the propeller blade. These corrosion pits are clusters of tiny black dots (see sketch #1) which appear most frequently under the narrow black border of the decal.

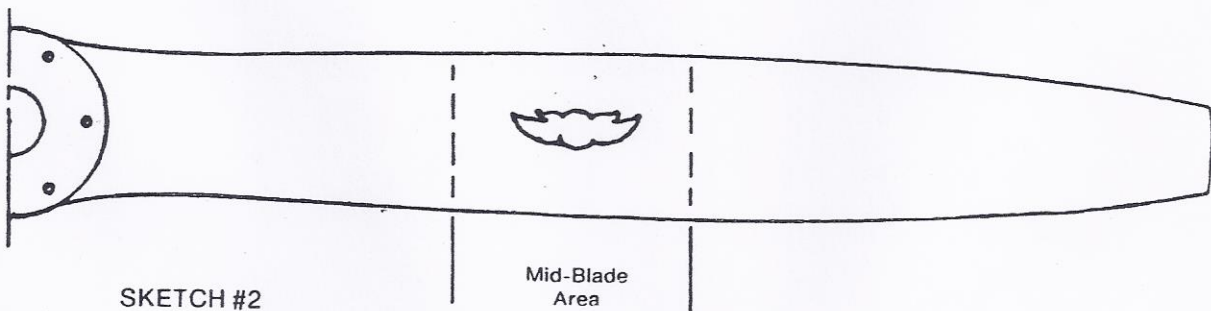
It now appears that some owners, when attempting to comply with Bulletin R-10, were looking for a white powdery corrosion and failed to notice the small black dots. The new style epoxy adhesive decal was then installed over these corrosion pits. For this reason, and to ensure that all propellers are properly inspected, the mid-blade decals must be removed. The decals should be soaked with paint remover and rubbed off with a rag; they must not be scraped or sanded off. The mid-blade area (sketch #2) must be thoroughly re-inspected with a glass of approximately 3 power.

If a crack is found the propeller must be replaced immediately. If corrosion pits (the tiny black dots) are discovered they must be removed within the next 20 hours of operation. They can be removed in the following manner: (1) Sand the area with 220 grit wet-or-dry abrasive paper and polish with 320 grit or finer. (2) Clean the area thoroughly and apply a dye penetrant. (3) Inspect with a low-power glass; it is very important that the bottom of the pits be completely removed. If the pits re-appear, repeat the operations. (4) When the pits are completely removed, spray the area with a clear lacquer.

Owners who wish to do so may return their propellers to the factory for reconditioning or exchange for a factory reconditioned propeller.

NOTE: This bulletin does not apply to propellers which have been reconditioned or exchanged by the factory in compliance with Bulletin R-10.

SKETCH #1



SKETCH #2

Mid-Blade
Area

PROPELLER BULLETIN

Sensenich Corp.



Lancaster, Pa.

NUMBER R-12A

FEBRUARY 6, 1967

TO: FAA APPROVED PROPELLER REPAIR STATIONS, SENSENICH DISTRIBUTORS;
BEECH MUSKETEER OWNERS

PROPELLER MODELS AFFECTED:

ALL SENSENICH FIXED-PITCH METAL PROPELLERS WITH WATER-SOLUBLE MID-BLADE DECALS INCLUDING MODELS M74DC AND M74DM WITH BEECH MID-BLADE DECALS, BUT EXCLUDING THOSE PROPELLERS WHICH HAVE ALREADY BEEN SERVICED OR REPLACED IN ACCORDANCE WITH SENSENICH BULLETINS R-11 AND R-12 AND FEDERAL AVIATION AGENCY AIRWORTHINESS DIRECTIVES 66-11-3 AND 66-23-2

COMPLIANCE DATE: NOT LATER THAN THE NEXT TWENTY HOURS OF OPERATION

SUBJECT: REMOVAL OF MID-BLADE DECALS AND INSPECTION OF MID-BLADE AREA FOR CORROSION PITS AND CRACKS

Sensenich Propeller Bulletin Number R-11 dated March 1, 1966 and FAA Airworthiness Directive 66-11-3 dealt with the problem of corrosion pits found in the area of the mid-blade propeller decal. Instances of corrosion pits under and in the immediate area of the mid-blade decal have been discovered in M74DC and M74DM propellers carrying Beech decals and other models of Sensenich fixed-pitch metal propellers with Sensenich decals attached by a water-soluble adhesive. The Sensenich decals can be identified by their black border (sketch #1). Later Sensenich epoxy-adhesive decals (with a narrow gold border outside the black, sketch #2) are satisfactory. Water-soluble decals must not be re-installed.

These decals must be removed by soaking with paint remover and rubbing off with a rag; they must not be scraped or sanded off. The mid-blade area must be thoroughly inspected with a glass of at least 3 power. If a crack or corrosion pits deeper than .015 inch are found, the propeller must be replaced before further flight. If corrosion pits (tiny black dots) are discovered, they must be removed within the next twenty hours of operation. They can be removed in the following manner: (1) Sand the area with 220 grit wet-or-dry abrasive paper and polish with 320 grit or finer. (2) Clean the area thoroughly and apply a dye penetrant. (3) Inspect with a low-power glass; it is very important that the bottom of the pits be completely removed. If the pits re-appear, repeat the operations. (4) When the pits are completely removed, spray the area with a clear lacquer.

Owners who wish to do so may return their propellers to the factory for reconditioning or exchange for a factory reconditioned propeller.



SKETCH #1



SKETCH #2

PROPELLER BULLETIN

Sensenich Corp.



Lancaster, Pa.

PROPELLER SERVICE BULLETIN NO. R-13

11 APRIL 1969

SUBJECT:

Tip failures of Model M76EMM-0, M76EMMS-0, 76EM8-0, and 76EM8S5-0 propellers on all Lycoming O-360 series engines except the O-360-A4A.

DISCUSSION:

There are at present more than three thousand of the above listed propeller-engine combinations in service, first used in 1962. Recently several tip failures have occurred. These were fatigue-type failures and the cause is believed to be continuous operation in an rpm range of relatively high vibration stress with the propeller blades in a nicked or stone bruised condition. Following is a list of precautions for these propeller-engine combinations to prevent tip failures.

RECOMMENDED ACTION:

- (1) Avoid continuous operation between 2150 and 2350 rpm. Have your tachometer calibrated if facilities are available.
- (2) A close look at the propeller blades should be the first part of your pre-flight inspection. Cracks usually start at a nick on the leading edge, or a stone cut or bruise on the rear face of the blade.
- (3) Remove nicks and cuts promptly by rounding out and polishing according to approved methods before accumulating more flight time (fatigue cycles).

DISTRIBUTION:

- (1) FAA Regional Offices
- (2) Propeller Repair Stations
- (3) Sensenich Distributors
- (4) Aircraft Manufacturers
- (5) Lycoming Division, AVCO Corporation

PROPELLER BULLETIN

Sensenich Corp.



Lancaster, Pa.

SERVICE BULLETIN NO. R-14

MARCH 23, 1970

TO: AFFECTED AIRCRAFT OWNERS, AIRFRAME MANUFACTURERS, FAA APPROVED PROPELLER REPAIR STATIONS, AND SENSENICH DISTRIBUTORS.

SUBJECT: METAL FATIGUE IN MODELS M76EMM-0, M76EMMS-0, 76EM8-0, AND 76EM8S5-0 PROPELLERS ON ALL LYCOMING 0-360 SERIES ENGINES EXCEPT MODELS 0-360-A4A AND 0-360-A4G (SOLID CRANKSHAFT ENGINES).

AIRCRAFT MODELS AFFECTED:

| | |
|-------------------------|------------------------|
| BEECH B23 | PIPER PA-28-180 |
| C.A.A.R.P. CP 1310 | SOCATA COMMODORE 180CV |
| CENTER EST JODEL DR 253 | SOCATA HORIZON 180CV |
| PARTENAVIA P64B | WASSMER WA41 |

REFERENCE: SERVICE BULLETIN NO. R-13 DATED 11 APRIL 1969
AIRWORTHINESS DIRECTIVE NO. 69-9-3 DATED 9 MAY 1969

DISCUSSION:

Service Bulletin No. R-13 (copy on reverse side) discussed fatigue-type failures of this propeller and recommended specific steps to prevent them.

Since it is possible that some of these propellers had already used up a significant portion of their endurance life by the accumulation of fatigue cycles in the placarded rpm range, further precautions are recommended.

Recent research has shown that metal specimens, which have been fatigue-cycled to 50% of their endurance life, can be restored to original condition by the removal of a thin layer of surface metal.

This reduction of blade thickness affords a further important benefit by shifting the 2nd order-1st mode resonance peak, now at 2250 rpm, downward in the rpm range.

RECOMMENDED ACTION:

Propellers with 500 hours or more of flight time should be returned for factory inspection and reconditioning. This reconditioning will include smoothing out all nicks and cuts and the removal of the layer of fatigued metal from the entire surface of the blades. The propeller will then be re-anodized and refinished.

DISTRIBUTION:

1. Affected Aircraft Owners
2. Affected Aircraft Manufacturers
3. FAA Regional Offices, Domestic and Foreign
4. Propeller Repair Stations
5. Sensenich Distributors
6. Lycoming Division, AVCO Corporation



FIXED-PITCH METAL PROPELLERS INSTRUCTIONS FOR USE AND CARE

Supersedes previous Use & Care Instructions

Service Bulletins and Airworthiness Directives are not affected by these instructions

Your Sensenich propeller has been manufactured under closely controlled conditions to the approved design in accordance with the applicable FAA Regulations. Stamped on the propeller hub face are the Model and Serial Number, the Type Certificate Number, and the Production Certificate Number (Sensenich Corp. P.C. No. 1).

DO

1. Have your propeller installed by an A.&P. mechanic. For convenience, the proper installation bolt torque is shown on the blade decal near the hub. Always have blade track checked after the hub bolts are tightened. Note: Every propeller is accurately balanced at the factory. If the propeller-engine combination feels rough in flight, ask your mechanic to remove the propeller, rotate it 180 degrees on the engine crankshaft flange, and re-install. Again check blade track. This provides a means to verify that the crankshaft flange is true.
2. Inspect the blades of your propeller before each flight for nicks, cuts, and stone bruises. Have minor repairs* promptly performed by an A.&P. mechanic. If a crack is discovered, **THE PROPELLER MUST BE IMMEDIATELY REMOVED FROM SERVICE.**
3. Have major repairs* performed by an FAA Certificated Propeller Repair Station or by the factory.
4. Conform to applicable RPM limitations and periodically have your tachometer checked for accuracy.
5. Frequently wipe the propeller blades clean with an oily rag. This oily wipe will remove corrosive substances, and the oily residue will repel water and corrosives.
6. The recommended flight-time between reconditioning for your Sensenich fixed-pitch metal propeller is One Thousand hours PROVIDED IT HAS NOT RECEIVED PRIOR DAMAGE REQUIRING IMMEDIATE ATTENTION. This accomplishes the removal of fatigued surface metal and the accumulation of small nicks and cuts too numerous to be repaired individually.

Do Not permit installation of a propeller unless it is the model approved under the Aircraft Type Certificate or STC and has been obtained from a reliable source. Beware of a propeller of unknown service history.

Do Not push or pull on the propeller when moving an aircraft by hand.

Do Not run up your engine/propeller over loose stones or gravel.

Do Not paint over corroded or damaged blades. This hides the defect and may deter needed repair.

Do Not permit repair of blade damage by peening or welding. These practices will lead to early blade failure.

Do Not fly your aircraft under any circumstance before a thorough inspection by qualified personnel if the propeller has been subjected to impact.

Do Not have your propeller straightened except by an FAA Certificated Propeller Repair Station or the factory. Even partial straightening of blades for convenience of shipping to a repair station may cause hidden damage which, if not detected, could result in the return to service of a non-airworthy propeller. Report anything of this nature before repair is initiated.

RECOMMENDED ATTACHING BOLT WRENCH TORQUE
Sensenich Metal Propellers (Torque also shown on Blade Information Decal)

| Bolt Specification | Bolt Dia.(inches) | Recommended Wrench Torque | | |
|--------------------|-------------------|---------------------------|---------|-------|
| | | in.-lb. | ft.-lb. | n.-m. |
| AN6 , AN76 | 0.375 | 280-300 | 23-25 | 32-34 |
| AN7 , AN77 | 0.4375 | 480-540 | 40-45 | 54-61 |
| AN8 , AN78 | 0.500 | 720-780 | 60-65 | 81-88 |

NOTE: Equivalent torque values are given in Inch-pounds, foot-pounds and newton-meters for convenience.

*** DEFINITIONS**

Minor Repair:

Rounding out a shallow nick or cut shall be considered a minor repair provided that the strength, weight, and stiffness of the blade is not materially affected.

Major Repair:

Major repairs to aluminum alloy propellers include diameter reduction (when permissible) to repair tip damage, repairs to deep cuts or nicks, and straightening of bent blades.

PROPELLER RECORD

MODEL: _____ SERIAL NO.: _____ DATE INSTALLED: _____

| Date | Recording Tach Time | Description of work performed (Inspection, Repairs, etc.) | Agency Performing Work | Comments |
|------|---------------------|---|------------------------|----------|
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IMPORTANT:

These instructions are packed with every Sensenich metal propeller. They should be placed with the aircraft owner's manual and/or log book and referred to frequently.

The Factory Service Department, adjacent to the Lancaster Airport is equipped to provide prompt repair or replacement service for propellers shipped or flown in. There are a number of Sensenich Propeller Distributors and Approved Propeller Repair Stations conveniently located throughout the United States of America and other parts of the world who can also provide this service.

SENSENICH CORPORATION

ADJACENT TO THE LANCASTER MUNICIPAL AIRPORT

AREA CODE 717
PHONE-569-0435
CABLE-"SENSNIK"



AIRPORT ROAD
P.O. BOX 4187

Lancaster, Pa., U.S.A.
17604

SERVICE MEMO #86-1
SUPPLEMENT TO REPAIR MANUAL SCRM478
3 September 1986

LIMITS FOR RE-PITCH OF FIXED-PITCH METAL PROPELLERS

Recent inquiries indicate much concern about allowable limits for pitch-change of SENSENICH aluminum propellers. Re-pitch of a fixed-pitch propeller may be beneficial only if the propeller will be installed on an airplane significantly faster or slower than the one for which it was originally purchased, or when the airplane's principal base of operation is changed (for example, to a much higher elevation - requiring compromise for take-off & climb at the expense of cruise). If re-pitch is necessary then the rules given here should be followed.

1) Because a verifiable record of a propeller's history is usually not available, study the stamping in the hub for evidence of previous re-pitching (possibly shown by over stamping). Previous re-pitching may also be indicated by a wavy appearance of the trailing edge between the 30% and 45% blade radius stations.

2) Propeller pitch must remain within the pitch range shown in SCRM 478 for the propeller series. Also, re-pitching of an aluminum propeller shall not exceed 8 inches, minus the difference between its initial pitch and the median pitch. For example, a SENSENICH 76EM8-0-63 (median pitch 60) may be set to 66 inches pitch, however it will then be permissible to reduce pitch no further than to 64. The same propeller (originally a 76EM8-0-63) may be twisted to 58 pitch if it had not been previously been set to a higher pitch.

3) No twisting shall be accomplished at a blade section which is greater than 1.100 inches thick.

4) Twists to change pitch should not be made at the same radius location more than one time. Large twists in a blade should be made in several steps at locations between 30% and 45% blade radius.

SENSENICH CORPORATION

Robert E. Bristol

Robert E. Bristol
Propeller Engineering Manager