SENSENICH GROUND ADJUSTABLE AIRCRAFT PROPELLER INSTALLATION AND INSTRUCTIONS FOR CONTINUED AIRWORTHINESS -- 2EK and 2EM6 HUB ASSEMBLY

AND

SENSENICH GROUND ADJUSTABLE PROPELLER LOG BOOK

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THIS LOG BOOK IS TO BE KEPT WITH THE
AIRCRAFT MAINTENANCE RECORDS

LB2EK-b

SENSENICH GROUND ADJUSTABLE AIRCRAFT PROPELLER INSTALLATION -- 2EK and 2EM6 HUB ASSEMBLY

CAUTION: Failure to follow these instructions will void all warranties, expressed and implied. Mounting difficulties and increased vibration will result with improper assembly of the propeller blades and hub parts.

PACKING LIST

(1) 2E Series Two Piece Hub
(2) C(XX)AE-(X) Propeller Blades
(6) AN6-(XX)A Mounting Bolts, for Mounting Hub on engine
(6) AN6-15A Clamping Bolts, for Clamping Hub halves together
(12) 10.3-2081 Special Lock Washers
(2) A10-20 Springs
(1) CT2E-(XX) Pitch Cartridge
(1) SPKS(X) or SPM6S(X) Spacer (If Required)
(2) PIN12X2 Pins (Required for Spacer)

Tools

A good quality calibrated torque wrench is required to properly torque clamping bolts and mounting bolts. You will also need a socket wrench. See **Table 1** for bolt size and torque.

ATTACH MOUNTING HUB HALF

1. Be certain that the magneto switch is “OFF” and that both magnetos are grounded. Chock the aircraft wheels to prevent movement. Clean dirt and oil residue from the engine flange. Refer to **Figure 1** for views of the propeller assembly.

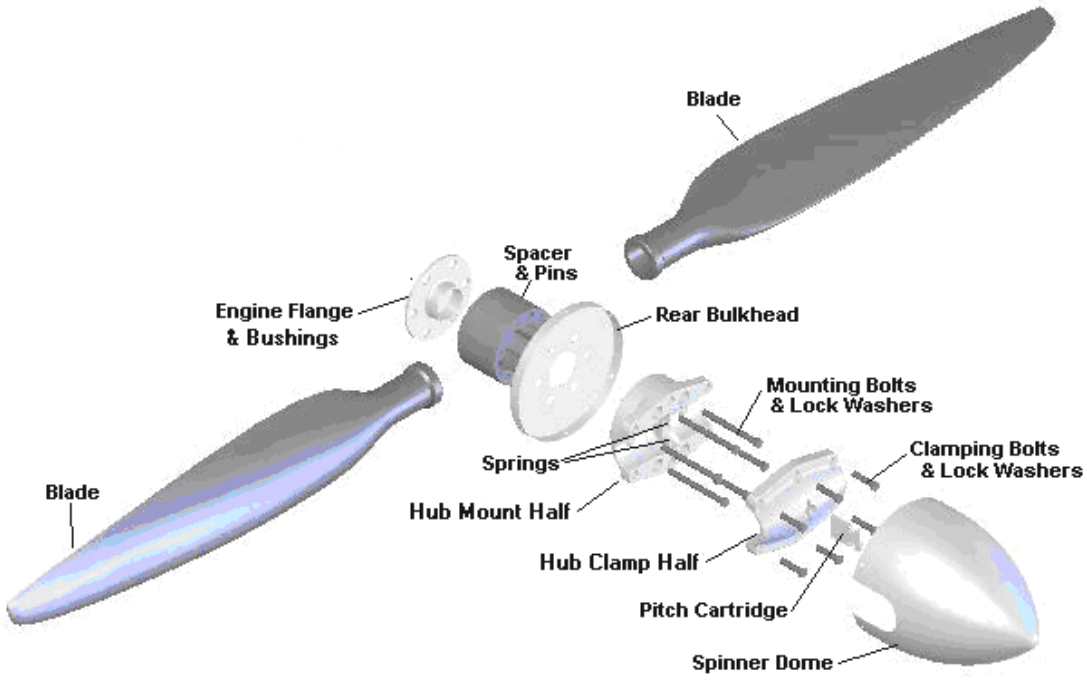


Figure 1

2. Be certain the two springs are installed in the mounting half of the hub.

3. Place spacer (if applicable), rear spinner bulkhead, and the hub mount half, as shown in **Figure 1**, on the engine mounting flange. Vertical orientation of the hub is recommended for ease of assembly. The hub and spacer (if applicable) must sit flush on the mounting flange and the rear spinner bulkhead. **NOTE:** Bolt breakage will occur if not flush. Place special lock washers, under the bolt heads, on 6 mounting bolts (AN6-XXA) and insert into the 6 mounting holes inside the hub mount half. Each special lock washer works in pairs with the "ramped" sides facing each other. See **Figure 2**. Position the hub mount half, rear bulkhead, and spacer (if applicable) on the engine flange with the six mounting bolts running through the engine flange. Torque the 6 mounting bolts using a star pattern similar to **Figure 3**. See **Table 1** for mounting bolt torques.

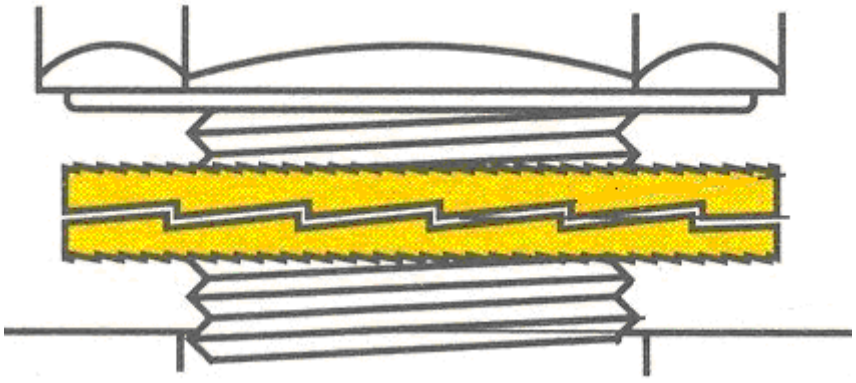


Figure 2

INSERT BLADES IN HUB MOUNTING HALF

4. Each blade has a camber, round side (decal) and a flat side. With the round side facing forward, and the hub in the vertical position, insert one blade at a time into the hub mounting half. You may need to hold the upper blade with one hand.

5. Place the hub clamp half over the blade shanks. Place special lock washers, under the heads, on clamp bolts (AN6-15A) and insert into the hub cover half. Hand tighten the clamp bolts into the threaded clamp bushings, taking care to start with an even gap between hub halves on both sides. **NOTE:** Once fully torqued, the gap will close up and the hub halves will meet on the hub sides.

6. Rotate each blade's leading edge slightly towards the aircraft. Insert the pitch cartridge into the slot of the hub clamp half. You should be able to feel the springs depress and push back when you press on the cartridge. Take a blade with one hand and depress the pitch cartridge. Rotate the blade's leading edge, away from the aircraft, until it engages the pitch cartridge. Rotate the second blade until it engages the pitch cartridge. Grab each blade together and rock into the pitch cartridge. You should hear a click when the blades are seated properly. Slight play is normal after blades are locked in. Rock the blades back and forth to center the pitch cartridge in the slot.

7. Using a calibrated torque wrench and following the pattern shown in **Figure 3.** Tighten the bolts in ¼ to ½ turn increments (this will take several passes) until the proper torque given in **Table 1** is reached.

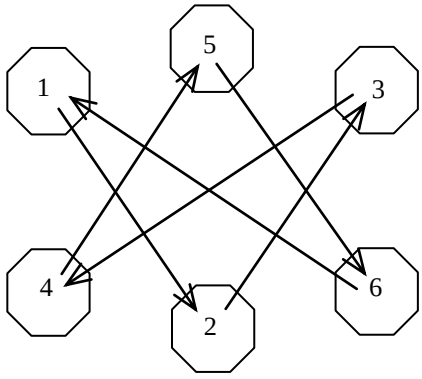


Figure 3

NOTE: Have your tachometer calibrated by a professional before performing this next operation. With the brakes on, run the engine full throttle to verify your desired static RPM. **CAUTION: YOU SHOULD NEVER EXCEED THE MAXIMUM RPM RATING FOR YOUR ENGINE.** If you are not seeing your correct static RPM, be certain the tach was properly calibrated. You may contact Sensenich to purchase a slightly lower or higher pitch cartridge if you feel this is the problem due to your density altitude. **CAUTION: YOU SHOULD NEVER MASK AN ENGINE PROBLEM WITH A PITCH CHANGE.** If you are unsure, please contact the factory.

Changing the Pitch

If changing the pitch is necessary, first loosen the 6 clamp bolts until the blades are loose, then hand tighten the bolts to maintain an even hub gap in each side. **NOTE: The special lock washers will click loudly when loosened.** Unlock each blade by depressing the pitch cartridge while rotating each blade's leading edge towards the aircraft. Remove the first pitch cartridge. Follow steps 6 and 7 of the **Installation Procedure**. **NOTE: This is considered a model change and must be noted in the logbook.**

TACHOMETER INSPECTION:

Owing to the exceptionally high stresses that may be generated by particular propeller/engine combinations at certain operating ranges, many propeller and aircraft manufacturers have established revolutions per minute (RPM) restrictions and maximum RPM limits for some models. An improperly operating tachometer can cause an engine to exceed the maximum RPM limits or allow operation unknowingly within a restricted RPM band. Since there are no post-manufacture accuracy requirements for engine tachometers, tachometer inaccuracy could be a direct cause of propeller failure, excessive vibration, or unscheduled maintenance. Proper tachometer operation and accuracy should always be checked (using the manufacturer's procedure, if available) during normal maintenance intervals. One means of checking the tachometer's accuracy is with a commercial strobe unit through which the rotating propeller is viewed.

SENSENICH GROUND ADJUSTABLE AIRCRAFT PROPELLER INSTRUCTIONS FOR CONTINUED AIRWORTHINESS -- 2EK and 2EM6 HUB ASSEMBLY

March 22, 2010

Continued Airworthiness Requirements:

The following will help you operate your propeller safely, keep it looking good and help it to last longer.

- Never install a propeller on an aircraft unless it is a model approved for the aircraft and the engine. The service history must be properly documented, and a pre-installation inspection must indicate that the propeller is airworthy.

- A visual Inspection is the primary defense against early failure of propellers. When inspecting propellers, it is necessary to use touch and hearing, as well as visual clues. 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 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.

- Do not operate your propeller above the recommended engine RPM. If your propeller has been subjected to an over speed condition of 10% over the maximum rating (example 2750 X 1.1 = 3025) for more then 2 minutes, you must perform the **Inspection After Suspected Impact.** listed below.

- Do not paint over areas of corrosion on hub parts. Corroded areas must be removed in accordance with approved procedures under **Hub Minor Repairs** prior to applying the approved Alodine (MIL-C-5541) and paint

- Do not operate any aircraft after a propeller has been subjected to an impact without a thorough inspection. See **Inspection After Suspected Impact** below,

- The pre-flight 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. Carefully examine the propeller assembly for looseness, any signs of damage, excessive wear or any other condition that would make the propeller unsafe to operate. Check the leading edge for cracks and debonds. Externally check the spinner and bulkhead for security, missing fasteners, damage, and cracks. Cracks typically originate from the attachment screws. Check for looseness of the bulkhead. This could be an indication that the mounting bolts are loose and need to be torqued again. Note any indications in the logbook for future reference to determine whether an acceptable condition is getting worse.

- Do not use the propeller as a tow-bar to move your aircraft.

- Apply a good quality automotive paste wax to the blades at least once a year. Avoid liquid waxes.

- Avoid running-up in areas containing loose stones, sand, and gravel, to reduce erosion and/or damage to the leading edges and blades.

- Finish loss off the leading edge is a normal wear item and is dependent on the amount of operation in rain and grit.

- Whenever there is evidence of roughness on operation, check bolt torque on both the clamping and mounting bolts, and check the propeller blades for track. The blades should track within 1/8" of each other at the tip. For new installations, rotating the propeller 180 degrees and reinstalling may help.

- If the bolts are ever over-torqued, they should be replaced immediately.

- If your propeller part begins to show any of the following damage, it must be repaired by an approved propeller shop or retired from service:

  (a) Cracks in the metal hub or bolts,
  (b) Loose metal leading edge,
  (c) Any crack across the blade,
  (d) Any crack along the blade length,
  (e) Blade impact damage with missing composite material larger than .5 square inches and/or deeper than .025"

or (f) Obvious damage or wear beyond economical repair.

Inspection for Lightning Strike on Composite Blades

Any Sensenich composite blade suspected of lightning strike should be inspected and may require repair or replacement. Lightning strikes usually enter a composite blade through the metal erosion shield. If a lightning strike is present, a darkened area and possible pitting, usually in the proximity of the tip, will be noticeable. If a lightning strike is suspected or detected, consider the blade unairworthy. Return the blade to the factory or an approved propeller shop for further examination.

Inspection After Suspected Impact.

Propellers that have been involved in a known or suspected static or rotating impact with relatively solid objects (e.g., ground, maintenance stands, runway lights, birds, etc.) or relatively yielding objects (e.g., snow banks, puddles of water, heavy accumulation of slush, etc.) should be inspected for damage before further flight. If the inspection reveals one or more of the following listed indications, the propeller should be removed and sent to an **Approved Propeller Repair Station**.

(1) A blade that tracks out of limits or out of edge alignment.

(2) Loose blades in the hub.

(3) Any noticeable or suspected damage to the pitch cartridge or blade pins.

(4) Any diameter reduction (tip damage).

(5) Visible major damage to the hub that cannot meet the **Minor Hub Repairs** criteria.

(6) Visible major damage to a blade that cannot meet the **Minor Blade Repairs** criteria.

(7) Operating changes, such as vibration or abnormal RPM.

NOTE: The bolts should be magnetic particle inspected per ASTM E 1444 or replaced after any propeller strike.

Mandatory Inspections:

- **Annual Inspection -- To be accomplished by an A&P or IA**.

    1. Remove Spinner Dome and examine it for damage, and cracks. If necessary, replace the spinner dome. See **Spinner Repairs** below.
    2. Remove Clamp Bolts. -- The bolts should be dimensionally checked against one another. Any bolts that exhibit stretching, corrosion or damage such as cracks or nicks are to be replaced.
    3. Depress pitch cartridge and detach blade pins from pitch cartridge.
    4. Remove the Hub Clamp Half and set aside.
    5. Remove each blade and inspect blade shanks for any wear making sure the pin is still tight in the blade. A thorough visual inspection is recommended together with a coin tap inspection of each composite blade, including the metal erosion shield on the leading edge (see AC 43-5). No dents in the metal erosion shield should be deeper than 1/8". No dents should puncture the metal erosion shield. There should be no excessive wear on the leading edge. If blade damage is beyond **Minor Blade Repair** instructions below, the blade must either be retired from service or sent to a repair station for evaluation before further service.
    6. Examine the data plate on the shank of each blade. Verify that you are using approved blades for the hub and that everything appears normal. If you are unsure, you can go to http://www.sensenich.com/engineer/senscdesg.htm for reference or contact the factory for assistance.
    7. Conditions requiring blade replacement:
        a) Any hole in hollow blade shell (doesn't apply if a replacement metal erosion shield will cover hole)
        b) Any crack deeper than .025"
        c) Any solid tip damage that can't be trimmed off completely
    8. Remove the pitch cartridge and inspect both the springs and the cartridge. If either is damaged or broken, they must be replaced. The springs are held in place by a non-permanent bonding adhesive.
    9. Remove the Mounting Bolts -- The bolts should be dimensionally checked against one another. Any bolts that exhibit stretching, corrosion or damage such as cracks or nicks are to be replaced.
    10. Remove the Hub Mount Half and spacer. Inspect both hub halves for corrosion. If necessary, carefully remove any flaked or blistered paint from the hub surface, taking care not to scratch the aluminum surface. If there is any corrosion or damage present, please see **Minor Hub Repair** instructions below. If necessary, apply alodine using an approved alodine (MIL-C-5541) system, prime using Tempo A802 Primer or equivalent, and Tempo A151 Gray paint or equivalent.
    11. Remove the rear spinner bulkhead and examine for missing fasteners, damage, and cracks. If damaged, replace the spinner bulkhead.
    12. **REPLACE** the special lock washers.
    13. Reinstall the assembly per the above installation instructions.

- **2000 Hour Inspection -- To be accomplished by an A&P or IA**

    1. Remove Spinner Dome and examine for damage, and cracks. If necessary, replace the spinner dome. See **Spinner Repairs** below
    2. Remove Clamp Bolts and Special Lock Washers and retire both sets from service.
    3. Depress Pitch Cartridge and detach blade pins from pitch cartridge.
    4. Remove the Hub Clamp Half, Blades, and Pitch Cartridge. Set aside.

5. Remove Mount Bolts and Special Lock Washers and retire from service.
6. Remove Rear Spinner Bulkhead Dome and examine for damage, and cracks. If necessary, replace the Rear Bulkhead.
7. Remove the Hub Mount Half and Spacer (if applicable).
8. Send Hub Clamp Half, Hub Mount Half, Blades, and Pitch Cartridges to an **Approved Propeller Repair Station** for the remaining 2000 hour inspection.
9. Reinstall Propeller Repair Station approved or new propeller, spacer (if necessary), and spinner per the above installation instructions.

NOTE: There is no specified overhaul time. The propeller parts are removed from service when they can no longer meet the Continued Airworthiness Requirements.

Minor Blade Repairs -- To be accomplished by an A&P or IA

Minor impact damage, nicks, and gouges in composite material of blade not to exceed .025 depth and or .5 square inches of surface area: Fill with high strength epoxy resin West System 105/206 or equivalent (NOT 5 minute epoxy) thickened with aerospace filler material, such as Colloidal Silica 406, Cabosil, or equivalent. Sand smooth when dry.

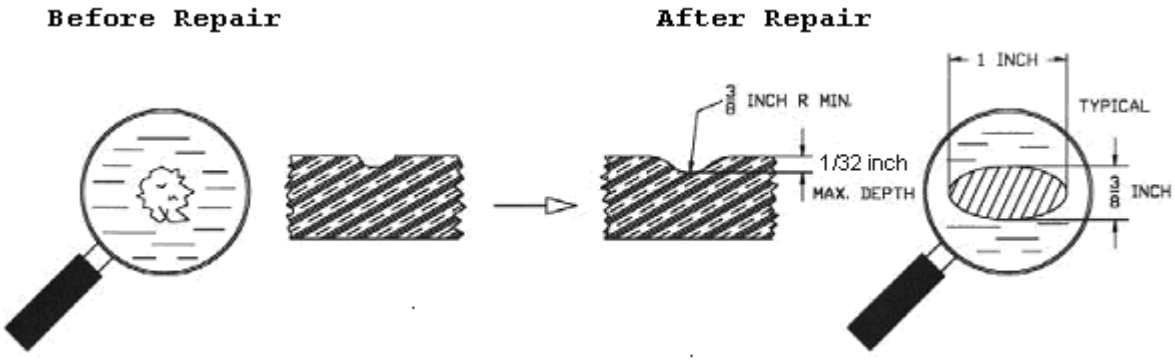
Wear and/or roughness of metal erosion shield on blade leading edge: If metal is not worn through, use 220 grit sandpaper or coarse scotch pad to remove roughness or minor pitting, being careful to not grind through the erosion shield. Polish with fine scotch pad or equivalent to remove scratches.

Paint wear on blade:
NOTE, wear is inevitable on the metal erosion shield. The wear rate depends on several factors, including high operating RPM's in rain or sandy areas, FOD on taxiways and runways, etc. Touch up paint using Tempo A150 Flat Black, A151 Gray (matches the hub color), A152 White, or equivalent. Sensenich Silver (does not match your hub color) is the original blade color and is available from the factory. When using touch up paint, keep in mind that paint can cause an out of balance situation so touch up should be kept to a minimum.

Minor Hub Repairs -- To be accomplished by an A&P or IA

1. Any hub or spacer that would exceed the following illustration for minor repair must be retired from service. These dimensions (other then radius) are maximum allowable. Anything less is acceptable. Radius can be greater. A hub can be returned to service with the following limitations:
    - No more then two (2) repairs in a single barrel half (where the blade touches the hub) for a total of 8 barrel repairs in one (1) complete hub, as long as the repairs do not touch.
    - General hub repairs can be indefinite, both inside and outside, as long as the repairs do not touch.
    - No repairs over a previous repair.
    - No repairs on the hub mounting flange face.
    - No repairs on either flange face of the spacer.

    Clean the area thoroughly, apply an approved penetrant (**ASTM E 1417** or equivalent), and inspect with a l0X glass before returning to service.



2. **Corrosion** – All corrosion must be removed before a hub can be returned to service. Corrosion is considered a repair.

   Instructions for removing the damage or corrosion spot:

   1. Sand the area with 220 wet-or-dry abrasive paper until all evidence of corrosion is removed. A small motorized grinding tool may be used.

   2. Polish the area with 320 grit (or finer) to remove all scratches.

   3. Clean the area thoroughly, apply an approved penetrant (**ASTM E 1417** or equivalent), and inspect with a l0X glass. **NOTE:** It is extremely important that all corrosion be completely removed. If cavities reappear during penetrant inspection, the repair operation must be repeated.

   4. Remove penetrant from the affected area..

   5. Apply ALODINE (MIL-C-5541) or equivalent treatment in accordance with manufacturer's instructions *(proper ALODINE treatment will leave a smooth amber/gold tint on the aluminum surface after the ALODINE solution has been rinsed off).*

   6. Apply Tempo A802 primer or equivalent over the repaired area. Note that some primers are intended for Alodine treated aluminum, while others are not - and may result in loss of adhesion of the outer coat.

   7. Spray area with Tempo A151 Gray paint or equivalent to better protect against corrosion.

Spinner Repairs:

Minor impact damage, nicks, and gouges in composite material of dome or rear bulkhead not to exceed .025 depth and or .5 square inches of surface area: Fill with high strength epoxy resin West System 105/206 or equivalent (NOT 5 minute epoxy) thickened with aerospace filler material, such as Colloidal Silica 406, Cabosil, or equivalent. Sand smooth when dry.

TABLE 1:

INSTALLATION TORQUE FOR HUB MOUNTING BOLTS AND HUB CLAMPING BOLTS

Bolt Diameter	Required Wrench Torque
3/8 inch bolts	340 to 360 inch pound

DESCRIPTION OF ALL OPERATIONS PERTAINING TO INSPECTIONS AND MAINTENANCE

DATE	TACH TIME	DESCRIPTION OF WORK	SIGNATURE