

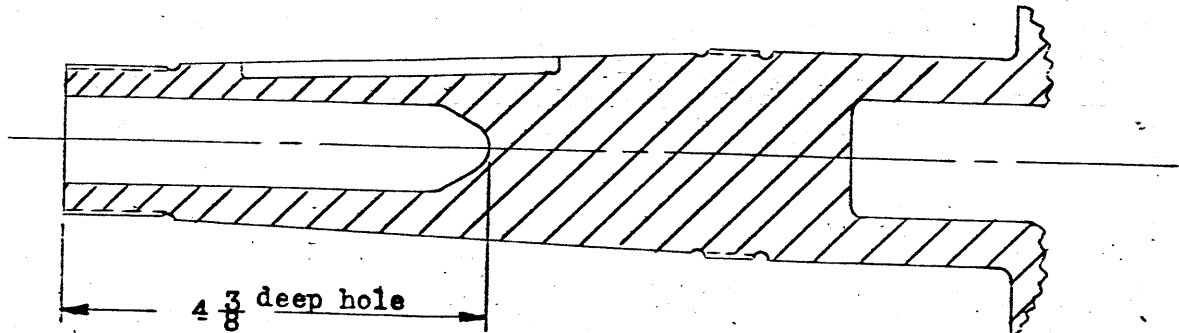
September 14, 1942

SERVICE LETTER A-11

Subject: Periodic Inspection of Crankshafts on Warner Scarab
125 H.P. Engines.

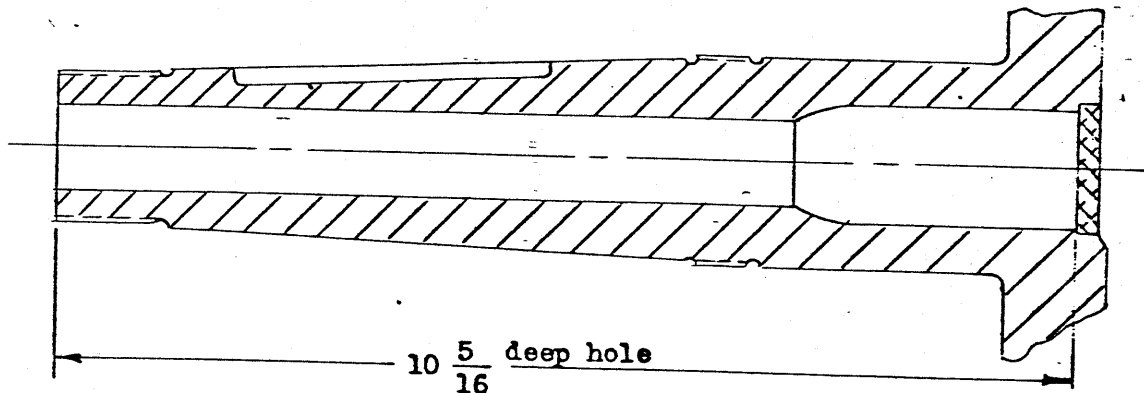
To: All owners of Scarab 125 H.P. engines.
All authorized Warner Aircraft service representatives.

1. Check which type of crankshaft is used in your engine. If the shaft has a $4\frac{3}{8}$ " deep hole in the front end of the crankshaft as indicated in Sketch No. 1 below, then the contents of this service order are not applicable to the engine and no 50 hour inspection of the shaft is required. It may be advisable to occasionally take off the propeller and check for galling and to relap the hub on the shaft as outlined below in paragraph 10 if the shaft is found galled.



SKETCH No. 1

2. If the shaft has a $10\frac{5}{16}$ " deep hole as shown in Sketch No. 2, the instructions of this service letter are applicable and must be carried out.



SKETCH No. 2

3. The National Bureau of Standards upon examination of broken tapered shafts came to the conclusion that high stress concentrations may be induced by both a high clamping stress and galling at the rear of tapered sections, such as tapered shaft ends. It is considered that inadequate maintenance may provide the galling through a looseness and poor seating of the hub. Additional stress at this point may then be the result of propeller unbalance, loose engine mount fastening, or other factors which would cause roughness in operation.

8. Continued - Magnaflux Corporation licensees.

Lewis School of Aeronautics, Lockport, Illinois
 Lincoln Aeronautical Institute, Lincoln, Nebraska
 Milwaukee Airways, Inc., Milwaukee, Wisconsin
 Northeast Airlines, Inc., East Boston, Massachusetts
 Northwest Air Service, Inc., Seattle, Washington
 Pacific Airmotive Corp., Los Angeles, California
 San Francisco, California
 Parks Air College, Inc., East St. Louis, Illinois
 Piedmont Aviation, Inc., Winston-Salem, North Carolina
 Precision Aeromotive Corp., Houston, Texas
 St. Louis School of Aeronautics, Inc., St. Louis, Missouri
 Snyder Aircraft Corporation, Chicago, Illinois
 Southern Air Services, Inc., Memphis, Tennessee
 Southwest Airmotive Co., Dallas, Texas
 Spartan School of Aeronautics, Tulsa, Oklahoma
 Springfield Flying Service, Inc., Springfield, Missouri
 Texas Aviation School, Inc., Fort Worth, Texas
 Van Dusen Aircraft Supplies, Minneapolis, Minnesota
 Wallace Air Service, Spokane, Washington
 A. W. Whitaker, Portland, Oregon

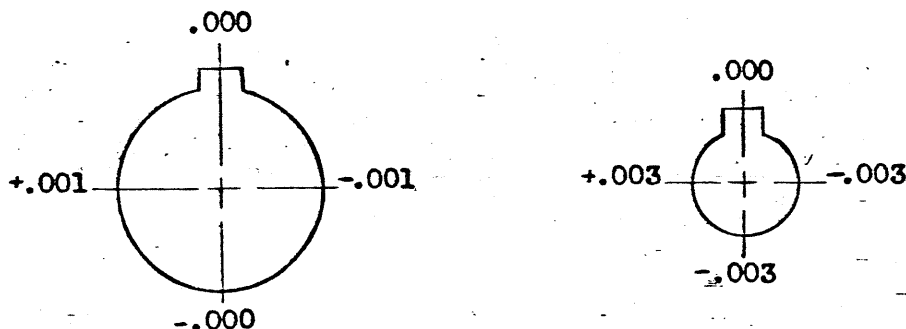
9. This magnetic inspection can either be done with a small coil operating on alternating current or with battery current and two special nuts for the attachment of the electrodes. The Warner Aircraft Corporation will gladly furnish the necessary information to all licensees of the Magnaflux Corporation.
10. If the crankshaft shows any signs of galling from the propeller hub, it should be relapped using a small amount of fine grain grinding compound (Clover No. 1A or equivalent). Lap the surfaces together by periodically oscillating the propeller and relieving the load to obtain a good fit. After lapping, check the fit by using pencil lines axially along the taper. Remount the propeller, oscillating it several times and remove to check fit. When both bearing surfaces show a good fit, apply a very small amount of the lapping compound to the small front end of the crankshaft and lap a slight amount more, using only oil on the larger rear bearing surface. Clean all surfaces thoroughly. Re-install the key and after oiling the shaft and hub thoroughly, mount the propeller. It is advisable to ascertain that the keyway in the hub is deep enough so that the hub assembly does not ride on top of the key in the shaft. This has been found to be the cause of a failure in at least one instance.
11. At all times during the operation of the airplane particular attention should be paid to the following factors which introduce fatigue stresses in the propeller end of the crankshaft.
- (a) The propeller should be periodically checked to determine that it is in balance and track and is properly mounted on the crankshaft.
 - (b) The motor mount must be kept in the same condition as when it left the factory. If the ship is equipped with a rubber motor mount, it is so designed that the unavoidable resonance points fall outside of the operating range. Deterioration of the rubber mount will cause the rate of deflection of the rubber to change so that the motor mount resonance may creep into the operating range. A motor mount resonance point can be detected by seeing and/or feeling vibration at a given R.P.M. which vibration decreases as the engine

11. (b) Continued.

speed is raised or lowered. Whenever the resonance range with rubber motor mounts has changed, new rubber bushings must be installed on the motor mount.

(c) For cruising, the engine should always be operated at a speed at which it operates smoothest and at which the least vibration is felt and/or seen.

(d) If your airplane has been involved in an accident which may have bent the crankshaft, it should be checked with a dial indicator at the small and large ends of the taper. For this purpose a dial indicator should be mounted on a rod which is securely fastened to a thrust bearing cover attaching stud. For a crankshaft checked without ball bearings on a surface plate, the allowable runout at the small end is .004" if the checking procedure outlined on page 21 of the third edition of the Warner Engine Handbook is followed. When the engine is installed in the airplane slightly higher readings may be observed due to the eccentricity limits of the ball bearings. When in doubt, make a rough sketch of the indicator readings obtained at the large and small ends of the taper in relation to the keyway as seen from the front and submit it to the Warner Aircraft Corporation for comments. To clarify this matter, a sample sketch is shown:



At no time should a crankshaft, which is found to be bent, be straightened.

(e) If, at any time, there is a noticeable roughness in the engine, the cause of the roughness should be ascertained and corrected.

12. The Warner Aircraft Corporation is undertaking these steps for the best interests of its customers and to insure the greatest safety for them.

13. In order to get our records on Scarab engines up to date, we would appreciate it if all the owners will fill out the enclosed questionnaires and return them in the enclosed postage-paid envelopes.

Yours very truly,

THE WARNER AIRCRAFT CORPORATION

20263 Hoover Avenue

Detroit, Michigan