Maintaining the Teledyne Bendix D-3200 series Magneto



BACKGROUND: To provide additional information for aiding technicians in maintaining the Teledyne Bendix D-3200 Magneto.

PROCEDURES:

NOTE

This tutorial is not intended to replace the information contained in the Teledyne Service Support Manual. The Teledyne Service Support Manual must be used while actual maintence is performed on the magneto.

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- I. Recommended Maintenance Intervals.
 - A. First 25 hr: Inspect contact assemblies for condition, gap, and internal timing.
 - B. 100 Hr: I Inspect contact assemblies for condition, gap, and internal timing.
 - C. 500Hr: Inspect in accordance with section 2-3 (Page2-6) of the Teledyne Service Support Manual.
- II. Description and Specifications.
 - A. The Magneto used on the Enstrom C and F series helicopters is the D4LN-3200 manufactured by Teledyne Continental Motors.
 - B. D Dual type ignition unit.
 - C. 4 Number of engine cylinders
 - D. L Direction of rotation of the magneto from the drive end.
 - E. N Manufactured by TCM.
 - F. 3200- Shower-of-sparks starting system.
- III. Shower-of-sparks Starting system description
 - A. The shower-of-sparks starting system uses a vibrator/relay that is mounted on the firewall behind the co-pilot seat. When the pilot presses the starter switch mounted on the collective the vibrator/relay performs the following functions.
 - 1. Grounds the right magneto P lead.
 - 2. Switches the left magneto P lead to the retard P lead position on the magneto.
 - 3. Energizes the vibrator and sends the current into the retard P lead.



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NOTE

THIS IS NOT AN ACTUAL DIAGRAM OF THE ENSTROM INSTALLATION AS THE ENSTROM HAS A SEPARATE STARTER SWITCH THAT IS NOT INCORPORATED INTO THE MAGNETO SWITCH

IV. Magneto Parts Identification.



- V. Inspection of contact assemblies.
 - A. Remove the cover assembly remove the 4 corner screws and wiggle the cap assembly while withdrawing it from the magneto. The ignition wire insulators may stick in the distributer block making the cap initially difficult to remove.
 - B. When the cover is loose reach in and remove the upper (right magneto) cover P lead from the contactor terminal.
 - C. Open the cover and twist it downwards to expose the left side P lead contact and remove it from the contactor terminal.
 - D. Push the cover down so that it is out of the way, the wire bundle clamps may have to be loosened to achieve enough wire slack to move the cover away from the magneto.
 - E. Turn the engine by the fan so that the contactor cam followers are on a cam high point.



- F. Use a .14 feeler gauge as a go-no-go gauge. The Teledyne tolerance for the left points is .16 ±.002 and ±.004 for the right mag but Enstrom has determined that -.002, is the minimum point gap acceptable for the engine to deliver best power and operation time between magneto maintenance.
- G. If the gaps are less than .014 remove the magneto to readjust the contactors. This process cannot be accomplished with the magneto installed on the engine.
- H. Inspect the condition of the contactor in accordance with 6-2 of the Teledyne maintenance manual.
- I. Remove the magneto for contactor replacement if the parameters of the MM are not met.



J. Contact condition:



- i. Inspect the contact surface carefully to determine cause of the points closing. It is normal for the cam follower to wear some where it rubs on the cam.
- ii. If the points show signs of arcing, or the cam follower is melted where it pushes on the spring (Fig 4) the capacitor is most likely faulty and should be replaced.
- iii. If the cam follower is excessively worn where it rubs on the cam, the felt may be dry, the cam may need replacement, or the shaft bearing may be running hot in the distributer block.



- VI. Replacing contacts and Internal Magneto Timing.
 - A. Remove both sets of contacts, and both cams. The bottom cam can be removed by inserting a flat blade screw driver between the cam and the bearing and prying the cam off the shaft. (Fig 5)

Fig 5. Removing the cam with a flat blade screwdriver.



- B. Reinstall the cam on the shaft in any position that will cause the right side contactor cam follower to be on the top of a cam lobe. (High point of the cam)
- C. Install the right points and set the gap to .016 + .002, 0.0. Torque the screws to 21 to 25 in-lb. If there is not a good contact between the point contacts, they can be cleaned by dragging a piece of hard cardboard such as a business card through the contacts. Follow the Teledyne manual section 9-2.7 for proper lubrication of the cam follower felt.
- D. Position the rotating magnet so that the 'C' is adjacent to the mark cast into the housing (Fig 6), the magneto is in the neutral position, and the two chamfered teeth are showing in the windows in the ends of the magneto (Fig 7). (When the "L" is adjacent to the mark cast in the housing, one chamfered gear will be centered in the window and the other will be about one tooth off from centered).





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- E. Loosen the cam from the shaft and rotate it until the points open when the 'L' on the rotating magnet is **exactly** adjacent the marker cast into the cover.
- F. Install the retard cam assembly, and the left side retard contact assembly.
- G. Set the gap of the left main contactor so the points open at exactly the same time as the right contactor by adjusting the points. Changing the position where the points open on the left contactor is accomplished by changing the gap. Torque the screws to 21 to 25 in-lb.
- H. Carefully hold open the retard points to reach a feeler gauge through and use a .014, and .020 feeler gauge as a go-no-go gauge.
- I. Place the retard contactor on the high point of the retard cam and check the retard contactor for correct gap. ($.016 \pm .004$).
- J. If the gaps for the main or retard contacts are not within limits, the contact frame may be bent slightly to correct the gap. If the gap tolerance cannot be achieved between the right, left, and retard contact assemblies, the contact cam followers are worn and the contact assemblies will need to be replaced.
- K. Connect the timing light to the retard 'P' lead contact tang.
 - i. Install the timing light onto the retard 'P' lead connector. When using an LED style timing light, it must ground through the coil to work so it is necessary to clip the coil wire to the contactor 'P' lead contact with the timing light wire. (Fig 8)
 - Loosen the cam securing screw and rotate the cam so that the retard points open when the 20° mark on the rotating magnet is exactly adjacent to the mark cast into the magneto housing. (Fig 9) The main cam will maintain its positon on the shaft because of the taper.
 - iii. Re-check the retard contactor gap. The tolerance is $.016 \pm .004$.



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L. Torque the cam and contact securing screws to 21 to 25 in-lb.



- VII. Installing the magneto onto the engine.
 - A. Set the engine to the firing positon for #1 cylinder. (20° BTDC)
 - B. Set the magneto to the firing position for the #1 cylinder.
 - i. The C in the top window, the two red chamfered teeth in the side windows, and the label up. (Fig 6 & 7)
 - C. Check the alignment of the drive adapter on the magneto to the adapter inside the engine. On older magnetos, the drive adapter was installed with the connector palls horizontal and on the newer magnetos it is installed with the palls vertical. (Fig 10, item 1)



i. Occasionally, the adapter will come out of the engine with the magneto or need to be repositioned due to the magneto having the adapter in a different position.



- ii. Install the adapter into the engine in a positon that will allow the magneto to be installed and rotated a few degrees in both directions so the magneto to engine timing may be adjusted. The adapter has an odd number of gear teeth and if the angle is a little off, the adapter can be rotated 180° and reinstalled with the palls in a slightly different positon.
- D. Install the gasket onto the magneto base, and the magneto onto the engine. Apply a small amount of Lubriplate 105, Shell 22 grease, or engine oil to the gasket to hold it in place on the magneto during installation and to prevent it from tearing when the magneto is turned to adjust engine timing.
- E. Install the magneto hold down clamps, new star washers, and the nuts: tighten the nuts enough to hold the magneto but loose enough so it can be swiveled for timing to the engine.
- F. Connect the timing light and adjust the magneto so that the first set of points open at 21.5 degrees BTDC.
 - i. Enstrom has determined that the acceptable tolerance for advance timing is ± .5°.
 - ii. Torque the hold down nuts to 204 in-lb.



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- G. Set the Retard contact points opening.
 - i. Install the timing light onto the retard points contact.
 - ii. Set the retard points to open at ½ tooth on the ring gear after TDC.
 - iii. If the retard points need to be adjusted for proper timing to the engine, loosen the cam securing screw and use fingers or circlip pliers to move the cam so the retard points will open ½ tooth on the ring gear after TDC.
 - iv. Torque the cam retention screw to 21 to 25 in-lb.
 - v. Ensure that the copper retard contact is positioned properly to it will contact the retard P lead when the magneto cover is installed.
- H. Lubricate the internal cover ignition lead insulators with dry silicone spray so they will not stick in the distributer block during removal.
- I. Install the magneto cover and torque the corner screws to 30 to 35 in-lb. DO NOT OVERTORQUE.
- J. Install the P leads, be sure that the retard P lead is contacting the copper contact tang inside the magneto.

VIII. Troubleshooting

- A. Engine starts when the starter button is released.
 - i. Retard points are set at TDC which is too far advanced for high speed starters.
 - ii. Reset retard points to open at ½ tooth on the ring gear after TDC.
- B. Pilot complains that he feels an intermittent *Kick in his back* but the magneto ground run-up checks are OK.
 - i. Hover the helicopter at a low hover and perform a mag check.

CAUTION

NEVER PERFORM A MAGNETO CHECK ON A HELICOPTER ENGINE IN FLIGHT AS THE ENGINE MAY STOP RUNNING

CAUTION

WHEN PERFORMING A MAGNETO CHECK IN A LOW HOVER, BE PREPARED FOR THE ENGING TO LOOSE POWER AND FOR THE HELICOPTER TO SETTLE ON TO THE GROUND

- ii. If the engine runs OK during run-up but shows a mag drop in hover, it is an indication that the contactor gaps have closed or are faulty.
- iii. Remove the magneto and reset the contactor gaps and timing or replace the contact assemblies.

CAUTION

NEVER BUMP A MAG ON A HELICOPTER ENGINE TO CORRECT MAGNETO TO ENGINE TIMING. THIS WILL CAUSE THE MAGNETO INTERNAL TIMING TO BE OUT OF TOLERANCE AND A LARGE REDUCTION IN THE AVAILABLE ENGINE POWER.



- C. Cam follower is melted or excessively worn on the cam side.
 - i. Felt is dry, cam needs to be boiled in oil or replaced.
 - 1. Lubricate felt or cam in accordance with Bendix instructions.
 - ii. Cam is running hot due to problems with the bearing in the distributer block.
 - 1. Replace block.
- D. Points show signs of arcing.
 - i. Capacitor is failing.
 - 1. Replace capacitors.
- E. Cam follower is melted where it touches the contact spring. (Fig 4)
 - i. Capacitor has failed, arcing has overheated point spring.
 - ii. Replace capacitors.
- F. Engine has low power, (high manifold pressure) and high fuel flow.
 - i. Magneto internal timing is out of tolerance
 - ii. Check and correct magneto internal and engine timimg.
- G. Engine shows high TIT.
 - i. Magneto internal timing is out of tolerance.
 - ii. Check and correct magneto internal and engine timing.
- H. Engine misses on one cylinder during run up.
 - i. Spark plug not firing.
 - ii. Ignition lead open or shorted.
 - iii. Ignition lead trapped inside magneto between the cover and the distributer block.
 - iv. Spring missing from the distributor block.
 - 1. Bendix and Enstrom both have tools to insert the spring into the magneto block.





T-0179 Magneto block spring installation tool

- I. Engine misses after spark plugs are removed and replaced.
 - i. No 1 and 3 top spark plug leads are crossed.
- J. Ignition lead sticks inside distributer block when removing cover
 - i. Lubricate insulators with dry silicone spray when installing cover.

