PRECISION AIRMOTIVE CORPORATION

Service Information Letter - Fuel Systems

SIL RS-67

SMALL RECIPROCATING ENGINES
All RSA
Issued 11/20/02

SUBJECT: Idle Speed and Mixture Adjustments for RSA Fuel Injection Systems

PURPOSE: To provide comprehensive idle speed and mixture adjustment procedures.

A. EFFECTIVITY: All aircraft using RSA fuel injection systems.

B. DESCRIPTION: The following procedures may be used to inspect and set idle speed and mixture settings. The recommended interval between inspections is every 25 hours for the first 100 hours and at every 100 hour or annual inspection thereafter.

C. DETAILED INSTRUCTIONS:
Refer to the aircraft maintenance manual for idle speed and mixture setting procedures and limitations. If the aircraft maintenance manual has no procedures and limitations, the following instructions should be followed:

1. Start the engine and warm up in the usual manner until the oil temperature is in the 140 to 180 degrees F range. To eliminate any possible effects from vapor formation, the engine should be cold prior to startup (see paragraph C.13). The relationship of the aircraft to the direction of the prevailing wind will have an effect on the propeller load and its RPM; hence, it is advisable to make the idle setting with the aircraft crosswind.
2. Run the engine at the RPM recommended in the aircraft flight manual for magneto check for a minimum of 30 seconds to clear engine before performing the following checks.
3. Check magnetos in accordance with instructions furnished in the aircraft operational manual. If the “mag-drop” is excessive, check for fouled plugs. If the “mag-drop” is normal, proceed with idle adjustment.
4. Move the cockpit throttle control to idle and release the control. Set throttle stop screw so that the engine idles at the airframe manufacturer’s recommended idling speed. If the airframe manufacturer’s information does not have an idle RPM setting, 700 RPM - 750 RPM is recommended. If the RPM changes appreciably after making idle adjustment during the succeeding steps, readjust the idle speed to the desired RPM.

5. When the idle speed has stabilized, move the cockpit mixture control very slowly toward the "idle cut-off" position. If the aircraft is equipped with a vernier mixture control, use the vernier. If the aircraft does not have a vernier mixture control, move the control in very small increments and allow a few seconds for the engine to respond between mixture control movements. Observe the tachometer for changes in engine RPM during this leaning process. Continue leaning until a definite drop in engine RPM is indicated on the tachometer. The maximum observed RPM during the leaning process is "best power" RPM. An increase in RPM while "leaning out" indicates the mixture is richer than best power. An immediate decrease in RPM (not preceded by an increase) indicates the idle mixture is set too lean. Caution must be exercised to return the mixture control to the "Full Rich" position before the RPM can drop to a point where the engine cuts out.
6. The optimum idle setting is one that is rich enough to provide a satisfactory acceleration under all conditions and lean enough to prevent spark plug fouling or rough operation. A rise of 10-40 RPM will usually satisfy both of these conditions.
7. If the above indicates that the idle adjustment is too rich or too lean, turn the idle mixture adjustment in the direction required for correction, and check this new position by repeating the above procedure. Make additional adjustments as necessary until a check results in the desired RPM rise. Each time the adjustment is changed, the engine should be run up to the RPM used for the magneto check to clear the engine before proceeding with the RPM check.
8. The actual idle mixture adjustment is made by the lengthening (richening) or shortening (leaning) of the linkage between the throttle lever and idle valve lever. The center screw assembly has right hand threads on both ends but one end has a No. 10-24 thread and the other end has a No. 10-32 thread. The screw assembly also has a thumb wheel or a hex nut in between the course and fine threads to be used as a means of adjustment. For easy reference, consider only the coarse thread end. When it is turned out of its block, the linkage becomes longer and a richer mixture is provided. When it is turned into its block, the linkage is shortened and a leaner mixture is provided. Many servos have an "R" and an arrow engraved on one of the links to indicate which way to turn the screw assembly to enrichen the mixture.
9. A major adjustment is available for use when the screw assembly bottoms out on either of the blocks. If the idle adjustment is almost satisfactory, measure the distance between the two blocks. Disconnect the spring (when applicable) from the most accessible linkage pin and remove the linkage pin, wave and flat washer. Turn the block and adjustment screw until the adjusting wheel is centered and the distance between blocks is as previously measured. Reinstall the linkage pin, flat, and wave washer and spring (if used). There is now additional adjustment range and the reference point is retained.
10. Make the final idle speed adjustment to obtain the desired idling RPM with closed throttle.
11. The above method aims at a setting that will be suitable for a normal range of atmospheric conditions. In case the setting does not remain stable, check the idle linkage; any looseness in this linkage would cause erratic idling. In all cases, allowance should be made for the effect of weather conditions and field altitude upon idling adjustment.

12. Idle speed and mixture adjustments made according to this method should require very little further attention except for significant variations in temperature and altitude. Under some conditions the mixture rise may fall outside of the values set during adjustment. It is normally acceptable to have no rise as long as the RPM remains within ±50 RPM of the original setting. It is also normally acceptable to have a rise of up to 75 RPM as long as the engine continues to run smoothly.

13. If the system has been set up in accordance with the above instructions and the mixture does not meet the criteria set in paragraph C.12 after a short period of time, further troubleshooting is in order. If the system is set in accordance with this letter (prior to extended engine runs or flights), and the mixture does not meet the criteria after flight (especially in warm weather), vapor formation may be indicated. See the publications referenced in paragraph D for further information. If no other discrepancies are found, the servo should be removed and sent to an approved repair facility for evaluation.

D. REFERENCE PUBLICATIONS:

1. Precision Airmotive
   - 15-338 RSA-5 & RSA-10AD1 Operations and Service Manual
   - 15-812 RSA Fuel Injection System Training Manual
   - 15-810 Troubleshooting Techniques for the Precision Airmotive RSA Fuel Metering System

2. Textron Lycoming
   - SI 1497 Engine Procedures for Flight Training Operations
   - SI 1498 Recommended Engine Procedures for Purging Vapor During Ground Operations
   - L192 Spark Plug Fouling
   - L197 Recommendations to Avoid Valve Sticking