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MANDATORY SERVICE BULLETIN

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Engineering Aspects are
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SUBJECT: Dynamic Counterweight System Detuning.

MODELS AFFECTED: GO-435, GO-480, IGO-480, GSO-480, IGSO-480, IGO-540, IGSO-540, VO-540, TIGO-541.

TIME OF COMPLIANCE: At all times during engine operation including ground running.

In the piston engine, the reciprocating inertia forces (which increase with engine speed) are counteracted by the expansion forces acting on the pistons. Therefore, the loads imposed on the engine parts are represented by the difference between the two forces. Thus, at high speeds where the inertia forces are the greatest, the resultant forces are much higher with low manifold pressure than with high manifold pressure, cylinder pressure being in direct proportion to manifold pressure. When one of these two forces, the inertia force or the expansion forces, is suddenly changed, the effect on the resultant forces can cause the counterweight system to detune.

Detuning the counterweight system of the engine can occur when the engine operates outside of its normal range and by abrupt throttle change. When this happens the dynamic counterweights can not follow the spectrum of frequencies for which they were designed and rapid and severe damage to the counterweights, rollers and bushings may result, culminating in engine failure.

Essentially, there are four operating conditions that can cause the counterweight system to detune; they are as follows:

1. RAPID THROTTLE OPERATION: Rapid opening or closing of the throttle can cause counterweight detuning. This can occur while adjusting the governors or other checks on the engine which make it necessary to run the engine at rated take-off speed. Also, detuning can occur if the power is suddenly cut-off, such as during a simulated engine failure as required for pilot training. To avoid detuning during simulated engine failure, use the mixture control to shut off the engine and leave the throttle in normal open position until the engine has slowed down because of lack of fuel. Then close the throttle to an idle condition. The throttle being open allows the cylinder to fill with air, maintaining the normal compression forces which are sufficient to cushion the deceleration of the engine. Another result of rapid throttle movement is severe strain on the supercharger gears and associated gears because of the inertia force of the high speed impeller.

2. HIGH ENGINE SPEED AND LOW MANIFOLD PRESSURE: Any operating procedure involving high R.P.M. engine speed and low manifold pressure (under 15 inches Hg.), such as might be the case during a power-off descent, can cause detuning of the dynamic counterweight system. However, just prior to touchdown, during the landing sequence it is permissible to place the propeller governor con-

trol in the high R.P.M. (low pitch) position and the throttle control may be closed. At this low airspeed there will be no increase in engine R.P.M.

3. EXCESSIVE SPEED AND POWER: Any supercharged or turbocharged engine, without automatic manifold pressure controllers, has the inherent capability of operating at power settings beyond the capability of the engine; this is particularly true at low altitude. See the operators manual for speed and power limitations for specific engine models. Reference latest edition of Service Bulletin No. 369 for limits on manifold pressure and speed.

4. PROPELLER FEATHERING: Avoid propeller feathering during flight. If practice feathering must be accomplished be sure the throttle of the feathered engine is set at approximate zero thrust position before mixture control is opened and engine operation resumed. See the aircraft operation manual for specific feathering instructions.

NOTE: Revision "D" changes Models Affected and revises text.