pilot valve on the governor, which moves up or down inside the driveshaft to direct the oil through different ports. One port diverts oil pressure to the propeller dome; another allows it to flow back, relieving the pressure.

Pilot valve position is controlled by a set of flyweights mounted at the end of the driveshaft. The flyweights, sensitive to centrifugal force, tilt outward as RPM increases, inward as it decreases. In the outward position, the flyweights raise the pilot valve; in the inward position, they lower it. Pressing down on the pilot valve is a speeder spring, which is connected by control cable, pulley, and speeder rack to the cockpit propeller lever.

If the pilot wants a higher engine RPM, the propeller control lever is pushed forward. This compresses the speeder spring, which in turn pushes down on the flyweights, tilting them inward. The propeller, which has been turning at a lower RPM than is now desired, is in an "underspeed" condition. As the flyweights are tilted inward, they move the pilot valve down, permitting oil to flow under pressure to the propeller dome. The oil pushes on the piston, which in turn decreases the blade angle. The lower blade angle allows the propeller to turn faster under the given conditions, so RPM increases. When it does, centrifugal force on the flyweights slowly overcomes speeder spring force and the pilot valve returns to the neutral position. This stops the oil flow and maintains a constant blade angle.

If the pilot wants a lower RPM, the propeller control is moved aft, which relaxes speeder-spring tension, tilting the flyweights outward. This condition, called "overspeed," occurs whenever existing RPM is higher than that selected with the propeller lever. The result is the flyweights raise the pilot valve, permitting the oil to flow out of the propeller dome, causing the blade angle to increase, and thereby causing RPM to decrease. Decreased RPM results in decreased centrifugal force on the flyweights; slowly, the flyweights again succumb to speeder-spring force. The pilot valve returns to the neutral position, the oil flow stops, and blade angle remains constant until the next disturbance. If this sounds involved and complicated, then consider that it occurs almost instantaneously. Overspeed and underspeed conditions are corrected so quickly, the pilot typically is unaware they have occurred; they don't even show up on the tachometer!

Of course, there are limitations to this process. The governor can maintain a given RPM as long as the blade angle remains between the low- and high-pitch stops, but it also requires horsepower. For instance, every airplane can outclimb its maximum sea-level RPM if allowed to go high enough. Normally aspirated aircraft will do so quickly, in fact. But there is another source of horsepower available to the propeller besides the engine: free-stream energy. The governor doesn't care if the engine turns the propeller or the propeller is turning the engine as long as it does it at the selected RPM! Placing the engine at idle and putting the aircraft in a fast descent can cause the airflow to turn the propeller, which in turn can cause the propeller to turn the engine. If the prop is set for 2200 RPM, the governor will try to maintain that RPM, regardless of throttle setting, by adjusting the blade angle as necessary.

Taken to the extreme the governor eventually will run out of blade travel. When that happens the prop functionally becomes "fixed pitch," with RPM directly affected by throttle setting (manifold pressure). But a windmilling constant-speed prop has sufficient

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