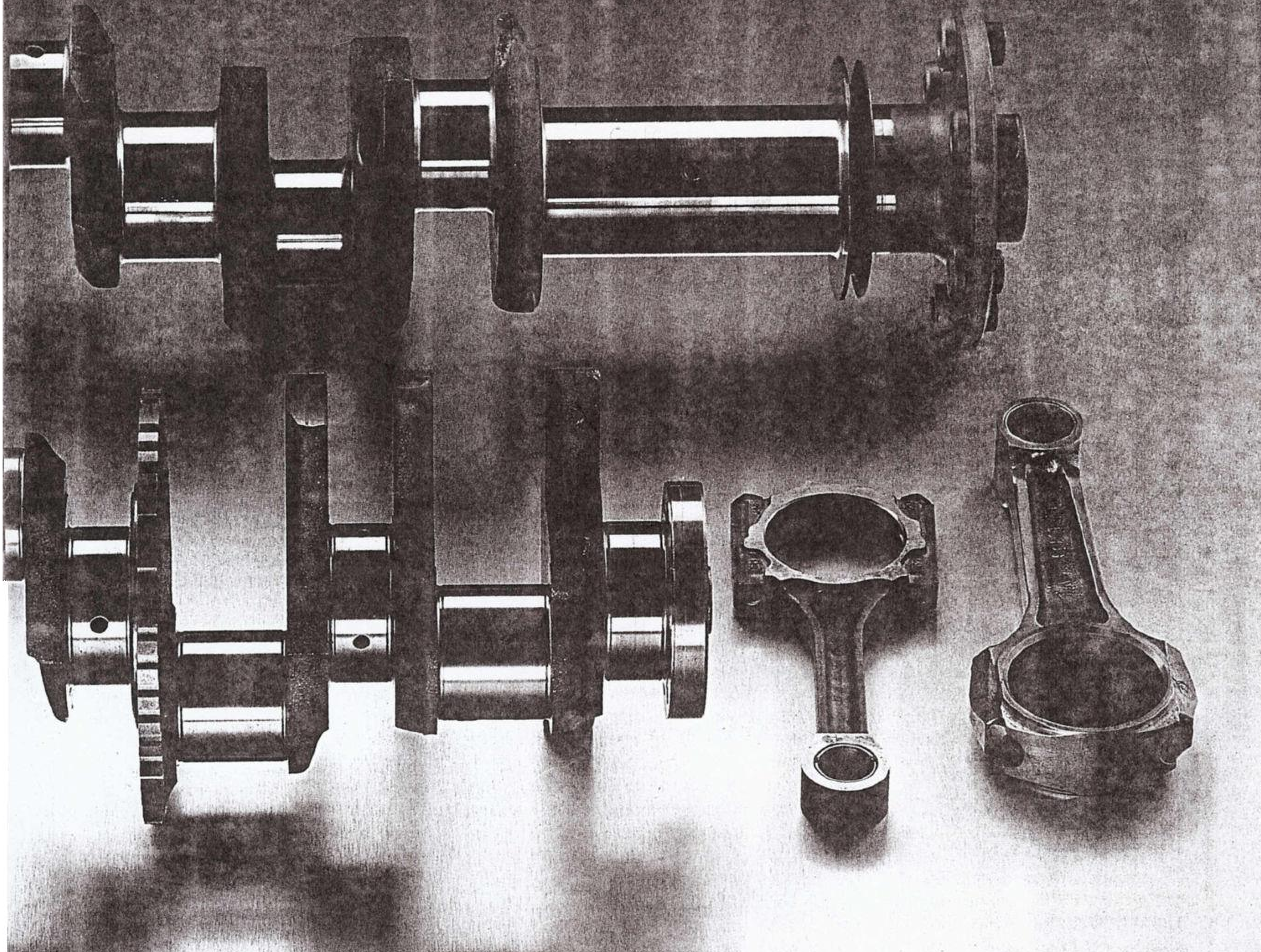
Power Struggle

Why car engines won't fly.

by Don Sherman



The crankshafts and connecting rods of two 300-horsepower engines illustrate the stark differences between automobiles and aircraft. The Cadillac Northstar V-8 crankshaft (foreground) has five main bearing journals, all narrower and of larger diameter than the four connecting rod journals, each of which is linked to a pair of pistons. The large toothed ring near the middle of the crankshaft governs spark timing. The Lycoming IO-540 crankshaft (background) has four main bearing journals, including the extra large one for the propeller at the front end (right) and six connecting rod journals, one for each cylinder. The cooling fins on each cylinder increase the engine's intercylinder distances, making the crankshaft considerably longer than the Cadillac's (inset). Because of their length, combined with a more severe operating environment, aircraft cranks must be made heavier than a car's.

During World War II, liquid-cooled piston engines did more than their share to help secure victory. The U.S. Allison V-1710 in the P-40 Warhawk and P-38 Lightning and the British Merlin in the Hurricane, Spitfire, and P-51 Mustang were "fighter" engines: two banks of six cylinders arranged in a "V" not much wider than the pilot's shoulders, the whole thing shoehorned into a slim cowling that parted the air like a stiletto. The Allison notwithstanding, the Americans had a preference for air-cooled radial engines, and liquid-cooled engines were a primarily European technology. It was the license-built Merlin that made the Mustang a legend (see "Who Made the Mustang?" Aug./Sept. 1996), and after the Allisons, no American liquid-cooled V was produced in volume.

In the United States today the only aircraft piston engines of any kind in volume production—leaving aside for a moment the issues of liquid cooling and the V configuration—are produced by Teledyne Continental Motors (TCM) and Textron Lycoming. The two companies offer primarily air-cooled engines that have cylinders opposed in a horizontal, or "flat" layout, and produce 100 to 425 horsepower. They have been used primarily in light, general aviation single- and multi-engine airplanes. (TCM wraps the cylinders in water jackets to cool its "Voyager" series engines, but the layout is unchanged.)

With the exception of these small engines, the piston engine has been replaced in aircraft by the powerful, lightweight turbine. Even in Europe the liquid-cooled V has long been extinct, and today, not a single modern descendant of the thundering Merlin has made its way into a current aircraft. The largest U.S. piston engine for aircraft made today is the 46-inch-long eight-cylinder Lycoming IO-720 rated at 400 horsepower. An Allison 250-B17, the closest comparable turbine engine, produces 420 shaft horsepower but weighs only 35 percent as much as the big Lycoming. It makes up for the lower weight with a higher price,

ROBERT T. VANMARTER (2)