

## Lycoming



**Lycoming Engines** is a major [aircraft engine](#) company, known primarily for their smaller [general aviation engines](#). For most of its history Lycoming has been part of the [AVCO group](#) as **AVCO Lycoming**. In 1987 AVCO was purchased by [Textron](#) to become **Textron Lycoming**. In 2002 the company was renamed **Lycoming Engines**.<sup>[1]</sup>

### History

Lycoming first set up business in [1916](#) in [Williamsport, Pa](#) (in Lycoming County) as a [sewing machine](#) manufacturer, and soon branched out into [bicycle](#) manufacturing as well. Through the early post-[WWI](#) era they increasingly focused on [automobile](#) engines, and at one time became a major supplier for [Auburn](#), which produced the [Auburn](#), [Cord](#), and [Duesenberg](#) lines. Eventually they became their major supplier, and in [1929](#) Cord bought the company, placing it under his [Auburn Manufacturing](#) umbrella group. Also in 1929 Lycoming produced their first aviation engine, the [radial R-680](#). This was a fairly successful design, and was used widely in light [aircraft](#), including Cord's [Travel Air](#).

Through the [1930s](#) Lycoming made a number of efforts to break into the "big league" with high-power engine designs. The 1200 [hp O-1230](#) was their attempt to produce a [hyper engine](#), an aviation engine that could produce one [horsepower](#) per [cubic inch](#) (46 kW/L) of [engine displacement](#). The hyper engine concept was a psychological target for engine designers in the 1930s; in order to make really long-distance flights routine, an engine of this sort of [power-to-weight ratio](#) would be needed to lift the required [fuel](#) and still have power left over to lift the cargo. However the O-1230 took so long to reach service that it had been bypassed by other designs and their [US\\$500,000](#) (over [US\\$6 million](#) in year [2000](#)) was not recouped. Another attempt was made to rescue the design by stacking two O-1230's to make the 2300 hp (1,700 kW) [H engine H-2470](#), but the only design to use it, the [P-54](#), never entered production.

Not to be stopped by the O-1230's failure, they turned to an even larger design, the [R-7755](#), the largest aviation [piston engine](#) ever built. However this design ran into problems, and was only ready for use at the very end of [World War II](#), when the aviation world was turning to [jet engines](#) for power on future large designs. There was apparently some interest in using it on the [B-36 Peacemaker bomber](#), but the [Pratt & Whitney R-4360](#) was used instead.

In [1939](#) Cord re-organized all of his aviation holdings into the AVCO group, at which point they became AVCO Lycoming. They also leased a government-owned plant in [Stratford, Connecticut](#) and produced [Wright radial engines](#) under licence. After the war this plant was converted to produce the [T53 turboshaft](#) engine, one of their more successful designs. From this point on the piston and [turbine](#) engine lines remained separate, with the piston lines being built in the original Williamsport factories, and turbines in Stratford.

Their most successful post-war products were a series of [flat-4](#) and [flat-6](#) air-cooled general aviation engines. Most famous among these are the [O-235](#) and [O-360](#) fours, and the [O-540](#) six. The vast majority of light aircraft today are powered by a version of these engines, covering everything from the 100 to 360 hp (75 to 270 kW) range. Other engines in the series include the basic [O-320](#) four, [O-580](#) six and [O-720](#) eight, and the advanced [TIGO-541](#) which delivered 450 hp (340 kW) from an engine the same size as the O-540.

In the early [1980s](#) the bottom dropped out of the general aviation market, and Lycoming's piston engine business suddenly disappeared. Attempts were made to move some of the turbine production to Williamsport, but this led to a series of [quality control](#) problems and eventually the attempt was abandoned.

## **Textron purchase**

Textron purchased the company in [1986](#)

Another attempt to rescue Williamsport was made in an attempt to introduce the "radical" *SCORE* engine, a [Wankel engine](#) originally developed in a partnership between [Curtiss-Wright](#) and [John Deere](#). Curtiss-Wright lost interest in the design just as it was maturing and sold it to John Deere, who brought in Lycoming to sell into the aviation markets. They were guaranteed a startup run by [Cessna](#), also owned by Textron. Just as production was ready to start Cessna announced they were exiting the small-aircraft business, and SCORE was cancelled. The remains of the John Deere licenses were later purchased by [Rotary Power International](#), who produced a 340hp version for a short time.

Textron eventually decided that the piston engine market was dead, and that Lycoming should exist only as a "shell", offering parts and service to the huge number of general aviation engines in service. Accordingly they sold off the turbine division to [AlliedSignal](#) in [1996](#), and started selling off the machinery from Williamsport in [1995](#).

## **Engines**

### **[Lycoming IO-320](#)**

The Lycoming IO-320 is a four [cylinder](#), [air cooled](#) horizontally opposed [aircraft engine](#). It has a 320 cubic inch displacement. "IO" stands for fuel injected and opposed cylinders. Versions are [fuel injected](#) and [turbocharged](#) and it has an outstanding reputation for reliability. It is used in many [light aircraft](#), especially small touring aircraft and trainers. It generally produces 150-160 [horsepower](#), depending upon the model.

### **[Lycoming IO-540](#)**

The Lycoming IO-540 is a six-cylinder, horizontally opposed direct drive engine of 540 cubic inch displacement. Versions of this engine are equipped with [carburetors](#) (referred to as "O-540") or turbochargers (known as "TIO-540"). Generally these engines produce 260 to 315 horsepower. They are installed on many [Aero Commanders](#), [Piper Navajos](#), [Chieftans](#), [Aztecs](#), [Saratogas](#), [Comanches](#) and Aerostars. Their main competitive engine is the [Continental](#) IO-520 and IO-550 series.

## Lycoming O-320



A Lycoming O-320-D2A installed in a [Symphony SA-160](#)

The [Lycoming](#) (now Textron-Lycoming) **O-320** is a normally-aspirated, air-cooled, four-cylinder, direct-drive engine commonly used on entry-level [aircraft](#) such as the [Cessna 172](#) and [Piper Cherokee](#). Different variants are rated for 150 or 160 [horsepower](#) (112 or 119 kilowatts). As implied by the engine's name, it has a displacement of 320 cubic inches (5.2 L).

The O-320 series engines look very much like the four-cylinder Lycomings of lesser power. The increased cubic-inch displacement is the result of increased bore. Stroke is the same as the O-235's and O-290's - 3.875 inches. All modern lightplane engines of the opposed cylinder layout are over-square. That is, stroke is markedly less than bore. A short stroke holds down piston speeds and reduces wear.

In design and operation, the O-320's tappets are almost identical to the hydraulic tappets used on Continental engines. As the camshaft lobe actuates the cam follower and pushes the hydraulic lifter cylinder outward, the oil in the chamber acts as a cushion. While the engine valve is off its seat a bit of oil leaks between the plunger and cylinder bore to compensate for any contraction or expansion in the valve train. Then, as the cam lobe moves off the follower and the engine valve closes, the supply chamber immediately refills and prepares for another cycle.

The O-320 series engines have provision in the crankcase (ahead of number one cylinder) for a hydraulic propeller installation. Also, the chrome moly crankshaft on some models are fitted with a pair of small propeller flange bushings which allow this shaft, designed for constant-speed propellers, to accommodate a controllable-pitch prop. But crankshafts intended for constant speed props may not be substituted for shafts in fixed pitch installations unless the plug, in the rear of the hollow front section of the shaft, is installed. (Or removed, if switching from fixed-pitch to controllable pitch). The O-320 in the used market may or may not have chromed cylinder barrels. Just make sure that you never put chromed piston rings into a chromed cylinder barrel, because something has to give, and chrome against chrome makes this impossible. As a general rule, Lycoming chromes the cylinder barrels of its higher power engines in manufacture, while Continental prefers to use chrome rings.

Internal engine lubrication is conventional on the O-320s. Mains, con rods, camshaft bearings, tappets, and pushrods are pressure lubricated. Oil collectors and spray lubricate the piston pins, cylinder walls, and gears. The oil pump, located in the accessory housing, sucks oil from the sump and sends it through a drilled passage in the accessory housing a threaded connection on the rear face of the housing, through a flex line and into the external cooler. Pressure oil from the oil cooler returns to another threaded connection on the accessory housing and goes through a drilled passage to the oil pressure screen, which is in a casting mounted on the accessory housing. If cold oil or an

obstruction should restrict the oil flow to the cooler, a bypass valve allows the oil to flow directly from the oil pump to the oil pressure screen chamber.

From the pressure screen chamber, oil flows through a drilled passage to the pressure relief valve (located on the upper right side of the crankcase ahead of the accessory housing), and this relief valve maintains proper oil pressure in the engine by diverting excess oil back into the sump. The pressure oil is then fed to the main oil gallery in the right half of the crankcase.

Flowing through this main gallery, the oil is distributed to the drilled passages which take it to the main bearings of the crankshaft. Angular holes are drilled through the mains to the rod journals where sludge removal tubes are located. Thus the centrifugal force of the crankshaft in motion removes sludge and foreign matter that may be in the oil.

Drilled passages from the rear main send oil to the crankshaft idler gear shafts. And oil from the main oil gallery also flows to the cam and valve gear passages, and then through branch passages to the hydraulic tappets and cam bearings. Oil enters the tappet through indexing holes and goes out through the hollow pushrods to the valve mechanism, lubricating the rocker bearings and valve stems.

The O-320 Lycomings have an ignition system similar to that of the O-235 and O-290 engines, and also employ the Scintilla 84LN-20 and -21 magnetos, except as noted in the model list below. The induction system, too is practically the same, except that the O-320 is fitted with a Marvel-Schebler MA-4SPA carburetor.

The AN 20010 propeller governor drive furnished with the O-320 allows installation of a constant speed governor and a single - acting controllable pitch prop. High pressure oil is carried from the governor, which is mounted on the accessory housing, to the front of the crankcase by way of an external oil line. The oil then flows into the hollow front section of the crankshaft through indexing holes in the crankcase, front main bearing, and crankshaft.

## Lycoming O-540

A six-[cylinder](#), [horizontally opposed direct drive aeroplane](#) engine of 540 cubic inch (8.8 l) displacement.

Versions of the "O" type engine are equipped with carburetors (referred to as "O-540" and fuel injected versions are denominated as "IO-540s"). Turbochargers are known as "TIO-540".

Generally these engines produce 260 to 315 horsepower (194 to 235kW). They are installed on many [Aero Commanders](#), [Piper Navajos](#), [Chieftains](#), [Cessnas](#), [Piper Aztecs](#), [Piper Saratogas](#) [Piper PA-24 Comanches](#), [Robinson R44](#), and aircraft from the [Aerostar Aircraft Corp.](#) Their main competitive engine is the [Continental](#) IO-520 and IO-550 series.

Retrieved from "[http://en.wikipedia.org/wiki/Lycoming\\_O-540](http://en.wikipedia.org/wiki/Lycoming_O-540)"



A Textron Company

## **CORPORATE BACKGROUNDER**

### **OVERVIEW**

On April 3, 1929, a Beech-designed TravelAir biplane was the first aircraft to feature a Lycoming motor (the nine-cylinder, 215 horsepower R-680 radial engine) on successful trial flights. It was christened “The Lycoming” because the Lycoming Manufacturing Company, now known as Lycoming Engines, built the motor. The successful trial came just two years after Charles Lindbergh flew his “Spirit of St. Louis” nonstop from New York to Paris marking the “golden age of aviation” and introduced Lycoming as the world’s foremost piston aircraft engine manufacturer. Over the next twenty years, Lycoming built over 25,000 R-680 radial engines and established a worldwide reputation for excellence that has thrived ever since.

Headquartered in Williamsport, Pennsylvania, today Lycoming is a global operating division of Textron’s Avco Corporation subsidiary, and an operating unit of Textron Systems, specializing in the engineering, manufacturing, assembly, test and support of piston aircraft engines. Lycoming’s factory produces the most complete line of horizontally opposed, air-cooled, four-, six- and eight-cylinder engines available including the only FAA-certified aerobatic and helicopter piston engines on the market. The company has built more than 325,000 piston aircraft engines and powers more than half the world's general aviation fleet, both rotary and fixed wing.

Lycoming engines power a wide range of aircraft, are consistently reliable and are backed by a worldwide network of sales, service and technical support. As the industry leader, Lycoming continues to improve the performance and value delivered to its customers through research and development with enhanced valve train systems, alternative fuels and materials advancement.

Textron Inc. is a \$10 billion multi-industry company with more than 44,000 employees in 40 countries. The company leverages its global network of businesses to provide customers with innovative solutions and services in industries such as aircraft, fastening systems, industrial products, industrial components and finance. Textron is known around the world for its powerful brands such as Bell Helicopter, Cessna Aircraft, Jacobsen, Kautex, Lycoming, E-Z-GO and Greenlee, among others.

### **MILESTONES**

- 1907: Creation of Lycoming Foundry and Machine Company
- 1910: Produced first automobile engine for Velie Motor Corporation. Produced Cord, Auburn, Duesenberg, Locomobile, Paige, Graham, McFarlan, and Checker models
- 1929: The Lycoming factory developed its first aircraft engine: a nine-cylinder radial, the R-680. More than 25,000 R-680s were built.
- 1933: Lycoming becomes part of Aviation Corporation, later AVCO

- 1938: Lycoming develops the O-145 opposed cylinder engine. Igor Sikorsky flew the first successful helicopter powered by a 65-horsepower GO-145
- 1945: A Lycoming-powered Stinson "Sentinel" liaison plane becomes the first allied plane to land on Iwo Jima
- 1967: Lycoming developed the first and only FAA-certified aerobatic engine
- 1987: Textron purchase AVCO which includes AVCO Lycoming
- 1994: Lycoming selected to power the Cessna Single Engine Restart Program
- 1996: Lycoming piston engines power all United States aircraft competing the World Aerobatic Championships
- 1997: Lycoming engines power more than 85% of the new general aviation aircraft produced worldwide
- 2002: Textron Lycoming announces name change to "Lycoming Engines" eliminating Textron from it previously co-branded logo
- 2003: Lycoming announces the debut of its racing program with the sponsorship of two teams appearing at the 40<sup>th</sup> anniversary National Champion Air Races and Air Show at Reno, Nevada
- 2004: Lycoming opens engine museum at company HQ in honor of the 75<sup>th</sup> anniversary
- 2005: January 18, Lycoming powered Robinson helicopter lands on South Pole after departing Buenos Aires, Argentina on December 29, 2004

## **FACILITIES (1) & EMPLOYEES (526)**

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Michael Everhart  
Director of Distribution and Channel Management

Peter Bates  
Director of Customer Service

Suzette Snyder  
Sr. Manager, Human Resources

Dane McGuffee  
Director of Aftermarket Sales

## **PRODUCTS**

Lycoming specializes in aerobatic, general aviation, helicopter and experimental engines. Overall there are six families of engines: the 235-, 320-, 360-, 390-, 540-, 580-, and 720-cubic inch series. In total, Lycoming has more than 580 current certified models, and can match the right engine configuration to virtually any airframe. Lycoming can design, build and customize an engine to meet Original Equipment Manufacturer requirements and provides engines to OEMs and kit plane builders involved in Supplemental Type Certificate (STC) modifications and major refurbishments.

## **CUSTOMERS**

Cessna Aircraft, The New Piper Aircraft, Robinson Helicopter, Diamond Aircraft, Aviall

## **MEDIA CONTACTS**

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## **OTHER RESOURCES**

Lycoming: [www.lycoming.textron.com](http://www.lycoming.textron.com)  
Press center: [www.lycomingpower.com/media](http://www.lycomingpower.com/media)

Textron: [www.textron.com](http://www.textron.com)