PRATT&WHITNEY



AN

ASME HISTORIC ENGINEERING LANDMARK

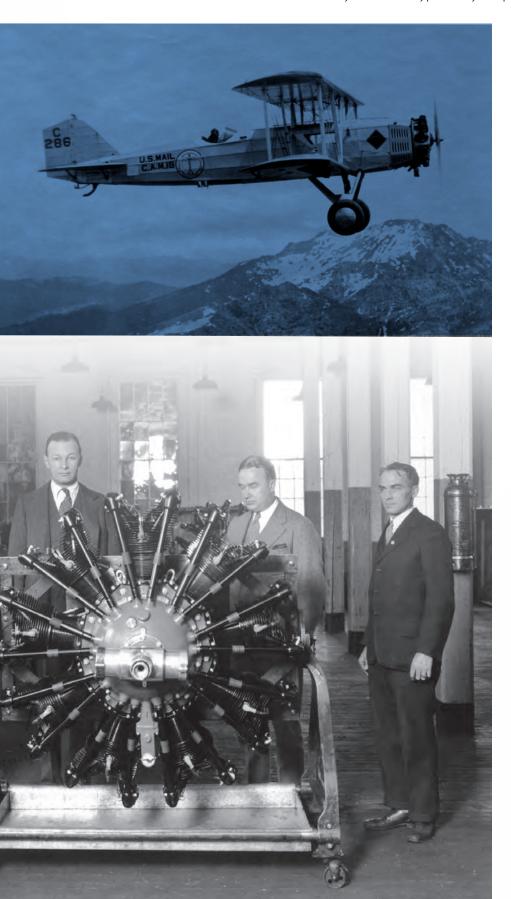




It is no exaggeration to say the progress of aviation can be measured by the pace of propulsion development. This was how Pratt & Whitney founder Frederick B. Rentschler expressed it in 1925. "It seemed very definite that the best airplane could only be designed around the best engine."

R-1340 ENGINE

The Pratt & Whitney R-1340 Wasp was a major milestone in a stream of progress that has taken us from the Wright Brothers 28-horsepower engine to the turbofan engines of today that can produce 100,000 pounds of thrust. The Wasp would change military aviation and pioneer reliable commercial airline service, powering nearly 100 aircraft types. Many Wasps still fly today all over the world.



In the beginning, only 22 years after the Wright Brothers, it was a small team led by Rentschler that had the idea for a remarkable product. Rentschler came from an Ohio manufacturing family by way of Princeton University. During World War I he was an Army inspector at the Wright engine plant in New Jersey, building the European Hispano-Suiza engine. After the war Rentschler was invited to run the newly organized Wright Aeronautical Corporation in Paterson, New Jersey. The major project became air-cooled radial engines. At that time most engines were like auto engines, cylinders in line, cooled by water and cooling fluid like glycol. Although some were excellent performers, they tended to be heavy with the extra weight of plumbing and coolant. There were those, especially the fledging aviators of the U.S. Navy, who believed an air-cooled radial engine was an alternative. These engines would be more compact, easier to maintain without the liquid cooling hardware and also more reliable without the radiators, pipes, hoses, pumps and tanks. They could take the pounding of carrier landings.



The Navy told Rentschler that it wanted an engine even more powerful than the Wright Whirlwind, at least 400 horsepower. There would be no initial development money, but if Rentschler and his small team could build such an engine, the service would be very interested.

Through family connections Rentschler was introduced to the management of the Pratt & Whitney Company in Hartford, Connecticut. Founded by Francis Pratt and Amos Whitney, who had worked for Samuel Colt, the company was highly respected for its machine tools. Pratt & Whitney would put up \$250,000, machine tools and factory space and have a 50 percent interest in the new Pratt & Whitney Aircraft Company. Rentschler and chief engineer George Mead would hold the other half. Mead had worked for Rentschler at Wright and also wished to try for something better.

Other key Wright people came to Hartford, too, including Andy Wilgoos, a brilliant engine designer. In fact, the first design work on what would become the Wasp was done in Wilgoos' garage in Paterson, New Jersey, in June 1925. By August the garage was left behind and everyone, about 20-30 people, worked at the old Pope-Hartford automobile plant, that still smelled of Connecticut Valley cigar tobacco that had been stored in the vacant building.



1,708,458 Patented Apr. 9, 1929. UNITED STATES PATENT OFFICE.

ANDREW V. D. WILLGOOS, OF WEST HARTFORD, CONNECTICUT, ASSIGNOR TO THE FRATE & WHITNEY AIRCRAFT CO., OF HARTFORD, CONNECTICUT.

INTERNAL-COMBUSTION ENGINE.

Application filed July 28, 1928. Serial No. 125,503.

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It was a pretty simple organization. Rentschler, Mead and factory manager Don Brown each had an office. Andy Wilgoos worked in the drafting room. Wright alums Jack Borrup and Charlie Marks scavenged the machine tool company for equipment and people who might be able to build an aircraft engine. Mead would release drawings to Brown who was also the purchasing agent because he did not really have much factory to manage. He, in turn, would pass the drawings through a hole in his office wall to Borrup, perched on a small platform overlooking the "factory floor."

Besides the goals of 400-plus horsepower and a 650-pound weight, the engine had to be easy to build and maintain and very reliable. On top of all that, the team had until the end of year 1925 to complete the first engine, and it was already August.

George Mead and Andy Wilgoos worked out a unique design that was rugged and easy to build. The one-piece master connecting rod was fitted around a two-piece crankshaft. This greatly strengthened the highly stressed master rod that transmitted the full power of all nine cylinders to the crankshaft, allowing a service rpm as high as 2400. The crankcase was a two-piece forging, lighter and stronger than the traditional casting design. Because the overall design cut down on weight, the engine could be bigger – 1340-cubic-inch displacement compared to 1140 cubic inches in a competing Wright design. Mead and Wilgoos even figured out a way to machine cylinder-cooling fins from a solid block so they would be thinner and more could be fitted to each cylinder.



All quotations of Frederick Rentschler taken from Frederick B. Rentschler, An Account of the Pratt & Whitney Aircraft Company, 1925-1950, [E. Hartford, Conn.]: [Pratt & Whitney Co.], [1950].

Other text sourced from Pratt & Whitney Aircraft Division of United Aircraft Corporation, The Pratt & Whitney Aircraft Story, [E. Hartford, Conn.], [1950], and Mark P. Sullivan, Dependable Engines: The Story of Pratt & Whitney, (Reston, Va.: American Institute of Aeronautics and Astronautics, 2008).



By Christmas Eve the last bolt was torqued down. To celebrate the accomplishment, everyone received a holiday turkey and celebrated. But the engine did not have a name. Later Rentschler recalled: "Dozens and dozens of suggestions were thrown back and forth within our little group. Finally, we began gravitating toward 'bees' as a general designation for our engine types, and according to my best recollection, my wife (Faye) suggested Wasp for the name of our first product." By January the Wasp was running at 425 horsepower with no glitches. "It ran as clean as a hound's tooth and was actually just the thoroughbred that it looked," said Rentschler. The Wasp's combination of weight, power and durability had never before been achieved in an aircraft engine.

Following Navy ground tests the engine flew on a Wright Apache for the first time on May 5, 1926. In October the Navy ordered 200 engines. That production line would run until 1960 with more than 30,000 R-1340 Wasps built. That first Wasp was followed by a long line of Pratt & Whitney piston engines – the Hornet, the Wasp Junior, the Twin Wasp, the Twin Wasp Junior, the Double Wasp and the 4300-horsepower behemoth, the Wasp Major, the largest displacement piston aircraft engine ever built. During World War II alone, Pratt & Whitney and its licensees would build 363,619 Wasp family engines. R-1340 ENGINE



THE HISTORY AND HERITAGE PROGRAM OF ASME

Since the invention of the wheel, mechanical innovation has critically influenced the development of civilization and industry as well as public welfare, safety and comfort. Through its History and Heritage program, the American Society of Mechanical Engineers (ASME) encourages public understanding of mechanical engineering, fosters the preservation of this heritage and helps engineers become more involved in all aspects of history.

In 1971 ASME formed a History and Heritage Committee composed of mechanical engineers and historians of technology. This Committee is charged with examining, recording and acknowledging mechanical engineering achievements of particular significance. For further information, please visit http://www.asme.org

LANDMARK DESIGNATIONS

There are many aspects of ASME's History and Heritage activities, one of which is the landmarks program. Since the History and Heritage Program began, 259 artifacts have been designated throughout the world as historic mechanical engineering landmarks, heritage collections or heritage sites. Each represents a progressive step in the evolution of mechanical engineering and its significance to society in general.

The Landmarks Program illuminates our technological heritage and encourages the preservation of historically important works. It provides an annotated roster for engineers, students, educators, historians and travelers. It also provides reminders of where we have been and where we are going along the divergent paths of discovery.

ASME helps the global engineering community develop solutions to real world challenges. ASME, founded in 1880, is a not-for-profit professional organization that enables collaboration, knowledge sharing and skill development across all engineering disciplines, while promoting the vital role of the engineer in society. ASME codes and standards, publications, conferences, continuing education and professional development programs provide a foundation for advancing technical knowledge and a safer world.

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Additional Resources on the Pratt & Whitney Wasp R-1340 engine:

Jack Connors, The Engines of Pratt & Whitney: A Technical History, (Reston, Va.: American Institute of Aeronautics and Astronautics, 2009).

Bill Gunston, World Encyclopedia of Aero Engines, (Stroud, U.K.: Sutton, 5th ed., 2007).

Bill Gunston, The Development of Piston Aero Engines, (Sparkford, U.K.: Patrick Stephens, 2nd rev. ed., 2007).

Herschel Smith, A History of Aircraft Piston Engines, [Manhattan, Kan.: Sunflower University Press, 6th ed., 1998).

Examples of the full range of the Wasp family of engines, including one of the original 1926 prototypes, are on display at the New England Air Museum (NEAM) in Windsor Locks, Connecticut. NEAM's mission is to preserve, study and celebrate Connecticut's incredible aerospace legacy, including the ongoing contributions made by Pratt & Whitney over the past 90 years.

For more information visit www.neam.org



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