Pratt & Whitney R-2800 Double Wasp

R-2800 Double Wasp

R-2800-21 Double Wasp

Type	Radial engine
National origin	United States
Manufacturer	Pratt & Whitney
First run	1937
Major applications	A-26 Invader B-26 Marauder CH-37 Mojave Convair CV-240 family Curtiss C-46 Commando Douglas DC-6 F4U Corsair F6F Hellcat P-47 Thunderbolt
Number built	125,334

The **Pratt & Whitney R-2800 Double Wasp** is a two-row, 18-cylinder, air-cooled radial aircraft engine with a displacement of 2,804 in³ (46 L), and is part of the long-lived Wasp family. The R-2800 is considered one of the premier radial piston engines ever designed and is notable for its widespread use in many important American aircraft during and after World War II. During the war years, Pratt & Whitney continued to develop new ideas to upgrade this already powerful workhorse, most notably water injection to give emergency power in combat.

First run in 1937, the R-2800 was America's first 18-cylinder radial engine design. The *Double Wasp* was more powerful than the world's only other modern eighteen, the Gnome-Rhône 18L of 3,442 in³ (56.4 L), but it was much smaller and heat dissipation was a greater problem. To enable more efficient cooling, the usual practice of casting or forging the cylinder head cooling fins that had been effective enough for other engine designs was discarded, and instead, much thinner and closer-pitched cooling fins were machined from the solid metal of the head forging. The fins were all cut at the same time by a gang of milling saws, automatically guided as it fed across the head in such a way that the bottom of the grooves rose and fell to make the roots of the fins follow the contour of the head. Cylinder cooling was effected by aluminum cooling muffs that were shrunk onto the steel alloy forged barrels. In addition to requiring a new cylinder head design, the Double Wasp was probably the most difficult to effectively direct a flow of cooling air around.

In 1939, when the R-2800 was introduced it was capable of producing 2,000 hp (1,500 kW), for a specific power value of 0.71 hp/in³ (32.6 kW/L). No other air-cooled engine came close to this figure, and even liquid-cooled ones barely matched it. The designing of conventional air-cooled radial engines had become so scientific and systematic by then that the Double Wasp was introduced at a power rating that was not amenable to anything like the developmental power increases that had been common with earlier engines. Nevertheless, in 1941 the power output of

production models increased to 2,100 hp (1,600 kW), and to 2,400 hp (1,800 kW) late in the war. However, even more was coaxed from experimental models, with fan-cooled subtypes producing 2,800 hp (2,100 kW), but in general the R-2800 was a rather highly developed power plant right from the beginning.

The R-2800 was used to power several types of fighters and medium bombers during the war, notably the US Navy's F4U Corsair, with the first prototype Corsair becoming the first-ever single-engine US fighter plane to exceed 400 mph (640 km/h) in level flight during October 1940. The R-2800 also powered the Corsair's naval rival, the Grumman F6F Hellcat, the US Army Air Forces' P-47 Thunderbolt, and the twin engined B-26 Marauder and A-26 Invader. When the US entered the war in December 1941 there were very quickly some major changes in philosophy, and such long-established engines as the Wright Cyclone and Double Wasp were re-rated on fuel of much higher octane rating (anti-knock value) to give considerably more power, and by 1944 versions of the R-2800 powering late-model P-47s (and other aircraft) had a rating (experimental) of 2,800 hp on 115-grade fuel with water injection.

After World War II, the engine was used in the Korean War, and surplus World War II aircraft powered by the Double Wasp served with other countries well past the Korean War, some being retired as late as the latter part of the 1960s when the aircraft were replaced.

Engines naturally grow in power with development, but a major war demands the utmost performance from engines fitted to aircraft whose life in front-line service was unlikely to exceed 50 hours' flying, over a period of only a month or two. In peace time however, the call was for reliability over a period of perhaps a dozen years, and the R-2800's reliability commended its use for long-range patrol aircraft and for the Douglas DC-6, Martin 4-0-4, and Convair transports. This last application is noteworthy, since these were twin-engine aircraft of size, passenger capacity,

and high wing loading comparable with the DC-4 and the first Constellations.

Today, more than seventy years after the first Double Wasp was built, it is still used in many restored vintage warbird aircraft displayed at air shows, and sees frequent service worldwide on aircraft such as the Canadair CL-215 water-bomber. A total of 125,334 R-2800 engines were produced between 1939 and 1960.

Variants

Note: The suffix **W** e.g.: **-10W** denotes engines using water injection equipment, used to increase power for short periods. Suffixes such as **-S14A-G** denote engines developed for export to other countries.

- **R-2800-2SB-G** - 1,850 hp (1,379 kW)
- **XR-2800-4** - 1,805 hp (1,350 kW)
- **R-2800-5** - 1,850 hp (1,379 kW)
- **R-2800-8** - 2,000 hp (1,491 kW)
- **R-2800-8(B)** - 2,000 hp (1,491 kW)
- **R-2800-8W** - 2,250 hp (1,677 kW)
- **R-2800-9** - 2,000 hp (1,491 kW)
- **R-2800-10** - 2,000 hp (1,491 kW)
- **R-2800-10W** - 2,200 hp (1,640 kW)
- **R-2800-18W** - 2,450 hp (1,827 kW)
- **R-2800-21** - 2,000 hp (1,491 kW)
- **R-2800-21W** - 2,300 hp (1,700 kW)
- **R-2800-22W** - 2,400 hp (1,789 kW)
- **R-2800-27** - 2,000 hp (1,491 kW)
- **R-2800-30W** - 2,250 hp (1,677 kW)
- **R-2800-31** - 2,000 hp (1,491 kW)
- **R-2800-32(E)** - 2,450 hp (1,827 kW), 2,850 hp (2,125 kW) with water-methanol injection
- **R-2800-34** - 2,100 hp (1,567 kW)

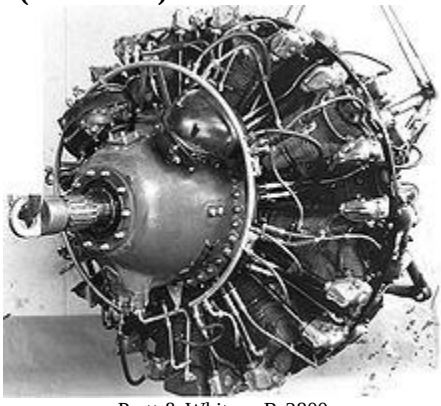
- **R-2800-34W** - 2,400 hp (1,789 kW)
- **R-2800-39** - 2,000 hp (1,491 kW)
- **R-2800-41** - 2,000 hp (1,491 kW)
- **R-2800-43** - 2,000 hp (1,491 kW)
- **R-2800-44** - 2,300 hp (1,700 kW)
- **R-2800-44W** - 2,400 hp (1,789 kW)
- **R-2800-48** - 2,500 hp (1,890 kW)
- **R-2800-48W** - 2,400 hp (1,789 kW)
- **R-2800-51** - 2,000 hp (1,491 kW)
- **R-2800-54** - 2,100 hp (1,567 kW)
- **R-2800-57** - 2,800 hp (2,090 kW)
- **R-2800-57C** - 2,800 hp (2,090 kW)
- **R-2800-59** - 2,300 hp (1,700 kW)
- **R-2800-59W** - 2,500 hp (1,890 kW)
- **R-2800-65** - 2,000 hp (1,491 kW)
- **R-2800-65W** - 2,250 hp (1,677 kW)
- **R-2800-71** - 2,000 hp (1,491 kW)
- **R-2800-73** - 2,800 hp (2,090 kW)
- **R-2800-75** - 2,200 hp (1,640 kW)
- **R-2800-77** - 2,800 hp (2,090 kW)
- **R-2800-79** - 2,000 hp (,1491 kW)
- **R-2800-83** - 2,100 hp (1,567 kW)
- **R-2800-83AM** - 2,100 hp (1,567 kW)
- **R-2800-99W** - 2,300 hp (1,700 kW)
- **R-2800-103W** - 2,500 hp (1,890 kW)
- **R-2800-CB16** - 2,400 hp (1,789 kW), 2,500 hp (1,890 kW)
- **R-2800-CB17** - 2,500 hp (1,890 kW)
- **R-2800-S1A4-G** - 1,850 hp (1,379 kW)
- **R-2800-S1C3-G** - 2,100 hp (1,567 kW)

Applications

The following is a partial list of aircraft that were powered by the R-2800 (and a few prototypes that utilized it at one point):

- Brewster XA-32
- Breguet Deux-Ponts
- Canadair CL-215
- Canadair C-5 North Star
- Consolidated TBY Sea Wolf
- Convair 240, 340 and 440
- Curtiss P-60
- Curtiss XF15C
- Curtiss C-46 Commando
- Douglas A-26 Invader
- Douglas DC-6
- Fairchild C-82 Packet
- Fairchild C-123 Provider
- Grumman AF Guardian
- Grumman F6F Hellcat
- Grumman F7F Tigercat
- Grumman F8F Bearcat Howard 500
- Lockheed Ventura/B-34 Lexington/PV-1 Ventura/PV-2 Harpoon
- Lockheed XC-69E Constellation
- Martin B-26 Marauder
- Martin 2-0-2
- Martin 4-0-4
- North American AJ Savage
- North American XB-28
- Northrop XP-56 Black Bullet
- Northrop P-61 Black Widow
- Northrop F-15 Reporter
- Republic P-47 Thunderbolt
- Sikorsky CH-37 Mojave
- Sikorsky S-60
- Vickers Warwick
- Vought F4U Corsair
- Vultee YA-19B

Specifications (R-2800-54)



Pratt & Whitney R-2800

General characteristics

- **Type:** 18-cylinder air-cooled two-row radial engine with water injection
- **Bore:** 5.75 in (146.05 mm)
- **Stroke:** 6 in (152.4 mm)
- **Displacement:** 2,804.5 in³ (45.96 L)
- **Diameter:** 52.8 in (1,342 mm)
- **Dry weight:** 2,360 lb (1,073 kg)

Components

- **Valve train:** Poppet, two valves per cylinder
- **Supercharger:** Variable-speed (in F8F-2, unified with throttle via AEC automatic engine control), single-stage single-speed centrifugal type supercharger
- **Fuel system:** One Stromberg injection carburetor
- **Fuel type:** 100/130 octane gasoline
- **Cooling system:** Air-cooled

Performance

- **Power output:** 2,100 hp (1,567 kW) @ 2,700 rpm
- **Specific power:** 0.75 hp/in³ (34.1 kW/L)
- **Power-to-weight ratio:** 0.89 hp/lb (1.46 kW/kg)