STANDARDIZED DATA PAGES FOR RECIPROCATING ENGINES

Standardized data pages are used to present the specifications of the basic aircraft engines and airborne auxiliary units described and illustrated in the following section of the book. The arrangement of the data on the standardized data pages is as follows:

First, there is a concise description of the engine, its construction and the major accessories with which it is equipped. Then, in tabular form, there are items such as bore, stroke, displacement (swept volume), compression ratio, overall dimensions, frontal area, total weight and weight per maximum horsepower.

Fuel and lubricating oil consumptions at cruising output are given in units of weight. The fuel grade and the viscosity of the lubricating oil at 210° F. (100° C) also are specified.

Efficiency figures such as maximum power output per unit of displacement, maximum power output per unit of piston area, maximum piston speed and maximum brake mean effective pressure have been calculated for comparative purposes.

Finally, the various horsepower ratings of the engine are given, such as:

Take-off rating, or the maximum horsepower which it is permissible to use at sea level and at low altitudes.

Military (combat) rating, or the maximum horsepower which it is permissible to use for military purposes at various altitudes.

Normal rating, or the maximum horsepower which the engine can deliver continuously for climb without undue stress.

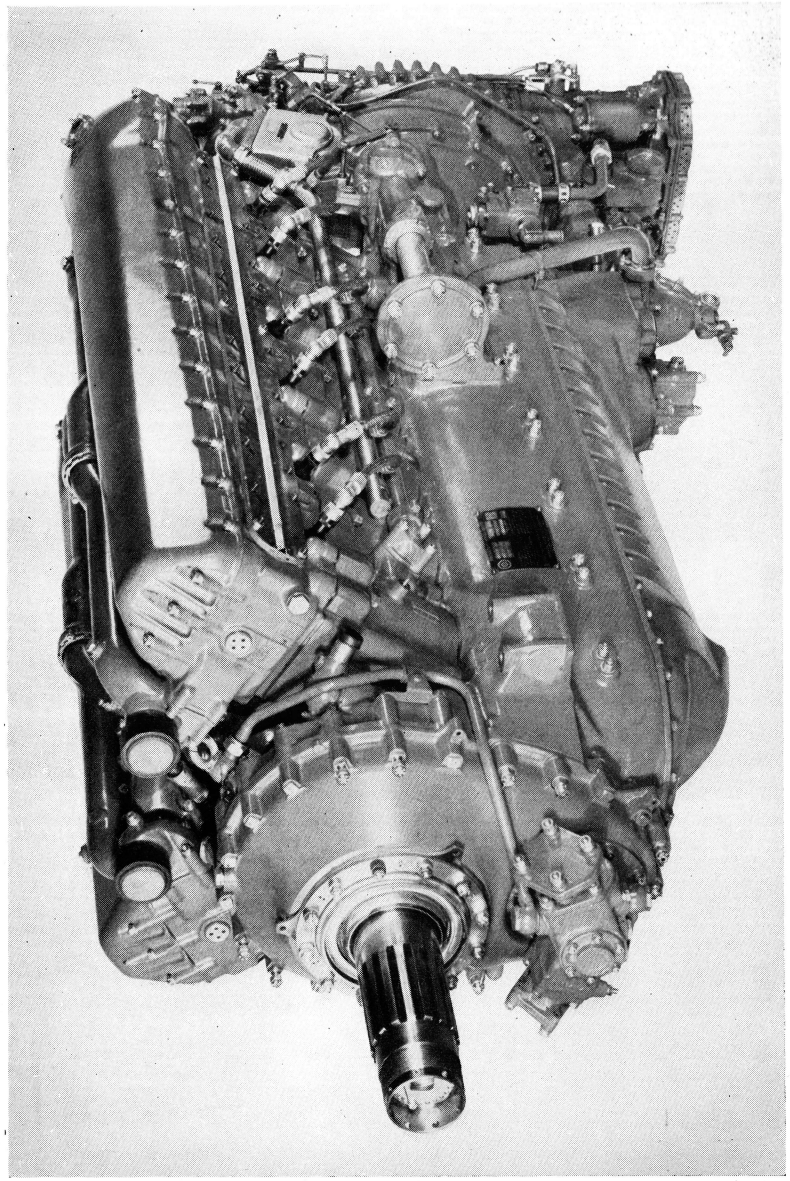
Cruising rating, or the maximum horsepower recommended for continuous operation consistent with reasonable fuel economy.

Emergency rating, or the maximum horsepower which it is permissible to use for a short period of time in an emergency.

Stand-by ratings, or the maximum horsepower which it is permissible to use continuously when one or more engines are out of operation, are given where available.

Ratings obtained with alcohol-water injection or methanol-water injection—commonly known as water injection—are indicated by the letters A.D.I. (Anti-Detonant Injection).

The status of the data on the standardized pages can be seen from the notation at the top of each page adjacent to the country of origin. *New* denotes completely new data. *Revised* indicates major revisions. Unmarked pages have only minor changes.



Packard V-1650-1

Packard V-1650-1

Model ..... V-1650-1.

Type ..... 12-cylinders, vee 60 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.

Construction ..... 2-piece aluminum alloy crankcase. 2 aluminum alloy cylinder blocks with detachable heads for each block. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.477:1.

Supercharger ..... Gear-driven 2-speed 1-stage supercharger, ratios 8.15:1 and 9.49:1. Automatic boost control.

Carburation ..... 1 Bendix-Stromberg PD-16A1 2-barrel injection type updraft carburetor with automatic mixture control and 4-position manual mixture control.

Ignition ..... 2 B.T.H. C5SE12S-2 (American-built) magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.

Lubrication ..... Pressure feed, 70-80 lb./sq.in. (4,9 - 5,6 kg/cm²). Dry sump.

Starter ..... Eclipse 792 or 840 direct cranking electric starter.

Bore	5.40 in.	137 mm
Stroke	6.00 in.	152 mm
Displacement	1,649 cu.in.	27,0 lit
Compression ratio	6.0:1	6,0:1
Width	30.0 in.	762 mm
Height	42.6 in.	1 082 mm
Length	79.7 in.	2 025 mm
Frontal area	5.8 sq.ft.	0,54 m²
Weight	1,512 lb.	685 kg
Weight/horsepower	1.16 lb./h.p.	0,53 kg/hp
Fuel consumption (cr.)	0.45 lb./h.p./hr.	205 g/hp/hr
Oil consumption (cr.)	0.018 lb./h.p./hr.	8 g/hp/hr
Gasoline grade	100/130 grade	100/130 grade
Oil grade (viscosity)	100 S.U. secs.	20,5 cs
Output/displacement	0.79 h.p./cu.in.	48,1 hp/lit
Output/piston area	4.73 h.p./sq.in.	0,73 hp/cm²
Piston speed (max.)	3,000 ft./min.	15,2 m/sec
B.m.e.p. (max.)	209 lb./sq.in.	14,7 kg/cm²

Rating (take-off) ..... 1,300 h.p./3,000 r.p.m./54.3 in. (1 379 mm) Hg. boost
Rating (military, low) .... 1,240 h.p./3,000 r.p.m./11,500 ft. (3 500 m)
Rating (military, high) ... 1,120 h.p./3,000 r.p.m./18,500 ft. (5 600 m)
Rating (normal, low) .... 1,080 h.p./2,650 r.p.m./9,500 ft. (2 900 m)
Rating (normal, high) ... 1,010 h.p./2,650 r.p.m./16,000 ft. (4 900 m)

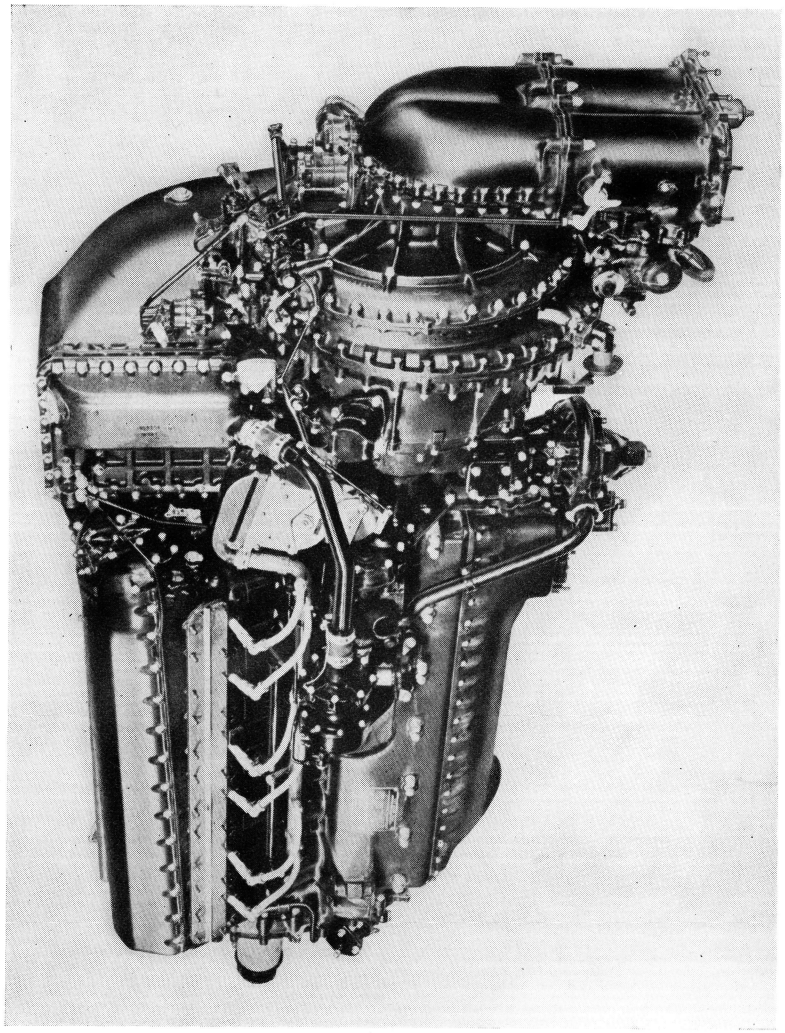
This engine is similar to the British Rolls-Royce Merlin XX. It is manufactured by Packard for use in United States aircraft.

The following 1-stage engines are manufactured by Packard for use in British aircraft:

Merlin 28: Similar to V-1650-1. Reduction gear ratio 0.42:1.

Merlin 29: Same as Merlin 28. Reduction gear ratio 0.48:1.

Merlin 31, 33, 38: Same as Merlin 28. Reduction gear ratio 0.42:1.



Packard V-1650-3

Packard V-1650-3

Model ..... V-1650-3.

Type ..... 12 cylinders, vee 60 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.

Construction ..... 2-piece aluminum alloy crankcase. 2 aluminum alloy cylinder blocks with detachable heads for each block. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.479:1.

Supercharger ..... Gear-driven 2-speed 2-stage supercharger, ratios 6.391:1 and 8.095:1. Automatic boost control. Water-cooled interstage passages and aftercooler.

Carburation ..... 1 Bendix-Stromberg PD-18A1 2-barrel injection type updraft carburetor with automatic mixture control and 4-position manual mixture control.

Ignition ..... 2 B.T.H. C6SE12S-2 (American-built) magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.

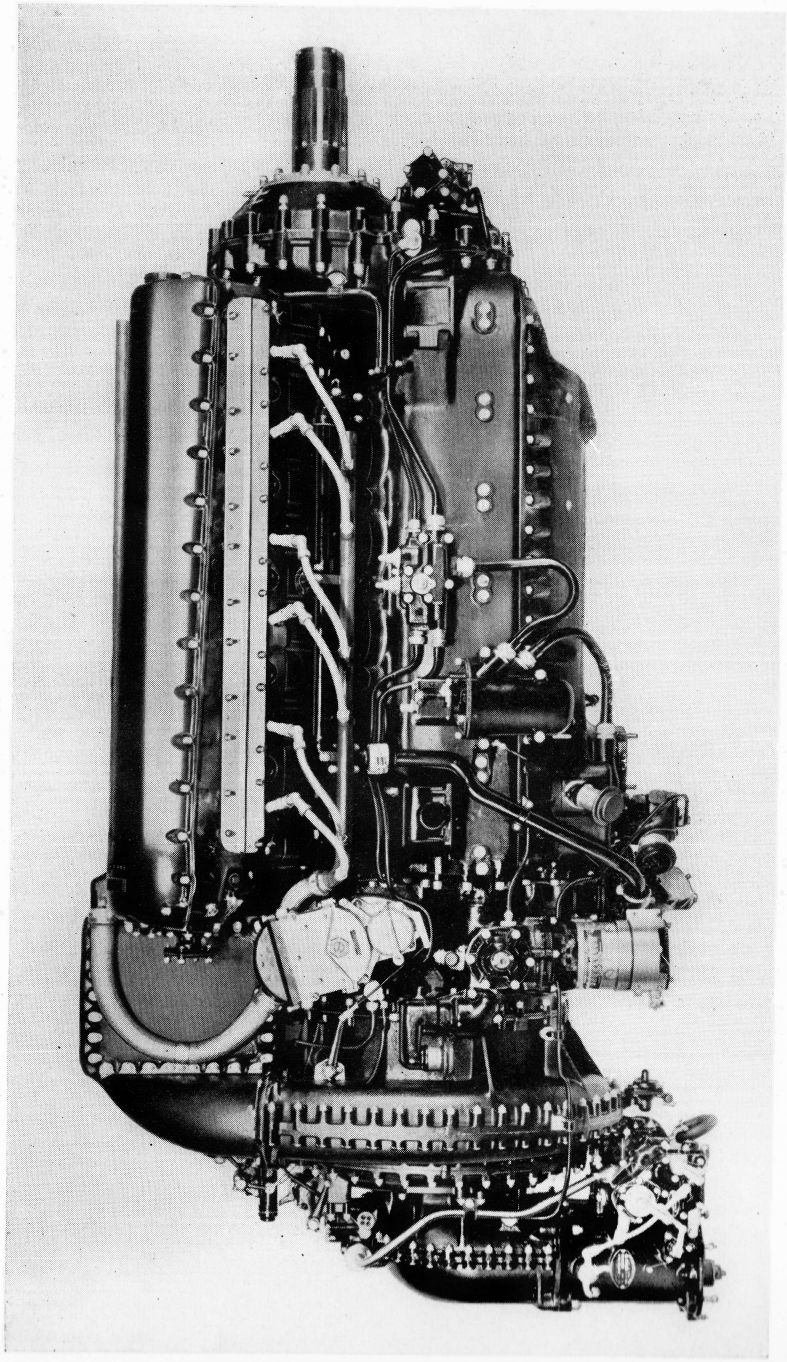
Lubrication ..... Pressure feed, 70-80 lb./sq.in. (4,9 - 5,6 kg/cm^2). Dry sump.

Starter ..... Eclipse 840 direct cranking electric starter.

Bore	5.40 in.	137 mm
Stroke	6.00 in.	152 mm
Displacement	1,649 cu.in.	27,0 lit
Compression ratio	6.0:1	6,0:1
Width	30.0 in.	762 mm
Height	41.6 in.	1 056 mm
Length	87.1 in.	2 212 mm
Frontal area	5.9 sq.ft.	0,55 m^2
Weight	1,690 lb.	766 kg
Weight/horsepower	1.13 lb./h.p.	0,51 kg/hp
Fuel consumption (cr.)	0.45 lb./h.p./hr.	205 g/hp/hr
Oil consumption (cr.)	0.018 lb./h.p./hr.	8 g/hp/hr
Gasoline grade	100/130 grade	100/130 grade
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.90 h.p./cu.in.	55,1 hp/lit
Output/piston area	5.42 h.p./sq.in.	0,84 hp/cm^2
Piston speed (max.)	3,000 ft./min.	15,2 m/sec
B.m.e.p. (max.)	238 lb./sq.in.	16,7 kg/cm^2

Rating (take-off) ..... 1,380 h.p./3,000 r.p.m./61.0 in. (1 549 mm) Hg. boost
Rating (military, low) ... 1,490 h.p./3,000 r.p.m./13,750 ft. (4 200 m)
Rating (military, high) .. 1,210 h.p./3,000 r.p.m./25,800 ft. (7 900 m)
Rating (normal, low) .... 1,100 h.p./2,700 r.p.m./17,400 ft. (5 300 m)
Rating (normal, high) ... 950 h.p./2,700 r.p.m./29,500 ft. (9 000 m)

This engine is similar to the British Rolls-Royce Merlin 61. It is manufactured by Packard for use in United States aircraft.



Packard V-1650-7

Packard V-1650-7

Model ..... V-1650-7.

Type ..... 12 cylinders, vee 60 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.

Construction ..... 2-piece aluminum alloy crankcase. 2 aluminum alloy cylinder blocks with detachable head for each block. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.479:1.

Supercharger ..... Gear-driven 2-speed 2-stage supercharger, ratios 5.80:1 and 7.35:1. Automatic boost control. Water-cooled interstage passages and aftercooler.

Carburation ..... 1 Bendix-Stromberg PD-18A1 or PD-18C1 2-barrel injection type updraft carburetor with automatic mixture control and 4-position manual mixture control.

Ignition ..... 2 B.T.H. C6SE12S-2 (American-built) magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.

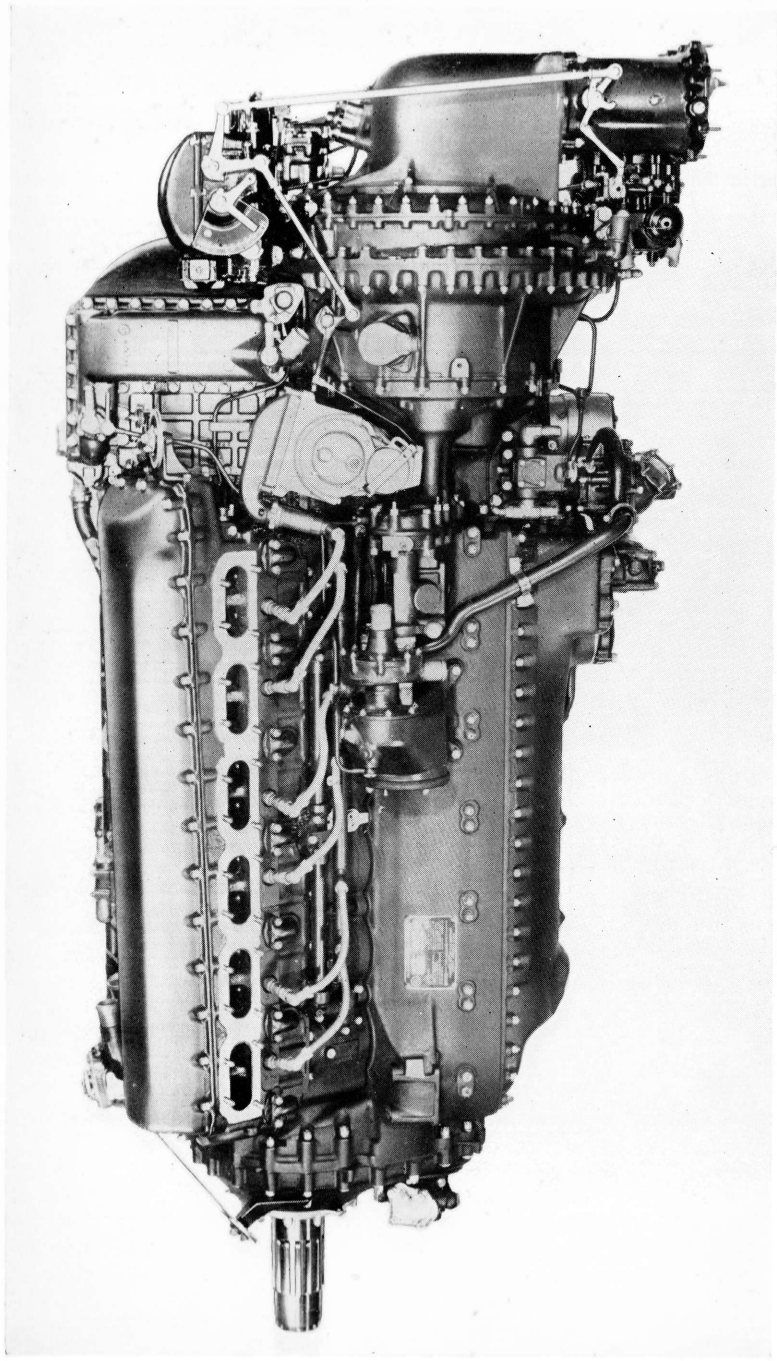
Lubrication ..... Pressure feed, 70-80 lb./sq.in. (4,9 - 5,6 kg/cm^2). Dry sump.

Starter ..... Eclipse 840 direct cranking electric starter.

Bore	5.40 in.	137 mm
Stroke	6.00 in.	152 mm
Displacement	1,649 cu.in.	27,0 lit
Compression ratio	6.0:1	6,0:1
Width	30.0 in.	762 mm
Height	41.6 in.	1 056 mm
Length	87.1 in.	2 212 mm
Frontal area	5.9 sq.ft.	0,55 m^2
Weight	1,690 lb.	766 kg
Weight/horsepower	1.06 lb./h.p.	0,48 kg/hp
Fuel consumption (cr.)	0.50 lb./h.p./hr.	225 g/hp/hr
Oil consumption (cr.)	0.005 lb./h.p./hr.	2 g/hp/hr
Gasoline grade	100/130 grade	100/130 grade
Oil grade (viscosity)	100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement	0.96 h.p./cu.in.	58,9 hp/lit
Output/piston area	5.92 h.p./sq.in.	0,92 hp/cm^2
Piston speed (max.)	3,000 ft./min.	15,2 m/sec
B.m.e.p. (max.)	253 lb./sq.in.	17,8 kg/cm^2

Rating (take-off) ..... 1,490 h.p./3,000 r.p.m./61.0 in. (1 549 mm) Hg. boost
Rating (military, low) ... 1,590 h.p./3,000 r.p.m./8,500 ft. (2 600 m)
Rating (military, high) .. 1,370 h.p./3,000 r.p.m./21,400 ft. (6 500 m)
Rating (normal, low) .... 1,180 h.p./2,700 r.p.m./11,300 ft. (3 400 m)
Rating (normal, high) ... 1,065 h.p./2,700 r.p.m./23,400 ft. (7 100 m)

This engine is similar to the British Rolls-Royce Merlin 63. It is manufactured by Packard for use in United States aircraft.



Packard V-1650

Packard V-1650

Model ..... V-1650-9.

Type ..... 12 cylinders, vee 60 degrees, pressure liquid cooled, geared drive, supercharged, 4-cycle.

Construction ..... 2-piece aluminum alloy crankcase. 2 aluminum alloy cylinder blocks with a detachable head for each block. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.479:1.

Supercharger ..... Gear-driven 2-stage 2-speed supercharger, ratios 6.391:1 and 8.095:1. Liquid-cooled interstage passages and intercooler. Simmonds SA-9 automatic boost control and A.D.I. control.

Carburetion ..... 1 Bendix-Stromberg PD-18C3-A 2-barrel updraft injection type carburetor with automatic mixture control and 4-position manual mixture control. Equipped for A.D.I.

Ignition ..... 2 Delco North East S-12RAP-5 and S-12LAP-5 magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system with resistors.

Lubrication ..... Pressure feed, 70-90 lb./sq.in. (4,9 - 6,3 kg/cm^2). Dry sump.

Starter ..... Eclipse 840-9 direct cranking electric starter.

Bore	5.40 in.	137 mm
Stroke	6.00 in.	152 mm
Displacement	1,649 cu.in.	27,0 lit
Compression ratio	6.0:1	6,0:1
Width	30.7 in.	780 mm
Height	44.9 in.	1 141 mm
Length	87.1 in.	2 212 mm
Frontal area	7.5 sq.ft.	0,70 m^2
Weight	1,744 lb.	791 kg
Weight/horsepower	1.15 lb./h.p.	0,52 kg/hp
Fuel consumption (cr.)	0.50 lb./h.p./hr.	225 g/hp/hr
Oil consumption (cr.)	0.005 lb./h.p./hr.	2 g/hp/hr
Gasoline grade	100/130 grade	100/130 grade
Oil grade (viscosity)	80-120 S.U. secs.	15,6 - 25,1 cs
Output/displacement	0.92 h.p./cu.in.	56,3 hp/lit
Output/piston area	5.53 h.p./sq.in.	0,86 hp/cm^2
Piston speed (max.)	3,000 ft./min.	15,2 m/sec
B.m.e.p. (max.)	243 lb./sq.in.	17,1 kg/cm^2

Rating (take-off) ..... 1,400 h.p./3,000 r.p.m./61.0 in. (1 549 mm) +15.5 lb.
Rating (military, low) ... 1,520 h.p./3,000 r.p.m./14,400 ft. (4 400 m)
Rating (military, high) .. 1,275 h.p./3,000 r.p.m./26,500 ft. (8 100 m)
Rating (normal, low) .... 1,160 h.p./2,700 r.p.m./16,500 ft. (5 000 m)
Rating (normal, high) ... 985 h.p./2,700 r.p.m./28,500 ft. (8 700 m)

This engine also has military ratings of 2,280 h.p./3,000 r.p.m./3,750 ft. (1 100 m) and 1,905 h.p./3,000 r.p.m./17,000 ft. (5 200 m) with higher boost and A.D.I.

V-1650-25: Same as V-1650-9. Propeller shaft rotates in opposite direction.

Note: The above Packard-built engines, of British Rolls-Royce design, are used in United States aircraft.