

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.

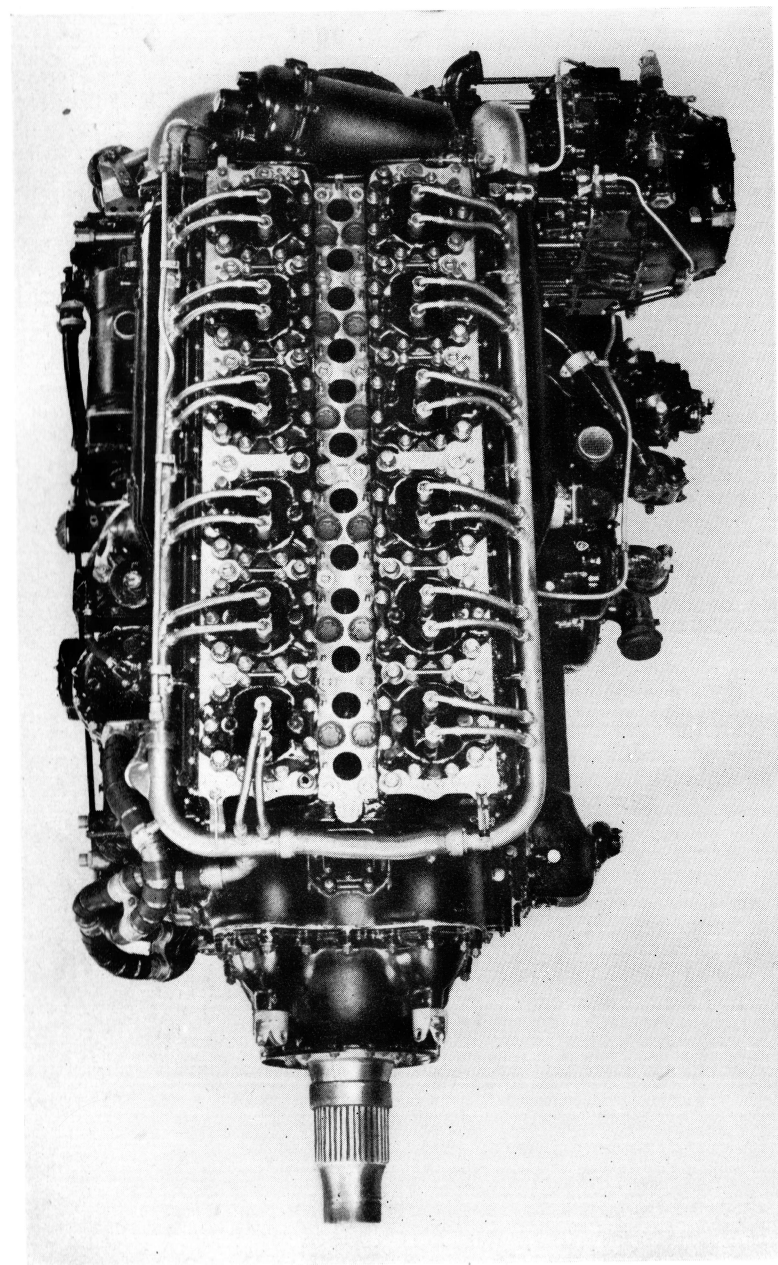
Cruising rating, or the maximum horsepower recommended for continuous operation consistent with reasonable fuel economy.

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.

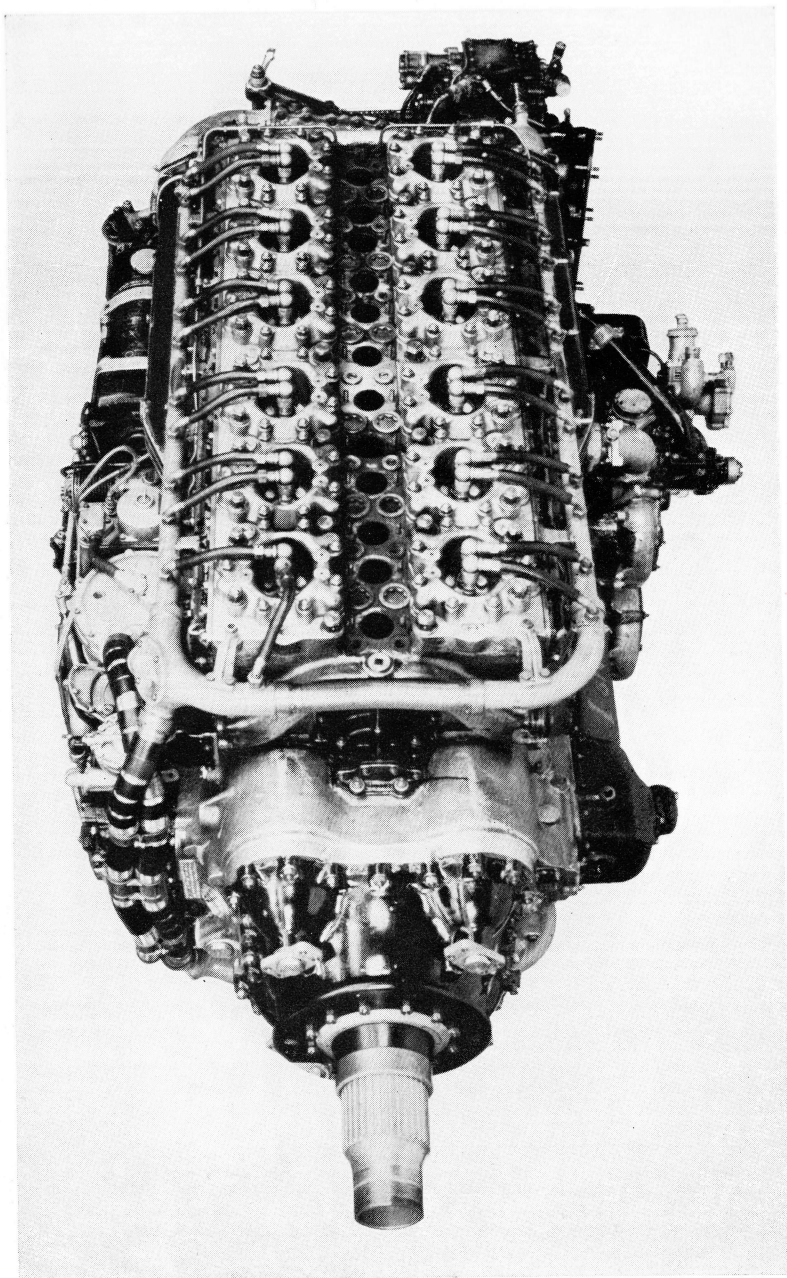


Napier Sabre

Napier Sabre

Model	Sabre IIA.	
Type	24 cylinders, horizontal H with 4 banks, pressure water cooled, geared drive, supercharged, 4-cycle.	
Construction	2-piece aluminum alloy crankcase divided vertically. 2 interchangeable aluminum alloy cylinder blocks each containing 6 upper and 6 lower cylinder bores. Steel cylinder liners. Cylinder blocks attached horizontally to crankcase by 12 tie bolts and 26 studs. Individual jacketed detachable cylinder heads. 1 4-port reciprocating single-sleeve valve per cylinder. 3 inlet ports and 2 exhaust ports per cylinder. 2 6-throw 1-piece crankshafts supported in 7 plain bearings. Compound helical reduction gear, ratio 0.274:1. Equipped for De Havilland Hydromatic propeller.	
Supercharger	Gear-driven 2-speed supercharger, ratios 4.48:1 and 6.26:1. Double entry impeller. Automatic boost control.	
Carburation	1 S.U. AVQ-30/200 4-barrel updraft carburetor with automatic mixture control and altitude control.	
Ignition	2 B.T.H. CISE-ES duplex magnetos and 2 B.T.H. 24-point distributors. 2 14-mm long reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 60-90 lb./sq.in. (4.2-6.3 kg/cm ²). Dry sump.	
Starter	Plessey Coffman L-4S combustion type starter with 5-cartridge magazine.	
Bore	5.00 in.	127 mm
Stroke	4.75 in.	120 mm
Displacement	2,240 cu.in.	36.7 lit
Compression ratio	7.0:1	7.0:1
Width	40.0 in.	1 016 mm
Height	51.1 in.	1 297 mm
Length	81.1 in.	2 059 mm
Frontal area	10.0 sq.ft.	0.93 m ²
Weight	2,360 lb.	1 070 kg
Weight/horsepower	1.07 lb./h.p.	0.48 kg/hp
Fuel consumption (cr.)	0.46 lb./h.p./hr.	210 g/hp/hr
Oil consumption (cr.)	0.015 lb./h.p./hr.	7 g/hp/hr
Gasoline grade	100/130 (D.E.D. 2475)	100/130 grade
Oil grade (viscosity)	100 S.U. (D.T.D. 472-B)	20.5 cs
Output/displacement	0.98 h.p./cu.in.	60.0 hp/lit
Output/piston area	4.67 h.p./sq.in.	0.72 hp/cm ²
Piston speed (max.)	2,929 ft./min.	14.8 m/sec
B.m.e.p. (max.)	210 lb./sq.in.	14.7 kg/cm ²
Rating (take-off)	2,200 h.p./3,700 r.p.m.	

Sabre IIB: 2,400 h.p./take-off. All other data restricted, January, 1945.



Napier Sabre

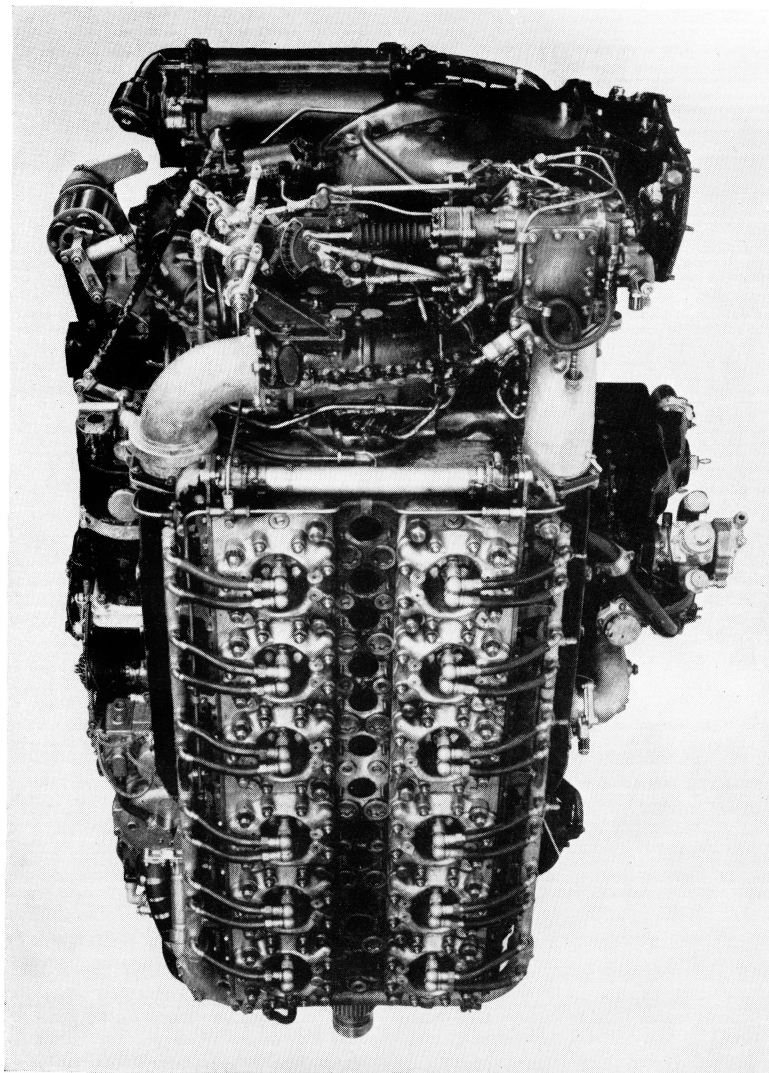
Napier Sabre

Model	Sabre VA (NS 81 SM).
Type	24 cylinders, horizontal H with 4 banks, pressure liquid cooled, geared drive, supercharged, 4-cycle.
Construction	2-piece aluminum alloy crankcase divided vertically. 2 interchangeable horizontal aluminum alloy cylinder blocks, each with 6 upper and 6 lower bores, attached to crankcase by 12 tie bolts and 26 studs. Individual jacketed detachable die-cast aluminum alloy cylinder heads. 3 inlet ports and 2 exhaust ports per cylinder. 1 reciprocating and oscillating single-sleeve valve per cylinder, with 2 inlet ports and 1 exhaust port and 1 port alternately inlet and exhaust. 2 6-throw 1-piece crankshafts each supported in 7 plain bearings. Double helical reduction gear, ratio 0.2742:1. Provision for De Havilland Hydromatic, or Rotol constant speed, propeller.
Supercharger	Gear-driven 2-speed single-entry supercharger, ratios 4.68:1 and 5.83:1. 4 manifolds to cylinder banks.
Carburetion	1 Hobson-R.A.E. BI/NS4 fuel injector, with injection through 1 nozzle into eye of supercharger impeller. Updraft air intake. Automatic boost control.
Ignition	2 B.T.H. CISE-ES duplex magnetos and 2 B.T.H. 24-point distributors. 2 14-mm long reach spark plugs per cylinder. Shielded ignition system.
Lubrication	Pressure feed, 60-90 lb./sq.in. (4.2-6.3 kg/cm ²). Dry sump.
Starter	Plessey Coffman L-4S cartridge starter with 5-cartridge magazine.

Bore	5.00 in.	127 mm
Stroke	4.75 in.	120 mm
Displacement	2,238 cu.in.	36.7 lit
Compression ratio	7.0:1	7.0:1
Width	40.0 in.	1 016 mm
Height	46.0 in.	1 168 mm
Length	82.2 in.	2 089 mm
Frontal area	8.8 sq.ft.	0.82 m ²
Weight	2,500 lb.	1 135 kg
Weight/horsepower	0.96 lb./h.p.	0.44 kg/hp
Fuel consumption (cr.)	0.50 lb./h.p./hr.	225 g/hp/hr
Oil consumption (cr.)	0.034 lb./h.p./hr.	15 g/hp/hr
Gasoline grade	100/130 (D.E.D. 2475)	100/130 grade
Oil grade (viscosity)	100 S.U. (D.E.D. 2472B)	20.5 cs
Output/displacement	1.16 h.p./cu.in.	70.8 hp/lit
Output/piston area	5.52 h.p./sq.in.	0.85 hp/cm ²
Piston speed (max.)	3,048 ft./min.	15.4 m/sec
B.m.e.p. (max.)	239 lb./sq.in.	16.8 kg/cm ²
Rating (take-off)	2,300 h.p./3,850 r.p.m./54.3 in. (1 380 mm)	+12.0 lb.
Rating (military, low)	2,600 h.p./3,850 r.p.m./2,500 ft. (750 m)	
Rating (military, high)	2,300 h.p./3,850 r.p.m./12,750 ft. (3 900 m)	
Rating (normal, low)	2,165 h.p./3,650 r.p.m./6,500 ft. (2 000 m)	
Rating (normal, high)	1,930 h.p./3,650 r.p.m./15,750 ft. (4 800 m)	
Rating (cruising, low)	1,715 h.p./3,250 r.p.m./6,750 ft. (2 100 m)	
Rating (cruising, high)	1,565 h.p./3,250 r.p.m./14,250 ft. (4 300 m)	

The above military ratings are with 60.5 in. (1 537 mm) + 15.0 lb. boost.

Additional models of Napier Sabre engines will be found on page 175.



Napier Sabre

Napier Sabre

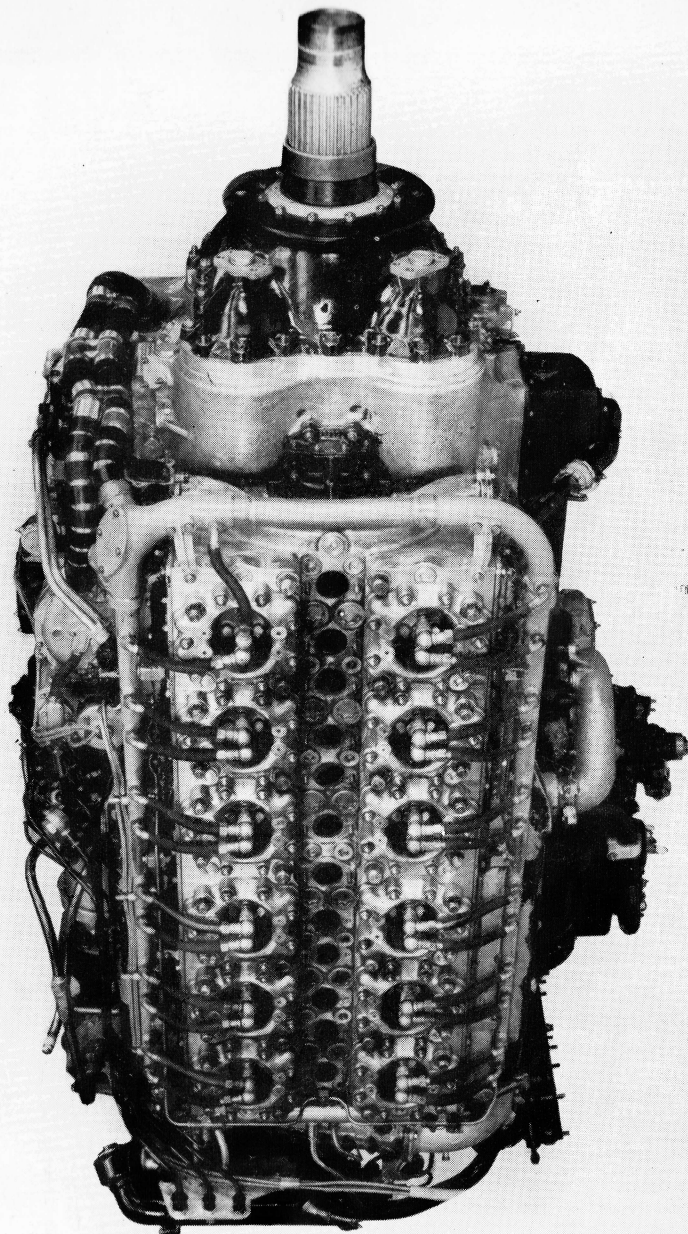
Model	Sabre VII.	
Type	24 cylinders, horizontal H with 4 banks, pressure liquid cooled, geared drive, supercharged, 4-cycle.	
Construction	2-piece aluminum alloy crankcase divided vertically. 2 interchangeable horizontal aluminum alloy cylinder blocks, each with 6 upper and 6 lower bores, attached to crankcase by 12 tie bolts and 26 studs. Individual jacketed detachable die-cast aluminum alloy cylinder heads. 3 inlet ports and 2 exhaust ports per cylinder. 1 reciprocating and oscillating single-sleeve valve per cylinder, with 2 inlet ports and 1 exhaust port and 1 port alternately inlet and exhaust. 2 6-throw 1-piece crankshafts each supported in 7 plain bearings. Double helical reduction gear, ratio 0.2742:1. Provision for De Havilland Hydromatic, or Rotol constant speed, propeller.	
Supercharger	Gear-driven 2-speed single-entry supercharger, ratios 4.68:1 and 5.83:1. 4 manifolds to cylinder banks.	
Carburetion	1 Hobson-R.A.E. BI/NS8 fuel injector, with injection through 1 nozzle into eye of supercharger impeller. Updraft air intake. Automatic boost control. Automatic fuel de-richment control for A.D.I.	
Ignition	2 B.T.H. CISE-ES duplex magnetos and 2 B.T.H. 24-point distributors. 2 14-mm long reach spark plugs per cylinder. Shielded ignition system. Automatic over-ride control for altering timing for A.D.I.	
Control	Master control unit interconnected to throttle, boost, injector, ignition and propeller controls.	
Lubrication	Pressure feed, 60-90 lb./sq.in. (4,2-6,3 kg/cm ²). Dry sump.	
Starter	Plessey Coffman L-4S cartridge starter with 5-cartridge magazine.	
Bore	5.00 in.	127 mm
Stroke	4.75 in.	121 mm
D.splacement	2,238 cu.in.	36,7 lit
Compression ratio	7.0:1	7,0:1
Width	40.0 in.	1 016 mm
Height	47.2 in.	1 283 mm
Length	83.0 in.	2 108 mm
Frontal area	8.8 sq.ft.	0,82 m ²
Weight	2,540 lb.	1 152 kg
Weight/horsepower	0.83 lb./h.p.	0,37 kg/hp
Fuel consumption (cr.)	0.51 lb./h.p./hr.	230 g/hp/hr
Oil consumption (cr.)	0.034 lb./h.p./hr.	15 g/hp/hr
Gasoline grade	100/130 (D.E.D. 2475)	100/130 grade
Oil grade (viscosity)	100 S.U. (D.E.D. 2472B)	20,5 cs
Output/displacement	1.36 h.p./cu.in.	83,2 hp/lit
Output/piston area	6.49 h.p./sq.in.	1,00 hp/cm ²
Piston speed (max.)	3,048 ft./min.	15,4 m/sec
B.m.e.p. (max.)	280 lb./sq.in.	19,7 kg/cm ²
Rating (take-off, A.D.I.)	3,000 h.p./3,850 r.p.m./65.0 in. (1 651 mm) +17.25 lb.	
Rating (military, low)	3,055 h.p./3,850 r.p.m./2,250 ft. (700 m)	
Rating (military, high)	2,760 h.p./3,850 r.p.m./12,450 ft. (3 800 m)	
Rating (normal, low)	2,235 h.p./3,700 r.p.m./8,500 ft. (2 600 m)	
Rating (normal, high)	1,960 h.p./3,700 r.p.m./18,250 ft. (5 600 m)	
Rating (cruising, low)	1,730 h.p./3,250 r.p.m./8,500 ft. (2 600 m)	
Rating (cruising, high)	1,570 h.p./3,250 r.p.m./17,000 ft. (5 200 m)	

Additional Models of Napier Sabre Engines

(Continued from page 189)

- Sabre IIA:** Similar to Sabre VB. Reduction gear ratio 0.274:1. 2-speed double-entry supercharger, ratios 4.48:1 and 6.26:1. 1,995 h.p./3,750 r.p.m./take-off; 2,235 h.p./3,750 r.p.m./2,500 ft. (750 m) and 1,880 h.p./3,750 r.p.m./15,250 ft. (4 600 m) military ratings; 2,065 h.p./3,700 r.p.m./4,750 ft. (1 400 m) and 1,735 h.p./3,700 r.p.m./17,000 ft. (5 200 m) normal ratings. 100/130 grade gasoline.
- Sabre IIB (NS 85 SM):** Similar to Sabre IIA. 2,010 h.p./3,850 r.p.m./take-off; 2,400 h.p./3,850 r.p.m./sea level and 2,045 h.p./3,850 r.p.m./13,750 ft. (4 200 m) military ratings; 2,065 h.p./3,700 r.p.m./4,750 ft. (1 400 m) and 1,735 h.p./3,700 r.p.m./17,000 ft. (5 200 m) normal ratings. 100/130 grade gasoline.
- Sabre III (NS 12 SM):** Similar to Sabre IIA. 2,250 h.p./4,000 r.p.m./take-off; 2,310 h.p./4,000 r.p.m./2,500 ft. (750 m) and 1,920 h.p./4,000 r.p.m./16,000 ft. (4 900 m) military ratings; 1,890 h.p./3,500 r.p.m./5,000 ft. (1 500 m) and 1,630 h.p./3,500 r.p.m./16,500 ft. (5 000 m) normal ratings. 100/130 grade gasoline.
- Sabre IV:** Similar to Sabre VA. Hobson-R.A.E. BI/NS2 fuel injector.
- Sabre V (NS 81 SM):** Same as Sabre VA.
- Sabre VI:** Similar to Sabre VA, and equipped with Rotol gear-driven cooling fan and annular radiator.

Napier Sabre



Napier Sabre

Model	Sabre VII.	
Type	24 cylinders, horizontal II with 4 banks, pressure liquid cooled, geared drive, supercharged, 4-cycle.	
Construction	2-piece aluminum alloy crankcase divided vertically. 2 interchangeable horizontal aluminum alloy cylinder blocks, each with 6 upper and 6 lower bores, attached to crankcase by 12 tie bolts and 26 studs. Individual jacketed detachable die-cast aluminum alloy cylinder heads. 3 inlet ports and 2 exhaust ports per cylinder. 1 reciprocating and oscillating single-sleeve valve per cylinder, with 2 inlet ports and 1 exhaust port and 1 port alternately inlet and exhaust. 2 6-throw 1-piece crankshafts each supported in 7 plain bearings. Spur and helical reduction gear, ratio 0.2742:1.	
Supercharger	Gear-driven 2-speed single-entry supercharger, ratios 4.68:1 and 5.83:1. 4 manifolds to cylinder banks.	
Fuel system	1 Hobson-R.A.E. BI/NS8 fuel injector, with injection through 1 nozzle into eye of supercharger impeller. Updraft air intake. Automatic boost control. Automatic fuel de-richment control for water injection.	
Ignition	2 B.T.H. C2SE-ES1 duplex magnetos and 2 B.T.H. 24-point distributors. 2 14-mm long reach spark plugs per cylinder. Shielded ignition system. Automatic over-ride control for altering timing for water injection.	
Control	Master control unit interconnected to throttle, boost, injector, ignition and propeller controls.	
Lubrication	Pressure feed, 60-90 lb./sq.in. (4.2-6.3 kg/cm ²). Dry sump.	
Starter	Plessey Coffman L-4S cartridge starter.	
Bore	5.00 in.	127 mm
Stroke	4.75 in.	121 mm
Displacement	2,238 cu.in.	36.7 lit
Compression ratio	7.0:1	7,0:1
Width	40.0 in.	1 016 mm
Height	47.2 in.	1 283 mm
Length	83.0 in.	2 108 mm
Frontal area	8.8 sq.ft.	0,82 m ²
Weight	2,540 lb.	1 152 kg
Weight/horsepower	0.73 lb./h.p.	0,33 kg/hp
Fuel consumption (cr.)	0.45 lb./h.p./hr.	205 g/hp/hr
Oil consumption (cr.)	0.013 lb./h.p./hr.	6 g/hp/hr
Gasoline grade	D.Eng.RD. 2485	100/130 grade
Oil grade (viscosity)	100 S.U. (D.E.D. 2472B)	20,5 cs
Output/displacement	1.56 h.p./cu.in.	95,4 hp/lit
Output/piston area	7.44 h.p./sq.in.	1,15 hp/cm ²
Piston speed (max.)	3,048 ft./min.	15,4 m/sec
B.m.e.p. (max.)	321 lb./sq.in.	22,6 kg/cm ²
Rating (take-off, wet)	3,500 h.p./3,850 r.p.m./70.6 in. (1 790 mm) +20.0 lb.	
Rating (military, low)	3,055 h.p./3,850 r.p.m./2,250 ft. (700 m)	
Rating (military, high)	2,820 h.p./3,850 r.p.m./12,500 ft. (3 800 m)	
Rating (normal, low)	2,235 h.p./3,700 r.p.m./8,500 ft. (2 600 m)	
Rating (normal, high)	1,975 h.p./3,700 r.p.m./18,250 ft. (5 600 m)	
Rating (cruising, low)	1,750 h.p./3,250 r.p.m./8,500 ft. (2 600 m)	
Rating (cruising, high)	1,600 h.p./3,250 r.p.m./17,000 ft. (5 200 m)	
Sabre IIC:	Similar to Sabre VII, but with supercharger ratios 4.73:1 and 6.26:1, and S.U. AQV type updraft carburetor. 2,065 h.p./3,850 r.p.m./take-off.	
Sabre VA:	Similar to Sabre VII, with fuel injector. 2,565 h.p./3,850 r.p.m./take-off with 60.5 in. (1 537 mm) +15.0 lb. boost.	