

Spec. No. 130-E

Date Issued: Dec. 28, 1938

Revised: June 1, 1939  
Sept. 22, 1939  
Oct. 20, 1939  
Dec. 18, 1939  
Sept. 29, 1941

MODEL SPECIFICATION

ENGINE, AIRCRAFT: MODEL V-1710-35

ALLISON DIVISION

General Motors Corporation

Indianapolis, Indiana

(ALLISON MODEL DESIGNATION V-1710-E4)

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A. APPLICABLE SPECIFICATIONS.

A-1. The following specifications of the issue in effect on date of invitation for bids shall form a part of this specification:

A-1a. Army-Navy Specification.

AN-9500 Engines, Aircraft: General Specification and applicable specifications of the issues indicated on page 16.

A-1b. U. S. Army Specification.

None applicable.

B. TYPE AND MODEL

B-1. This specification covers the requirements for the V-1710-35 engines.

C. MATERIAL AND WORKMANSHIP.

C-1. The requirements for material and workmanship shall be as specified in Specification AN-9500.

D. GENERAL REQUIREMENTS.

D-1. See Section E.

E. DETAIL REQUIREMENTS.

E-2 Drawings. - The following Allison Engineering drawings form part of this specification:

36991 Engine Assembly, Complete - (Showing Accessory Drive Oil Seals.)

36990 Installation Drawing (Showing clearances for engine accessories and their removal)

41282-B Priming System Assembly

37791-A Carburetor, PD-12K2 Bendix-Stromberg

37228-D Spark Plug Assembly BG LS321

40010-A Spark Plug Assembly Bendix 6S9

40600-B Spark Plug Assembly AC-LS85

40601 Spark Plug Assembly Champion C34S

37466-C Terminal, Spark Plug (Contact)

37230-A Lubrication System Diagram

41550 Magneto

40185-F Radio Shielding Assembly

37583-B Manifold Assem. - Spark Plug Cooling R.H.

37584-B Manifold Assem. - Spark Plug Cooling L.H.

33536-G Nut - Magneto Cable Shielding Conn.

36496-H Nut - Spark Plug Cable Shielding

37463-O Shielding - Spark Plug Cable - Intake

37476-Q Shielding - Spark Plug Cable - Exhaust

40844-B Manifold Assem. - Gas Intake (With Intake Port Type Backfire Screens)

40565-G Cover Coolant Pump Inlet Double Opening

E-3 Acceptance. - The engine shall be model tested in accordance with Specification AN-9502 with the following exceptions:

(1) (Reference, Paragraph F-3c., Power Calibration) - Power Calibration of the engine shall be made without loading the accessory drives.

E-4. Weight. - The total dry weight of the engine shall not exceed the values indicated below:

Basic Engine, including integral supercharger, supercharger drive mechanism, propeller reduction

gears, coolant pump and piping on the engine, engine lubrication system, oil pumps, starter connection, including starter dog, tachometer drives, fuel pump drive, generator drive, vacuum pump drives, propeller governor drive and all piping and controls between engine parts	1336.3 lbs.
Carburetor and injection nozzle	34.5
Carburetor Screens and Gaskets	1.0
Magneto, Shielded	13.2
Ignition Distributors (included in Shielding Assembly)	
Radio Shielded Ignition assembly, complete with Cable and Distributors.	31.1
Spark Plugs	7.2
Priming System on Engine	.5
Cooling Air Deflectors and Baffles	None
Accessory Drive Covers	1.2
TOTAL DRY WEIGHT OF ENGINE	1425 lbs.

E-5 Performance Characteristics. - The ratings specified herein, and the curves specified herein and shown on pages 14 & 15, shall constitute the power and specific fuel consumption guarantees. The terms used and the standard conditions shall be in accordance with the applicable definitions contained in specification AN-9502.

E-5a. Ratings. - The engine shall be rated as follows, using fuel conforming to specification AN-VV-F-781 and oil conforming to specification AN-9532, grade 1120. Ratings are based upon operation without the intake port backfire screens.

880 B.H.P. at 2600 R.P.M. at sea level  
 1000 B.H.P. at 2600 R.P.M. at 10,800 ft. - Normal  
 1150 B.H.P. at 3000 R.P.M. Take-off for five minutes.  
 1150 B.H.P. at 3000 R.P.M. military rating at  
 12,000 feet for 15 minutes - Military  
 Rated Altitude.

3120 R.P.M. rated overspeed dive R.P. M.

E-5b. Curves. - The following curves shall be furnished as part of this specification:

E-5b. (1). Curve as specified in Paragraph E-5b (1) of specification AN-9501.

E-5b. (3). The curves shall be constructed as shown on page 14.

E-5e. Specific Oil Consumption. - The specific oil consumption shall not exceed .025 lb./BHP/hr. at normal rated power and speed, .025 lb./BHP/hr. at 70 per cent normal rated power and 89 per cent normal rated speed.

E-5h. Coolant Flow and Heat Rejection. - The following guarantee is given for the heat rejection to the Coolant.

When operating the engine on a dynamometer at take-off power and speed for 5 minutes operation with 250°F. coolant outlet temperature and with an oil inlet temperature of 185°F. and with an oil flow not to exceed 140 lb./min. and running at guaranteed specific fuel consumption, the coolant flow to the radiator shall not exceed 240 gal./min. and the heat rejection to the coolant shall not exceed 430 H.P. The above estimates are based upon a 10 M.P.H. and 60°F. air blast on the engine during dynamometer operation.

E-5i. Oil Flow and Heat Rejection. - The following guarantee is given for the heat rejection to the oil.

When operating the engine on a dynamometer at take-off power and speed for 5 minutes operation and with an oil inlet temperature of 185°F. and with 250°F. coolant outlet temperature and with a coolant flow not to exceed 240 gals./min. and running at guaranteed specific fuel consumption, the oil flow at 65 lbs./sq. in. pressure shall not exceed 140 lbs./min. and the heat rejection to the oil shall not exceed 140 H.P. The above estimates are based upon a 10 M.P.H. and 60°F. air blast on the engine during dynamometer operation.

E-6. Engine Performance. - (Reference, specification AN-9500 paragraph D-6.) - The complete engine shall function satisfactorily at military rated power up to the service ceiling of the airplane.

E-7. Propeller. - The engine shall have a No. 60 propeller shaft end as shown on installation drawing No. 36990. Provision shall be made for a governor type of propeller

control mechanism. No provision shall be made for hydraulic propeller operation. An oil vapor opening shall be provided on the governor mounting pad as shown on installation drawing No. 36990. Oil pressure shall not be supplied to the pad.

E-12. Overall Dimensions. - The overall dimensions of the engine shall not exceed the following:

Length	194	inches
Width	29	9/32 inches
Height	36	17/32 inches

E-14. Preparation for Storage. - The engine shall be prepared for storage in accordance with Allison Technical Order No. 150, Appendix "A", dated September 5, 1941.

E-16b. Parts List of the Engine. - The parts list applicable in all details to the engine which successfully completed government tests, with exception of later design improvements as since agreed upon between the Contractor and the Government shall constitute a requirement of this specification. The engine and parts list shall also include special designed Intake Manifolds with port type backfire screens in accordance with Drawing No. 40844.

E-18. Propeller Drive. - The engine shall be equipped with a reduction gear ratio of 1.80:1. The propeller drive shall be mounted on a remote gear box located outboard of an extension shaft which operates at crankshaft speed. The gear box should be lubricated from an external tank of not less than 2 gallons capacity which shall not be provided with the engine. The direction of propeller rotation when viewed from the anti-propeller end, shall be clockwise. The maximum oil flow required for the reduction gear box is 20 lbs./min. at military rated speed. The gear box will function satisfactorily, provided the correct specified lubricant is used and an oil inlet temperature of 60° C. (140°F.) is not exceeded. The lubricant for the gear box oil system shall conform to Air Corps Specification Y-3587.

E-19. Impeller Gear. - The impeller gear ratio shall be 8.80:1 and the impeller shall be 9-1/2 inches in diameter.

E-20. Pistons. - The engine shall be fitted with pistons of 6.65:1 compression ratio.

E-23a.(1)Spark Plugs. - The engine shall be fitted with BG LS321, Bendix 6S9, Champion C34S or AC-LS85 Spark Plugs.

E-23b. Radio Shielded Ignition Assemblies. - The engine

shall be equipped with Allison designed radio shielded ignition assemblies with the following exceptions to specification AN-9510:

- (1) Reference, paragraph D-1e, - Mounting Lugs) Mounting clamps shall be provided in place of integral, soldered, or welded mounting lugs.
- (2) (Reference, paragraph E-8, Capacitance) The Capacitance between the shielding and each ignition cable contained therein shall not exceed 175 micro-microfarads.
- (3) (Reference, paragraph E-1a, Single Cable Conduits) Single Cable conduit connections shall be as shown on Allison Drawings Nos. 33536, 36496, 37463, and 37476.

E-23c. High Tension Ignition Cable. - (Reference, Specification AN-9500, paragraph D-23c) - High tension ignition cable conforming to Air Corps Specification 32152 shall be used on all distributor head to spark plug leads.

E-23d. Magnetos.- The engine shall be equipped with one Scintilla Type DF 4 pole magneto with breaker Cam, Scintilla Part No. 10-24176, in accordance with Specification AN-9511 with the following exceptions:

- (1) (Reference, paragraph D-1a, (1), Distributor Block) The holes in the distributor head and the high tension terminals of the magneto for the cable connecting the magneto and distributor heads are for 9mm Cable.
- (2) (Reference, paragraph D-1a (4) a, Type Designations.) This magneto does not have a numeral in the type designation to indicate number of cylinders. A direction arrow plate instead of letters "R" or "L" denotes rotation.
- (3) (Reference, paragraph D-1b(1), Threads) - Connections for the high tension terminals are 15/16-18 threads.
- (4) (Reference, paragraph E-1b(2), Type D Magneto.) - The heads of screws for securing the bearing retainer in the flange project beyond the .125" minimum recess in pilot specified in Figure No. 3.
- (5) (Reference, paragraph E-2c., Normal Operating Temperature) - The temperature rise of this magneto is 55.5°C. (100°F) above room temperature.

(6) (Reference, paragraph E-2d, Endurance, F-4a (11)b.). - (Elevated Temperature Run). - This magneto will not meet the temperature requirements specified except for very short periods of time.

(7) (Reference, paragraph E-3b., Voltage Speed Characteristics) - F-4a (6) - Voltage Characteristics Test). - The breakers of this magneto are assembled to provide a 9° stagger spark, measured on the magneto drive shaft. Accordingly, the voltage output for both breakers will not be equal, particularly at 50% rated maximum rotor speed. Following are the minimum peak voltages for this magneto:

## FULL ADVANCE

ROOM TEMP. 98.9°C. (210°F.)

100 R.P.M. (engine)	8 K. V.	6 K. V.
300 R.P.M. (engine)	12 K. V.	10 K. V.
50% rated max. rotor speed	15 K. V.	13 K. V.
75% rated max. rotor speed	16 K. V.	14 K. V.
Rated max. rotor speed	16 K. V.	14 K. V.

(8) (Reference, paragraph E-3b(1), Voltage Output.) - F-4a(6) a., Voltage Output Test.) - The minimum voltage of either breaker at 50% rated maximum rotor speed is 15 K.V.

(9) (Reference, paragraph E-3e., Simulated Service.) - F-4a(10a., Rain and Spray Test.) - The Magneto will not meet the requirements when subjected to the test specified in this paragraph. The installation of this magneto on a liquid-cooled V engine requires and permits maximum ventilation in breaker cover.

(10) (Reference, paragraph I-4, Qualification Tests) - This magneto has not been submitted to the Army for type test under Spec. AN-9511a. It has been supplied to the Army under Specification 28159-C.

E-23f. Cooling. - (Reference, Specification AN-9500, paragraph D-23f.) - The engine shall be so designed as to permit the installation of adequate means for cooling the magnetos to required maximum temperature of 80° C. (176°F.). Provision for cooling the spark plugs and the spark plug elbows shall consist of air ducts, as shown on installation Drawings Nos. ~~41580~~ and ~~41580~~, and Drawings Nos. 37583 and 37584, to which the airplane manufacturer shall connect. For flight and ground operation, spark plug elbows shall be satisfactory, provided the ignition wire temperature measured in the elbow does not exceed 115°C. (239°F.) and



provided the cable furnished in accordance with A.C. Specification 32152 does not fail below this temperature.

E-24c. Oil Leakage Test. - (Reference, specification AN-9500, paragraph D-24c.) - With a mixture of equal parts of aviation gasoline and oil conforming to Spec. An-9532, grade 1100, supplied to the pressure oil pump inlet under a head of 36 inches the total flow of oil into the engine shall not exceed 0.2 pounds per hour.

E-24e. Scavenging and Pressure Pumps. - (Reference, Specification AN-9500, paragraph D-24e and D-24F.) - Provided no air traps exist in the external scavenging system, the engine scavenging system shall adequately scavenge the engine for extended periods of time under normal operating conditions, with a back pressure on the scavenging system not to exceed a maximum of 30 pounds per square inch at maximum flow, and two pounds per square inch at minimum idling speeds when using either Grade 1100 or Grade 1120 oil, conforming to Specification AN-9532 at an inlet viscosity of 100 plus or minus 5 Saybolt Universal seconds. The oil pressure pump shall function properly when its inlet pressure is 88% or more of the absolute atmospheric pressure.

E-24g. Oil Cleaner. - The engine shall be equipped with one Automatic Cuno No. 10863, oil strainer.

E-24q. Crankcase Breathers. - Ample breathing capacity shall be provided in accordance with paragraph D-24q., of Specification AN-9500, however, the airplane manufacturer shall locate the front and rear breather outlets to maintain a crankcase pressure measured at the front within the limits of +8 to -4 inches of water on any new or modified airplane installation. It is desired that the pressure at the front breather be held to 2 to 6 inches of water higher than pressure at the rear breather to provide proper ventilation through the engine from front to rear.

E-25. Fuel Metering System. - The engine shall be equipped with one Bendix-Stromberg Model PD-12K2 injection carburetor with A.C. setting No. 112. The carburetor shall meet the requirements of Specification AN-9515 except for the following:

(1) (Reference, paragraph D-7, Strainer.) - The carburetor shall meet requirements except that foreign material is not removed with the strainer.

(2) (Reference, paragraph D-17, Mixture Control) - The mixture control positions are located as follows:

- (A) Idle Cut-off Full Forward
- (B) Automatic Lean Directly back of A.
- (C) Automatic Rich Directly back of B.

## (D) Full Rich Directly Back of C.

(3) (Reference, paragraph D-26, Protective Treatment of Steel Parts.) - Cadmium plated parts shall have a minimum plating thickness of .0003".

(4) (Reference, paragraph D-32a. (1), Metering Characteristics.) - Sea Level). - The carburetors shall meet requirements except that at 30 to 70 per cent of air flow for normal rated power and speed the variation in fuel/air ratio shall be plus or minus 2 per cent.

(5) (Reference, paragraph D-32b.(1), Metering Characteristics, Master Carb.). - At Take-off power and speed, the carburetor shall contain a setting which in the rich mixture control position will furnish mixture strengths within +4%-0% of the guaranteed fuel consumption.

(6) (Reference, paragraph D-32b.(13), Carburetor Heat on Test) - The complete airflow to the carburetor shall be heated to avoid icing conditions on test. Duplication of the airplane method of admitting warm air shall not be attempted.

(7) (Reference, paragraph D-32c., Metering Characteristics of Production Carburetors.) - The carburetors shall meet requirements except that at 30 to 70 per cent airflow for normal rated power and speed the variation in fuel/air ratio shall be plus or minus 2 per cent.

(8) (Reference, paragraph F-4e.(3), Metering Tests of Production Carburetors.) - A procedure for air box testing production carburetors, in accordance with War Department, Air Corps, Materiel Division letter of April 29, 1938, Serial No. E-57-809-16, shall be used, the procedure being as follows:

Mixture readings are obtained on the normal rated power and speed propeller load curve, using the following points; such points being subject to change to agree with individual carburetor specifications:

<u>AIRFLOW</u>	<u>METERING TOLERANCE</u>	<u>MIXTURE CONTROL POSITION</u>			
Take-off Airflow	±2%	Auto. Rich	Auto. Lean	Full Rich	Rich
100% rated power airflow	"	" "	" "	" "	" "
75% " " "	"	" "	" "	" "	" "
62-1/2% " " "	"	" "	Auto. Lean	" "	" "
50% " " "	"	" "	" "	" "	Full Rich
35% " " "	"	" "	" "	" "	" "

<u>AIRFLOW</u>	<u>METERING TOLERANCE</u>	<u>MIXTURE CONTROL POSITION</u>
22-1/2% rated power airflow	±5%	Auto. Rich
15% " " "	"	" "
10% " " "	"	" "
Airflow at min. idling speed	"	" " Idle cut-off

In addition, carburetors designed for automatic altitude compensation are checked at an airflow equivalent to 50% of normal rated power airflow with the mixture control in the automatic rich position and readings are taken at air box pressures of 0, 4, 8, and 14 inches of Hg. less than atmospheric pressure.

E-26. Fuel Priming System. - Provision shall be made for priming the engine with fuel from a separately installed priming pump and lead line, supplied by the airplane manufacturer and attached to the engine priming connection.

E-29. Coolant Pump. - The coolant pump shall be supplied with an internal spring loaded packing. Replacement of the packing is made by disassembly of the pump. No provision shall be made for external packing adjustment. An Inlet Cover with double opening (#40565) shall be provided.

E-30. Coolant Temperature. - The cooling liquid outlet temperature for liquid cooled engines shall be 121°C. (250°F.)

E-31a (3) Supercharger Drain Valve. - (Reference, Specification AN-9500, paragraph D-31a(3).) - A gurgle passage without a valve shall be the only provision made for automatic drainage of the induction system.

E-32a. Exhaust Flanges. (Reference Specification AN-9500, paragraph D-32a). - Exhaust flanges and gaskets in accordance with installation Drawing No. 36990 shall be supplied, but shall not be included in the engine dry weight. Flanges and gaskets shall be shipped with, or separate from the engine, at the request of the procuring agency.

E-36. Accessory Drives. - The gear ratio of each accessory drive to the engine crankshaft, based on the lowest normal rated speed of the engine, the maximum permissible torque in inch-pounds for continuous operation, the maximum permissible static torque in inch-pounds, and the direction of rotation when looking at the end of the accessory drive shaft in the engine shall be as follows:

<u>Accessory Drives</u>	<u>Ratio to Crankshaft</u>	<u>TORQUE RATINGS</u>		<u>ROTATION</u>
		<u>Continuous</u>	<u>IN. - LBS. Static</u>	
<u>Starter</u>	1.000:1	-	16200	C
<u>Generator</u>	1.440:1	600	6000	C
<u>Fuel Pump</u>	0.864:1	25	450	CC
<u>Vacuum Pump (Rear)</u>	1.440:1	150	2250	C
<u>Vacuum Pump (Red. Gear Box)</u>	1.167:1	150	2250	CC
<u>Tachometer (two drives)</u>	0.500:1	2.5	12.5	C
<u>Propeller Governor</u>	0.875:1	15	150	CC
<u>Gun Synchronizer Impulse Generator (Two drives)</u>	0.556:1	25	125	CC

NOTE: CC indicates counter-clockwise rotation  
C indicates clockwise rotation.

E-36a. Starter. - The starter mounting pad and drive shall be Type I, in accordance with Specification AN-9517. The direction of rotation when looking at the starter dog attached to the engine shall be clockwise.

E-36a(1) (Reference, Specification AN-9517, paragraph E-4b) Clearance shall be provided for a Type F-2 starter installed as shown on installation Drawing No. 36990. Also clearance is provided for a Type G-6 starter.

E-36c. Power Take-off Drive. - A power take-off drive shall not be provided for driving a gear box assembly.

E-36e Pad and Drive for Gun Synchronizer Impulse Generator. Provision shall be made for driving Gun Synchronizing Impulse Generators by a Type I pad and drive in accordance with Spec. AN-9520 with the following exception to paragraph D-1a; the two pads shall be located on the rear face of the reduction gear box and the face of the mounting pad shall be perpendicular to the longitudinal axis of the engine.

E-36e(1) Gun Synchronizing Impulse Generators shall not be furnished.

E-36f Vacuum and Hydraulic Mechanism Oil Pump (Reference Spec. AN-9521 Par. D-1) Provision shall not be made for

supplying oil pressure to the outboard reduction gear box hydraulic mechanism oil pump pad.

F. METHODS OF SAMPLING, INSPECTION, AND TESTS

F-1. The requirements for sampling, inspection and tests shall be as shown in Specification AN-9500.

G. PACKAGING, PACKING, AND MARKING FOR SHIPMENT.

G-1. The requirements for packaging, packing and marking for shipment shall be as shown in Specification AN-9500.

PERFORMANCE CHARACTERISTICS  
OF THE ALLISON V-1710-35 ENGINE  
AT SEA LEVEL & ALTITUDE.

(NO RAM)

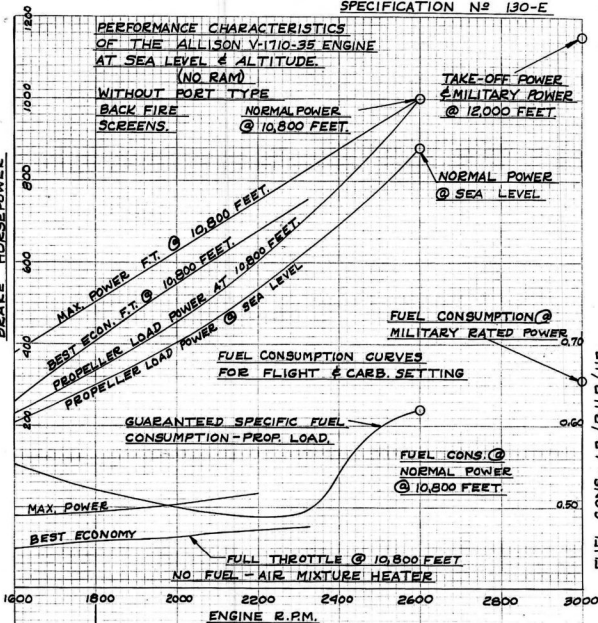
WITHOUT PORT TYPE

BACK FIRE  
SCREENS.

NORMAL POWER  
@ 10,800 FEET.

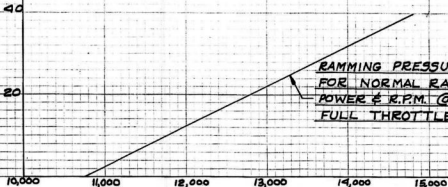
TAKE-OFF POWER  
& MILITARY POWER  
@ 12,000 FEET.

BRAKE HORSEPOWER



FUEL CONS. - LB./B.H.P./HR.

RAMMING PRESSURE  
IN - H<sub>2</sub>O



**TO FIND ACTUAL HORSEPOWER FROM ALTITUDE, R.P.M., MANIFOLD PRESSURE AND AIR INLET TEMP**

1. LOCATE A ON FULL THROTTLE ALTITUDE CURVE FOR GIVEN R.P.M. & MANIFOLD PRESS.
2. LOCATE B ON SEA LEVEL CURVE FOR R.P.M. & MANIFOLD PRESSURE & TRANSFER TO C.
3. CONNECT A & C BY STRAIGHT LINE & READ HORSEPOWER AT GIVEN ALTITUDE D.
4. MODIFY HORSEPOWER AT D FOR VARIATION OF AIR INLET TEMPERATURE T<sub>a</sub> FROM STANDARD ALTITUDE TEMPERATURE T<sub>s</sub> BY FORMULA:-

$$[HP \text{ AT } D] \times \frac{460 - T_a}{460 - T_s} = \text{ACTUAL HP}$$

[APPROXIMATELY 1% CORRECTION FOR EACH 10° F. VARIATION FROM T<sub>s</sub>]

**CORRECTIONS FOR VARIATION OF CARB. INLET TEMP. "T" FROM 60° F. SHALL BE MADE BY THE FORMULA:-**

$$\text{CHART H.P.} \times \left[ \frac{520}{460 + T} \right]^{0.25} = \text{CORRECTED H.P.}$$

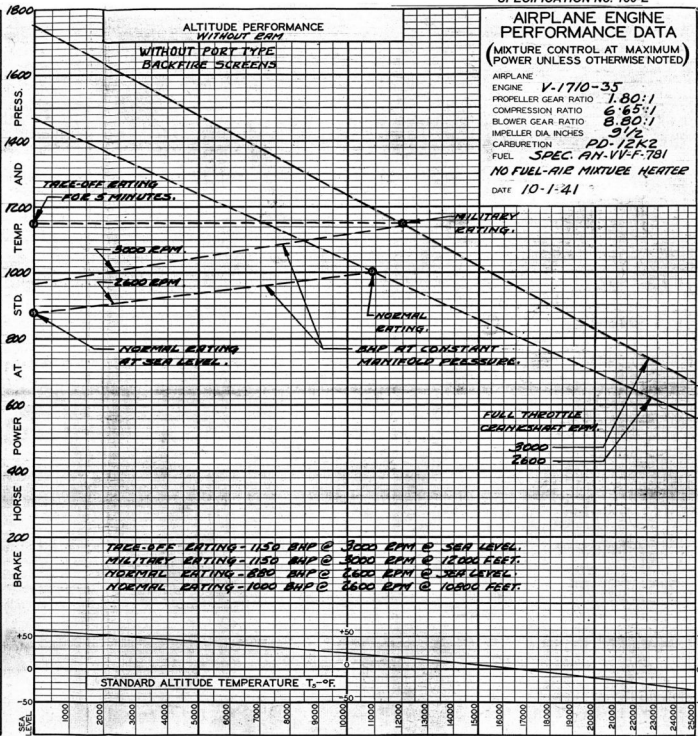
**SEA LEVEL PERFORMANCE**

**ALTITUDE PERFORMANCE**  
*WITHOUT ERM*

**WITHOUT PORT TYPE BACKFIRE SCREENS**

**AIRPLANE ENGINE PERFORMANCE DATA**  
(MIXTURE CONTROL AT MAXIMUM POWER UNLESS OTHERWISE NOTED)

AIRPLANE ENGINE **V-1710-35**  
 PROPELLER GEAR RATIO **1.80:1**  
 COMPRESSION RATIO **6.65:1**  
 BLOWER GEAR RATIO **8.80:1**  
 IMPELLER DIA. INCHES **9 1/2**  
 CARBURETOR **PD-12K2**  
 FUEL **SPEC. AN-VV-F-781**  
**NO FUEL-AIR MIXTURE HEATER**  
 DATE **10-1-41**



Specifications as of dates listed below shall be applicable to this model specification. Any specification revisions and/or amendments issued prior to date of bid for this model engine and after the particular dates listed below shall not be applicable

Army-Navy Spec.	AN-9500a	Mar. 30, 1940
" " "	AN-9501a	Mar. 30, 1940
" " "	*AN-9502a	Mar. 30, 1940
" " "	*AN-9503a	Mar. 30, 1940
" " "	*AN-9504	Mar. 1, 1939
" " "	(2)*AN-9506	Mar. 1, 1939
" " "	(3)*AN-9507	Mar. 1, 1939
Army-Navy Spec.	AN-9509a	July 18, 1940
" " "	AN-9510a	July 31, 1940
" " "	AN-9511a	July 31, 1940
" " "	(2)*AN-9512	Mar. 1, 1939
Air Corps Spec.	(4)*32152-A	May 4, 1939
Army-Navy Spec.	AN-9513	Mar. 1, 1939
" " "	AN-9515a	Mar. 30, 1940
" " "	AN-9516	Mar. 1, 1939
" " "	AN-9517	Mar. 1, 1939
" " "	AN-9518	Mar. 1, 1939
" " "	AN-9519	Mar. 1, 1939
" " "	(2)*AN-9520	Mar. 1, 1939
" " "	*AN-9521	Mar. 1, 1939
" " "	(2)*AN-9522	Mar. 1, 1939
A-N Aero Spec.	(2)*AN-QQ-M-181	Mar. 24, 1939
" " "	AN-VV-C-566	Aug. 1, 1939
" " "	AN-GGG-S-126	July 5, 1939
Army-Navy Spec.	(2)*AN-VV-F-781	Sept. 26, 1940
" " "	AN-9532	Mar. 1, 1939
" " "	AN-9533	Mar. 1, 1939
Army-Navy Drawing	AN-4033	Mar. 1, 1939
" " "	AN-4034	Mar. 1, 1939
" " "	AN-4037	Mar. 1, 1939
AND Drawings	AND-10201	Apr. 12, 1940

NOTE: ( \* ) Asterisk and preface number in ( ) parentheses indicate that the specification has been amended, and the particular amendment that is applicable.