Spec. No. 228-A

October 5, 1942

Revised: March 12, 1943

MODEL SPECIFICATION

ENGINE, AIRCRAFT: MODEL V-3420-19

ALLISON DIVISION
General Motors Corporation
Indianapolis, Indiana

(ALLISON MODEL V-3420-B8)

-1-

MODEL SPECIFICATIONS

ENGINE, AIRCRAFT: MODEL V-3420-19
Allispn Division of General Motors Corporation
(Allison Model V-3420-B8)

A. APPLICABLE SPECIFICATIONS

A-1. The specification listed on pages 17 & 18 except as revised herein shall form a part of this specification.

B. TYPE AND MODEL

B-1. This specification covers the requirements for the V-3420-19 engine.

B-1a. The V-3420-19 (B8) engine is a 24 cylinder liquid cooled double Vee engine equipped with an outboard reduction gear with counter rotating propeller shafts.

It is equipped with an integrally mounted auxiliary stage supercharger which is driven through a variable speed hydraulic coupling. The speed of the auxiliary stage is dependent upon the hydraulic coupling slip which is controlled by an aneroid.

E. DETAIL REQUIREMENTS

E-2. Drawings and Data. The following Allison Division drawings shall form a part of this specification:

43741 - Engine Assembly, complete showing accessory drive oil seals.

43740 - Installation drawing (showing clearances for engine accessories and their removal)

Priming System Assembly
Carburetor - PR type - Bendix - Stromberg
Spark Plug Assembly - Champion C-34S
Spark Plug Assembly - Champion C-35S
Spark Plug Assembly - AC - LS
Terminal - Spark Plug (contact assembly)
Lubrication System diagram
Shielding Assembly
Photographs

E-3. Acceptance. Each engine shall be acceptance tested in accordance with AN9503 except that due to the characteristics of the variable speed hydraulic coupling certain requirements of the tests are not applicable nor definitely defined. The actual test procedure shall be that agreed upon between the government and the contractor at the time of testing the first engine.

The engine shall be type tested in accordance with AN9502 with the following exceptions:

(1) Ref. Par. F-3 (d) 7. The 42% power, 56% speed run shall be made at 42% power and at the lowest speed (not less than 56%) obtainable with propeller available for testing.

(2) Ref. Par. F-3 e (2). Two Stage Multi-speed Supercharged Engines. The following coupling control positions shall apply in lieu of those specified:

"Main Stage only shall be in operation" ---------- Sea Level Position

"Main Stage and low speed auxiliary stage" - Position Calculated for Normal Power at 10,000 ft.

"Main Stage and High Speed Auxiliary" -------- Minimum Slip

(3) Ref. Par. F-4a(1). The knock rating of the fuel for model testing shall be in accordance with AN-F-28 Grade 130.

(4) Ref. Par. F-4b(1). Oil Outlet Pressure. The restriction to the oil outlet shall be adjusted to give a back pressure of 40 psi. at take-off conditions and this restriction shall remain fixed during the entire test.

(5) Ref. Par. F-4c. Carburetor Air Temperature. During operation with the auxiliary stage air being wasted the carburetor air inlet temperature shall be comparable to actual operation under standard conditions. The definite values shall be established at the time of model testing subject to approval by government and the contractor.

E-4. DRY WEIGHT OF COMPLETE ENGINE. The total dry weight of the engine shall not exceed the value listed below.

It is estimated that the distribution of the various component parts shall be as follows:

Basic engine including integral superchargers, supercharger drive mechanism, coolant pumps and piping on the engine, engine lubrication system,

oil pumps, starter connection including starter dog, tachometer drive, fuel pump drive, generator drive, power take-off drive, vacuum or hydraulic power pump drive and all piping and controls between engine parts	-2510	lbs.
Carburetor	50	
Air Intake screen & gasket included with basic engine.		
Magnetos	26	
Ignition Distributors and Radio Shielded Ignition Assembly complete with Cable	63	
Spark Plugs	12	
Priming System on Engine	2	
Cooling Air Deflectors	None	
Accessory drive covers	2	
Automatic Manifold & Coupling Control	10	
	2675	lbs.
Outboard Reduction Gear Assembly, including gun syn. Drive (but not including gun syn.) hydraulic power pump drive and propeller gov. drive.	385	
Extension shafts and support bearing	115	
Total Dry Weight of Engine	3175	lbs.

E-5. Performance Characteristics. The ratings specified herein, and the curves specified herein and shown on pages 14, 15, and 16, 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 either Specification AN-9502 or AN-9503.

E-5a. Ratings. The engine shall be rated as follows, using fuel conforming to Specification ~~AN-F-28 Grade A100~~ and Amdt. No. 5) and oil conforming to Specification AN-VV-O-446, Grade 1120.

2100 BHP at 2600 RPM at sea level.

2100 BHP at 2600 RPM at 17,000 feet normal rated altitude.

2600 BHP at 3000 RPM take-off for 5 minutes.

2300 BHP at 3000 RPM military rating at 20,000 feet for 15 minutes.

3120 RPM rated over speed dive r.p.m.

Note: Military rating shall be for 15 minutes duration for flight and 15 minutes for type test purposes.

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

E-5b(1). Curves on Page 14 showing horsepower vs altitude at rated speeds up to and including the guaranteed altitude of the engine. The data shown shall apply to operation with guaranteed specific fuel consumption as given in the table of Par. E-5b(3). Estimated power vs altitude for other speeds within the operating range shall be included with the curves of Par. E-5b(2).

E-5b(2). Curves on Page 15 showing estimated horsepower vs altitude at full throttle for various engine speeds. Manifold pressures shall be included when available.

E-5b(3). Curves on Page 16 showing estimated minimum specific fuel consumption in the low power and low speed range, and a table showing guaranteed fuel consumption on normal rated power propeller load at rated power, 90, 80 and 70% rated power and also at take-off and military power.

E-5b(3)a. The data furnished on the above curves shall be based upon standard temperature and pressure at the entrance to the auxiliary stage. Since intercooling is not required, the requirements of paragraph E-5b(3)a of AN-9501 are inapplicable.

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

E-5h. Coolant Flow and Heat Rejection. The following guarantee is given for coolant flow and heat rejection to the coolant, when operating on a dynamometer for 5 minutes with a 60°F, 10 MPH air blast over the engine:

Conditions:

Power	Take-off (2600 BHP)
Speed	Take-off (3000 RPM)
Fuel Consumption	Guaranteed specific
Oil Inlet Temp.	185°F.
Oil Pressure	65 p.s.i.
Coolant Outlet Temp.	250°F.

Guarantee:

Coolant flow not to exceed 530 GPM.
Heat to coolant not to exceed 36,500 BTU/min. (860HP)

E-5h(1); E-5h(1)(a); E-5h(1)(b). The coolant pump shall function satisfactorily providing the pressure at the coolant pump inlet shall not fall below 25" Hg. absolute at the altitude at which military power is obtained and providing the pressure drop with 530 GMP flow through the radiator circuit does not exceed 15 lbs./sq.in. To obtain these conditions it will be necessary

to pressurize the coolant system. The pressure at the coolant pump inlet in the pressurized system shall not exceed 36" Hg. absolute under altitude or sea level conditions. The coolant pump flow data required by AN-9501 shall be furnished following completion of tests by the engine manufacturer, of the coolant pump with the external system to be used in the airplane as furnished by the airplane manufacturer.

E-5j. Oil Flow and Heat Rejection. The following guarantee is given for oil flow and heat rejection to the oil, when operating on a dynamometer for 5 minutes with a 60°F, 10 MPH air blast over the engine:

Conditions:

Power	Take-off (2600 BHP)
Speed	Take-off (3000 RPM)
Fuel Consumption	Guaranteed specific
Oil Inlet	185°F
Oil Pressure	65 p.s.i.
Coolant Outlet	250°F.
Coolant flow not to exceed	530 GPM

Guarantee:

Oil flow not to exceed 375 lb./min.
Heat rejection to oil 17,000 BTU/min. (400 HP)

E-6. The complete engine shall function satisfactorily up to and including an altitude of 40,000 feet.

E-7. Propeller. The engine shall have a No. 50 and No. 70 dual propeller shaft end in accordance with the general requirements of SAE Standard No. AS-91. Detail arrangements shall be submitted when the AN-N-1 specification has been released (Ref. AN-9500 Par. D-7). Provision shall be made for mounting a governor as specified in Par. E-36g of this specification.

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

Length	262
Width	60 inches
Height	40-1/2 inches

E-14. Preparation for Storage. The engine shall be prepared for storage in accordance with AN-F-E-568 with the exceptions to paragraphs as listed below:

(1) (Par. B-1b. AN-Aero. Standard Drawings). The following Allison Division drawings shall apply in lieu of AN parts.

42288 - Plug Crankcase Dehydrator
36411 - Cap - Prop. Shaft Thread
43401 - Envelope - Engine Protector

(2) (Par. F-2a(1) - Operation Procedure). The requirements of this paragraph shall be met except that the specified compound-lubricating oil mixture shall not be used in the manner specified. The engine shall be thoroughly flushed with the compound-lubricating oil mixture at a later operation during the preparation for storage procedure.

(3) (Par. F-3h - Intake Manifold). A one pound bag of dehydrating agent shall be secured to the inside of the air intake cover.

(4) (Par. F-3n - Crankcase). A dehydrator plug No. 42288 shall be installed in an appropriate opening of the crankcase.

(5) (Par. F-4a(1) Packing Procedure). The base of the engine shipping box shall function as the shipping saddle and the upper case may be removed leaving the engine, bag, and shipping box base intact.

E-18. Propeller Drive. The engine shall be equipped with a reduction gear ratio of 2.458:1. The direction of rotation when viewed from the antipropeller end of the engine shall be clockwise for the No. 50 shaft and counter-clockwise for the No. 70 shaft. The reduction gear shall be mounted outboard and driven by two extention shafts rotating at crankshaft speed. The gear box shall be lubricated from an external tank of approximately 3 gallons oil capacity which shall not be furnished with the engine. The maximum oil flow required for the reduction gear assembly shall be approximately 40 lbs./min. The reduction gear assembly shall function satisfactorily with lubricating oil in conformance with AAF Specification Y-3587 at a maximum inlet temperature of 60°C (140°F).

E-19. Impeller gear. The impeller gear ratio and diameters shall be as follows:

Engine stage 6.82:1 and 10 inches
Aux. Stage 6.96:1 (no slip) and 12-3/16 inches

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

E-22. Crankshaft Torsional Vibration. The crankshaft torsional vibration shall be made the subject of specific requirements based on a detailed analysis of the proposed engine-propeller system as required in Par. E-4 of AN-9504. The detailed analysis shall consist of a torsional vibration survey conducted by the engine manufacturer during development tests using Government furnished propellers selected to give comparable characteristics with the propellers to be used in flight.

E-23a(1). Spark Plugs. The engine shall be fitted with AC-LS85, Champion C34S, or Champion C35S Spark Plugs.

E-23b. Radio Shielded Ignition Assembly. The engine shall be equipped with Allison designed radio shielding assembly. The magnetos and distributors shall be designed to permit supercharging from the suxiliary stage supercharger outlet. Deviations to AN-S-27 shall be listed herein when the manufacturer has received copies of AN-S-27 currently being prepared.

E-23c. High Tension Ignition Cable. High tension ignition cable conforming to the general requirements of AN-J-C-56 (7mm) shall be used except that the cable diameter may vary from the 7mm specified.

E-23d. Magnetos. The engine shall be equipped with two Scintilla Type DFLN6 magnetos. Deviations to AN-M-4 currently being prepared shall be listed herein after receipt of specification and coordination with the magneto manufacturer.

E-23f. Ignition System Cooling. Provision shall be made for cooling the spark plugs and spark plug elbows by spark plug cooling manifolds as shown on the installation drawing. The airplane manufacturer shall circulate sufficient air through the cooling manifolds and shall maintain engine compartment temperatures, suitable for operation of ignition parts installed and manufactured in accordance with the specifications listed below except as modified herein:

Spark plugs	AN-P-4
H.T. Cable	AN-J-C-56
Magneto	AN-M-4

E-24c. Lubricating System. After the model test with a mixture of equal parts of aviation gasoline and an oil having a viscosity of approximately 100 Saybolt Universal seconds at 98.9°C (210°F) supplied to the oil pump inlet at room temperature and under a head of three feet, the total flow of the oil into the engine due to the total leakage through both the engine and auxiliary sta ge, pumps shall not exceed 0.6 pound per hour.

E-24e and E-24f. Scavenge and Pressure Systems. The engine manufacturer shall cooperate in obtaining a satisfactory external lubrication system by testing and making recommendations on the external system as furnished by the airplane manufacturer.

E-24g. Oil Cleaner. The engine shall be equipped with Manual Cuno oil strainers in both the engine and auxiliary stage.

E-24i. Oil Temperature Measurement. Provision shall not be made for measuring oil inlet temperatures.

E-25. Fuel Metering System. The enigne shall be equipped with one Bendix-Stromberg model PR Type carburetor in conformance with AN-9515 with exceptions to paragraphs as listed below:

(1) Par. D-26 Protective Treatment of Steel Parts:
Cadmium plated parts shall have minimum plating thickness of .0003".

(2) Par. D-32a(2) Altitude.
Carburetors which compensated automatically for altitude shall hold the fuel air ratios at constant air flow at all altitudes up to 16,000 ft. standard altitudes to within ± 2% of that obtained at sea level. At altitudes greater than 16,000 ft. standard altitudes, the fuel air ratios shall be within limits as specified in deviation to Par. D-32a(3).

(3) Par. D-32a(3) Carburetor Air Temperature:
Carburetors which compensate automatically for altitude shall hold the fuel air ratio at constant air flow, to within ± 2% of that obtained for 15.6°C(60°F) over a range of carburetor air intake temperatures from -28.9° to 48.9°C(-20 to + 120°F) and to within ± 3% from 16,000 ft. to 25,000 ft. standard altitudes with carburetor air intake temperatures from 40° to 4.4°C(-40° to + 40°F) and to within ± 5% from 25,000 ft. to 40,000 ft. standard altitudes with carburetor air intake temperatures from -54° to -17.8°C (-67° to 0°F).

(4) Par. D-32b to D-32 b(3) Inclusive, Metering characteristics.
In lieu of the requirements of these paragraphs, the carburetor shall be set to give mixture strengths as shown on Page 13.

(5) Par. D-32b(17) Fuel Pressure.
The fuel pressure used during the reference carburetor tests shall be maintained at 15 ± 1 p.s.i.

(6) Par. F4e(3) Metering Test of Production Carburetors.
This paragraph is complied with, except as follows:
Mixture readings in automatic lean position are checked for normal rated power and speed propeller load curve at airflows corresponding to 30, 40, 50, 60 and 100 percent of normal rated power airflow and take-off airflow.
In addition, carburetors designed for automatic altitude compensation are checked at airflow equivalent to 50% of normal rated power airflow with the mixture control in the automatic lean position and readings are taken at airbox pressures of 0,8, 14 and 23 inches of Hg less than atmospheric pressure.

E-26. Engine Starting. 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 lines Assembly . In lieu of the requirements of Par. D-26 of AN-9500 the following shall apply:

> "The engine shall be capable of consistent starting when its temperature has been stabilized in an ambient temperature of minus 30°F when cranked at a minimum of 30 RPM. This shall be accomplished with the specified lubricant diluted 30% by volume using the fuel specified in the engine model specification. The pour point of the diluted oil shall be minus 40°F or lower. The use of special starting fuel shall be permitted. Consistent starting shall be defined as a complete start following not more than two 30 second cranking periods. Starting demonstrations when required shall be made in a laboratory under controlled conditions."

The specified lubricant for cold starting shall be Grade 1100 of AN-VV-O-446.

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

E-30a. Coolant Pressure. The maximum inlet pressure to the cooling liquid pump shall be as designated in Par. E-5h(1)a, and E-5h(1)b of this specification.

E-31a(3). Supercharger Drain Valve. (Ref. Spec. AN-9500 Par. D-31a(3). A fuel aspirator without a valve shall be the only provision made for automatic drainage of the induction system.

E-32a Exhaust Flanges. (Ref. Spec. AN-9500 Par. D-32a) The use of exhaust port flanges in accordance with Allison part No. 36549 and gaskets, part No. 40751 shall be a requirement in the installation of this engine. The exhaust flanges shall not be furnished with the engine and separate procurement must be initiated by the airplane manufacturer. The gaskets and nuts shall be furnished with the engine.

E-36. Accessory Pads and Drives. The type of each accessory drive, the number used, the gear ratio to engine crankshaft, the maximum permissible [redacted] torque for continuous operation, the maximum permissible static torque and the direction of rotation when looking at the end of the accessory drive shaft in the engine shall be as follows:

ACCESSORY & TYPE	NO. USED	RATIO TO CRANKSHAFT	MAX. TORQUE CONTINUOUS IN. - LBS.	MAX. TORQUE STATIC IN. - LBS.	ROTATION CLOCKWISE - C COUNTER CLOCKWISE - CC
Starter IV.	1	1.000:1		24,000	CC
Generator	1	3.000:1	300	3,000	C
Power Take-off	1	3.000:1	1000	5,100	C
Fuel Pump	1	.912:1	25	525	CC
Gun Syn. Impulse Generator	1	.406:1	20	200	C
Vacuum & Hyd. Power Pump on Eng. Type II Modified	1	1.284:1	150	2250	CC
Hyd. Power Pump on Red. Gear Box	1	1.266:1	150	2250	CC
Tachometer Type I	1	.500:1	2.5	12.5	CC
Tachometer Type II	1	.500:1	2.5	12.5	C
Governor	1	.876:1	125	2300	CC

E-36b. Generator and Power Take-off. The requirements of this paragraph shall be met except that provisions shall not be made for supplying oil to either pad and the max. torque ratings shall be as specified in the table of Par. E-36 above.

E-36b(1). Lubrication. Oil pressure shall not be supplied to either of the two pads. Provisions for draining oil back into the engine shall not be made.

E-36d. Gun Synchronizing Impulse Generator. Only one pad and drive shall be supplied.

E-36d(2)a. Gun Synchronizing Impulse Generator. The mounting pad for the Gun Synchronizing Impulse Generator shall be located on the rear face of the outboard reduction gear assembly and shall be in a plane perpendicular to the longitudinal axis of the engine.

E-36e. Vacuum Pump and Hydraulic Power Pump. The engine shall be equipped with two type two mounting pads in accordance with AND-10001 with the exception that the adapter flange AN-4055, bushing AN-4051 and gasket AN-4045 shall not be furnished.

E-36e(1). Lubrication (Vac. and Hyd. Power Pump). Provision shall not be made on the mounting pad located on the outboard reduction gear box for lubrication in accordance with AN-9500. Par. D-36e(1)

E-36e(2). Accessibility Vac. and Hyd. Power Pump). Clearance back of the outboard reduction gear mounting pad shall conform to AND-10302 only.

E-36f(1). Tachometer Accessibility. Clearance back of the Type I pad shall not be provided as required in Par. D-36f(1) of AN-9500 and AND 10310. Clearance shall be provided for installation and removal of a flexible tachometer shaft and shaft connection.

E-36g. Propeller Governor or Hydro Control Valve. The requirements of all D-36g items of AN-9500 shall be waived. Provisions shall be made for mounting a governor by a pad and drive conforming dimensionally to the requirements of AND 10010 except that oil shall be supplied to only one hole in the governor mounting pad at the minimum rate of 2 qts./min. at 50% normal rated engine speed or above, and a minimum of 0.5 qts./min. at minimum idling speeds.

A return drain from the governor shall be provided by means of a hollow governor drive shaft. The above requirements shall be met using the outboard reduction gear lubricant as specified in Par. E-18 of this specification. Clearance shall be provided back of the mounting pad for outline, AND 10307.

E-38. Fuel Air Mixture Temperature Connections. No provision shall be made for installing a mixture thermometer.

E-46. Torquemeter. The engine shall not be equipped with a torquemeter.

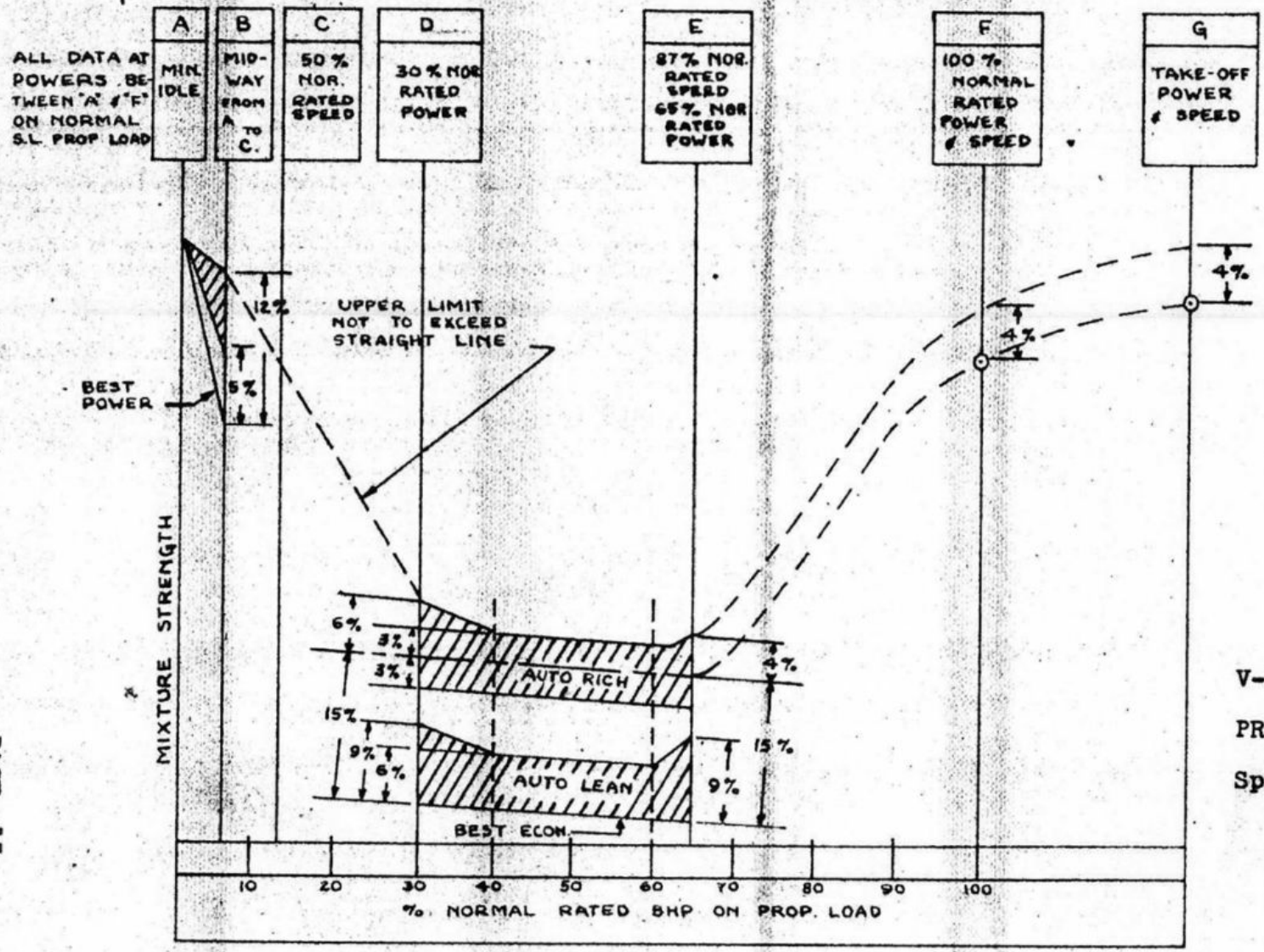
G-1a. Pipe Plugs (for shipment). Threaded openings which will definitely be used in the airplane installation shall be closed by unsafetied covers or plugs suitable for the purpose.

CARBURETOR SETTING

IN LIEU OF PAR. D-32b TO D-32b (3) OF AN 9515 b THE CARBURETOR SETTING SHALL BE ESTABLISHED AS SHOWN BELOW.

⊙ - GUARANTEED SPECIFIC FUEL CONSUMPTION POINTS

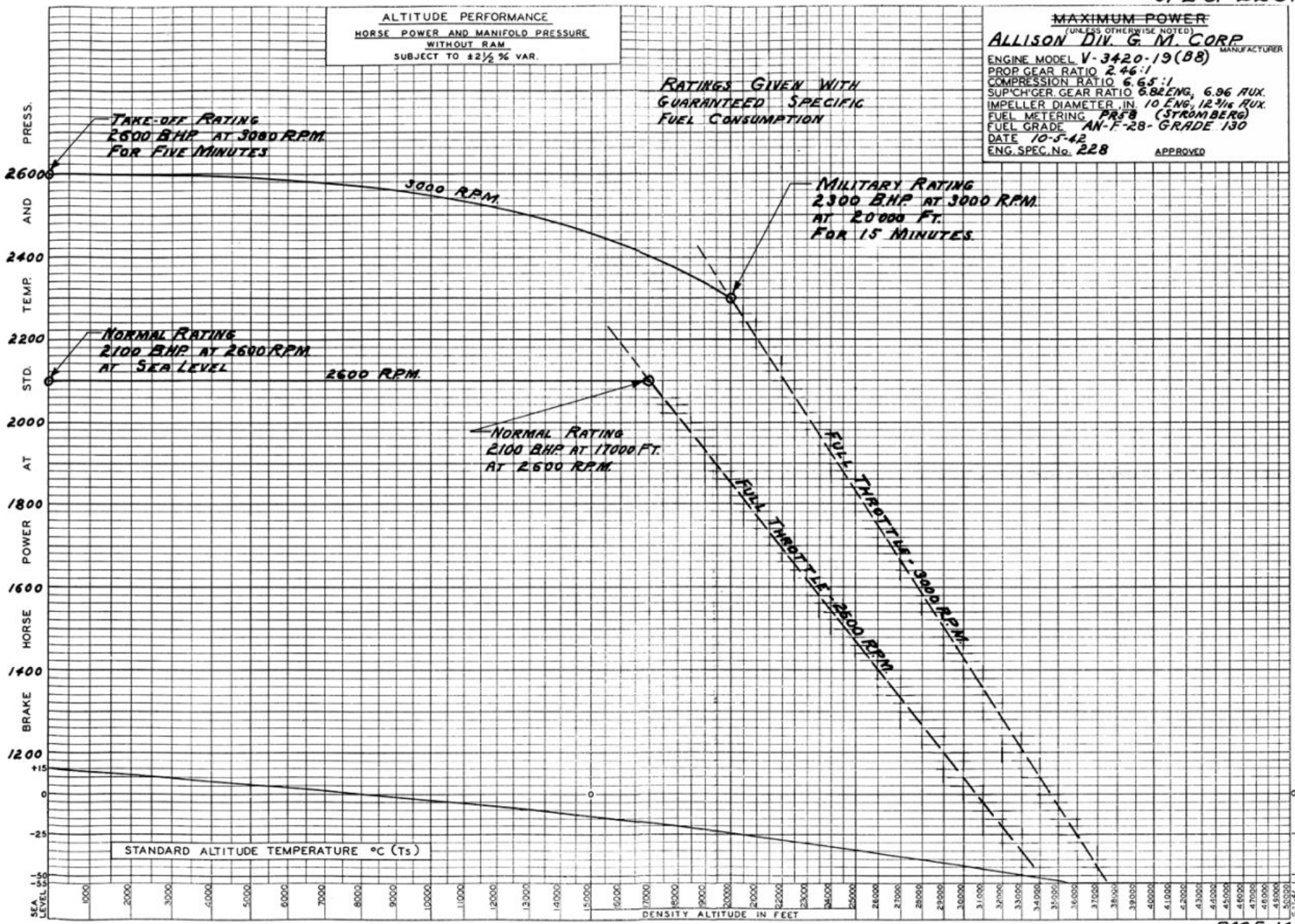
▨ - SETTING WILL FALL WITHIN SHADED AREA AND WITHIN LIMITS SPECIFIED AT SPECIFIED AIRFLOWS.



V-3420-19 (B8)

PR58 CARB.

Spec. No. 228-A


ALTITUDE PERFORMANCE
HORSE POWER AND MANIFOLD PRESSURE
WITHOUT RAM
SUBJECT TO ±2½ % VAR.
~~MAXIMUM POWER~~
(UNLESS OTHERWISE NOTED)
ALLISON DIV. G. M. CORP.
MANUFACTURER
ENGINE MODEL V-3420-19(B8)
PROP GEAR RATIO 2.46:1
COMPRESSION RATIO 6.65:1
SUP'CH'GER. GEAR RATIO 6.82 ENG., 6.96 AUX.
IMPELLER DIAMETER, IN. 10 ENG., 12 3/16 AUX.
FUEL METERING PR58 (STROMBERG)
FUEL GRADE AN-F-28- GRADE 130
DATE 10-5-42
ENG. SPEC. No. 228
APPROVED
RATINGS GIVEN WITH GUARANTEED SPECIFIC FUEL CONSUMPTION
TAKE-OFF RATING
2600 B.H.P. AT 3000 R.P.M.
FOR FIVE MINUTES
3000 R.P.M.
MILITARY RATING
2300 B.H.P. AT 3000 R.P.M.
AT 20000 FT.
FOR 15 MINUTES
NORMAL RATING
2100 B.H.P. AT 2600 R.P.M.
AT SEA LEVEL
2600 R.P.M.
NORMAL RATING
2100 B.H.P. AT 17000 FT.
AT 2600 R.P.M.
FULL THROTTLE - 3000 R.P.M.
FULL THROTTLE - 2600 R.P.M.
BRAKE HORSE POWER AT STD. AND PRESS. TEMP.
1200
1400
1600
1800
2000
2200
2400
2600
+15
0
-25
-50
-55
STANDARD ALTITUDE TEMPERATURE °C (Ts)
SEA LEVEL
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
16000
17000
18000
19000
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39000
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41000
42000
43000
44000
45000
46000
47000
48000
49000
50000
DENSITY ALTITUDE IN FEET

TO FIND ACTUAL H.P. WHEN GIVEN PRESS ALT. R.P.M. MAN. PRESS & FREE AIR TEMP.

1. LOCATE POSITION "A" ON ALTITUDE CURVE FOR GIVEN R.P.M. AND MANIFOLD PRESSURE.
2. LOCATE "B" ON SEA LEVEL PERFORMANCE CURVE FOR SAME R.P.M. AND MANIFOLD PRESSURE TRANSFER POSITION TO "C".
3. DRAW STRAIGHT LINE FROM "C" THRU "A" AND READ H. P. AT OBSERVED DENSITY ALTITUDE OF FLIGHT. (POINT "D" IN EXAMPLE.)
4. CORRECT H. P. IN ACCORDANCE WITH FREE AIR TEMPERATURE BY APPLYING THE FOLLOWING—
   (A) ADD 1 ¾ FOR EACH 6°C. DECREASE FROM T_S
   (B) SUBTRACT 1 ¾ FOR EACH 6°C. INCREASE FROM T_S
   (T_S = STANDARD ALTITUDE TEMP.)

SEA LEVEL PERFORMANCE

HORSE POWER VS MANIFOLD PRESSURE

ALTITUDE PERFORMANCE

HORSE POWER AND MANIFOLD PRESSURE

WITHOUT RAM

SUBJECT TO ±1½ % VAR.

ESTIMATED PERFORMANCE AND OPERATING LIMITS

~~MAXIMUM POWER~~

RATED STATIONARY SERVICE

ALLISON DIV. G.M. CORP. — MANUFACTURER

ENGINE MODEL V-1420-19 (B&H)

PROP GEAR RATIO 2.45:1

COMPRESSION RATIO 6.65:1

SUPERCHGR GEAR RATIO 6.84 ENG. 6.96 AUX.

IMPELLER DIAMETER IN. 10 ENG. 12 ⅜ AUX.

FUEL METERING MKF3 (STROMBERG)

FUEL GRADE AN-F-28, GRADE 130

DATE 10-5-42

ENG. SPEC. No. 228 — APPROVED

Take-Off Rating
2600 BHP AT 3000 RPM
FOR FIVE MINUTES

3000 R.P.M. - MILITARY RATED SPEED

Military Rating
2300 BHP AT 3000 RPM
AT 20000 FT. FOR 15 MINUTES

Normal Rating
2100 BHP AT 2600 R.P.M.
AT 17000 FT.

Normal Rating
2100 BHP at 2600 RPM
AT SEA LEVEL

2600 R.P.M. LIMIT FOR CONTINUOUS OPERATION

Maximum Limit For Full Coupling - Full Throttle Operation

2500 R.P.M.

2400 R.P.M.

2300 R.P.M. LIMIT FOR BEST ECONOMY OPERATION

2200 R.P.M.

1800 R.P.M.

1600 R.P.M.

1800 R.P.M.

1600 R.P.M. - BEST ECONOMY

2600 R.P.M. LIMIT FOR CONTINUOUS OPERATION

2300 R.P.M. LIMIT FOR BEST ECONOMY OPERATION

2400 R.P.M.

1800 R.P.M.

2600 R.P.M.

Maximum Full Throttle Full Coupling Limit For Best Economy Operation

3000 R.P.M. FULL THROTTLE MILITARY RATED SPEED

Aux. Stage Supercharger Driven Through Hydraulic Coupling

Indicates Maximum B.H.P. For Continuous Operation In Best Economy At R.P.M. Indicated.

Indicates Maximum B.H.P. For Continuous Operation At R.P.M. Indicated And Must Be In Auto Rich.

Indicates Maximum Allowable Limit For Continuous Operation With Full Coupling And Full Throttle Actual Setting On Coupling Control May Vary The Altitude At Which Full Coupling Can Be Obtained.

PRESS AND TEMP STD. AT SEA LEVEL

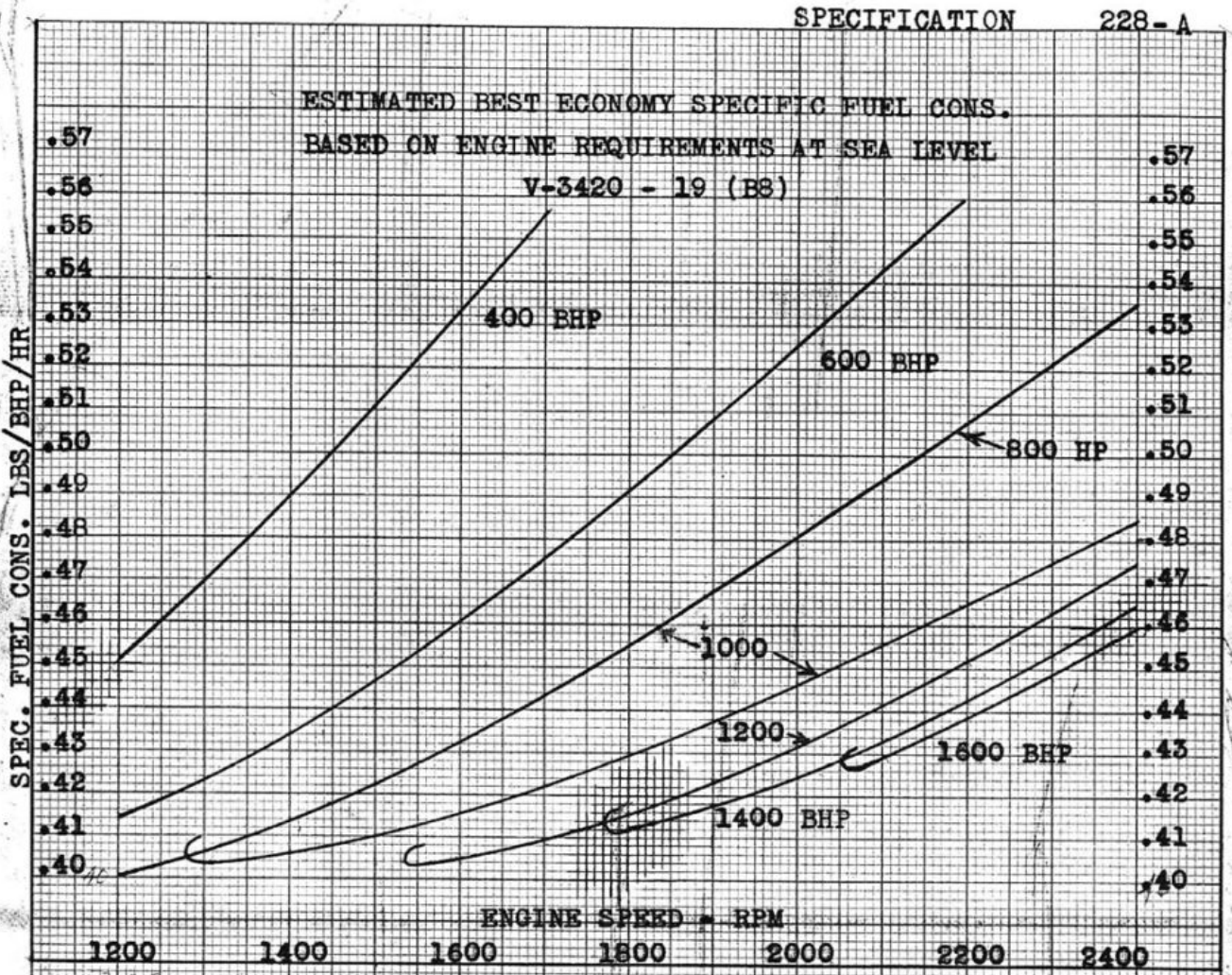
BRAKE HORSE POWER

MANIFOLD PRESSURE, IN. HG

STANDARD ALTITUDE TEMPERATURE °C (Ts)

DENSITY ALTITUDE IN FEET

WF-F-5-11-136



Guar. B.S.F.C. ON NORMAL S.L. Rated Prop.Lead at Sea Level.
(For Model Testing)

% Normal Power	LBS/BHP/HR
100%	0.63
90%	0.60
80%	0.54
70%	0.48
60%	Best Econ. not 0.45

Take-off Power --- 0.73

Military Power 0.75 at Critical Altitude

NOTE: It is estimated that the values shown on this page will apply at the normal rated altitude of the engine.

The following specifications and drawings of the issue in effect as listed below and as modified herein shall form a part of this specification. Any 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.

ANA Specs.	Rev.	AMEND.	DATED	TITLE (IN BRIEF)
AN-VV-C-576			12/30/41	Compound - Corrosion Preventive
AN-F-E-568			11/27/41	Prep. for Storage
AN-GGG-P-363		(2)	5/9/42	Pipe Threads
AN-GGG-S-126		(1)	3/31/41	Screw Threads
AN-J-C-56		(1)	1/26/42	Ignition Cable - High Tension
AN-QQ-M-181	(a)		3/31/42	Magnetic Inspection
AN-QQ-P-421	(a)		3/19/41	Cadmium Plating
AN-VV-F-746		(1)	11/8/40	Fuel - Gen. (Knock Test)
AN-VV-F-748	(a)		6/17/42	Fuel - Gen. (Super. Knock Test)
AN-VV-F-756		(2)	6/6/41	Fuel Grade 65
AN-VV-F-776		(4)	8/13/42	Fuel Grade 91
AN-F-28			12/23/42	Fuel Grade 130
AN-VV-O-446a			1/5/43	Oil - Lubricating
AN-P-4		(1)	2/13/42	Spark Plugs
AN-M-4	(See E-23d of this spec.)			Magnetos
AN-N-1	(See E-7 of this spec.)			Noses - Engine

ARMY-NAVY SPECS.

AN-9500	(b)		8/26/42	Engines - General
AN-9501	(b)		8/10/42	Engines - Model Spec.
AN-9502	(b)		8/11/42	Engines - Type Test
AN-9503	(b)		8/6/42	Engines - Acceptance Test
AN-9504		(1)	12/25/40	Engines - Torsional Vibration
AN-9513			3/1/39	Markers - Ignition Cable
AN-9515	(b)		8/6/42	Carburetors

ANA STAND. DWGS.	REV.	AMEND.	DATED	TITLE (IN BRIEF)
AN-4034			11/2/42	Data Plate
AN-4037			6/10/40	Oil Flange - 3 bolt
AN-4044	1		8/1/42	Gasket - Vac. and Hyd. Pump
AN-4046			5/27/42	Gasket - Prop. Gov. Pad
AN-4047	1		8/1/42	Gasket - Starter Pad, Type I
AN-4048			1/6/42	Oil Flange - 4 bolt

ANA DESIGN STD.				
AND-10001			1/6/42	Hyd. & Vac. Pump Pad - Type II
AND-10002			10/30/42	Generator Pad
AND-10003			1/6/42	Fuel Pump Pad
AND-10004			12/26/41	Starter Pad (All Types)
AND-10005	1		8/20/42	Tachometer Pad (Both Types)
AND-10010			3/18/42	Prop. Gov. Pad
AND-10301	1		3/28/42	Vac. Pump Clearance Type II
AND-10302	1		3/19/42	Hyd. Pump Clearance Type II
AND-10303			1/6/42	Starter Clearance Type IV
AND-10305			2/28/42	Generator Clearance
AND-10307			11/25/41	Prop. Gov. Clearance
AND-10310			12/5/41	Tachometer Clearance
AND-10320			2/16/42	Fuel Pump Clearance

REVISION RECORD 228-A

(V-3420-19 (B8)

This revision was made to change the propeller shaft requirements from a No. 60-80 combination to No. 50-70.

Detail changes are as follows:

Page 1	Revision date March 12, 1943 added.
Par. E-7	Propellers. Reference to propeller shaft No. 50 and 80 changed to No. 50 and 70.
Par. E-14(1)	Preparation for Storage. Part No. 41310 changed to No. 36411 to provide a No. 50 propeller shaft thread cap.
Par. E-18	Propeller Drive. Reference to shaft size No.60 and 80 changed to No. 50 and 70. The following sentence has been deleted. "Gun clearance shall be provided through the propeller shafts as shown on the installation drawing."
Par. E-26	Engine Starting. In the last sentence reference to grade 1100a oil changed to grade 1100, in order to conform to the AN-VV-O-446a method of specifying the various grades.
Page 13	This page has been redrawn to show coordinates of mixture strength vs. per cent normal rated power rather than mixture strength vs. air flow. The change was made in order to be consistent with similar curves appearing in AN-9515B Specification.
Page 17	Reference A dated 1/5/43 added to AN-VV-O-446 lubricating oil.

NOTE: This revision record is submitted for your convenience. In case of discrepancy between the revision record and the specification, the specification shall be considered correct.